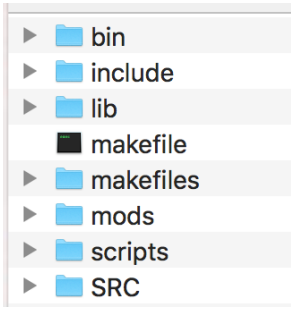
SUPPLEMENTS

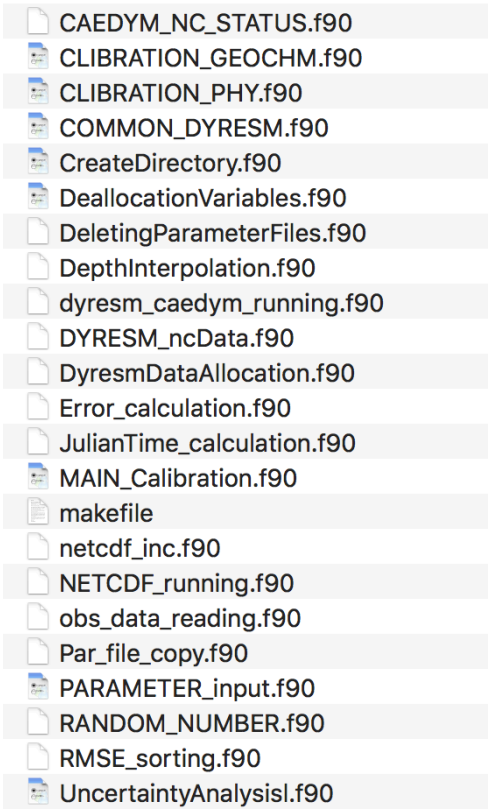
There are two folders for the source code. One is "NETCDF_TEST" including two fortran files reading the netcdf file information (e.g. all the variables, dimensional information, simulation time etc) produced by the model. The other folder is "AUTO_CALIBRATION" including all the fortran source code files for the automatic calibration. Both of the two folders are at the folder "SRC" (see below).

The folder "bin" is the place for the execuable files to be installed
The folder "include" includes all the "inc" files which are needed for the code compiling.
The folder "lib" include all the "lib" files which are needed for the code compiling.
The folder "makefiles" includes all the makefiles included in the root-path makefile.
The folder "mods" includes all the "mod" files which are needed for the code compiling.
The folder "scripts" includes all the script files which need to run before runing the root-path makefile.
The folder "SRC" includes two folders "NETCDF_TEST" and "AUTO_CALIBRATION".

1 - FOLDER / FILE STRUCTURE FOR THE SOUCE CODE PACKAGE



2 – ALL THE FILES AT THE FOLDER "AUTO_CALIBRATION"



Makefile for all the source code (root makefile)

```
SHELL = /bin/bash
OS = OSX
F90 = ifort
IFORT_TYPE = 64BIT

#-----------------------------------------------------------------------------#
# Debug on(1) or off(0)
# comment out the one you don't want
#-----------------------------------------------------------------------------#
ifeq ($(DEBUGON),)
   #DEBUGON = 0
   DEBUGON = 1
endif

#-----------------------------------------------------------------------------#
# Warning messages on(1) or off(0)
# comment out the one you don't want
#-----------------------------------------------------------------------------#
ifeq ($(WARNON),)
   #WARNON = 0
   WARNON = 1
endif

#-----------------------------------------------------------------------------#
CWRAPPS = $(shell pwd)
#-----------------------------------------------------------------------------#

BUNDLE_DIR = AUTO_DYCD_SensertivityUncertainty_2016
SCRIPTSDIR = $(CWRAPPS)/scripts
INCLUDE_DIR = $(CWRAPPS)/include
LIB_DIR = $(CWRAPPS)/lib
MOD_DIR = $(CWRAPPS)/mods
MAKEFILESDIR = $(CWRAPPS)/makefiles
AUTO_CALIBRATION = $(CWRAPPS)/SRC/AUTO_CALIBRATION
AUTO_OPENMP = $(CWRAPPS)/SRC/AUTO_DYCD_OpenMP
ELCD_GRADS = $(CWRAPPS)/SRC/ELCD_GRADS

NETCDF = $(CWRAPPS)/SRC/ExternalLibs/src/external/netcdf_src/netcdf-4.0
NETCDF_TEST= $(CWRAPPS)/SRC/NETCDF_TEST
NETCDF_EternalLibs =    $(CWRAPPS)/SRC/ExternalLibs
EXTERNAL_INCLUDE_DIR =    $(CWRAPPS)/SRC/ExternalLibs/include

DYCD =$(CWRAPPS)/SRC/ExternalLibs/src/external/CWRModelSource
DYCD_EXE = $(DYCD)//bin/OSX/ifort_64

$(source $(SCRIPTSDIR)/setDirectoryVariables.sh)

# Include the dirs
include $(MAKEFILESDIR)/makefile.dirs

INCLUDE_MAKEFILE = $(MAKEFILESDIR)/makefile.$(OS).$(F90)
include $(INCLUDE_MAKEFILE)

default:
	@echo "
	@echo '    make AUTO_CALIBRATION       - makes AUTO2_DYRESM executable file'
	@echo '    make AUTO_OPENMP              - makes AUTO2_DYRESM_OPEMMP executable file'
	@echo '    make CLEAN_AUTO               - clean the AUTO2 & NETCDF_TEST files'
	@echo '    make NETCDF                  - makes netcdf library'
	@echo '    make NETCDF_TEST              - makes NETCDF_TEST.exe for reading DYRISM.nc'
	@echo '    make ELCD_GRADS               - makes ELCD_GRADS executable file'
	@echo '    make DYCD                    - make DYRESM executable files'
	@echo '    make all                     - makes all programs including compiling NETCDF'
	@echo '    make all_noNETCDF             - makes all programs without compling NETCDF'
	@echo '    make clean                   - cleans all intermediate files'
#	@echo '    make cleandist             - cleans all intermediate files and removes executables'
#	@echo '    make tarball               - makes a cleaned archive of software bundle'
	@echo "

NETCDF:
	cd $(NETCDF_EternalLibs) && $(MAKE) clean
	cd $(NETCDF_EternalLibs) && $(MAKE) NETCDF
```

```
ELCD_GRADS :
	cd $(ELCD_GRADS); make DEBUGON="$(DEBUGON)" INCLUDE_MAKEFILE="$(INCLUDE_MAKEFILE)
$(MAKEFILESDIR)/makefile.dirs" ADD_F90_FLAGS="$(ADD_F90_FLAGS)" IFORT_TYPE="$(IFORT_TYPE)"
	cd $(ELCD_GRADS); make install DEBUGON="$(DEBUGON)" INCLUDE_MAKEFILE="$(INCLUDE_MAKEFILE)
$(MAKEFILESDIR)/makefile.dirs" ADD_F90_FLAGS="$(ADD_F90_FLAGS)" IFORT_TYPE="$(IFORT_TYPE)"

AUTO_CALIBRATION: COPY_EXTERNAL_LIB_FILES
#	cd $(AUTO_CALIBRATION); rm -f *.obj *.OBJ *.o *.O *.mod *.MOD *.exe *.EXE
	cd $(AUTO_CALIBRATION); make DEBUGON="$(DEBUGON)"
INCLUDE_MAKEFILE="$(INCLUDE_MAKEFILE) $(MAKEFILESDIR)/makefile.dirs"
ADD_F90_FLAGS="$(ADD_F90_FLAGS)" IFORT_TYPE="$(IFORT_TYPE)"
	cd $(AUTO_CALIBRATION); make install DEBUGON="$(DEBUGON)"
INCLUDE_MAKEFILE="$(INCLUDE_MAKEFILE) $(MAKEFILESDIR)/makefile.dirs"
ADD_F90_FLAGS="$(ADD_F90_FLAGS)" IFORT_TYPE="$(IFORT_TYPE)"
	-cp $(AUTO_CALIBRATION)/*.exe $(CWRAPPS)/bin
	-cp $(AUTO_CALIBRATION)/*.EXE $(CWRAPPS)/bin
	-cd $(AUTO_CALIBRATION); $(SCRIPTSDIR)/mvMods.sh $(MOD_DIR)

AUTO_OPENMP: COPY_EXTERNAL_LIB_FILES
	#	cd $(AUTO_OPENMP); rm -f *.obj *.OBJ *.o *.O *.mod *.MOD *.exe *.EXE
		cd $(AUTO_OPENMP); make DEBUGON="$(DEBUGON)"
INCLUDE_MAKEFILE="$(INCLUDE_MAKEFILE) $(MAKEFILESDIR)/makefile.dirs"
ADD_F90_FLAGS="$(ADD_F90_FLAGS)" IFORT_TYPE="$(IFORT_TYPE)"
		cd $(AUTO_OPENMP); make install DEBUGON="$(DEBUGON)"
INCLUDE_MAKEFILE="$(INCLUDE_MAKEFILE) $(MAKEFILESDIR)/makefile.dirs"
ADD_F90_FLAGS="$(ADD_F90_FLAGS)" IFORT_TYPE="$(IFORT_TYPE)"
		-cp $(AUTO_OPENMP)/*.exe $(CWRAPPS)/bin
		-cp $(AUTO_OPENMP)/*.EXE $(CWRAPPS)/bin
		-cd $(AUTO_OPENMP); $(SCRIPTSDIR)/mvMods.sh $(MOD_DIR)

DYCD:
	cd $(DYCD) && $(MAKE) clean
	cd $(DYCD) && $(MAKE) DYCD
	cd $(DYCD) && $(MAKE) DYCD-TOOLS
ifeq ($(IFORT_TYPE), 64BIT)
	-cp $(DYCD)/bin//$(OS)/$(F90)_64/*.* $(CWRAPPS)/bin
else
	-cp $(DYCD)/bin//$(OS)/$(F90)/*.* $(CWRAPPS)/bin
endif

NETCDF_TEST:
	cd $(NETCDF_TEST); rm -f *.obj *.OBJ *.o *.O *.mod *.MOD *.exe *.EXE
	cd $(NETCDF_TEST); make DEBUGON="$(DEBUGON)" INCLUDE_MAKEFILE="$(INCLUDE_MAKEFILE)
$(MAKEFILESDIR)/makefile.dirs" ADD_F90_FLAGS="$(ADD_F90_FLAGS)" IFORT_TYPE="$(IFORT_TYPE)"
	cd $(NETCDF_TEST); make install DEBUGON="$(DEBUGON)" INCLUDE_MAKEFILE="$(INCLUDE_MAKEFILE)
$(MAKEFILESDIR)/makefile.dirs" ADD_F90_FLAGS="$(ADD_F90_FLAGS)" IFORT_TYPE="$(IFORT_TYPE)"
	-cd $(NETCDF_TEST); $(SCRIPTSDIR)/mvMods.sh $(MOD_DIR)
	-cp $(NETCDF_TEST)/*.exe $(CWRAPPS)/bin
	-cp $(NETCDF_TEST)/*.EXE $(CWRAPPS)/bin

COPY_EXTERNAL_LIB_FILES:
	-cp $(EXTERNAL_INCLUDE_DIR)/*.* $(INCLUDE_DIR)
	-cp $(EXTERNAL_LIB_DIR)/*.* $(LIB_DIR)
	-cp $(EXTERNAL_INCLUDE_DIR)/*.mod $(INCLUDE_DIR)
	-cp $(EXTERNAL_LIB_DIR)/*.* $(LIB_DIR)

all:
	make clean
	cd $(NETCDF_EternalLibs) && $(MAKE) clean
	cd $(NETCDF_EternalLibs) && $(MAKE) NETCDF
	make AUTO_CALIBRATION
	make -B NETCDF_TEST
	make -B DYCD
	-cp $(CWRAPPS)/SRC/AUTO_CALIBRATION/*.exe $(CWRAPPS)/bin
	-cp $(CWRAPPS)/SRC/AUTO_CALIBRATION/*.EXE $(CWRAPPS)/bin
	-cp $(CWRAPPS)/SRC/AUTO_CALIBRATION/ExternalLibs/src/external/NETCDF_TEST/*.exe $(CWRAPPS)/bin
	-cp $(CWRAPPS)/SRC/AUTO_CALIBRATION/ExternalLibs/src/external/NETCDF_TEST/*.EXE $(CWRAPPS)/bin
	-cp $(DYCD_EXE)/*.*    $(CWRAPPS)/bin
all_noNETCDF: CLEAN_AUTO
	make AUTO_CALIBRATION
	make -B NETCDF_TEST
	-cp $(CWRAPPS)/SRC/AUTO_CALIBRATION/*.exe $(CWRAPPS)/bin
	-cp $(CWRAPPS)/SRC/AUTO_CALIBRATION/*.EXE $(CWRAPPS)/bin
	-cp $(CWRAPPS)/SRC/AUTO_CALIBRATION/ExternalLibs/src/external/NETCDF_TEST/*.exe $(CWRAPPS)/bin
	-cp $(CWRAPPS)/SRC/AUTO_CALIBRATION/ExternalLibs/src/external/NETCDF_TEST/*.EXE $(CWRAPPS)/bin
```

```
.PHONY: clean

CLEAN_AUTO:
	cd $(NETCDF_TEST); rm -f *.obj *.OBJ *.o *.O *.mod *.MOD *.exe *.EXE
	cd $(AUTO_CALIBRATION); rm -f *.obj *.OBJ *.o *.O *.mod *.MOD *.exe *.EXE

clean:
	cd $(NETCDF_TEST); rm -f *.obj *.OBJ *.o *.O *.mod *.MOD *.exe *.EXE
	cd $(AUTO_CALIBRATION); rm -f *.obj *.OBJ *.o *.O *.mod *.MOD *.exe *.EXE
	cd $(AUTO_OPENMP); rm -f *.obj *.OBJ *.o *.O *.mod *.MOD *.exe *.EXE
	cd $(DYCD) && $(MAKE) clean
#	cd $(NETCDF_EternalLibs) && $(MAKE) clean
	$(_BREAKPOINT)
d2u:
	find . -name "*" -exec d2u {} \;
```

FOLDER 1 - NETCDF_TEST in SRC

Makefile for NETCDF_TEST

```
#---- Set the shell ==-
SHELL = /bin/bash

#---- Include makefiles ==-
include $(INCLUDE_MAKEFILE)

#--==    target    ==--
TARGET = NETCDF_TEST

# Source files - order is important

SOURCES = COMMON_VAR.f90 Main_NetCDFreading.f90    # Libraries to include when linking
  INCLUDE_LIBS = $(INC_NETCDF) # INCLUDE_LIBS = $(INCLUDE_DIR)

# The make rules
include $(MAKEFILEDIR)/makefile.exe

```

COMMON_VAR.F90

```
!*******************************************************************************
!
!    PROGRAM: Auto-calibration of DYRESM-CAEDYM
!
!    MODIFICATION HISTORY:
!    --------------------
!    Original code : Liancong Luo 27/11/2008
!    Changed by Liancong Luo 25 June 2010.
!*******************************************************************************

MODULE DYRESM_COMMON
!-------VARAIABLES FOR NC FILES-------------------------------------------
!-------VARAIABLES FOR NC FILES-------------------------------------------
!-------VARAIABLES FOR NC FILES-------------------------------------------
integer, parameter:: Number_var=40

INTEGER, ALLOCATABLE :: NO_DIM_NETCDF(:,:)
INTEGER :: N1,N2,N3,N4,N5,N6,N7,N8,N9,N10
LOGICAL :: DYCD_ALIVE,ELCD_ALIVE,temp_alive
integer :: iMode    !1=dycd       3=elcd


   integer,parameter       :: mvrlen=4
   integer,parameter       :: mtlen=80    ,NUM_elcd_VAR=68
   integer     :: maxvars,maxatts
   integer                 :: ncid
   integer                 :: rcode
   integer                 :: ndims
   integer                 :: nvars
   integer                 :: natts
   integer                 :: recdim
   integer                 :: dimid
   integer                 :: varid
   integer                 :: vsize, status
   integer                 :: fsize
```

```
      integer, ALLOCATABLE    :: vartyp(:)
      integer, ALLOCATABLE                    :: vdims(:)
      integer, ALLOCATABLE                    :: vvdims(:,:)
      integer, ALLOCATABLE                    :: nvatts(:)
      character(len=31), ALLOCATABLE       :: dimnam(:)
      character(len=31), ALLOCATABLE       :: varnam(:)
      character(len=31), ALLOCATABLE       :: attnam(:,:)
      integer, ALLOCATABLE                    :: dimsiz(:)
      integer, ALLOCATABLE                    :: nvdims(:)
      integer, ALLOCATABLE                    :: attype(:,:)
      integer, ALLOCATABLE                    :: attlen(:,:)
      character(len=11), ALLOCATABLE       :: avt(:),avtgetvar(:)          !

      character(len=11)       :: avartyp(6),getvartyp(6)
      character(len=1024)    :: input_file
      character(len=1024)    :: output_file
      character(len=30)       :: nfcall
      data avartyp /'logical*1','character*1','integer*2','integer*4','real*4     ','real*8     '/
      data getvartyp /'logical','text','int2','int','real','double'/
      integer unlimdimid,ngatts
      character(len=1024):: text
      character(len=1024):: ch,char_temp,FMT
      character(len=1024):: chdim(50)
   character(LEN=20) :: VAR_NAME(1:NUM_elcd_VAR)
   character (len=100) :: temp_nc_name
   real*4, ALLOCATABLE     ::   dyresmLAYER_HTS_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmTEMPTURE_Var( :,: )
   !real*4, ALLOCATABLE     ::   dyresmDENSITY_Var( :,: )
   !real*4, ALLOCATABLE     ::   dyresmSALINITY_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmDO_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmNO3_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmNH4_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmTN_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmPO4_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmTP_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmCYANO_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmFDIAT_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmTCHLA_Var( :,: )

   !Liancong Luo added some variables here in June 2010 (Denmark)
   real*4, ALLOCATABLE     ::   dyresmPOCL_Var ( :,: )
   real*4, ALLOCATABLE     ::   dyresmDOCL_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmPOPL_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmDOPL_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmPONL_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmDONL_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmPOCR_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmDOCR_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmPOPR_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmDOPR_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmPONR_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmDONR_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmCRYPT_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmNODUL_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmDINOF_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmCHLOR_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmMDIAT_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmZOOP1_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmZOOP2_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmZOOP3_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmZOOP4_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmZOOP5_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmSSOL1_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmSSOL2_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmFISH1_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmFISH2_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmFISH3_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmBAC_Var( :,: )
   real*4, ALLOCATABLE     ::   dyresmPAR_Var( :,: )


   CHARACTER(LEN=31) :: DYRESM_VARname(1:Number_var)
   data(DYRESM_VARname(i),i=1,Number_var)/         &
   'dyresmLAYER_HTS_Var',                          &
```

```
'dyresmTEMPTURE_Var',                &
!'dyresmDENSITY_Var',                &
!'dyresmSALINITY_Var',               &
'dyresmDO_Var',                      &
'dyresmNO3_Var',                     &
'dyresmNH4_Var',                     &
'dyresmTN_Var',                      &
'dyresmPO4_Var',                     &
'dyresmTP_Var',                      &
'dyresmCYANO_Var',                   &
'dyresmFDIAT_Var',                   &
'dyresmTCHLA_Var',                   &
'dyresmPOCL_Var',                    &
'dyresmDOCL_Var',                    &
'dyresmPOPL_Var',                    &
'dyresmDOPL_Var',                    &
'dyresmPONL_Var',                    &
'dyresmDONL_Var',                    &
'dyresmPOCR_Var',                    &
'dyresmDOCR_Var',                    &
'dyresmPOPR_Var',                    &
'dyresmDOPR_Var',                    &
'dyresmPONR_Var',                    &
'dyresmDONR_Var',                    &
'dyresmCRYPT_Var',                   &
'dyresmNODUL_Var',                   &
'dyresmDINOF_Var',                   &
'dyresmCHLOR_Var',                   &
'dyresmMDIAT_Var',                   &
'dyresmZOOP1_Var',                   &
'dyresmZOOP2_Var',                   &
'dyresmZOOP3_Var',                   &
'dyresmZOOP4_Var',                   &
'dyresmZOOP5_Var',                   &
'dyresmSSOL1_Var',                   &
'dyresmSSOL2_Var',                   &
'dyresmFISH1_Var',                   &
'dyresmFISH2_Var',                   &
'dyresmFISH3_Var',                   &
'dyresmBAC_Var','dyresmPAR_Var'/

DATA(VAR_NAME(i),I=1,NUM_elcd_VAR)                                                    &
/'TEMPERATURE','U_VELOCITY','V_VELOCITY','W_VELOCITY','RETENTION_T','DENSITY','LW_RAD_IN',      &
'LW_RAD_NET','SOLAR_RAD','EVAP_VOL_FLUX','EVAP_MASS_FLUX','EVAP_HEAT_FLUX','HEIGHT',           &
'F_PRESSURE','T_PRESSURE','RI','SHEAR','MIX_ENERGY','MIX_FRACTION','MIX_REGIME',                &
'SHEAR_ENERGY','WIND_ENERGY','BBL_ENERGY','DISSIPATION' ,'TRACER_1',                            &
'DIC','POCL','DOCL','TOC','TPOC','TAC','PHYCEX','PHYCUP',                                      &
'TN','NH4','NO3','TKN','PONL','DONL','PIN','PHYNEX','PHYNUP','NITRF','DENIT',                  &
'TP','PO4','POPL','DOPL','PIP','PHYPEX','PHYPUP',                                              &
'CYANO','TCHLA','FDIAT','DO','BOD','PH','SSOL1','SSOL2',                                       &
'PAR','EXTC','DN_CYA','DN_FDI','TA','CMR','GPP','NPP','PPB'/


!-----------------VARIABLES FOR NC FILES ----------------------

      integer*4     :: start(10)
      integer*4     :: count(10)
      integer*4     :: dimids(10)! allow up to 10 dimensions
      integer*4     :: ndim, xtype
      integer*4     :: j,len
      character(len=31) :: dummy
!---------------------------------------------------------------
!    Define "scale_factor" and "add_offset" variables
!---------------------------------------------------------------
END MODULE DYRESM_COMMON
```

Main_NetCDFreading.f90

```
program nc2f90
USE DYRESM_COMMON
!USE NETCDFINC
include 'netcdf.inc'
write(6,'(a)')'READING NETCDF FILE...'
maxvars=1500
maxatts=300
```

```
INPUT_FILE='DYSIM.NC'
   !-------ALOOCATE DATA, CHANGED BY LIANCONG LUO----------
     ALLOCATE (vartyp(MAXVARS) )
  ALLOCATE (vdims(MAXVARS)           )
ALLOCATE (vvdims(MAXVARS,maxatts))
   ALLOCATE (nvatts(MAXVARS)       )
ALLOCATE (dimnam(MAXVARS)         )
ALLOCATE (varnam(MAXVARS)       )
ALLOCATE (attnam(MAXVARS,maxatts) )
ALLOCATE (dimsiz(MAXVARS)         )
ALLOCATE (nvdims(MAXVARS)         )
ALLOCATE (attype(MAXVARS,maxatts))
ALLOCATE (attlen(MAXVARS,maxatts)    )
  ALLOCATE (avt(MAXVARS))
  ALLOCATE (avtgetvar(MAXVARS))              !
        if (iargc() .eq. 2) then
            call getarg(2,output_file)
        else
            output_file = 'NETCDF_ReadingCode.f90'
        endif
        open(unit=10,file=trim(output_file),status='unknown')
        open(unit=11,file='Var_par.txt')
        open(unit=12,file='AllVar_PAR.txt')

!               status=nf_open(trim(input_file),nf_nowrite,ncid)
! READING DYDRSM FILE

INQUIRE(FILE='DYSIM.NC',EXIST=DYCD_ALIVE)
!INQUIRE(FILE='temp.NC',EXIST=DYCD_ALIVE)
IF(DYCD_ALIVE)THEN

!               status=nf_open('temp.nc.nc',nf_nowrite,ncid)
                status=nf_open('dysim.nc',nf_nowrite,ncid)
                  if ( status/=nf_noerr ) write (*,*) nf_strerror(status)

                imode=1

ELSE
WRITE(6,*)'DYSIM.NC does not exist'
INQUIRE(FILE='ALL.NC',EXIST=elcd_ALIVE)
IF(ELCD_ALIVE)THEN
                status=nf_open('ALL.nc',nf_nowrite,ncid)
                  if ( status/=nf_noerr ) write (*,*) nf_strerror(status)

                imode=3
ELSE
WRITE(6,*)'dyresm.nc and ALL.NC do not exist'
write(6,*)'Plese input the NETCDF file name (e.g. temp.nc)'
read(*,*)temp_nc_name
INQUIRE(FILE=temp_nc_name,EXIST=temp_ALIVE)
if(temp_ALIVE)then
                status=nf_open('temp.nc',nf_nowrite,ncid)
                  if ( status/=nf_noerr ) write (*,*) nf_strerror(status)

else
write(6,*)temp_nc_name//'does not exist.'
stop
endif

endif
endif

              status=nf_inq(ncid,ndims,nvars,ngatts,recdim)    !recdim=id of unlimdimid
            if ( status/=nf_noerr ) write (*,*) nf_strerror(status)

        do i=1,ndims
            dimid=i
                status=nf_inq_dim(ncid,dimid,dimnam(i),dimsiz(i))
                if ( status/=nf_noerr ) write (*,*) nf_strerror(status)
            if (recdim.ne.-1) numrecs=dimsiz(recdim)
        end do

        do i=1,nvars
            varid=i
       status=nf_inq_var(ncid,varid,varnam(i),vartyp(i),nvdims(i),vdims,nvatts(I))
```

```
        if ( status/=nf_noerr ) write (*,*) nf_strerror(status)

            if (nvdims(i).ne.0) then
                do k=1,nvdims(i)
                    vvdims(i,k)=vdims(k)
                end do
            endif

        end do

        do i=1,nvars
            varid=i
            do j=1,nvatts(i)
        status=nf_inq_attname(ncid,varid,j,attnam(i,j))
        if ( status/=nf_noerr ) write (*,*) nf_strerror(status)
        status=nf_inq_atttype(ncid,varid,attnam(i,j),attype(i,j))
        if ( status/=nf_noerr ) write (*,*) nf_strerror(status)
        status=nf_inq_attlen(ncid,varid,attnam(i,j),attlen(i,j))
        if ( status/=nf_noerr ) write (*,*) nf_strerror(status)
           end do
        end do


        do i=1,nvars
            varid=i
            avt(i)=avartyp(vartyp(varid))
               avtgetvar(i)=getvartyp(vartyp(varid))
        end do

        write(10,'(9a)') '!-------------------------------------------------------'
        write(10,'(9a)') '!    '
        write(10,'(9a)') '!    ',trim(output_file)
        write(10,'(9a)') '!       This file is a fortran template file designed to read the given'
        write(10,'(9a)') '!         netCDF file ',"'",trim(input_file),"'",' into memory.'
        write(10,'(9a)') '!    '
        write(10,'(9a)') '!    History: '
        write(10,'(9a)') '!    Date             Name                 Action'
        write(10,'(9a)') '!-------------------------------------------------------'
        write(10,'(9a)') '!    '
        write(10,'(9a)') '!    ?? Oct 1993    B. Schwartz      Created.'
        write(10,'(9a)') '!    24 Aug 1994    E. Boer            Modified dimension output.'
        write(10,'(9a)') '!    29 Jul 2007    S. Rupert         Standardized and reinstated required include of netcdf.inc. '
        write(10,'(9a)') '!    30 Jul 2007    S. Rupert         Added usage message and command line inputs.'
write(10,'(9a)') '!    03 Apr 2003    H. Yan           Change output to fortran 90 format, modified maximum dimesions to 5.'
write(10,'(9a)') '!    30 Mar 2004    H. Yan             Added usage message, retrieve "scale_factor" and "add_offset" parameters.'
write(10,'(9a)') '!    18 May 2006    H. Yan             Fixed bugs of dimensions definition and remark lines. '
write(10,'(9a)') '!    14 Nov 2008    L. Luo             Arrays are changed to be user-specified and delete the NUM2CHA in case &
                                                         of ARRAY BOUNDS EXCEEDED '
        write(10,'(9a)') '!-------------------------------------------------------'
        write(10,'(9a)') '!    Do not forget to include the -I path_to_netcdf_includes in your compile statement Required includes.'
        write(10,'(9a)') '!    Also note: need ','"','netcdf.lib','"',' or ','"','netcdfs.lib','"', ' when link .'
          write(10,'(9a)') "           include 'netcdf.inc'"
          write(10,'(9a)') '!'
            write(10,'(9a)') '!-------------------------------------------------------'
            write(10,'(9a)') '!'
            write(10,'(9a)') '!       Using below command line to get the head information of the NetCDF file:'
            write(10,'(9a)') '!       Please execute " ncdump -h ',trim(input_file),' > output.txt " '
            write(10,'(9a)') '!-------------------------------------------------------'
            write(10,'(9a)') '!'
          write(10,'(9a)') '!         Define Variables.'
  !       ch=num2cha(nvars)
            write(ch,*)nvars
          write(10,'(9a)') '!         Variable ids run sequentially from 1 to nvars=',trim(adjustl(ch)), ' ! number of variables'
  !       ch=num2cha(dimsiz(recdim))
  !there will be some problem if recdim=-1 !!!!!!!!!!!!!!!!!!
  ! write(6,*)recdim
  !write(6,*)dimsiz(recdim)
          if (recdim.ne.-1)    write(char_temp,*)dimsiz(recdim)
         if (recdim.ne.-1) write(10,'(9a)') '           integer,parameter :: nrec=',trim(adjustl(char_temp)),'    ! change this to generalize'
          write(10,'(9a)') '           integer*4    ncid, status','       ! file control'
          if (recdim.ne.-1) write(10,'(9a)') '           integer*4 recdim ','    ! record dimension'
            write(10,'(9a)') '!-------------------------------------------------------------'
!           ch=num2cha(nvars)
            write(char_temp,*)nvars
            write(10,'(9a)') ' !         Below ',trim(adjustl(char_temp)),' variables is the data in netCDF file'
```

```
            write(11,'(9a)') ' !         Below ',trim(adjustl(char_temp)),' variables is the data in netCDF file'
            do i=1,nvars
               varid=i
5           vsize=index(varnam(varid),' ')-1
            if (nvdims(varid).eq.0) write(10,'(9a)')    '           ',avt(varid),'              ',trim(varnam(varid))
            if (nvdims(varid).eq.0) write(11,'(9a)')    '           ',avt(varid),'              ',trim(varnam(varid))
                 if(nvdims(varid)>=1) then
                        do j=1,nvdims(varid)
10                              write(char_temp,*)dimsiz(vvdims(varid,j))
!                        chdim(j)=num2cha( dimsiz(vvdims(varid,j)) )
                         chdim(j)=char_temp
                         chdim(j)=adjustl(chdim(j))
                         enddo
15                 endif
            if (nvdims(varid).eq.1) then
                if (recdim.ne.-1) then
                   if (vvdims(varid,1).eq.recdim) then
!                       write(10,'(9a)') '          ',avt(varid),'       ',':',    ',trim(varnam(varid)(1:vsize)),'(nrec)'
20                     write(10,'(9a)') '          ',avt(varid),'       ',':',    ',trim(varnam(varid)),'(nrec)'
                       write(11,'(i10,9a)')i, '          ',avt(varid),'       ',':',    ',trim(varnam(varid)),'(nrec)'
                        endif
                   if (vvdims(varid,1).ne.recdim) then
                       write(10,'(9a)') '          ',avt(varid),'       ',':',    ',trim(varnam(varid)),'( ',trim(chdim(1)),' )'
25                     write(11,'(i10,9a)')i, '          ',avt(varid),'       ',':',    ',trim(varnam(varid)),'( ',trim(chdim(1)),' )'
!                       write(10,'(9a)') '          ',avt(varid),'       ',':',    ',trim(varnam(varid)(1:vsize)),'( ',trim(chdim(1)),' )'

                        endif
                endif
30              if (recdim.eq.-1) write(10,581) avt(varid),trim(varnam(varid)),(trim(chdim(j)),j=1,nvdims(varid))

                if (recdim.eq.-1) write(11,5811)i,    avt(varid),trim(varnam(varid)),(trim(chdim(j)),j=1,nvdims(varid))
!       trim(varnam(varid)(1:vsize)),(trim(chdim(j)),j=1,nvdims(varid))
!                    if (recdim.eq.-1)       WRITE(6,*)I,trim(varnam(varid)(1:vsize))
35  !                   PAUSE 55

  581           format(6x,a,2x,a,'( ',a,' )')
  5811           format(i10,6x,a,2x,a,'( ',a,' )')
            endif
40          if (nvdims(varid).eq.2) then
                if (recdim.ne.-1) then
                  if (nvdims(varid).eq.recdim) then
!        write(10,585) avt(varid),trim(varnam(varid)(1:vsize)),(trim(chdim(j)),j=1,nvdims(varid)-1)    !&
          write(10,585) avt(varid),trim(varnam(varid)),(trim(chdim(j)),j=1,nvdims(varid)-1)    !&
45        write(11,5851)i,    avt(varid),trim(varnam(varid)),(trim(chdim(j)),j=1,nvdims(varid)-1)    !&

             if(imode.eq.1)then
    DO KKK=1,Number_var
          IF((trim(ADJUSTL(ADJUSTR(varnam(varid))))).EQ.DYRESM_VARname(KKK))THEN
50        write(12,5852)i,    (trim(chdim(j)),j=1,nvdims(varid)-1), trim(varnam(varid)) !&
          ENDIF
            ENDDO
                  elseif(imode.eq.3)then
    DO KKK=1,NUM_elcd_VAR
55        IF((trim(ADJUSTL(ADJUSTR(varnam(varid))))).EQ.VAR_name(KKK))THEN
          write(12,5852)i,    (trim(chdim(j)),j=1,nvdims(varid)-1), trim(varnam(varid)) !&
          ENDIF
            ENDDO
            else
60          endif


  585               format(6x,a,4x,'::',2x,a,'( ',a,', nrec )')
  5851               format(i10,6x,a,4x,'::',2x,a,'( ',a,', nrec )')
65 5852               format(i10,6x,4x,' ',2x,'    ',a,'    ',a)
                  else
!        write(10,584) avt(varid),trim(varnam(varid)(1:vsize)),(trim(chdim(j)),j=1,nvdims(varid))    !&
          write(10,584) avt(varid),trim(varnam(varid)),(trim(chdim(j)),j=1,nvdims(varid))    !&
          write(11,5841)i,    avt(varid),trim(varnam(varid)),(trim(chdim(j)),j=1,nvdims(varid))    !&
70
          if(imode.eq.1)then
          DO KKK=1,Number_var
            IF(trim(ADJUSTL(ADJUSTR(varnam(varid)))).EQ.DYRESM_VARname(KKK))THEN
          write(12,5842)i,    (trim(chdim(j)),j=1,nvdims(varid)),trim(varnam(varid))    !&
75        ENDIF
```

```
            ENDDO
                  elseif(imode.eq.3)then
          DO KKK=1,NUM_elcd_VAR
            IF((trim(ADJUSTL(ADJUSTR(varnam(varid))))).EQ.VAR_name(KKK))THEN
          write(12,5842)i,    (trim(chdim(j)),j=1,nvdims(varid)-1), trim(varnam(varid)) !&
          ENDIF
            ENDDO

            else
            endif

   584              format(6x,a,4x,'::',2x,a,'( ',a,', ',a,' )')
   5841               format(I10,6x,a,4x,'::',2x,a,'( ',a,', ',a,' )')
   5842               format(I10,6x,4x,' ',2x,'    ',a,' ',a,'    ',a)

             endif
           endif
!            if (recdim.eq.-1) write(10,586) avt(varid),trim(varnam(varid)(1:vsize)),(trim(chdim(j)),j=1,nvdims(varid))    !&
           if (recdim.eq.-1) write(10,586) avt(varid),trim(varnam(varid)),(trim(chdim(j)),j=1,nvdims(varid))    !&
           if (recdim.eq.-1) write(11,5861)i,    avt(varid),trim(varnam(varid)),(trim(chdim(j)),j=1,nvdims(varid))    !&

if(imode.eq.1)then
          DO KKK=1,Number_var
            IF(trim(ADJUSTL(ADJUSTR(varnam(varid)))).EQ.DYRESM_VARname(KKK))THEN
          if (recdim.eq.-1) write(12,5862)i,    (trim(chdim(j)),j=1,nvdims(varid)),trim(varnam(varid))    !&
          ENDIF
            ENDDO
elseif(imode.eq.3)then
          DO KKK=1,NUM_elcd_VAR
            IF(trim(ADJUSTL(ADJUSTR(varnam(varid)))).EQ.VAR_name(KKK))THEN
          if (recdim.eq.-1) write(12,5862)i,    (trim(chdim(j)),j=1,nvdims(varid)),trim(varnam(varid))    !&
          ENDIF
            ENDDO
endif

   586              format(6x,a,4x,'::',2x,a,'( ',a,', ',a,' )')
   5861               format(I10,6x,a,4x,'::',2x,a,'( ',a,', ',a,' )')
   5862               format(I10,6x,4x,' ',2x,'    ',a,' ',a,'    ',a)

             endif
             if (nvdims(varid).eq.3) then
!                 if (recdim.ne.-1) write(10,590)
avt(varid),trim(varnam(varid)(1:vsize)),(trim(chdim(j)),j=1,nvdims(varid)-1)     !&
           if (recdim.ne.-1) write(10,590) avt(varid),trim(varnam(varid)),(trim(chdim(j)),j=1,nvdims(varid)-1)     !&
           if (recdim.ne.-1) write(11,5901)i,    avt(varid),trim(varnam(varid)),(trim(chdim(j)),j=1,nvdims(varid)-1)     !&

   if(imode.eq.1)then
          DO KKK=1,Number_var
            IF(trim(ADJUSTL(ADJUSTR(varnam(varid)))).EQ.DYRESM_VARname(KKK))THEN
                 if (recdim.ne.-1) write(12,5902)i, (trim(chdim(j)),j=1,nvdims(varid)-1), trim(varnam(varid))     !&
          ENDIF
            ENDDO
elseif(imode.eq.3)then
          DO KKK=1,NUM_elcd_VAR
            IF(trim(ADJUSTL(ADJUSTR(varnam(varid)))).EQ.VAR_name(KKK))THEN
                 if (recdim.ne.-1) write(12,5902)i, (trim(chdim(j)),j=1,nvdims(varid)-1), trim(varnam(varid))     !&
          ENDIF
            ENDDO
endif

   590              format(6x,a,4x,'::',2x,a,'( ',a,', ',a,', nrec )')
   5901               format(I10,6x,a,4x,'::',2x,a,'( ',a,', ',a,', nrec )')
   5902               format(I10,6x,4x,' ',2x,'    ',a,' ',a,'    ',a)

!            if (recdim.eq.-1) write(10,591) avt(varid),trim(varnam(varid)(1:vsize)),(trim(chdim(j)),j=1,nvdims(varid))     !&
           if (recdim.eq.-1) write(10,591) avt(varid),trim(varnam(varid)),(trim(chdim(j)),j=1,nvdims(varid))     !&
           if (recdim.eq.-1) write(11,5911)i,    avt(varid),trim(varnam(varid)),(trim(chdim(j)),j=1,nvdims(varid))     !&

   if(imode.eq.1)then
          DO KKK=1,Number_var
            IF(trim(ADJUSTL(ADJUSTR(varnam(varid)))).EQ.DYRESM_VARname(KKK))THEN
                 if (recdim.eq.-1) write(12,5912)i,    trim(varnam(varid)),(trim(chdim(j)),j=1,nvdims(varid))     !&
          ENDIF
            ENDDO
```

```
elseif(imode.eq.3)then
        DO KKK=1,NUM_elcd_VAR
          IF(trim(ADJUSTL(ADJUSTR(varnam(varid)))).EQ.VAR_name(KKK))THEN
               if (recdim.eq.-1) write(12,5912)i,    trim(varnam(varid)),(trim(chdim(j)),j=1,nvdims(varid))      !&
        ENDIF
          ENDDO
endif



  591               format(6x,a,4x,'::',2x,a,'( ',a,', ',a,', ',a,' )')
  5911               format(i10,6x,a,4x,'::',2x,a,'( ',a,', ',a,', ',a,' )')
  5912               format(i10,6x,4x,' ',2x,a,'    ',a,' ',a,', ',a,'    ')
           endif
           if (nvdims(varid).eq.4) then
!                if (recdim.ne.-1) write(10,595) avt(varid),varnam(varid)(1:vsize),(trim(chdim(j)),j=1,nvdims(varid)-1)      !&
                 if (recdim.ne.-1) write(10,595) avt(varid),trim(adjustl(varnam(varid))),(trim(chdim(j)),j=1,nvdims(varid)-1)      !&
if (recdim.ne.-1)    write(11,5951)i,avt(varid),trim(adjustl(varnam(varid))),(trim(chdim(j)),j=1,nvdims(varid)-1)      !&

  if(imode.eq.1)then

        DO KKK=1,Number_var
          IF(trim(ADJUSTL(ADJUSTR(varnam(varid)))).EQ.DYRESM_VARname(KKK))THEN
 !                if (recdim.ne.-1) write(12,5952)i,    trim(adjustl(varnam(varid))),(trim(chdim(j)),j=1,nvdims(varid)-1)      !&
                 if (recdim.ne.-1) write(12,5952)i, (trim(chdim(j)),j=1,nvdims(varid)-1), trim(adjustl(varnam(varid)))      !&
        ENDIF
          ENDDO
elseif(imode.eq.3)then
        DO KKK=1,NUM_elcd_VAR
          IF(trim(ADJUSTL(ADJUSTR(varnam(varid)))).EQ.VAR_name(KKK))THEN
!this is the line for ELCOM output
                 if (recdim.ne.-1) write(12,5952)i, (trim(chdim(j)),j=1,nvdims(varid)-1), trim(adjustl(varnam(varid)))      !&
        ENDIF
          ENDDO
endif


595               format(6x,a,2x,a,'( ',a,', ',a,', ',a,', nrec )')
5951               format(I10,6x,a,2x,a,'( ',a,', ',a,', ',a,', nrec )')
5952               format(I10,6x,2x,a,'          ',a,'          ',a,'          ',a,'          ',a)

!                if (recdim.eq.-1) write(10,596) avt(varid),varnam(varid)(1:vsize),(trim(chdim(j)),j=1,nvdims(varid))      !&
                 if (recdim.eq.-1) write(10,596) avt(varid),trim(adjustl(varnam(varid))),(trim(chdim(j)),j=1,nvdims(varid))      !&
               if (recdim.eq.-1) write(11,5961)i,    avt(varid),trim(adjustl(varnam(varid))),(trim(chdim(j)),j=1,nvdims(varid))      !&
  596               format(6x,a,2x,a,'( ',a,', ',a,', ',a,', ',a,' )')
  5961               format(I10,6x,a,2x,a,'( ',a,', ',a,', ',a,', ',a,' )')
           endif
              if (nvdims(varid).eq.5) then
               if (recdim.ne.-1) write(10,597) avt(varid),trim(adjustl(varnam(varid))),(trim(chdim(j)),j=1,nvdims(varid)-1)      !&
             if (recdim.ne.-1) write(11,5971)i,    avt(varid),trim(adjustl(varnam(varid))),(trim(chdim(j)),j=1,nvdims(varid)-1)      !&
!                if (recdim.ne.-1) write(10,597) avt(varid),varnam(varid)(1:vsize),(trim(chdim(j)),j=1,nvdims(varid)-1)      !&
  597               format(6x,a,2x,a,'( ',a,', ',a,', ',a,', ',a,', nrec )')
  5971               format(I10,6x,a,2x,a,'( ',a,', ',a,', ',a,', ',a,', nrec )')
!                if (recdim.eq.-1) write(10,598) avt(varid),varnam(varid)(1:vsize),(trim(chdim(j)),j=1,nvdims(varid))      !&
                 if (recdim.eq.-1) write(10,598) avt(varid),trim(adjustl(varnam(varid))),(trim(chdim(j)),j=1,nvdims(varid))      !&
               if (recdim.eq.-1) write(10,5981)i, avt(varid),trim(adjustl(varnam(varid))),(trim(chdim(j)),j=1,nvdims(varid))      !&
  598               format(6x,a,2x,a,'( ',a,', ',a,', ',a,', ',a,', ',a,' )')
  5981               format(i10,6x,a,2x,a,'( ',a,', ',a,', ',a,', ',a,', ',a,' )')
           endif
        end do
  !       ch=num2cha(nvars)
  write(char_temp,*)nvars
!          write(6,'(a)')ch
           write(10,'(9a)') '!         above',trim(adjustl(char_temp)),' variables is the data in netCDF file'
           write(10,'(9a)') '!-------------------------------------------------------------'
         write(10,'(9a)') '         integer*4      :: start(10)'
           write(10,'(9a)') '         integer*4      :: count(10)'
         write(10,'(9a)') '         integer*4      :: dimids(10)',    '! allow up to 10 dimensions'
           write(10,'(9a)') '         integer*4      :: ndim, xtype'
           write(10,'(9a)') '         integer*4      :: natts,j,len'
         write(10,'(9a)') '         character(len=31) :: dummy'
         write(10,'(9a)') '!-------------------------------------------------------------'
           write(10,'(9a)') '!    Define "scale_factor" and "add_offset" variables'

               do i=1,nvars;do j=1,maxatts
```

```
      write(char_temp,*)i
                        if(attnam(i,j)=='scale_factor') then
!           write(10,*) '           ',avartyp(attype(i,j)), '::', '    scale'//TRIM(NUM2CHA(I))//'(1)',",",' add'//TRIM(NUM2CHA(I))//'(1)'
            write(10,*) '           ',avartyp(attype(i,j)), '::', '    scale'//TRIM(char_temp)//'(1)',",",' add'//TRIM(char_temp)//'(1)'
                        endif
                  enddo;enddo

            write(10,'(9a)') '!------------------------------------------------------------------'


             write(10,'(9a)') ''
             write(10,'(9a)') '! Open netCDF file.'
             write(10,'(9a)') ''           status=nf_open('',trim(input_file),'',',nf_nowrite,ncid)'
               write(10,'(9a)') '                  if ( status/=nf_noerr ) write (*,*) nf_strerror(status)'

             if (recdim.ne.-1) then
                 write(10,*)
              endif


             do i=1,nvars
                 write(10,'(9a)')
                    write(10,'(9a)') '!-------------------------------------------------------'
                    write(10,'(9a)') '!      Retrieve data for Variable ', '''',trim(varnam(i)),''''
                    do j=1,20
                    if(attnam(i,j)=='long_name') then
                    status=nf_get_att_text(ncid,i,'long_name',text)
                    ch='!      Long_name of '// ''''//trim(varnam(i))//''''//' is '//''''//trim(text(1:attlen(i,j)))//''''
                    write(10,'(a)')    trim(adjustl(ch))
                    elseif(attnam(i,j)=='units') then
                  status=nf_get_att_text(ncid,i,'units',text)
                  ch='!      Units of '// ''''//trim(varnam(i))//''''//' is '//''''//trim(text(1:attlen(i,j)))//''''
                    write(10,'(a)')    trim(adjustl(ch))
                    endif
                    enddo

                 lenstr=1
                 k=0
                 write(10,1015) i
      1015       format(6x,'status=nf_inq_var(ncid,',i4,',dummy,xtype,ndim,dimids,natts)')
                    write(10,'(9a)') '                  if ( status/=nf_noerr ) write (*,*) nf_strerror(status)'
                 write(10,'(9a)')    '           do j=1,ndim'
                 write(10,'(9a)') '          status=nf_inq_dim(ncid,dimids(j),dummy,len)'
                    write(10,'(9a)') '                  if ( status/=nf_noerr ) write (*,*) nf_strerror(status)'
                 write(10,'(9a)') '          start(j)=1 ; count(j)=len'
                 write(10,'(9a)') '          end do'

                  if (vartyp(i).eq.2) then
                    nfcall='status=nf_get_vara_'//trim(avtgetvar(i))
                     write(10,1250) nfcall,i,trim(varnam(i))
      1250           format(6x,a,'(ncid,',i4,',start,',count,',a,')')
                 else
                    nfcall='status=nf_get_vara_'//trim(avtgetvar(i))

                     write(10,1350) trim(nfcall),i,trim(varnam(i))
      1350           format(6x,a,'(ncid,',i4,',start,',count,',a,')')
                 endif

                    iiflag=0
                    do j=1,maxatts
                    if(attnam(i,j)=='scale_factor' .or. attnam(i,j)=='add_offset') then
                       iiflag=iiflag+1
                          if(iiflag==1) then
                            write(10,'(9a)') ''
                                                write(char_temp,*)i
                   write(10,'(9a)') '          scale'//TRIM(char_temp)//'(1)',' =0.0',' ; ','add'//TRIM(char_temp)//'(1)',' =0.0'
!                   write(10,'(9a)') '          scale'//TRIM(NUM2CHA(I))//'(1)',' =0.0',' ; ','add'//TRIM(NUM2CHA(I))//'(1)',' =0.0'
                            write(10,'(9a)') '! Scale_factor and add_offset for variable ', '''', trim(varnam(i)), ''''
                          endif

                        nfcall='status=nf_get_att_'//trim(getvartyp(attype(i,j)))
                          text=attnam(i,j)
                          write(char_temp,*)i
                        if(attnam(i,j)=='scale_factor') then
!                         write(10,1360) trim(nfcall),i,trim(text),'scale'//TRIM(NUM2CHA(I))//'(1)'
```

```
                        write(10,1360) trim(nfcall),i,trim(text),'scale'//TRIM(char_temp)//'(1)'
                        else
                        write(10,1360) trim(nfcall),i,trim(text),'add'//TRIM(char_temp)//'(1)'
                        endif
 1360          format(6x,a,'(ncid,',i4,',',"""",a,"""",',',a,')')
               endif
               enddo

               if(iiflag/=0) then
                 write(10,'(9a)') ''
                 write(10,'(9a)') '! add scale_factor and add_offset to get true value'
                 ch='! Caution: variable type of '//"""//trim(varnam(i))//"""//' may not as the same as the type of'
                 write(10,'(a)') trim(adjustl(ch))
                 write(char_temp,*)i
write(10,'(9a)') '! ',"""",'scale'//trim(char_temp)//'(1)',"""", ' and ', """,'add'//trim(char_temp)//'(1)',"""",', you must change it youself!'
write(10,'(9a)') '            ',trim(varnam(i)),'=',trim(varnam(i)),'*','scale'//trim(char_temp)//'(1)','+','add'//trim(char_temp)//'(1)'
               endif

        end do
          write(10,'(9a)') ''
          write(10,'(9a)') '! -----------      Some useful advices    ----------'
          write(10,'(9a)') '! If dimensions of a variable exceed 3, there can be an error (or warning)'
          write(10,'(9a)') '! "warning LNK4084: total image size 382214144 exceeds max (268435456); image may not run"'
          write(10,'(9a)') '! when link this program. The best way to resolve it: decrease dimensions'
          write(10,'(9a)') '! of the variable, use "do ...    end do" cycle to get little data at one time.'
          write(10,'(9a)') '! See NetCDF mannual to look for how to control the dimensions.'
          write(10,'(9a)') '!------------      End suggestions      -------------'
          write(10,'(9a)') ''
          write(10,'(9a)') '!-----------------------------------------------------'
        write(10,'(9a)') '!    Begin writing statements to use the data.'
        write(10,'(9a)') ''
          write(10,'(9a)') ''
          write(10,'(9a)') '!         Here write your own code please!'
        write(10,'(9a)') ''
          write(10,'(9a)') ''
          write(10,'(9a)') '!-----------------------------------------------------'
          write(10,'(9a)') '!    End Program'
          write(10,'(9a)') '              stop'
          write(10,'(9a)') '              end'
!c
        write(*,*)
          write(*,'(9a)')'Generated F90 program named ',"""",trim(output_file),""""
          write(*,*)
write(12,'(A3)')'EOF'

!c
close(10)
close(11)
CLOSE(12)
!       status=nf_close(ncid)

          status=nf_close(ncid)
        if ( status/=nf_noerr ) write (*,*) nf_strerror(status)
DEALLOCATE ( vartyp,vdims,vvdims,nvatts,dimnam,varnam,attnam,dimsiz,nvdims,attype,attlen,avt,avtgetvar)
!deALLOCATE (NO_DIM_NETCDF,dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var,dyresmDO_Var,          &
!               dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var,dyresmTP_Var,      &
!               dyresmCYANO_Var,dyresmFDIAT_Var,dyresmTCHLA_Var)

   !              status=nf_inq(ncid,ndims,nvars,ngatts,recdim)    !recdim=id of unlimdimid


!-------------------------------PROBLEM HERE-----------------------------------
!-------------------------------RE-OPEN THE NETCDF FILE------------------------
!             status=nf_open('dysim.nc',nf_nowrite,ncid)
!               if ( status/=nf_noerr ) write (*,*) nf_strerror(status)

 !     status=nf_close(ncid)

END program nc2f90
```

FOLDER 2 - AUTO_CALIBRATION in SRC

Makefile for AUTO_CALIBRATION

```
#---- Set the shell ==-
SHELL = /bin/bash

#---- Include makefiles ==-
include $(INCLUDE_MAKEFILE)

#--==   target   ==--
TARGET = AUTO_DYCD_MAC

# Source files - order is important

SOURCES =   netcdf_inc.f90                  \
            COMMON_DYRESM.f90               \
            PARAMETER_input.f90             \
            RANDOM_NUMBER.                  \
            DeallocationVariables.f90       \
            dyresm_caedym_running.f90       \
            Par_file_copy.f90               \
            CAEDYM_NC_STATUS.f90            \
            DeletingParameterFiles.f90      \
            NETCDF_running.f90              \
            CLIBRATION_GEOCHM.f90           \
            DYRESM_ncData.f90               \
            CreateDirectory.f90             \
            JulianTime_calculation.f90      \
            DepthInterpolation.f90          \
            obs_data_reading.f90            \
            CLIBRATION_PHY.f90              \
            DyresmDataAllocation.f90        \
            RMSE_sorting.f90                \
            Error_calculation.f90           \
            UncertaintyAnalysisl.f90        \
            MAIN_Calibration.f90
# Libraries to include when linking
INCLUDE_LIBS = $(INC_NETCDF)

# The make rules
include $(MAKEFILEDIR)/makefile.exe
```

COMMON_DYRESM.f90

```
MODULE DYRESM_COMMON

!******************************************************************************
!
!   PROGRAM: Auto-calibration of DYRESM-CAEDYM
!
!   MODIFICATION HISTORY:                                                  !   NN_LINE_CHM_par
!   --------------------
!   Original code : Liancong Luo 27/11/2008
!   Modification: Liancong Luo 26 June 2010 NERI
!*****************************************************************************CRYPT

!variables for auto_calibration

   ! Definition of directories, filenames, commands and calibration steps
   PUBLIC


real*8 random_no

   LOGICAL :: FILE_ALIVE ,AllVarTxt_alive
   REAL(KIND=8) :: Start_day
   REAL(KIND=8) , ALLOCATABLE :: FoutTime(:)
   INTEGER :: I_SWITCH_NC_DAILY_HOURLY, MODEL_DAYS, I_SWITCH_UNCERTAINTY

   real, PARAMETER          :: small_value_TIME=2.50E-5
integer, parameter :: I_defaultValue=9999
real(KIND=8), parameter    :: default_value=99999999.0
real(KIND=8), parameter    :: big_value=1.0E+25
real(KIND=8), parameter    :: default_value0=99999999.0

character(len=50) :: char_char, fmtfmt
character(len=3), PARAMETER :: FILE_END='EOF'
```

```
CHARACTER(LEN=1),PARAMETER :: COMMENT='!'
CHARACTER(LEN=1) :: FIRST_CHAR
CHARACTER(LEN=500) :: FILE_NAME_TEMP
INTEGER :: nUNC_loop_VALID       !THE TOTAL LOOP NUMBERS - ERROR SIMULATION NUMBERS
   CHARACTER(LEN=500):: CURRENT_DIR
   ! MODIFIED BY LIANCOGN 25 JUNE 2010 (NERI)
INTEGER :: NC_STATUS_DYSIM    ! 1 means that the nc file is ok (with caedym), 0 means wrong file then go to the next loop
   INTEGER :: I_ALLOCATED    ! 1 MEANS THE VARIABLES HAVE BEEN ALLOCATED AND DON'T NEED MORE ALLOCATION AGAIN

   ! 2----------read the par, chm, bio, cfg and sed file and make a copy of them ----------INTEGER, PARAMETER    :: NN_line_Bio=1387,NN_LINE_CHM=529,NN_LINE_SED=177,    num_CAEDYM_VARname=40
   INTEGER, PARAMETER    :: NN_Line_bio_par=1300,NN_Line_chm_par=155,NN_LINE_SED_PAR=159
   INTEGER, PARAMETER    :: NN_line_cfg=14,NN_LINE_par=16      !,NN_LINE_stg=165

!old code here
!    INTEGER, PARAMETER    :: NN_line_Bio=1388,NN_LINE_CHM=529,NN_LINE_SED=165
!    INTEGER, PARAMETER    :: NN_Line_bio_par=1300,NN_Line_chm_par=155,NN_LINE_SED_PAR=159
!    INTEGER, PARAMETER    :: NN_line_cfg=14,NN_LINE_par=16      !,NN_LINE_stg=165
character(len=8) :: CAEYM_VARname(1:num_CAEDYM_VARname)
character(len=8) :: Simulated_CAEYM_VARname(1:num_CAEDYM_VARname)
character(len=9) :: Simulated_CAEYM_VARname2(1:num_CAEDYM_VARname)    !this is for output list in cfg file
character(len=8) :: CAEDYM_VARNAME_TEMP    !for reading the var name at config file.
INTEGER :: NUM_SIMULATED_VAR,NUM_AllVarTxt,NUMBER_TEMP_delete


   character(len=1024) :: Note_chm(1:NN_LINE_CHM),Note_BIO(1:NN_LINE_BIO),    &
                          Note_SED(1:NN_LINE_SED),NOTE_CFG(1:NN_line_cfg),note_comment
   character(len=1):: cc
   integer :: icc
   integer :: Line_NO_chm_note(1:NN_Line_chm_par),Line_NO_chm_number(1:NN_Line_chm_par)
   integer :: Line_NO_BIO_note(1:NN_Line_BIO_par),Line_NO_BIO_number(1:NN_Line_BIO_par)
   integer :: Line_NO_SED_note(1:NN_Line_SED_par),Line_NO_SED_number(1:NN_Line_SED_par)
   integer :: I_chm_note, I_chm_number,I_BIO_note, I_BIO_number,I_SED_note, I_SED_number
   INTEGER :: NUM_LOOP

!REAL :: RANDOM_NO, RANDOM_XX

 real(kind=8)    :: par_chm(1:NN_LINE_CHM,1:2)      !chm parameter
 real(kind=8)    :: par_BIO(1:NN_LINE_BIO,1:2)      !BIO parameter
 real(kind=8)    :: par_SED(1:NN_LINE_SED,1:2)      !SED parameter

 real(kind=8) :: confidenceInt,Average,Std, F_kutosis, Skewness


INTEGER :: I_SWITCH_PHY,I_SWITCH_BIO,I_SWITCH_CHM,I_SWITCH_SED, I_fileSwitch
!, I_SWITCH_NCfileOK    !record the right simulation

   real(kind=8), ALLOCATABLE    :: par_chm_RANDOM(:,:)      !chm parameter
   real(kind=8), ALLOCATABLE    :: par_BIO_RANDOM(:,:)      !BIO parameter
   real(kind=8), ALLOCATABLE    :: par_SED_RANDOM(:,:)      !SED parameter

integer, ALLOCATABLE :: NUMBER_FILESsAVED0(:),NUMBER_FILESsAVED1(:)
 !FOR SORTING NUMBERS INTERM OF ERROR_EVERY_LOOP

   CHARACTER(LEN=1024) :: NOTE_LINE_TEMP

!    real :: STDO, STDM, MBE, MNBE, MAGE, MANGE, SSE, MSE, RMSE, RMNSE, E_Nash, R_Pearson

 integer :: NUMBER_obsVar,i_temp,I_SWITCH_DELEparFile,NUMBER_FILESsAVED
 REAL (KIND=8) :: TOTAL_ERROR_everyLoop
 !CHARACTER (LEN=100) :: obsVar_name(:)

 REAL (KIND=8),ALLOCATABLE :: ERROR_ALLerror0(:),ERROR_ALLerror1(:)      !for the sorting
 integer , allocatable :: number_ERROR_ALLerror0(:),number_ERROR_ALLerror1(:), NUMBER_error_SORTED(:)


 TYPE TOTAL_ERROR_SIMULAITONS    !this is the total error for all the error parmeters (MBE, MNBE...)
 REAL (KIND=8),ALLOCATABLE :: ERROR_TOTAL(:,:)      !FOR A SELECTED ERROR (RMSE, R, OR OTHERS)

 INTEGER, ALLOCATABLE :: SerNumber_ERROR_TOTAL(:,:)
!10 ERROR VARIABLE, AND NO_LOOP TIME SERIALS

 REAL (KIND=8),ALLOCATABLE :: ERROR_TOTAL_SORTED(:,:)
 !FOR A SELECTED ERROR (RMSE, R, OR OTHERS)
```

```
  INTEGER, ALLOCATABLE :: SerNumber_ERROR_TOTAL_SORTED(:,:)
!10 ERROR VARIABLE, AND NO_LOOP TIME SERIALS

  ENDTYPE !TOTAL_ERROR_SIMULAITONS

integer :: nUNC_loopFirst,nUNC_loopBest,nUNC_layer, num_VAR_UNCERTAINTY
INTEGER, ALLOCATABLE :: No_Ser_Var_UNCERTAINTY(:)
!THE SERIAL NUMBERS FOR VARIABLES FOR UNCERTAINTY ANALYSIS
REAL (KIND=8), ALLOCATABLE :: DEPTH_UNCERTAINTY(:)
REAL (KIND=8) :: BDAY_UNCERTAINTY,EDAY_UNCERTAINTY
INTEGER :: NO_OUTPUT_data      ! = N3, THE NUMBER OF OUTPUT, SimulatedDays*24*3600/timestep

  TYPE Uncertainty !this is the total error for all the error parmeters (MBE, MNBE...)
INTEGER, allocatable :: NUMBER_UNCERTAINTY(:)
real(kind=8), ALLOCATABLE     ::   Uncertainty_TdyresmLAYER_HTS( :,: ,:)     !Loops, TimeSteps, Layers    1
real(kind=8), ALLOCATABLE     ::   Uncertainty_TEMPTURE( :,: ,:)     !Loops, TimeSteps, Layers              2
real(kind=8), ALLOCATABLE     ::   Uncertainty_DO( :,: ,:)     !Loops, TimeSteps, Layers                   3
real(kind=8), ALLOCATABLE     ::   Uncertainty_NO3( :,: ,:)     !Loops, TimeSteps, Layers                  4
real(kind=8), ALLOCATABLE     ::   Uncertainty_NH4( :,: ,:)     !Loops, TimeSteps, Layers                  5
real(kind=8), ALLOCATABLE     ::   Uncertainty_TN( :,: ,:)     !Loops, TimeSteps, Layers                   6
real(kind=8), ALLOCATABLE     ::   Uncertainty_PO4( :,: ,:)     !Loops, TimeSteps, Layers                  7
real(kind=8), ALLOCATABLE     ::   Uncertainty_TP( :,: ,:)     !Loops, TimeSteps, Layers                   8
real(kind=8), ALLOCATABLE     ::   Uncertainty_CYANO( :,: ,:)     !Loops, TimeSteps, Layers                9
real(kind=8), ALLOCATABLE     ::   Uncertainty_FDIAT( :,: ,:)     !Loops, TimeSteps, Layers                10
real(kind=8), ALLOCATABLE     ::   Uncertainty_TCHLA( :,: ,:)     !Loops, TimeSteps, Layers                11
real(kind=8), ALLOCATABLE     ::   Uncertainty_POCL ( :,: ,:)     !Loops, TimeSteps, Layers                12
real(kind=8), ALLOCATABLE     ::   Uncertainty_DOCL( :,: ,:)     !Loops, TimeSteps, Layers                 13
real(kind=8), ALLOCATABLE     ::   Uncertainty_POPL( :,: ,:)     !Loops, TimeSteps, Layers                14
real(kind=8), ALLOCATABLE     ::   Uncertainty_DOPL( :,: ,:)     !Loops, TimeSteps, Layers                15
real(kind=8), ALLOCATABLE     ::   Uncertainty_PONL( :,: ,:)     !Loops, TimeSteps, Layers                16
real(kind=8), ALLOCATABLE     ::   Uncertainty_DONL( :,: ,:)     !Loops, TimeSteps, Layers                17
real(kind=8), ALLOCATABLE     ::   Uncertainty_POCR( :,: ,:)     !Loops, TimeSteps, Layers                18
real(kind=8), ALLOCATABLE     ::   Uncertainty_DOCR( :,: ,:)     !Loops, TimeSteps, Layers                19
real(kind=8), ALLOCATABLE     ::   Uncertainty_POPR( :,: ,:)     !Loops, TimeSteps, Layers                20
real(kind=8), ALLOCATABLE     ::   Uncertainty_DOPR( :,: ,:)     !Loops, TimeSteps, Layers                21
real(kind=8), ALLOCATABLE     ::   Uncertainty_PONR( :,: ,:)     !Loops, TimeSteps, Layers                22
real(kind=8), ALLOCATABLE     ::   Uncertainty_DONR( :,: ,:)     !Loops, TimeSteps, Layers                23
real(kind=8), ALLOCATABLE     ::   Uncertainty_CRYPT( :,: ,:)     !Loops, TimeSteps, Layers               24
real(kind=8), ALLOCATABLE     ::   Uncertainty_NODUL( :,: ,:)     !Loops, TimeSteps, Layers               25
real(kind=8), ALLOCATABLE     ::   Uncertainty_DINOF( :,: ,:)     !Loops, TimeSteps, Layers               26
real(kind=8), ALLOCATABLE     ::   Uncertainty_CHLOR( :,: ,:)     !Loops, TimeSteps, Layers               27
real(kind=8), ALLOCATABLE     ::   Uncertainty_MDIAT( :,: ,:)     !Loops, TimeSteps, Layers               28
real(kind=8), ALLOCATABLE     ::   Uncertainty_ZOOP1( :,: ,:)     !Loops, TimeSteps, Layers               29
real(kind=8), ALLOCATABLE     ::   Uncertainty_ZOOP2( :,: ,:)     !Loops, TimeSteps, Layers               30
real(kind=8), ALLOCATABLE     ::   Uncertainty_ZOOP3( :,: ,:)     !Loops, TimeSteps, Layers               31
real(kind=8), ALLOCATABLE     ::   Uncertainty_ZOOP4( :,: ,:)     !Loops, TimeSteps, Layers               32
real(kind=8), ALLOCATABLE     ::   Uncertainty_ZOOP5( :,: ,:)     !Loops, TimeSteps, Layers               33
real(kind=8), ALLOCATABLE     ::   Uncertainty_SSOL1( :,: ,:)     !Loops, TimeSteps, Layers               34
real(kind=8), ALLOCATABLE     ::   Uncertainty_SSOL2( :,: ,:)     !Loops, TimeSteps, Layers               35
real(kind=8), ALLOCATABLE     ::   Uncertainty_FISH1( :,: ,:)     !Loops, TimeSteps, Layers               36
real(kind=8), ALLOCATABLE     ::   Uncertainty_FISH2( :,: ,:)     !Loops, TimeSteps, Layers               37
real(kind=8), ALLOCATABLE     ::   Uncertainty_FISH3( :,: ,:)     !Loops, TimeSteps, Layers               38
real(kind=8), ALLOCATABLE     ::   Uncertainty_BAC( :,: ,:)     !Loops, TimeSteps, Layers                 39
real(kind=8), ALLOCATABLE     ::   Uncertainty_PAR( :,: ,:)     !Loops, TimeSteps, Layers                 40
end TYPE Uncertainty !this is the total error for all the error parmeters (MBE, MNBE...)

TYPE (Uncertainty) :: UncertaintyAna_WHOLE !this is the total error for all the error parmeters (MBE, MNBE...)
TYPE (Uncertainty) :: UncertaintyAna_ALL      !WITH THE WRONG SIMULAITONS DELETED
TYPE (Uncertainty) :: UncertaintyAna_FIRST !this is the total error for all the error parmeters (MBE, MNBE...)
TYPE (Uncertainty) :: UncertaintyAna_BEST    !this is the total error for all the error parmeters (MBE, MNBE...)

!    SENSITIVITY ANALYSIS ----------------------------------------------------------------------

! real(kind=8), ALLOCATABLE ::    PAR_PHY_RADOM(:,:), PAR_SED_RADOM(:,:),
PAR_CHM_RADOM(:,:),PAR_BIO_RADOM(:,:)

TYPE SENSITIVITY    !this is the total error for all the error parmeters (MBE, MNBE...)
real(kind=8), ALLOCATABLE     ::   SENSITIVITY_TdyresmLAYER_HTS( :,: ,:)     !Loops, TimeSteps, Layers    1
real(kind=8), ALLOCATABLE     ::   SENSITIVITY_TEMPTURE( :,: ,:)     !Loops, TimeSteps, Layers              2
real(kind=8), ALLOCATABLE     ::   SENSITIVITY_DO( :,: ,:)     !Loops, TimeSteps, Layers                   3
real(kind=8), ALLOCATABLE     ::   SENSITIVITY_NO3( :,: ,:)     !Loops, TimeSteps, Layers                  4
real(kind=8), ALLOCATABLE     ::   SENSITIVITY_NH4( :,: ,:)     !Loops, TimeSteps, Layers                  5
real(kind=8), ALLOCATABLE     ::   SENSITIVITY_TN( :,: ,:)     !Loops, TimeSteps, Layers                   6
real(kind=8), ALLOCATABLE     ::   SENSITIVITY_PO4( :,: ,:)     !Loops, TimeSteps, Layers                  7
real(kind=8), ALLOCATABLE     ::   SENSITIVITY_TP( :,: ,:)     !Loops, TimeSteps, Layers                   8
```

```
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_CYANO( :,: ,:)     !Loops, TimeSteps, Layers                9
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_FDIAT( :,: ,:)     !Loops, TimeSteps, Layers               10
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_TCHLA( :,: ,:)     !Loops, TimeSteps, Layers               11
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_POCL ( :,: ,:)     !Loops, TimeSteps, Layers               12
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_DOCL( :,: ,:)     !Loops, TimeSteps, Layers                13
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_POPL( :,: ,:)     !Loops, TimeSteps, Layers               14
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_DOPL( :,: ,:)     !Loops, TimeSteps, Layers               15
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_PONL( :,: ,:)     !Loops, TimeSteps, Layers               16
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_DONL( :,: ,:)     !Loops, TimeSteps, Layers               17
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_POCR( :,: ,:)     !Loops, TimeSteps, Layers               18
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_DOCR( :,: ,:)     !Loops, TimeSteps, Layers               19
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_POPR( :,: ,:)     !Loops, TimeSteps, Layers               20
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_DOPR( :,: ,:)     !Loops, TimeSteps, Layers               21
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_PONR( :,: ,:)     !Loops, TimeSteps, Layers               22
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_DONR( :,: ,:)     !Loops, TimeSteps, Layers               23
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_CRYPT( :,: ,:)     !Loops, TimeSteps, Layers              24
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_NODUL( :,: ,:)     !Loops, TimeSteps, Layers              25
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_DINOF( :,: ,:)     !Loops, TimeSteps, Layers              26
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_CHLOR( :,: ,:)     !Loops, TimeSteps, Layers              27
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_MDIAT( :,: ,:)     !Loops, TimeSteps, Layers              28
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_ZOOP1( :,: ,:)     !Loops, TimeSteps, Layers              29
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_ZOOP2( :,: ,:)     !Loops, TimeSteps, Layers              30
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_ZOOP3( :,: ,:)     !Loops, TimeSteps, Layers              31
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_ZOOP4( :,: ,:)     !Loops, TimeSteps, Layers              32
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_ZOOP5( :,: ,:)     !Loops, TimeSteps, Layers              33
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_SSOL1( :,: ,:)     !Loops, TimeSteps, Layers              34
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_SSOL2( :,: ,:)     !Loops, TimeSteps, Layers              35
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_FISH1( :,: ,:)     !Loops, TimeSteps, Layers              36
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_FISH2( :,: ,:)     !Loops, TimeSteps, Layers              37
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_FISH3( :,: ,:)     !Loops, TimeSteps, Layers              38
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_BAC( :,: ,:)     !Loops, TimeSteps, Layers                39
real(kind=8), ALLOCATABLE    ::   SENSITIVITY_PAR( :,: ,:)     !Loops, TimeSteps, Layers                40
end TYPE SENSITIVITY !this is the total error for all the error parmeters (MBE, MNBE...)

TYPE (SENSITIVITY) :: SENSITIVITY_DYCD    !this is the total error for all the error parmeters (MBE, MNBE...)


!THIS PARAMETERS ARE FOR CONFIDENDCE
! TYPE CONFIDENCE_INTERVAL
integer :: NN_CONF,NN_confVAR,NN_confWD
REAL(KIND=8), ALLOCATABLE :: CONF_INT(:,:,:)       !Confidence interval (1:nn_confidence, 1:nn_wd, 1:nn_var)
! add. other varabiles here such as x2, t-test, dv,


TYPE(TOTAL_ERROR_SIMULAITONS) :: TOTAL_ERRORS

 TYPE OBS_DATASET
 INTEGER :: NN_DATLINE
 INTEGER :: NN_DEPTH
 REAL(KIND=8) :: WeightFactor,ErrorEachVariable,ErrorTotal
 integer , allocatable :: number_data(:,:)
 character (len=100) :: name
 REAL(KIND=8), ALLOCATABLE :: WATER_DEPTH(:),DATA_TIME(:),OBS_DATA(:,:),WeightFactorVertical(:)
 real (kind=8), allocatable :: MBE(:,:), MNBE(:,:), MAGE(:,:), MANGE(:,:),      &
                               SSE(:,:), MSE(:,:), RMSE(:,:), RMNSE(:,:),       &
                               E_Nash(:,:), R_Pearson(:,:),STDO(:,:),STDM(:,:), T_TEST(:,:) !1:layers,1:LOOPS
 real (kind=8), allocatable :: MBE_TOT(:), MNBE_TOT(:), MAGE_TOT(:), MANGE_TOT(:),      &
                               SSE_TOT(:), MSE_TOT(:), RMSE_TOT(:), RMNSE_TOT(:),       &
                               E_Nash_TOT(:), R_Pearson_TOT(:),STDO_TOT(:),STDM_TOT(:),
T_TEST_TOT(:) !1:layers,1:LOOPS
 character(len=1024), allocatable :: errors_title(:)

 ENDTYPE

 !REAL(KIND=8), ALLOCATABLE :: COMPARIOSN_DATASET(:,:)    ! TIME, OBSDATA AND MODEL DATA

  ! 3 Random number making
  real(kind=8) :: random_number, timestep_DYRESM
  integer, allocatable :: noSer_obsPar(:),no_obsPar(:)      !for the par number and serial number of observed data

  real(kind=8) :: temp1(1:5),temp2(1:5)
  integer :: numberdd(1:5), Output_intervals

  data( temp1(i),i=1,5) / 10,52,33,22,15/
  !data( temp2(i),i=1,3) / 2,5,6/
```

```
!NN_LINE_SED=16,NN_LINE_CFG=14,NN_PHY_GROUP=7,NN_ZOO_GROUP=5

TYPE PARA_phy
REAL (KIND=8) :: PAR_BULK(1:2),                    &
                 par_albedo(1:2),                  &
                 par_emission(1:2),                &
                 par_CriticalWind(1:2),            &
                 par_output(1:2),                  &
                 par_bubbler(1:2),                 &
                 par_buoyant(1:2),                 &
                 par_shear(1:2),                   &
                 par_energy(1:2),                  &
                 par_windStiring(1:2),             &
                 par_surface(1:2),                 &
                 par_BBL(1:2),                     &
                 par_VerticalMixing(1:2),          &
                 MinLayerThickness(1:2),           &
                 MAXLayerThickness(1:2)
end type parA_phy

TYPE PARA_FILE
REAL (KIND=8), ALLOCATABLE    :: PAR_BULK(:),              &
                 par_albedo(:),                    &
                 par_emission(:),                  &
                 par_CriticalWind(:),              &
                 par_output(:),                    &
                 par_bubbler(:),                   &
                 par_buoyant(:),                   &
                 par_shear(:),                     &
                 par_energy(:),                    &
                 par_windStiring(:),               &
                 par_surface(:),                   &
                 par_BBL(:),                       &
                 par_VerticalMixing(:),            &
                 MinLayerThickness(:),             &
                 MAXLayerThickness(:)
end type parA_file

TYPE INPUT_FILENAME     ! THE MODEL FILE NAMES
CHARACTER (LEN=1024) :: STG,MET,INF,WDR,PRO,PAR,CON,BIO,CHM,SED,INT,CFG,DIRECTORY,command(1:4)
End type INPUT_FILENAME


TYPE (INPUT_FILENAME) :: FILENAME
TYPE (PARA_phy) :: PARa0
TYPE (PARA_FILE) :: para1
TYPE (OBS_DATASET), ALLOCATABLE :: obsVar_data(:)

INteger :: nn_obs      !which number of a specified variable
REAL (KIND=8), ALLOCATABLE :: RMSE_TEMP(:),R_Pearson_TEMP(:),RMSE_TEMP2(:),R_Pearson_TEMP2(:)
integer , allocatable :: RMSE_TEMP_no(:),R_Pearson_TEMP_no(:),RMSE_TEMP_no0(:),R_Pearson_TEMP_no0(:)
INTEGER :: LOOPnum_BEST
integer , parameter :: number_divide=20      ! for the big pearson correlation coefficent
INTEGER ::    NUMBER_ERROR, NumberOfLoopNumber_CaedymError
INTEGER, allocatable :: LoopNumber_CaedymError(:)
   ! 3----------------read the observation data ---------------------------------
   ! 4----------------run the model----------------------------------------------
   ! 5----------------read the dysim.nc data-------------------------------------
   ! 6----------------calculate the error (correlation) between model and obs data -----
   ! 7----------------change the par, chm, bio and sed parameters-----------------
   ! 8----------------output the error table--------------------------------------
   ! 9----------------select the best parameters for different target simulation (chla, TN, TP, Tem)---

!-------VARAIABLES FOR NC FILES-----------------------------------------------
integer, parameter:: Number_var=40
integer :: Number_Retrieve(1:Number_var)

INTEGER :: NO_DIM_NETCDF(1:Number_var,1:4)    !THE FOURTH IS FOR THE VARIABLE (USER-DEFINED)
INTEGER :: N1,N2,N3,N4,N5,N6,N7,N8,N9,N10

integer :: NN_LAYERS_NETCDF, NN_LINES_NETCDF


   integer,parameter       :: mvrlen=4
```

```
      integer,parameter       :: mtlen=80
!     integer     :: maxvars,maxatts
      integer                       :: ncid
      integer                       :: rcode
      integer                       :: ndims
      integer                       :: nvars
      integer                       :: natts
      integer                       :: recdim
      integer                       :: dimid
      integer                       :: varid
      integer                       :: vsize, status
      integer                       :: fsize

       !------------------- for netcdf file----------------------------------

      integer,parameter       :: maxvars=1000, maxatts=200
      integer :: vartyp(MAXVARS)
      integer                       :: vdims(MAXVARS)
      integer                       :: vvdims(MAXVARS,maxatts)
      integer                :: nvatts(MAXVARS)
      character(len=31)      :: dimnam(MAXVARS)
      character(len=31)       :: varnam(MAXVARS)
      character(len=31)       :: attnam(MAXVARS,maxatts)
      integer                   :: dimsiz(MAXVARS)
      integer                   :: nvdims(MAXVARS)
      integer                :: attype(MAXVARS,maxatts)
      integer                   :: attlen(MAXVARS,maxatts)
      character(len=11)      :: avt(MAXVARS),avtgetvar(MAXVARS)            !

      character(len=11)       :: avartyp(6),getvartyp(6)
      character(len=1024)    :: input_file
      character(len=1024)    :: output_file
      character(len=30)       :: nfcall
      data avartyp /'logical*1','character*1','integer*2','integer*4','real*4     ','real*8     '/
      data getvartyp /'logical','text','int2','int','real','double'/
      integer unlimdimid,ngatts
      character(len=1024):: text
      character(len=1024):: ch,char_temp,FMT,FMT_TEMP
      character(len=1024):: chdim(50)

!TYPE DYRESM_VARIABLES
real*4, ALLOCATABLE     ::    dyresmLAYER_HTS_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmTEMPTURE_Var( :,: )
!real*4, ALLOCATABLE     ::    dyresmDENSITY_Var( :,: )
!real*4, ALLOCATABLE     ::    dyresmSALINITY_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmDO_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmNO3_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmNH4_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmTN_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmPO4_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmTP_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmCYANO_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmFDIAT_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmTCHLA_Var( :,: )

!Liancong Luo added some variables here in June 2010 (Denmark)
real*4, ALLOCATABLE     ::    dyresmPOCL_Var ( :,: )
real*4, ALLOCATABLE     ::    dyresmDOCL_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmPOPL_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmDOPL_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmPONL_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmDONL_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmPOCR_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmDOCR_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmPOPR_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmDOPR_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmPONR_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmDONR_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmCRYPT_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmNODUL_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmDINOF_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmCHLOR_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmMDIAT_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmZOOP1_Var( :,: )
real*4, ALLOCATABLE     ::    dyresmZOOP2_Var( :,: )
```

```
real*4, ALLOCATABLE    ::   dyresmZOOP3_Var( :,: )
real*4, ALLOCATABLE    ::   dyresmZOOP4_Var( :,: )
real*4, ALLOCATABLE    ::   dyresmZOOP5_Var( :,: )
real*4, ALLOCATABLE    ::   dyresmSSOL1_Var( :,: )
real*4, ALLOCATABLE    ::   dyresmSSOL2_Var( :,: )
real*4, ALLOCATABLE    ::   dyresmFISH1_Var( :,: )
real*4, ALLOCATABLE    ::   dyresmFISH2_Var( :,: )
real*4, ALLOCATABLE    ::   dyresmFISH3_Var( :,: )
real*4, ALLOCATABLE    ::   dyresmBAC_Var( :,: )
real*4, ALLOCATABLE    ::   dyresmPAR_Var( :,: )
!END TYPE DYRESM_VARIABLES

data(CAEYM_VARname(i),i=1,num_CAEDYM_VARname)/'LAYER_HTS',      &              !
'TEMPTURE',     &          !     2
'DO'   ,        &          !     3
'NO3' ,         &          !     4
'NH4' ,         &          !     5
'TN'   ,        &          !     6
'PONL'      ,     &        !     7
'PONR'      ,     &        !     8
'DONL'      ,     &        !     9
'DONR'      ,     &        !     10
'PO4'  ,        &          !     11
'TP'   ,        &          !     12
'POPL'      ,     &        !     13
'POPR'      ,     &        !     14
'DOPL'      ,     &        !     15
'DOPR'      ,     &        !     16
'POCL'      ,     &        !     17
'POCR'      ,     &        !     18
'DOCL'      ,     &        !     19
'DOCR'      ,     &        !     20
'DINOF'     ,     &        !     21
'CYANO'     ,     &        !     22
'NODUL'     ,     &        !     23
'CHLOR'     ,     &        !     24
'CRYPT'     ,     &        !     25
'MDIAT'     ,     &        !     26
'FDIAT'     ,     &        !     27
'ZOOP1'     ,     &        !     28
'ZOOP2'     ,     &        !     29
'ZOOP3'     ,     &        !     30
'ZOOP4'     ,     &        !     31
'ZOOP5'     ,     &        !     32
'SSOL1'     ,     &        !     33
'SSOL2'     ,     &        !     34
'FISH1'     ,     &        !     35
'FISH2'     ,     &        !     36
'FISH3'     ,     &        !     37
'BAC' ,         &          !     38
'PAR' ,         &          !     39
'TCHLA'     /              !     40

CHARACTER(LEN=100) :: DYRESM_VARname(1:Number_var)
data(DYRESM_VARname(i),i=1,num_CAEDYM_VARname)/              &
'dyresmLAYER_HTS_Var',   &          !    1
'dyresmTEMPTURE_Var',      &          !     2
'dyresmDO_Var'   ,          &          !     3
'dyresmNO3_Var'  ,          &          !     4
'dyresmNH4_Var'  ,          &          !     5
'dyresmTN_Var'   ,          &          !     6
'dyresmPONL_Var'      ,     &          !     7
'dyresmPONR_Var'      ,     &          !     8
'dyresmDONL_Var'      ,     &          !     9
'dyresmDONR_Var'      ,     &          !     10
'dyresmPO4_Var'  ,          &          !     11
'dyresmTP_Var'   ,          &          !     12
'dyresmPOPL_Var',      &          !     13
'dyresmPOPR_Var',      &          !     14
'dyresmDOPL_Var'      ,     &          !     15
'dyresmDOPR_Var'      ,     &          !     16
'dyresmPOCL_Var',      &          !     17
'dyresmPOCR_Var'      ,     &          !     18
'dyresmDOCL_Var'      ,     &          !     19
'dyresmDOCR_Var'      ,     &          !     20
```

```
'dyresmDINOF_Var'    ,    &    !    21
'dyresmCYANO_Var'    ,    &    !    22
'dyresmNODUL_Var'    ,    &    !    23
'dyresmCHLOR_Var'    ,    &    !    24
'dyresmCRYPT_Var'    ,    &    !    25
'dyresmMDIAT_Var'    ,    &    !    26
'dyresmFDIAT_Var'    ,    &    !    27
'dyresmZOOP1_Var'    ,    &    !    28
'dyresmZOOP2_Var'    ,    &    !    29
'dyresmZOOP3_Var'    ,    &    !    30
'dyresmZOOP4_Var'    ,    &    !    31
'dyresmZOOP5_Var'    ,    &    !    32
'dyresmSSOL1_Var'    ,    &    !    33
'dyresmSSOL2_Var'    ,    &    !    34
'dyresmFISH1_Var'    ,    &    !    35
'dyresmFISH2_Var'    ,    &    !    36
'dyresmFISH3_Var'    ,    &    !    37
'dyresmBAC_Var' ,    &    !    38
'dyresmPAR_Var' ,    &    !    39
'dyresmTCHLA_Var'    /    !    40

CHARACTER(LEN=100) :: obs_VARname(1:Number_var)
data(obs_VARname(i),i=1,num_CAEDYM_VARname)/    &
'LAYER_HTS',    &    ! 1
'TEMPTURE',    &    !    2
'DO'  ,    &    !    3
'NO3' ,    &    !    4
'NH4' ,    &    !    5
'TN'  ,    &    !    6
'PONL'    ,    &    !    7
'PONR'    ,    &    !    8
'DONL'    ,    &    !    9
'DONR'    ,    &    !    10
'PO4' ,    &    !    11
'TP'  ,    &    !    12
'POPL'    ,    &    !    13
'POPR'    ,    &    !    14
'DOPL'    ,    &    !    15
'DOPR'    ,    &    !    16
'POCL'    ,    &    !    17
'POCR'    ,    &    !    18
'DOCL'    ,    &    !    19
'DOCR'    ,    &    !    20
'DINOF'   ,    &    !    21
'CYANO'   ,    &    !    22
'NODUL'   ,    &    !    23
'CHLOR'   ,    &    !    24
'CRYPT'   ,    &    !    25
'MDIAT'   ,    &    !    26
'FDIAT'   ,    &    !    27
'ZOOP1'   ,    &    !    28
'ZOOP2'   ,    &    !    29
'ZOOP3'   ,    &    !    30
'ZOOP4'   ,    &    !    31
'ZOOP5'   ,    &    !    32
'SSOL1'   ,    &    !    33
'SSOL2'   ,    &    !    34
'FISH1'   ,    &    !    35
'FISH2'   ,    &    !    36
'FISH3'   ,    &    !    37
'BAC' ,    &    !    38
'PAR' ,    &    !    39
'TCHLA'   /    !    40

!character , parameter :: Error_title=' STDO STDM MBE MNBE MAGE MANGE SSE MSE RMSE RMNSE
!E_Nash R_Pearson '

!-----------------VARIABLES FOR NC FILES ----------------------

!    real*4    ::    dyresmTEMPTURE_Var( 66, 7992 )
!    real*4    ::    dyresmDENSITY_Var( 66, 7992 )
!    real*4    ::    dyresmSALINITY_Var( 66, 7992 )
!    real*4    ::    dyresmDO_Var( 66, 7992 )
!    real*4    ::    dyresmNO3_Var( 66, 7992 )
!    real*4    ::    dyresmNH4_Var( 66, 7992 )
```

```
!          real*4               ::    dyresmTN_Var( 66, 7992 )
!          real*4               ::    dyresmPO4_Var( 66, 7992 )
!          real*4               ::    dyresmTP_Var( 66, 7992 )
!          real*4               ::    dyresmCYANO_Var( 66, 7992 )
!          real*4               ::    dyresmFDIAT_Var( 66, 7992 )
!          real*4               ::    dyresmTCHLA_Var( 66, 7992 )
        integer*4     :: start(10)
        integer*4     :: count(10)
        integer*4     :: dimids(10)! allow up to 10 dimensions
        integer*4     :: ndim, xtype
        integer*4     :: j,len
        character(len=31) :: dummy
!---------------------------------------------------------------------
!    Define "scale_factor" and "add_offset" variables
!---------------------------------------------------------------------
!this is for error

real(kind=8) :: dec_hourly(1:24)
data (dec_hourly(i),i=1,24)/0.000,0.042,0.083,0.125,0.167,0.208,0.250,0.292,0.333,0.375,0.417,0.458,     &
                                  0.500,0.542,0.583,0.625,0.667,0.708,0.750,0.792,0.833,0.875,0.917,0.958/
! EXPLAINATION FOR ALL THE VARIABLES
! Line_NO_chm_number    = 9999 (NOTE)     OR    =    DIGICAL (VARY DURING THE VALUE RANGE)
!    INTEGER, PARAMETER    :: NN_line_Bio=1387,           NN_LINE_CHM=529,
!    NN_LINE_SED=177,    num_CAEDYM_VARname=40
!    INTEGER, PARAMETER    :: NN_Line_bio_par=1300,    NN_Line_chm_par=155,          NN_LINE_SED_PAR=159
!    INTEGER, PARAMETER    :: NN_line_cfg=14,              NN_LINE_par=16      !,          NN_LINE_stg=165

END MODULE DYRESM_COMMON
```

netcdf_inc.f90

```
!        NetCDF-3.
! netcdf version 3 fortran interface:
! external netcdf data types:

module netcdf_inc
          integer nf_byte
          integer nf_int1
          integer nf_char
          integer nf_short
          integer nf_int2
          integer nf_int
          integer nf_float
          integer nf_real
          integer nf_double

          parameter (nf_byte = 1)
          parameter (nf_int1 = nf_byte)
          parameter (nf_char = 2)
          parameter (nf_short = 3)
          parameter (nf_int2 = nf_short)
          parameter (nf_int = 4)
          parameter (nf_float = 5)
          parameter (nf_real = nf_float)
          parameter (nf_double = 6)

!
! default fill values:
!
          integer                 nf_fill_byte
          integer                 nf_fill_int1
          integer                 nf_fill_char
          integer                 nf_fill_short
          integer                 nf_fill_int2
          integer                 nf_fill_int
          real                     nf_fill_float
          real                     nf_fill_real
          doubleprecision     nf_fill_double

          parameter (nf_fill_byte = -127)
          parameter (nf_fill_int1 = nf_fill_byte)
          parameter (nf_fill_char = 0)
          parameter (nf_fill_short = -32767)
          parameter (nf_fill_int2 = nf_fill_short)
          parameter (nf_fill_int = -2147483647)
```

```
      parameter (nf_fill_float = 9.9692099683868690e+36)
      parameter (nf_fill_real = nf_fill_float)
      parameter (nf_fill_double = 9.9692099683868690d+36)

!
! mode flags for opening and creating a netcdf dataset:
!
      integer nf_nowrite
      integer nf_write
      integer nf_clobber
      integer nf_noclobber
      integer nf_fill
      integer nf_nofill
      integer nf_lock
      integer nf_share
      integer nf_64bit_offset
      integer nf_sizehint_default
      integer nf_align_chunk
      integer nf_format_classic
      integer nf_format_64bit

      parameter (nf_nowrite = 0)
      parameter (nf_write = 1)
      parameter (nf_clobber = 0)
      parameter (nf_noclobber = 4)
      parameter (nf_fill = 0)
      parameter (nf_nofill = 256)
      parameter (nf_lock = 1024)
      parameter (nf_share = 2048)
      parameter (nf_64bit_offset = 512)
      parameter (nf_sizehint_default = 0)
      parameter (nf_align_chunk = -1)
      parameter (nf_format_classic = 1)
      parameter (nf_format_64bit = 2)

!
! size argument for defining an unlimited dimension:
!
      integer nf_unlimited
      parameter (nf_unlimited = 0)

!
! global attribute id:
!
      integer nf_global
      parameter (nf_global = 0)

!
! implementation limits:
!
      integer nf_max_dims
      integer nf_max_attrs
      integer nf_max_vars
      integer nf_max_name
      integer nf_max_var_dims

      parameter (nf_max_dims = 1024)
      parameter (nf_max_attrs = 8192)
      parameter (nf_max_vars = 8192)
      parameter (nf_max_name = 256)
      parameter (nf_max_var_dims = nf_max_dims)

!
! error codes:
!
      integer nf_noerr
      integer nf_ebadid
      integer nf_eexist
      integer nf_einval
      integer nf_eperm
      integer nf_enotindefine
      integer nf_eindefine
      integer nf_einvalcoords
      integer nf_emaxdims
      integer nf_enameinuse
```

```
      integer nf_enotatt
      integer nf_emaxatts
      integer nf_ebadtype
      integer nf_ebaddim
      integer nf_eunlimpos
      integer nf_emaxvars
      integer nf_enotvar
      integer nf_eglobal
      integer nf_enotnc
      integer nf_ests
      integer nf_emaxname
      integer nf_eunlimit
      integer nf_enorecvars
      integer nf_echar
      integer nf_eedge
      integer nf_estride
      integer nf_ebadname
      integer nf_erange
      integer nf_enomem
      integer nf_evarsize
      integer nf_edimsize
      integer nf_etrunc

      parameter (nf_noerr = 0)
      parameter (nf_ebadid = -33)
      parameter (nf_eexist = -35)
      parameter (nf_einval = -36)
      parameter (nf_eperm = -37)
      parameter (nf_enotindefine = -38)
      parameter (nf_eindefine = -39)
      parameter (nf_einvalcoords = -40)
      parameter (nf_emaxdims = -41)
      parameter (nf_enameinuse = -42)
      parameter (nf_enotatt = -43)
      parameter (nf_emaxatts = -44)
      parameter (nf_ebadtype = -45)
      parameter (nf_ebaddim = -46)
      parameter (nf_eunlimpos = -47)
      parameter (nf_emaxvars = -48)
      parameter (nf_enotvar = -49)
      parameter (nf_eglobal = -50)
      parameter (nf_enotnc = -51)
      parameter (nf_ests = -52)
      parameter (nf_emaxname = -53)
      parameter (nf_eunlimit = -54)
      parameter (nf_enorecvars = -55)
      parameter (nf_echar = -56)
      parameter (nf_eedge = -57)
      parameter (nf_estride = -58)
      parameter (nf_ebadname = -59)
      parameter (nf_erange = -60)
      parameter (nf_enomem = -61)
      parameter (nf_evarsize = -62)
      parameter (nf_edimsize = -63)
      parameter (nf_etrunc = -64)
!
! error handling modes:
!
      integer    nf_fatal
      integer nf_verbose

      parameter (nf_fatal = 1)
      parameter (nf_verbose = 2)

!
! miscellaneous routines:
!
      character*80     nf_inq_libvers
      external         nf_inq_libvers

      character*80     nf_strerror
!     (integer                ncerr)
      external         nf_strerror

      logical          nf_issyserr
```

```
!       (integer                ncerr)
        external        nf_issyserr

!
! control routines:
!
        integer         nf_inq_base_pe
!       (integer                ncid,
!       integer                 pe)
        external        nf_inq_base_pe

        integer         nf_set_base_pe
!                       (integer                ncid,
!                         integer               pe)
        external        nf_set_base_pe

        integer         nf_create
!                       (character*(*)          path,
!                         integer               cmode,
!                         integer               ncid)
        external        nf_create

        integer         nf__create
!                       (character*(*)          path,
!                         integer               cmode,
!                         integer               initialsz,
!                         integer               chunksizehint,
!                         integer               ncid)
        external        nf__create

        integer         nf__create_mp
!                       (character*(*)          path,
!                         integer               cmode,
!                         integer               initialsz,
!                         integer               basepe,
!                         integer               chunksizehint,
!                         integer               ncid)
        external        nf__create_mp

        integer         nf_open
!                       (character*(*)          path,
!                         integer               mode,
!                         integer               ncid)
        external        nf_open

        integer         nf__open
!                       (character*(*)          path,
!                         integer               mode,
!                         integer               chunksizehint,
!                         integer               ncid)
        external        nf__open

        integer         nf__open_mp
!                       (character*(*)          path,
!                         integer               mode,
!                         integer               basepe,
!                         integer               chunksizehint,
!                         integer               ncid)
        external        nf__open_mp

        integer         nf_set_fill
!                       (integer                ncid,
!                         integer               fillmode,
!                         integer               old_mode)
        external        nf_set_fill

        integer         nf_set_default_format
!                         (integer               format,
!                         integer               old_format)
        external        nf_set_default_format

        integer         nf_redef
!                       (integer                ncid)
        external        nf_redef
```

```
      integer           nf_enddef
!                             (integer                ncid)
      external          nf_enddef

      integer           nf__enddef
!                             (integer                ncid,
!                               integer               h_minfree,
!                               integer               v_align,
!                               integer               v_minfree,
!                               integer               r_align)
      external          nf__enddef

      integer           nf_sync
!                             (integer                ncid)
      external          nf_sync

      integer           nf_abort
!                             (integer                ncid)
      external          nf_abort

      integer           nf_close
!                             (integer                ncid)
      external          nf_close

      integer           nf_delete
!                             (character*(*)          ncid)
      external          nf_delete

!
! general inquiry routines:
!

      integer           nf_inq
!                             (integer                ncid,
!                               integer               ndims,
!                               integer               nvars,
!                               integer               ngatts,
!                               integer               unlimdimid)
      external          nf_inq

      integer           nf_inq_ndims
!                             (integer                ncid,
!                               integer               ndims)
      external          nf_inq_ndims

      integer           nf_inq_nvars
!                             (integer                ncid,
!                               integer               nvars)
      external          nf_inq_nvars

      integer           nf_inq_natts
!                             (integer                ncid,
!                               integer               ngatts)
      external          nf_inq_natts

      integer           nf_inq_unlimdim
!                             (integer                ncid,
!                               integer               unlimdimid)
      external          nf_inq_unlimdim

      integer           nf_inq_format
!                             (integer                ncid,
!                               integer               format)
      external          nf_inq_format

!
! dimension routines:
!

      integer           nf_def_dim
!                             (integer                ncid,
!                               character(*)          name,
!                               integer               len,
!                               integer               dimid)
      external          nf_def_dim
```

```
        integer         nf_inq_dimid
!                               (integer                ncid,
!                                character(*)           name,
!                                integer                dimid)
        external        nf_inq_dimid

        integer         nf_inq_dim
!                               (integer                ncid,
!                                integer                dimid,
!                                character(*)           name,
!                                integer                len)
        external        nf_inq_dim

        integer         nf_inq_dimname
!                               (integer                ncid,
!                                integer                dimid,
!                                character(*)           name)
        external        nf_inq_dimname

        integer         nf_inq_dimlen
!                               (integer                ncid,
!                                integer                dimid,
!                                integer                len)
        external        nf_inq_dimlen

        integer         nf_rename_dim
!                               (integer                ncid,
!                                integer                dimid,
!                                character(*)           name)
        external        nf_rename_dim

!
! general attribute routines:
!

        integer         nf_inq_att
!                               (integer                ncid,
!                                integer                varid,
!                                character(*)           name,
!                                integer                xtype,
!                                integer                len)
        external        nf_inq_att

        integer         nf_inq_attid
!                               (integer                ncid,
!                                integer                varid,
!                                character(*)           name,
!                                integer                attnum)
        external        nf_inq_attid

        integer         nf_inq_atttype
!                               (integer                ncid,
!                                integer                varid,
!                                character(*)           name,
!                                integer                xtype)
        external        nf_inq_atttype

        integer         nf_inq_attlen
!                               (integer                ncid,
!                                integer                varid,
!                                character(*)           name,
!                                integer                len)
        external        nf_inq_attlen

        integer         nf_inq_attname
!                               (integer                ncid,
!                                integer                varid,
!                                integer                attnum,
!                                character(*)           name)
        external        nf_inq_attname

        integer         nf_copy_att
!                               (integer                ncid_in,
!                                integer                varid_in,
```

```
!                                character(*)        name,
!                                integer              ncid_out,
!                                integer              varid_out)
      external          nf_copy_att

      integer           nf_rename_att
!                           (integer              ncid,
!                            integer              varid,
!                            character(*)         curname,
!                            character(*)         newname)
      external          nf_rename_att

      integer           nf_del_att
!                           (integer              ncid,
!                            integer              varid,
!                            character(*)         name)
      external          nf_del_att

!
! attribute put/get routines:
!

      integer           nf_put_att_text
!                           (integer              ncid,
!                            integer              varid,
!                            character(*)         name,
!                            integer              len,
!                            character(*)         text)
      external          nf_put_att_text

      integer           nf_get_att_text
!                           (integer              ncid,
!                            integer              varid,
!                            character(*)         name,
!                            character(*)         text)
      external          nf_get_att_text

      integer           nf_put_att_int1
!                           (integer              ncid,
!                            integer              varid,
!                            character(*)         name,
!                            integer              xtype,
!                            integer              len,
!                            nf_int1_t            i1vals(1))
      external          nf_put_att_int1

      integer           nf_get_att_int1
!                           (integer              ncid,
!                            integer              varid,
!                            character(*)         name,
!                            nf_int1_t            i1vals(1))
      external          nf_get_att_int1

      integer           nf_put_att_int2
!                           (integer              ncid,
!                            integer              varid,
!                            character(*)         name,
!                            integer              xtype,
!                            integer              len,
!                            nf_int2_t            i2vals(1))
      external          nf_put_att_int2

      integer           nf_get_att_int2
!                           (integer              ncid,
!                            integer              varid,
!                            character(*)         name,
!                            nf_int2_t            i2vals(1))
      external          nf_get_att_int2

      integer           nf_put_att_int
!                           (integer              ncid,
!                            integer              varid,
!                            character(*)         name,
!                            integer              xtype,
!                            integer              len,
```

```
!                               integer                 ivals(1))
      external          nf_put_att_int

      integer           nf_get_att_int
!                             (integer                  ncid,
!                               integer                 varid,
!                               character(*)            name,
!                               integer                 ivals(1))
      external          nf_get_att_int

      integer           nf_put_att_real
!                             (integer                  ncid,
!                               integer                 varid,
!                               character(*)            name,
!                               integer                 xtype,
!                               integer                 len,
!                               real                    rvals(1))
      external          nf_put_att_real

      integer           nf_get_att_real
!                             (integer                  ncid,
!                               integer                 varid,
!                               character(*)            name,
!                               real                    rvals(1))
      external          nf_get_att_real

      integer           nf_put_att_double
!                             (integer                  ncid,
!                               integer                 varid,
!                               character(*)            name,
!                               integer                 xtype,
!                               integer                 len,
!                               double                  dvals(1))
      external          nf_put_att_double

      integer           nf_get_att_double
!                             (integer                  ncid,
!                               integer                 varid,
!                               character(*)            name,
!                               double                  dvals(1))
      external          nf_get_att_double

!
! general variable routines:
!

      integer           nf_def_var
!                             (integer                  ncid,
!                               character(*)            name,
!                               integer                 datatype,
!                               integer                 ndims,
!                               integer                 dimids(1),
!                               integer                 varid)
      external          nf_def_var

      integer           nf_inq_var
!                             (integer                  ncid,
!                               integer                 varid,
!                               character(*)            name,
!                               integer                 datatype,
!                               integer                 ndims,
!                               integer                 dimids(1),
!                               integer                 natts)
      external          nf_inq_var

      integer           nf_inq_varid
!                             (integer                  ncid,
!                               character(*)            name,
!                               integer                 varid)
      external          nf_inq_varid

      integer           nf_inq_varname
!                             (integer                  ncid,
!                               integer                 varid,
!                               character(*)            name)
```

```
      external        nf_inq_varname

      integer         nf_inq_vartype
     !                     (integer          ncid,
     !                      integer          varid,
     !                      integer          xtype)
      external        nf_inq_vartype

      integer         nf_inq_varndims
     !                     (integer          ncid,
     !                      integer          varid,
     !                      integer          ndims)
      external        nf_inq_varndims

      integer         nf_inq_vardimid
     !                     (integer          ncid,
     !                      integer          varid,
     !                      integer          dimids(1))
      external        nf_inq_vardimid

      integer         nf_inq_varnatts
     !                     (integer          ncid,
     !                      integer          varid,
     !                      integer          natts)
      external        nf_inq_varnatts

      integer         nf_rename_var
     !                     (integer          ncid,
     !                      integer          varid,
     !                      character(*)     name)
      external        nf_rename_var

      integer         nf_copy_var
     !                     (integer          ncid_in,
     !                      integer          varid,
     !                      integer          ncid_out)
      external        nf_copy_var

     !
     ! entire variable put/get routines:
     !

      integer         nf_put_var_text
     !                     (integer          ncid,
     !                      integer          varid,
     !                      character(*)     text)
      external        nf_put_var_text

      integer         nf_get_var_text
     !                     (integer          ncid,
     !                      integer          varid,
     !                      character(*)     text)
      external        nf_get_var_text

      integer         nf_put_var_int1
     !                     (integer          ncid,
     !                      integer          varid,
     !                      nf_int1_t        i1vals(1))
      external        nf_put_var_int1

      integer         nf_get_var_int1
     !                     (integer          ncid,
     !                      integer          varid,
     !                      nf_int1_t        i1vals(1))
      external        nf_get_var_int1

      integer         nf_put_var_int2
     !                     (integer          ncid,
     !                      integer          varid,
     !                      nf_int2_t        i2vals(1))
      external        nf_put_var_int2

      integer         nf_get_var_int2
     !                     (integer          ncid,
     !                      integer          varid,
```

```
!                               nf_int2_t               i2vals(1))
      external          nf_get_var_int2

      integer           nf_put_var_int
!                           (integer                  ncid,
!                             integer                 varid,
!                             integer                 ivals(1))
      external          nf_put_var_int

      integer           nf_get_var_int
!                           (integer                  ncid,
!                             integer                 varid,
!                             integer                 ivals(1))
      external          nf_get_var_int

      integer           nf_put_var_real
!                           (integer                  ncid,
!                             integer                 varid,
!                             real                    rvals(1))
      external          nf_put_var_real

      integer           nf_get_var_real
!                           (integer                  ncid,
!                             integer                 varid,
!                             real                    rvals(1))
      external          nf_get_var_real

      integer           nf_put_var_double
!                           (integer                  ncid,
!                             integer                 varid,
!                             doubleprecision         dvals(1))
      external          nf_put_var_double

      integer           nf_get_var_double
!                           (integer                  ncid,
!                             integer                 varid,
!                             doubleprecision         dvals(1))
      external          nf_get_var_double

!
! single variable put/get routines:
!

      integer           nf_put_var1_text
!                           (integer                  ncid,
!                             integer                 varid,
!                             integer                 index(1),
!                             character*1             text)
      external          nf_put_var1_text

      integer           nf_get_var1_text
!                           (integer                  ncid,
!                             integer                 varid,
!                             integer                 index(1),
!                             character*1             text)
      external          nf_get_var1_text

      integer           nf_put_var1_int1
!                           (integer                  ncid,
!                             integer                 varid,
!                             integer                 index(1),
!                             nf_int1_t               i1val)
      external          nf_put_var1_int1

      integer           nf_get_var1_int1
!                           (integer                  ncid,
!                             integer                 varid,
!                             integer                 index(1),
!                             nf_int1_t               i1val)
      external          nf_get_var1_int1

      integer           nf_put_var1_int2
!                           (integer                  ncid,
!                             integer                 varid,
!                             integer                 index(1),
```

```
!                               nf_int2_t               i2val)
      external          nf_put_var1_int2

      integer           nf_get_var1_int2
!                           (integer                ncid,
!                             integer               varid,
!                             integer               index(1),
!                             nf_int2_t             i2val)
      external          nf_get_var1_int2

      integer           nf_put_var1_int
!                           (integer                ncid,
!                             integer               varid,
!                             integer               index(1),
!                             integer               ival)
      external          nf_put_var1_int

      integer           nf_get_var1_int
!                           (integer                ncid,
!                             integer               varid,
!                             integer               index(1),
!                             integer               ival)
      external          nf_get_var1_int

      integer           nf_put_var1_real
!                           (integer                ncid,
!                             integer               varid,
!                             integer               index(1),
!                             real                  rval)
      external          nf_put_var1_real

      integer           nf_get_var1_real
!                           (integer                ncid,
!                             integer               varid,
!                             integer               index(1),
!                             real                  rval)
      external          nf_get_var1_real

      integer           nf_put_var1_double
!                           (integer                ncid,
!                             integer               varid,
!                             integer               index(1),
!                             doubleprecision       dval)
      external          nf_put_var1_double

      integer           nf_get_var1_double
!                           (integer                ncid,
!                             integer               varid,
!                             integer               index(1),
!                             doubleprecision       dval)
      external          nf_get_var1_double

!
! variable array put/get routines:
!

      integer           nf_put_vara_text
!                           (integer                ncid,
!                             integer               varid,
!                             integer               start(1),
!                             integer               count(1),
!                             character(*)          text)
      external          nf_put_vara_text

      integer           nf_get_vara_text
!                           (integer                ncid,
!                             integer               varid,
!                             integer               start(1),
!                             integer               count(1),
!                             character(*)          text)
      external          nf_get_vara_text

      integer           nf_put_vara_int1
!                           (integer                ncid,
!                             integer               varid,
```

```
!                       integer             start(1),
!                       integer             count(1),
!                       nf_int1_t           i1vals(1))
      external      nf_put_vara_int1

      integer       nf_get_vara_int1
!                     (integer              ncid,
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       nf_int1_t           i1vals(1))
      external      nf_get_vara_int1

      integer       nf_put_vara_int2
!                     (integer              ncid,
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       nf_int2_t           i2vals(1))
      external      nf_put_vara_int2

      integer       nf_get_vara_int2
!                     (integer              ncid,
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       nf_int2_t           i2vals(1))
      external      nf_get_vara_int2

      integer       nf_put_vara_int
!                     (integer              ncid,
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       integer             ivals(1))
      external      nf_put_vara_int

      integer       nf_get_vara_int
!                     (integer              ncid,
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       integer             ivals(1))
      external      nf_get_vara_int

      integer       nf_put_vara_real
!                     (integer              ncid,
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       real                rvals(1))
      external      nf_put_vara_real

      integer       nf_get_vara_real
!                     (integer              ncid,
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       real                rvals(1))
      external      nf_get_vara_real

      integer       nf_put_vara_double
!                     (integer              ncid,
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       doubleprecision     dvals(1))
      external      nf_put_vara_double

      integer       nf_get_vara_double
!                     (integer              ncid,
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       doubleprecision     dvals(1))
```

```
      external        nf_get_vara_double

!
! strided variable put/get routines:
!

      integer         nf_put_vars_text
!                           (integer        ncid,
!                            integer        varid,
!                            integer        start(1),
!                            integer        count(1),
!                            integer        stride(1),
!                            character(*)   text)
      external        nf_put_vars_text

      integer         nf_get_vars_text
!                           (integer        ncid,
!                            integer        varid,
!                            integer        start(1),
!                            integer        count(1),
!                            integer        stride(1),
!                            character(*)   text)
      external        nf_get_vars_text

      integer         nf_put_vars_int1
!                           (integer        ncid,
!                            integer        varid,
!                            integer        start(1),
!                            integer        count(1),
!                            integer        stride(1),
!                            nf_int1_t      i1vals(1))
      external        nf_put_vars_int1

      integer         nf_get_vars_int1
!                           (integer        ncid,
!                            integer        varid,
!                            integer        start(1),
!                            integer        count(1),
!                            integer        stride(1),
!                            nf_int1_t      i1vals(1))
      external        nf_get_vars_int1

      integer         nf_put_vars_int2
!                           (integer        ncid,
!                            integer        varid,
!                            integer        start(1),
!                            integer        count(1),
!                            integer        stride(1),
!                            nf_int2_t      i2vals(1))
      external        nf_put_vars_int2

      integer         nf_get_vars_int2
!                           (integer        ncid,
!                            integer        varid,
!                            integer        start(1),
!                            integer        count(1),
!                            integer        stride(1),
!                            nf_int2_t      i2vals(1))
      external        nf_get_vars_int2

      integer         nf_put_vars_int
!                           (integer        ncid,
!                            integer        varid,
!                            integer        start(1),
!                            integer        count(1),
!                            integer        stride(1),
!                            integer        ivals(1))
      external        nf_put_vars_int

      integer         nf_get_vars_int
!                           (integer        ncid,
!                            integer        varid,
!                            integer        start(1),
!                            integer        count(1),
!                            integer        stride(1),
```

```
!                               integer                 ivals(1))
      external          nf_get_vars_int

      integer           nf_put_vars_real
!                             (integer                  ncid,
!                               integer                 varid,
!                               integer                 start(1),
!                               integer                 count(1),
!                               integer                 stride(1),
!                               real                    rvals(1))
      external          nf_put_vars_real

      integer           nf_get_vars_real
!                             (integer                  ncid,
!                               integer                 varid,
!                               integer                 start(1),
!                               integer                 count(1),
!                               integer                 stride(1),
!                               real                    rvals(1))
      external          nf_get_vars_real

      integer           nf_put_vars_double
!                             (integer                  ncid,
!                               integer                 varid,
!                               integer                 start(1),
!                               integer                 count(1),
!                               integer                 stride(1),
!                               doubleprecision         dvals(1))
      external          nf_put_vars_double

      integer           nf_get_vars_double
!                             (integer                  ncid,
!                               integer                 varid,
!                               integer                 start(1),
!                               integer                 count(1),
!                               integer                 stride(1),
!                               doubleprecision         dvals(1))
      external          nf_get_vars_double

!
! mapped variable put/get routines:
!

      integer           nf_put_varm_text
!                             (integer                  ncid,
!                               integer                 varid,
!                               integer                 start(1),
!                               integer                 count(1),
!                               integer                 stride(1),
!                               integer                 imap(1),
!                               character(*)            text)
      external          nf_put_varm_text

      integer           nf_get_varm_text
!                             (integer                  ncid,
!                               integer                 varid,
!                               integer                 start(1),
!                               integer                 count(1),
!                               integer                 stride(1),
!                               integer                 imap(1),
!                               character(*)            text)
      external          nf_get_varm_text

      integer           nf_put_varm_int1
!                             (integer                  ncid,
!                               integer                 varid,
!                               integer                 start(1),
!                               integer                 count(1),
!                               integer                 stride(1),
!                               integer                 imap(1),
!                               nf_int1_t               i1vals(1))
      external          nf_put_varm_int1

      integer           nf_get_varm_int1
!                             (integer                  ncid,
```

```
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       integer             stride(1),
!                       integer             imap(1),
!                       nf_int1_t           i1vals(1))
      external      nf_get_varm_int1

      integer       nf_put_varm_int2
!                   (integer                ncid,
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       integer             stride(1),
!                       integer             imap(1),
!                       nf_int2_t           i2vals(1))
      external      nf_put_varm_int2

      integer       nf_get_varm_int2
!                   (integer                ncid,
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       integer             stride(1),
!                       integer             imap(1),
!                       nf_int2_t           i2vals(1))
      external      nf_get_varm_int2

      integer       nf_put_varm_int
!                   (integer                ncid,
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       integer             stride(1),
!                       integer             imap(1),
!                       integer             ivals(1))
      external      nf_put_varm_int

      integer       nf_get_varm_int
!                   (integer                ncid,
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       integer             stride(1),
!                       integer             imap(1),
!                       integer             ivals(1))
      external      nf_get_varm_int

      integer       nf_put_varm_real
!                   (integer                ncid,
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       integer             stride(1),
!                       integer             imap(1),
!                       real                rvals(1))
      external      nf_put_varm_real

      integer       nf_get_varm_real
!                   (integer                ncid,
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       integer             stride(1),
!                       integer             imap(1),
!                       real                rvals(1))
      external      nf_get_varm_real

      integer       nf_put_varm_double
!                   (integer                ncid,
!                       integer             varid,
!                       integer             start(1),
!                       integer             count(1),
!                       integer             stride(1),
!                       integer             imap(1),
```

```
!                                       doubleprecision         dvals(1))
      external            nf_put_varm_double

      integer             nf_get_varm_double
!                               (integer                  ncid,
!                                integer                  varid,
!                                integer                  start(1),
!                                integer                  count(1),
!                                integer                  stride(1),
!                                integer                  imap(1),
!                                doubleprecision          dvals(1))
      external            nf_get_varm_double


!       NetCDF-2.
!ccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccccc
! begin netcdf 2.4 backward compatibility:
!

!
! functions in the fortran interface
!
      integer nccre
      integer ncopn
      integer ncddef
      integer ncdid
      integer ncvdef
      integer ncvid
      integer nctlen
      integer ncsfil

      external nccre
      external ncopn
      external ncddef
      external ncdid
      external ncvdef
      external ncvid
      external nctlen
      external ncsfil

      integer ncrdwr
      integer nccreat
      integer ncexcl
      integer ncindef
      integer ncnsync
      integer nchsync
      integer ncndirty
      integer nchdirty
      integer nclink
      integer ncnowrit
      integer ncwrite
      integer ncclob
      integer ncnoclob
      integer ncglobal
      integer ncfill
      integer ncnofill
      integer maxncop
      integer maxncdim
      integer maxncatt
      integer maxncvar
      integer maxncnam
      integer maxvdims
      integer ncnoerr
      integer ncebadid
      integer ncenfile
      integer nceexist
      integer nceinval
      integer nceperm
      integer ncenotin
      integer nceindef
      integer ncecoord
      integer ncemaxds
      integer ncename
      integer ncenoatt
```

```
      integer ncemaxat
      integer ncebadty
      integer ncebadd
      integer ncests
      integer nceunlim
      integer ncemaxvs
      integer ncenotvr
      integer nceglob
      integer ncenotnc
      integer ncfoobar
      integer ncsyserr
      integer ncfatal
      integer ncverbos
      integer ncentool

!
! netcdf data types:
!
      integer ncbyte
      integer ncchar
      integer ncshort
      integer nclong
      integer ncfloat
      integer ncdouble

      parameter(ncbyte = 1)
      parameter(ncchar = 2)
      parameter(ncshort = 3)
      parameter(nclong = 4)
      parameter(ncfloat = 5)
      parameter(ncdouble = 6)

!
!     masks for the struct nc flag field; passed in as 'mode' arg to
!     nccreate and ncopen.
!

!     read/write, 0 => readonly
      parameter(ncrdwr = 1)
!     in create phase, cleared by ncendef
      parameter(nccreat = 2)
!     on create destroy existing file
      parameter(ncexcl = 4)
!     in define mode, cleared by ncendef
      parameter(ncindef = 8)
!     synchronise numrecs on change (x'10')
      parameter(ncnsync = 16)
!     synchronise whole header on change (x'20')
      parameter(nchsync = 32)
!     numrecs has changed (x'40')
      parameter(ncndirty = 64)
!     header info has changed (x'80')
      parameter(nchdirty = 128)
!     prefill vars on endef and increase of record, the default behavior
      parameter(ncfill = 0)
!     do not fill vars on endef and increase of record (x'100')
      parameter(ncnofill = 256)
!     isa link (x'8000')
      parameter(nclink = 32768)

!
!     'mode' arguments for nccreate and ncopen
!
      parameter(ncnowrit = 0)
      parameter(ncwrite = ncrdwr)
      parameter(ncclob = nf_clobber)
      parameter(ncnoclob = nf_noclobber)

!
!     'size' argument to ncdimdef for an unlimited dimension
!
      integer ncunlim
      parameter(ncunlim = 0)
```

```
      !
      !     attribute id to put/get a global attribute
      !
            parameter(ncglobal    = 0)
      !
      !     advisory maximums:
      !
            parameter(maxncop = 64)
            parameter(maxncdim = 1024)
            parameter(maxncatt = 8192)
            parameter(maxncvar = 8192)
      !     not enforced
            parameter(maxncnam = 256)
            parameter(maxvdims = maxncdim)

      !
      !     global netcdf error status variable
      !     initialized in error.c
      !

      !     no error
            parameter(ncnoerr = nf_noerr)
      !     not a netcdf id
            parameter(ncebadid = nf_ebadid)
      !     too many netcdfs open
            parameter(ncenfile = -31)      ! nc_syserr
      !     netcdf file exists && ncnoclob
            parameter(nceexist = nf_eexist)
      !     invalid argument
            parameter(nceinval = nf_einval)
      !     write to read only
            parameter(nceperm = nf_eperm)
      !     operation not allowed in data mode
            parameter(ncenotin = nf_enotindefine )
      !     operation not allowed in define mode
            parameter(nceindef = nf_eindefine)
      !     coordinates out of domain
            parameter(ncecoord = nf_einvalcoords)
      !     maxncdims exceeded
            parameter(ncemaxds = nf_emaxdims)
      !     string match to name in use
            parameter(ncename = nf_enameinuse)
      !     attribute not found
            parameter(ncenoatt = nf_enotatt)
      !     maxncattrs exceeded
            parameter(ncemaxat = nf_emaxatts)
      !     not a netcdf data type
            parameter(ncebadty = nf_ebadtype)
      !     invalid dimension id
            parameter(ncebadd = nf_ebaddim)
      !     ncunlimited in the wrong index
            parameter(nceunlim = nf_eunlimpos)
      !     maxncvars exceeded
            parameter(ncemaxvs = nf_emaxvars)
      !     variable not found
            parameter(ncenotvr = nf_enotvar)
      !     action prohibited on ncglobal varid
            parameter(nceglob = nf_eglobal)
      !     not a netcdf file
            parameter(ncenotnc = nf_enotnc)
            parameter(ncests = nf_ests)
            parameter (ncentool = nf_emaxname)
            parameter(ncfoobar = 32)
            parameter(ncsyserr = -31)

      !
      !     global options variable. used to determine behavior of error handler.
      !     initialized in lerror.c
      !
            parameter(ncfatal = 1)
            parameter(ncverbos = 2)

      !
      !     default fill values.    these must be the same as in the c interface.
```

```
!
        integer filbyte
        integer filchar
        integer filshort
        integer fillong
        real filfloat
        doubleprecision fildoub

        parameter (filbyte = -127)
        parameter (filchar = 0)
        parameter (filshort = -32767)
        parameter (fillong = -2147483647)
        parameter (filfloat = 9.9692099683868690e+36)

        parameter (fildoub = 9.9692099683868690d+36)
    end module netcdf_inc
```

PARAMETER_imput.f90

```
!*************************************************************************
!
!   Module: reads the three configuration files
!               autoCalibration_CONFIGURE.cfg (CFG file)
!               autoCalibration_PHY.cfg (PHY file)
!               autoCalibration_chm.cfg (chm file, 1-155 lines)
!               autoCalibration_bio.cfg (bio file, 1-1300 lines)
!               autoCalibration_sed.cfg (sed file, 1-165 lines)
!
!   MODIFICATION HISTORY:
!   --------------------
!   Original code: Liancong Luo    20/12/2008
!   Modified by Liancong Luo 26 June 2010    JINAN UNIVERSITY
!   Modified by Liancong Luo 28 May 2017 NIGLAS
!*************************************************************************


MODULE PAR_READING

    USE DYRESM_COMMON

CONTAINS

subroutine parameter_input(NN_LINE_CHM,NN_LINE_BIO,NN_LINE_SED,Output_intervals,                    &
                           NN_LINE_CHM_PAR,NN_LINE_BIO_PAR,NN_LINE_SED_PAR,                        &
                           Note_chm,Note_BIO,Note_SED,    CURRENT_DIR,                             &
                           Line_NO_chm_note,Line_NO_chm_number,                                    &
                Line_NO_BIO_note,Line_NO_BIO_NUMBER,     &
                Line_NO_SED_note,Line_NO_SED_NUMBER,    &
                par_chm,par_BIO,par_SED,NUM_LOOP,            &
                I_SWITCH_PHY,I_SWITCH_BIO,I_SWITCH_CHM,I_SWITCH_SED,I_fileSwitch,               &
                obsVar_data,NUMBER_obsVar,NUM_SIMULATED_VAR,Simulated_CAEYM_VARname,      &
                FILENAME,PARa1,PARa0, Start_day,I_SWITCH_NC_DAILY_HOURLY,MODEL_DAYS,      &
                timestep_DYRESM,NUMBER_ERROR,noSer_obsPar,no_obsPar,NUMBER_FILESsAVED,       &
                nUNC_loopFirst,nUNC_loopBest,nUNC_layer,num_VAR_UNCERTAINTY,                    &
                DEPTH_UNCERTAINTY,BDAY_UNCERTAINTY,EDAY_UNCERTAINTY,                            &
                No_Ser_Var_UNCERTAINTY,I_SWITCH_UNCERTAINTY)

! NN_LINE_CHM,NN_LINE_BIO,NN_LINE_SED ---- THE TOTAL NUMBER OF LINES AT PHY, BIO AND CHM FILES
! NN_LINE_CHM_PAR,NN_LINE_BIO_PAR,NN_LINE_SED_PAR------
!THE TOTAL NUMBER OF PARAMETER LINES AT PHY, BIO AND CHM FILES
   !integer, allocatable :: no_par_obs(:)
! INTEGER, allocatable :: NUMBER_UNCERTAINTYana(:)
   character(len=1):: cc
   REAL(KIND=8) :: Start_day,timestep_DYRESM
   INTEGER :: NUMBER_ERROR, NUMBER_FILESsAVED
   INTEGER,INTENT(OUT) :: I_SWITCH_NC_DAILY_HOURLY, MODEL_DAYS,I_fileSwitch,NUMBER_obsVar
   INTEGER :: I_TEMP,NUM_SIMULATED_VAR, Output_intervals,I_SWITCH_UNCERTAINTY
   character(len=8) :: Simulated_CAEYM_VARname(1:num_CAEDYM_VARname)
! INTEGER, allocatable :: NUMBER_UNCERTAINTYana(:)
INTEGER ,ALLOCATABLE    :: No_Ser_Var_UNCERTAINTY(:)
REAL (KIND=8), ALLOCATABLE :: DEPTH_UNCERTAINTY(:)
CHARACTER(LEN=500), INTENT(OUT) :: CURRENT_DIR


 INTEGER :: nUNC_loopFirst,nUNC_loopBest,nUNC_layer,num_VAR_UNCERTAINTY
 REAL (KIND=8) :: BDAY_UNCERTAINTY,EDAY_UNCERTAINTY
```

```
!THIS IS THE NUBMER OF VARIABLES FOR SIMULATION OBTAINED FROM THE CONFIG FIEL.
   character(len=1024) :: Note_chm(1:NN_LINE_CHM),Note_BIO(1:NN_LINE_BIO),Note_SED(1:NN_LINE_SED)
   integer :: Line_NO_chm_note(1:NN_Line_chm_par),Line_NO_chm_number(1:NN_Line_chm_par)
   integer :: Line_NO_BIO_note(1:NN_Line_BIO_par),Line_NO_BIO_number(1:NN_Line_BIO_par)
   integer :: Line_NO_SED_note(1:NN_Line_SED_par),Line_NO_SED_number(1:NN_Line_SED_par)
   real(kind=8) :: par_chm(1:NN_LINE_CHM,1:2)      !chm parameter
   real(kind=8) :: par_BIO(1:NN_LINE_BIO,1:2)      !BIO parameter
   real(kind=8) :: par_SED(1:NN_LINE_SED,1:2)      !SED parameter
 INTEGER, INTENT (OUT) :: I_SWITCH_PHY,I_SWITCH_BIO,I_SWITCH_CHM,I_SWITCH_SED
CHARACTER (LEN=100) :: par_file,CHAR_TEMP
integer :: num_loop

   TYPE (INPUT_FILENAME) :: FILENAME
TYPE (PARA_phy) :: PARa0
TYPE (PARA_FILE) :: para1
TYPE (OBS_DATASET), ALLOCATABLE :: obsVar_data(:)
   integer, allocatable :: noSer_obsPar(:),no_obsPar(:)      !for the par number and serial number of observed data

!-----------------------------------------------------------------------------------------------!
! reading the physical parameter RANGES FROM AUTO_CONFIGATION FILE and the configuration file
!-----------------------------------------------------------------------------------------------!

INQUIRE(FILE='CONFIGURATION_FILES/autoCalibration_CONFIGURE.CFG',EXIST=FILE_ALIVE)
IF(FILE_ALIVE)THEN
OPEN (1,FILE='CONFIGURATION_FILES/autoCalibration_CONFIGURE.CFG',STATUS='OLD')
!WRITE(6,*)
!WRITE(6,'(a)')"PRINTING THE CONFIGURE FILE NOW"
DO I=1,4
READ(1,'(A)') NOTE_LINE_TEMP
!WRITE(6,'(A)') NOTE_LINE_TEMP
ENDDO
   READ(1,'(A)')FILENAME%STG
!WRITE(6,'(A)')FILENAME%STG
   READ(1,'(A)')FILENAME%MET
!WRITE(6,'(A)')FILENAME%MET
   READ(1,'(A)')FILENAME%INF
!WRITE(6,'(A)')FILENAME%INF
   READ(1,'(A)')FILENAME%WDR
!WRITE(6,'(A)')FILENAME%WDR
   READ(1,'(A)')FILENAME%PRO
!WRITE(6,'(A)')FILENAME%PRO
   READ(1,'(A)')FILENAME%Par
!WRITE(6,'(A)')FILENAME%PAR
   READ(1,'(A)')FILENAME%CON
!WRITE(6,'(A)')FILENAME%CON
   READ(1,'(A)')FILENAME%BIO
!WRITE(6,'(A)')FILENAME%BIO
   READ(1,'(A)')FILENAME%CHM
!WRITE(6,'(A)')FILENAME%CHM
   READ(1,'(A)')FILENAME%SED
!WRITE(6,'(A)')FILENAME%SED
   READ(1,'(A)')FILENAME%INT
!WRITE(6,'(A)')FILENAME%INT
   READ(1,'(A)')FILENAME%CFG
!WRITE(6,'(A)')FILENAME%CFG
   READ(1,'(A)')FILENAME%DIRECTORY
!WRITE(6,'(A)')FILENAME%DIRECTORY
   READ(1,'(A)')CURRENT_DIR
!WRITE(6,'(A)')CURRENT_DIR
!    ! !WRITE(6,'(A)')FILENAME%DIRECTORY
do kk=1,4
   READ(1,'(A)')FILENAME%command(kk)
!WRITE(6,'(A)')FILENAME%command(kk)
enddo

DO I=1,3
READ(1,'(A)') NOTE_LINE_TEMP
!WRITE(6,'(A)') NOTE_LINE_TEMP
ENDDO

READ(1,*)NUM_LOOP, I_SWITCH_PHY, I_SWITCH_CHM, I_SWITCH_BIO,    I_SWITCH_SED, I_fileSwitch
!WRITE(6,*)NUM_LOOP, I_SWITCH_PHY, I_SWITCH_CHM, I_SWITCH_BIO,    I_SWITCH_SED, I_fileSwitch
```

```
DO I=1,3
READ(1,'(A)') NOTE_LINE_TEMP
!WRITE(6,'(A)')NOTE_LINE_TEMP
ENDDO

!ALLOCATE (NUMBER_UNCERTAINTYana(1:NUM_LOOP))


READ(1,*)I_SWITCH_DELEparFile,NUMBER_FILESsAVED
!WRITE(6,*)I_SWITCH_DELEparFile,NUMBER_FILESsAVED
DO I=1,3
READ(1,'(A)') NOTE_LINE_TEMP
!WRITE(6,'(A)') NOTE_LINE_TEMP
ENDDO

READ(1,*) Start_day, MODEL_DAYS, Output_intervals,I_SWITCH_NC_DAILY_HOURLY,timestep_DYRESM
!WRITE(6,'(A)')Start_day, MODEL_DAYS, Output_intervals,I_SWITCH_NC_DAILY_HOURLY,timestep_DYRESM

DO I=1,7
READ(1,'(A)') NOTE_LINE_TEMP
!WRITE(6,'(A)') NOTE_LINE_TEMP
ENDDO
READ(1,*)NUMBER_ERROR
!WRITE(6,*) NUMBER_ERROR
if(NUMBER_ERROR.ge.1.and.NUMBER_ERROR.le.10)then
else
write(*,*)'YOU HAVE INPUTTED A WRONG NUMBER. IT SHOULD BE 1 - 10 (INTEGER)'
STOP
ENDIF

DO I=1,3
READ(1,'(A)') NOTE_LINE_TEMP
!WRITE(6,'(A)')NOTE_LINE_TEMP
ENDDO

READ(1,*)I_SWITCH_UNCERTAINTY
READ(1,*) nUNC_loopFirst,nUNC_loopBest
READ(1,*) nUNC_layer
ALLOCATE(DEPTH_UNCERTAINTY(1:nUNC_layer))

READ(1,*)(DEPTH_UNCERTAINTY(I),I=1,nUNC_layer)
READ(1,*) num_VAR_UNCERTAINTY

ALLOCATE(No_Ser_Var_UNCERTAINTY(1:num_VAR_UNCERTAINTY))
!THE SERIAL NUMBERS FOR VARIABLES FOR UNCERTAINTY ANALYSIS

READ(1,*)(No_Ser_Var_UNCERTAINTY(I),I=1,num_VAR_UNCERTAINTY)

!WRITE(6,*) I_SWITCH_UNCERTAINTY,nUNC_loopFirst,nUNC_loopBest,nUNC_layer,num_VAR_UNCERTAINTY

!WRITE(6,*)(DEPTH_UNCERTAINTY(I),I=1,nUNC_layer)

!WRITE(6,*)(No_Ser_Var_UNCERTAINTY(I),I=1,num_VAR_UNCERTAINTY)
!READ(1,*) BDAY_UNCERTAINTY,EDAY_UNCERTAINTY

DO I=1,3
READ(1,'(A)') NOTE_LINE_TEMP
!WRITE(6,'(A)') NOTE_LINE_TEMP
ENDDO
READ(1,*) NUMBER_obsVar
!WRITE(6,*) NUMBER_obsVar
!allocate(obsVar_name(1:NUMBER_obsVar))

!DO JJ=1,NUMBER_obsVar
!READ(1,'(A)') obsVar_name(i)
!enddo
!
ALLOCATE(obsVar_data(1:NUMBER_obsVar))     !the observation dataset type (error, depth and others)
ALLOCATE(noSer_obsPar(1:NUMBER_obsVar))    !the parameter number being read in the configure file
ALLOCATE(no_obsPar(1:NUMBER_obsVar))       !the parameter serial number in the configure file (successive)


DO JJ=1,NUMBER_obsVar
no_obsPar(jj)=jj
```

```
      READ(1,'(A)') NOTE_LINE_TEMP
      !WRITE(6,'(A)') NOTE_LINE_TEMP
      READ(1,*)noSer_obsPar(jj),obsVar_data(jj)%NN_DATLINE,obsVar_data(jj)%WeightFactor,obsVar_data(jj)%name
     !,NOTE_LINE_TEMP
      !WRITE(6,*)noSer_obsPar(jj),obsVar_data(jj)%NN_DATLINE,obsVar_data(jj)%WeightFactor,obsVar_data(jj)%name
     !,NOTE_LINE_TEMP

      FF_TEMP=obsVar_data(jj)%WeightFactor
      IF(FF_TEMP.GE.0.0.AND.FF_TEMP.LE.1.0)THEN
      ELSE
      WRITE(*,*)'YOU HAVE INPUTTED A WRONG WEIGHT FACTOR, SHOULD BE FROM 0.0 TO 1.0'
      STOP
      ENDIF

      !make sure the serial number is right and the name is right.
      DO IK=1,NUMBER_VAR
      IF(noSer_obsPar(jj).EQ.IK)THEN
      IF(TRIM(ADJUSTL(ADJUSTR(obsVar_data(jj)%name))).NE.TRIM(ADJUSTL(ADJUSTR(obs_VARname(IK)))))THEN
      !WRITE(6,*)TRIM(ADJUSTL(ADJUSTR(obsVar_data(jj)%name))),ik
      WRITE(*,*)'YOU HAVE INPUT A WRONG SERIAL NUMBER OR NAME OF OBSERVATION VARIABLE FOR
      THE',JJ,'VARIABLE!'
      STOP
      ENDIF
      ENDIF
      ENDDO

      READ(1,*)obsVar_data(jj)%NN_DEPTH      !NOTE_LINE_TEMP
      !WRITE(6,*)obsVar_data(jj)%NN_DEPTH      !NOTE_LINE_TEMP
      allocate(obsVar_data(jj)%WATER_DEPTH(1:obsVar_data(jj)%NN_DEPTH))
      allocate(obsVar_data(jj)%WeightFactorVertical(1:obsVar_data(jj)%NN_DEPTH))
      READ(1,*)(obsVar_data(jj)%WATER_DEPTH(k),k=1,obsVar_data(jj)%NN_DEPTH)      !,NOTE_LINE_TEMP
      !WRITE(6,*)(obsVar_data(jj)%WATER_DEPTH(k),k=1,obsVar_data(jj)%NN_DEPTH)      !,NOTE_LINE_TEMP
      READ(1,*)(obsVar_data(jj)%WeightFactorVertical(k),k=1,obsVar_data(jj)%NN_DEPTH)      !WeightFactor at vertical profile
      !WRITE(6,*)(obsVar_data(jj)%WeightFactorVertical(k),k=1,obsVar_data(jj)%NN_DEPTH)      !WeightFactor at vertical profile
      allocate(obsVar_data(jj)%OBS_DATA(1:obsVar_data(jj)%NN_DATLINE,1:obsVar_data(jj)%NN_DEPTH))
      allocate(obsVar_data(jj)%DATA_TIME(1:obsVar_data(jj)%NN_DATLINE))


      !allocate all the error parameters
      allocate(obsVar_data(jj)%STDO(1:obsVar_data(jj)%NN_DEPTH,1:NUM_LOOP))
      allocate(obsVar_data(jj)%STDM(1:obsVar_data(jj)%NN_DEPTH,1:NUM_LOOP))
      allocate(obsVar_data(jj)%MBE(1:obsVar_data(jj)%NN_DEPTH,1:NUM_LOOP))
      allocate(obsVar_data(jj)%MNBE(1:obsVar_data(jj)%NN_DEPTH,1:NUM_LOOP))    !,     &
      allocate(obsVar_data(jj)%MAGE(1:obsVar_data(jj)%NN_DEPTH,1:NUM_LOOP))    !,     &
      allocate(obsVar_data(jj)%MANGE(1:obsVar_data(jj)%NN_DEPTH,1:NUM_LOOP)) !,    &
      allocate(obsVar_data(jj)%SSE(1:obsVar_data(jj)%NN_DEPTH,1:NUM_LOOP))      !,       &
      allocate(obsVar_data(jj)%MSE(1:obsVar_data(jj)%NN_DEPTH,1:NUM_LOOP))      !,       &
      allocate(obsVar_data(jj)%RMSE(1:obsVar_data(jj)%NN_DEPTH,1:NUM_LOOP))    !,     &
      allocate(obsVar_data(jj)%RMNSE(1:obsVar_data(jj)%NN_DEPTH,1:NUM_LOOP))    !,    &
      allocate(obsVar_data(jj)%E_Nash(1:obsVar_data(jj)%NN_DEPTH,1:NUM_LOOP)) !, &
      allocate(obsVar_data(jj)%number_data(1:obsVar_data(jj)%NN_DEPTH,1:NUM_LOOP)) !, &
      allocate(obsVar_data(jj)%R_Pearson(1:obsVar_data(jj)%NN_DEPTH,1:NUM_LOOP))
      allocate(obsVar_data(jj)%T_TEST(1:obsVar_data(jj)%NN_DEPTH,1:NUM_LOOP))
      allocate(obsVar_data(jj)%Errors_title(1:obsVar_data(jj)%NN_DEPTH))

      allocate(obsVar_data(jj)%STDO_TOT(1:NUM_LOOP))
      allocate(obsVar_data(jj)%STDM_TOT(1:NUM_LOOP))
      allocate(obsVar_data(jj)%MBE_TOT(1:NUM_LOOP))
      allocate(obsVar_data(jj)%MNBE_TOT(1:NUM_LOOP))    !,     &
      allocate(obsVar_data(jj)%MAGE_TOT(1:NUM_LOOP))    !,     &
      allocate(obsVar_data(jj)%MANGE_TOT(1:NUM_LOOP)) !,    &
      allocate(obsVar_data(jj)%SSE_TOT(1:NUM_LOOP))      !,       &
      allocate(obsVar_data(jj)%MSE_TOT(1:NUM_LOOP))      !,       &
      allocate(obsVar_data(jj)%RMSE_TOT(1:NUM_LOOP))    !,     &
      allocate(obsVar_data(jj)%RMNSE_TOT(1:NUM_LOOP))    !,    &
      allocate(obsVar_data(jj)%E_Nash_TOT(1:NUM_LOOP)) !, &
      !allocate(obsVar_data(jj)%number_data_TOT(1:NUM_LOOP)) !, &
      allocate(obsVar_data(jj)%R_Pearson_TOT(1:NUM_LOOP))
      allocate(obsVar_data(jj)%T_TEST_TOT(1:NUM_LOOP))

      enddo


      READ(1,'(A)') NOTE_LINE_TEMP
      !WRITE(6,'(A)')NOTE_LINE_TEMP
```

```
READ(1,'(A)') NOTE_LINE_TEMP
!WRITE(6,'(A)')NOTE_LINE_TEMP
READ(1,'(A)') NOTE_LINE_TEMP
!WRITE(6,'(A)')NOTE_LINE_TEMP

I_TEMP=0
55 READ(1,'(A8)') CAEDYM_VARNAME_TEMP
I_TEMPI=0
DO IX=1,num_CAEDYM_VARname
IF(TRIM(ADJUSTL(ADJUSTR(CAEDYM_VARNAME_TEMP))).EQ.CAEYM_VARname(iX))THEN
I_TEMP=I_TEMP+1
Simulated_CAEYM_VARname(I_TEMP)=TRIM(ADJUSTL(ADJUSTR(CAEDYM_VARNAME_TEMP)))
I_TEMPI=1

ENDIF
ENDDO

IF(I_TEMPI.EQ.0)THEN    !NON-VARIABLE OF CAEDYM
IF(TRIM(ADJUSTL(ADJUSTR(CAEDYM_VARNAME_TEMP))).EQ.FILE_END)THEN
GO TO 56
ELSE
GO TO 55
ENDIF
ELSE
GO TO 55
ENDIF

56 NUM_SIMULATED_VAR=I_TEMP              !GETTING THE NUMBER OF SIMULATED VARIABLES
ELSE
  !WRITE(6,*)"THE CONFIGURATION FILE FOR AUTOCALIBRATION DOES NOT EXIST!"
ENDIF
CLOSE(1)


!-------------------------------------------------------------------------------------------!
! reading the physical parameter RANGES FROM AUTO_CONFIGATION FILE
!-------------------------------------------------------------------------------------------!

INQUIRE(FILE='CONFIGURATION_FILES/autoCalibration_PHY.CFG',EXIST=FILE_ALIVE)
IF(FILE_ALIVE)THEN
OPEN (1,FILE='CONFIGURATION_FILES/autoCalibration_PHY.CFG',STATUS='OLD')

DO I=1,6
READ(1,'(A)') NOTE_LINE_TEMP
ENDDO

READ(1,*)(PARa0%PAR_BULK(I),I=1,2)
READ(1,*)(PARa0%PAR_albedo(I),I=1,2)
READ(1,*)(PARa0%PAR_emission(I),I=1,2)
READ(1,*)(PARa0%PAR_CriticalWind(I),I=1,2)
READ(1,*)(PARa0%PAR_output(I),I=1,2)
READ(1,*)(PARa0%PAR_bubbler(I),I=1,2)
READ(1,*)(PARa0%PAR_buoyant(I),I=1,2)
READ(1,*)(PARa0%PAR_shear(I),I=1,2)
READ(1,*)(PARa0%PAR_energy(I),I=1,2)
READ(1,*)(PARa0%PAR_windStiring(I),I=1,2)
READ(1,*)(PARa0%PAR_surface(I),I=1,2)
READ(1,*)(PARa0%PAR_BBL(I),I=1,2)
READ(1,*)(PARa0%PAR_VerticalMixing(I),I=1,2)
READ(1,*)(PARa0%MinLayerThickness(I),I=1,2),(PARa0%MaxLayerThickness(I),I=1,2)
!! !WRITE(6,*)(PARa0%MinLayerThickness(I),I=1,2),(PARa0%MaxLayerThickness(I),I=1,2)
READ(1,'(A)') NOTE_LINE_TEMP
!READ(1,'(A)') NOTE_LINE_TEMP
!READ(1,'(A)') NOTE_LINE_TEMP
!READ(1,*) NUMBER_obsVar

ELSE
  !WRITE(6,*)"THE PHYSICAL CONFIGURATION FILE DOES NOT EXIST"
ENDIF
CLOSE(1)



!-------------------------------------------------------------------------------------------!
! reading the CHEMICAL parameter RANGES FROM AUTO_CONFIGATION FILE
```

```
!-------------------------------------------------------------------------------------------------!
INQUIRE(FILE='CONFIGURATION_FILES/autoCalibration_CHM.CFG',EXIST=FILE_ALIVE)
IF(FILE_ALIVE)THEN
OPEN (1,FILE='CONFIGURATION_FILES/autoCalibration_CHM.CFG',STATUS='OLD')

do i=1,NN_Line_chm_par    !529 lines
Line_NO_chm_note(i)=I_defaultValue           !9999, line number for the note lines in chm file
Line_NO_chm_number(i)=I_defaultValue       !9999, line number for the paremeter lines in the chm file
read(1,'(a)')note_comment
note_comment=trim(adjustl(note_comment))
cc=note_comment(1:1)
if((cc.eq.'!').or.(ichar(cc).le.90.and.ichar(cc).ge.65).or.      &
     (ichar(cc).le.97.and.ichar(cc).ge.122))then    !Geting the first simbol (!, a - z, A - Z)
Line_NO_chm_note(i)=i
!elseif(cc.eq.'0'.or.cc.eq.'1'.or.cc.eq.'2'.or.cc.eq.'3'.or.cc.eq.'4'      &
!           .or.cc.eq.'5'.or.cc.eq.'6'.or.cc.eq.'7'.or.cc.eq.'8'.or.cc.eq.'9')then
  elseif(cc.eq.'0'.or.cc.eq.'1'.or.cc.eq.'2'.or.cc.eq.'3'.or.cc.eq.'4'      &
          .or.cc.eq.'5'.or.cc.eq.'6'.or.cc.eq.'7'.or.cc.eq.'8'.or.cc.eq.'9' &
            .or.cc.eq.'-')then

Line_NO_chm_number(i)=i    !get the Line number with Mix and Max range.

else
  !WRITE(6,'(i5,5x,a)')i,cc

  !WRITE(6,*)"You have put wrong signals in the *.chm file (!,a-z,A-Z,number)"
  !WRITE(6,*)"Line",i
pause 10
endif
enddo
close(1)
else
endif
!--------------re-open the chm file for par par par par par reading-----------

INQUIRE(FILE='CONFIGURATION_FILES/autoCalibration_CHM.CFG',EXIST=FILE_ALIVE)
IF(FILE_ALIVE)THEN
OPEN (1,FILE='CONFIGURATION_FILES/autoCalibration_CHM.CFG',STATUS='OLD')

do i=1,NN_Line_chm_par    !155 of 529 lines
if(Line_NO_chm_note(i).ne.I_defaultValue)then
read(1,'(a)')Note_chm(i)                                        !--- NOTE LINE
elseIF(Line_NO_chm_nUMBER(i).ne.I_defaultValue)then
read(1,*)(par_chm(i,j),j=1,2)      !,Note_chm(i)              !--- PARAMEATER LINE
endif
enddo

do i=NN_Line_chm_par+1,NN_LINE_CHM
read(1,'(a)')Note_chm(i)
!! !WRITE(6,'(a)')Note_chm(i)
enddo
close(1)
else
endif


!-------------------------------------------------------------------------------------------------!
! reading the BIOLOGICAL parameter RANGES FROM AUTO_CONFIGATION FILE
!-------------------------------------------------------------------------------------------------!
INQUIRE(FILE='CONFIGURATION_FILES/autoCalibration_BIO.CFG',EXIST=FILE_ALIVE)
IF(FILE_ALIVE)THEN
OPEN (1,FILE='CONFIGURATION_FILES/autoCalibration_BIO.CFG',STATUS='OLD')

do i=1,NN_Line_bio_par    !1300 lines
Line_NO_BIO_note(i)=I_defaultValue           !line number for the note lines in chm file
Line_NO_BIO_number(i)=I_defaultValue       !line number for the paremeter lines in the chm file
IF(I.LE.15)THEN
read(1,'(a)')note_comment
Line_NO_BIO_note(i)=i
Line_NO_BIO_number(i)=I_defaultValue
ELSEIF(I.GE.16.AND.I.LE.22)THEN
read(1,'(a)')note_comment
Line_NO_BIO_note(i)=I_defaultValue
Line_NO_BIO_number(i)=I
ELSEIF(I.EQ.23)THEN
```

```
read(1,'(a)')note_comment
Line_NO_BIO_note(i)=i
Line_NO_BIO_number(i)=I_defaultValue
ELSEIF(I.GE.24.AND.I.LE.30)THEN
read(1,'(a)')note_comment
Line_NO_BIO_note(i)=I_defaultValue
Line_NO_BIO_number(i)=I
ELSEIF(I.GE.31.AND.I.LE.40)THEN
read(1,'(a)')note_comment
Line_NO_BIO_note(i)=i
Line_NO_BIO_number(i)=I_defaultValue
ELSEIF(I.GE.41)THEN

 IF((I.GE.314.AND.I.LE.320).OR.(I.GE.348.AND.I.LE.354).OR.         &
          (I.EQ.519).OR.(I.EQ.977).OR.(I.EQ.978).OR.(I.EQ.995).OR.    &
            (I.GE.1053.AND.I.LE.1056))THEN
read(1,'(a)')note_comment
Line_NO_BIO_note(i)=i
Line_NO_BIO_number(i)=I_defaultValue
ELSE
!ELSEIF((I.GE.41.AND.I.LT.314).OR.(I.GT.320))THEN
Read(1,'(a)')note_comment
note_comment=trim(adjustl(note_comment))
cc=note_comment(1:1)

if((cc.eq.'!').or.(ichar(cc).le.90.and.ichar(cc).ge.65).or.      &
    (ichar(cc).le.97.and.ichar(cc).ge.122))then
Line_NO_BIO_note(i)=i
elseif(cc.eq.'0'.or.cc.eq.'1'.or.cc.eq.'2'.or.cc.eq.'3'.or.cc.eq.'4'      &
          .or.cc.eq.'5'.or.cc.eq.'6'.or.cc.eq.'7'.or.cc.eq.'8'.or.cc.eq.'9' &
            .or.cc.eq.'-')then
Line_NO_BIO_number(i)=i
!! !WRITE(6,'(i5,5x,a)')i,cc
else
  !WRITE(6,'(i5,5x,a)')i,cc
!WRITE(6,*)"You have put wrong signals in the *.bio file (!,a-z,A-Z,number)"
pause 10
endif

ENDIF

ELSE
endif
enddo
close(1)
else
endif   !IF(FILE_ALIVE)THEN
!--------------re-open the BIOLOGICAL file for par par par par par reading----------

INQUIRE(FILE='CONFIGURATION_FILES/autoCalibration_BIO.CFG',EXIST=FILE_ALIVE)
IF(FILE_ALIVE)THEN
OPEN (1,FILE='CONFIGURATION_FILES/autoCalibration_BIO.CFG',STATUS='OLD')
do i=1,NN_Line_bio_par    !1300 lines
!! !WRITE(6,*)i,Line_NO_BIO_note(i),Line_NO_BIO_nUMBER(i)
if(Line_NO_BIO_note(i).ne.I_defaultValue)then
read(1,'(a)')Note_BIO(i)
elseIF(Line_NO_BIO_nUMBER(i).ne.I_defaultValue)then
read(1,*)(par_BIO(i,j),j=1,2)    !,Note_BIO(i)
!! !WRITE(6,'(i5,2f15.5,a)')i,(par_BIO(i,j),j=1,2)      !,Note_BIO(i)
else
endif
enddo
do i=NN_Line_BIO_par+1,NN_LINE_BIO
read(1,'(a)')Note_BIO(i)
enddo
close(1)
endif
!-------------------------------------------------------------------------------------------!
! reading the SEDIMENT parameter RANGES FROM AUTO_CONFIGATION FILE
!-------------------------------------------------------------------------------------------!
INQUIRE(FILE='CONFIGURATION_FILES/autoCalibration_SED.CFG',EXIST=FILE_ALIVE)
IF(FILE_ALIVE)THEN
OPEN (1,FILE='CONFIGURATION_FILES/autoCalibration_SED.CFG',STATUS='OLD')

do i=1,NN_Line_SED_par    !159 lines
```

```
Line_NO_SED_note(i)=I_defaultValue           !line number for the note lines in chm file
Line_NO_SED_number(i)=I_defaultValue       !line number for the paremeter lines in the chm file

read(1,'(a)')note_comment
note_comment=trim(adjustl(note_comment))
cc=note_comment(1:1)

!IF(I.EQ.121)THEN
!ENDIF

if((cc.eq.'!').or.(ichar(cc).le.90.and.ichar(cc).ge.65).or.      &
     (ichar(cc).le.97.and.ichar(cc).ge.122))then
Line_NO_SED_note(i)=i
!elseif(cc.eq.'0'.or.cc.eq.'1'.or.cc.eq.'2'.or.cc.eq.'3'.or.cc.eq.'4'      &
!           .or.cc.eq.'5'.or.cc.eq.'6'.or.cc.eq.'7'.or.cc.eq.'8'.or.cc.eq.'9')then
elseif(cc.eq.'0'.or.cc.eq.'1'.or.cc.eq.'2'.or.cc.eq.'3'.or.cc.eq.'4'      &
           .or.cc.eq.'5'.or.cc.eq.'6'.or.cc.eq.'7'.or.cc.eq.'8'.or.cc.eq.'9' &
            .or.cc.eq.'-')then
Line_NO_SED_number(i)=i
else
  !WRITE(6,'(i5,5x,a)')i,cc
  !WRITE(6,*)"You have put wrong signals in the *.sed file (!,a-z,A-Z,number)"
pause 10
endif

!IF(I.EQ.98.OR.I.EQ.102.OR.I.EQ.110.OR.I.EQ.115.OR.I.EQ.116)THEN    !OLD CODE
IF(I.EQ.96.OR.I.EQ.100.OR.I.EQ.108.OR.I.EQ.113.OR.I.EQ.114)THEN     !MODIFIED ON 25 JUNE 2010
Line_NO_SED_note(i)=i
Line_NO_SED_number(i)=I_defaultValue
ENDIF

!! !WRITE(6,'(I5,5X,A)')I,CC
!PAUSE 223


enddo
!do i=NN_Line_SED_par+1,NN_Line_SED
!Line_NO_SED_note(i)=i
!Line_NO_SED_number(i)=I_defaultValue
!ENDDO
close(1)
else
endif

!----------re-open the SED file for par par par par par reading----------

INQUIRE(FILE='CONFIGURATION_FILES/autoCalibration_SED.CFG',EXIST=FILE_ALIVE)
IF(FILE_ALIVE)THEN
OPEN (1,FILE='CONFIGURATION_FILES/autoCalibration_SED.CFG',STATUS='OLD')
do i=1,NN_Line_SED_par    !159 lines
if(Line_NO_SED_note(i).ne.I_defaultValue)then
read(1,'(a)')Note_SED(i)
!! !WRITE(6,*)I,Note_SED(i)
elseIF(Line_NO_SED_NUMBER(i).ne.I_defaultValue)THEN
read(1,*)(par_SED(i,j),j=1,2)
!! !WRITE(6,*)I,(par_SED(i,j),j=1,2)
endif
! !WRITE(6,*)I,Line_NO_SED_NUMBER(i),Line_NO_SED_NOTE(i)
enddo
do i=NN_Line_SED_par+1,NN_Line_SED
read(1,'(a)')Note_SED(i)
ENDDO
close(1)
else
endif

end subroutine parameter_input
end MODULE PAR_READING
```

RANDOM_NUMBER.f90

```
!*****************************************************************************
MODULE RANDOM

CONTAINS
subroutine randomnumber(random_no0)
```

```
real*8 random_no0
!integer N(2)
integer time(8)
integer seed(2)

!Method one-----------------------------------------------------
CALL DATE_AND_TIME(values=TIME)
seed(1)=time(4)*(360000*time(5)+6000*time(6)+100*time(7)+time(8))
call random_seed(PUT=seed)
call random_number(HARVEST = random_no0)
END SUBROUTINE RANDOMNUMBER

end MODULE RANDOM
```

DeallocationVariables.f90

```
!*****************************************************************************
!   PROGRAM: Auto-calibration of DYRESM-CAEDYM
!
!   MODIFICATION HISTORY:
!   --------------------
!   Original code : Liancong Luo 27/11/2008
!
!*****************************************************************************

module deallocationVariable

USE DYRESM_COMMON

CONTAINS

subroutine VarDeallocation_PARAMETER(NUMBER_obsVar)
INTEGER , INTENT (IN) :: NUMBER_obsVar
if(ALLOCATEd(obsVar_data))    deallocate(obsVar_data)    !the observation dataset type (error, depth and others)
if(ALLOCATEd(noSer_obsPar)) deallocate(noSer_obsPar) !(1:NUMBER_obsVar))    !the par no in the configure file
if(ALLOCATEd(no_obsPar))      deallocate(no_obsPar) !(1:NUMBER_obsVar)) !the par serial no in the con file (successive)
if(ALLOCATEd(obsVar_data))      deallocate(obsVar_data)
END subroutine VarDeallocation_PARAMETER

subroutine VarDeallocation_MAIN()
IF( ALLOCATED (par_chm_RANDOM))      DEALLOCATE(par_chm_RANDOM)
IF( ALLOCATED (par_BIO_RANDOM))      DEALLOCATE(par_BIO_RANDOM)
IF( ALLOCATED (par_SED_RANDOM))      DEALLOCATE(par_SED_RANDOM)
IF( ALLOCATED(PARa1%PAR_BULK))      DEALLOCATE(PARa1%PAR_BULK)
IF( ALLOCATED(PARa1%PAR_albedo))      DEALLOCATE(PARa1%PAR_albedo)
IF( ALLOCATED(PARa1%PAR_emission))      DEALLOCATE(PARa1%PAR_emission)
IF( ALLOCATED(PARa1%PAR_CriticalWind))      DEALLOCATE(PARa1%PAR_CriticalWind)
IF( ALLOCATED(PARa1%PAR_output))      DEALLOCATE(PARa1%PAR_output)
IF( ALLOCATED(PARa1%PAR_bubbler))      DEALLOCATE(PARa1%PAR_bubbler)
IF( ALLOCATED(PARa1%PAR_buoyant))      DEALLOCATE(PARa1%PAR_buoyant)
IF( ALLOCATED(PARa1%PAR_shear))      DEALLOCATE(PARa1%PAR_shear)
IF( ALLOCATED(PARa1%PAR_energy))      DEALLOCATE(PARa1%PAR_energy)
IF( ALLOCATED(PARa1%PAR_windStiring))      DEALLOCATE(PARa1%PAR_windStiring)
IF( ALLOCATED(PARa1%PAR_surface))      DEALLOCATE(PARa1%PAR_surface)
IF( ALLOCATED(PARa1%PAR_BBL))      DEALLOCATE(PARa1%PAR_BBL)
IF( ALLOCATED(PARa1%PAR_VerticalMixing))      DEALLOCATE(PARa1%PAR_VerticalMixing)
IF( ALLOCATED(PARa1%MinLayerThickness))      DEALLOCATE(PARa1%MinLayerThickness)
IF( ALLOCATED(PARa1%MaxLayerThickness))      DEALLOCATE(PARa1%MaxLayerThickness)
IF( ALLOCATED(FOUTTIME))      DEALLOCATE(FOUTTIME)
IF( ALLOCATED (par_chm_RANDOM))      DEALLOCATE(par_chm_RANDOM)
IF( ALLOCATED (par_BIO_RANDOM))      DEALLOCATE(par_BIO_RANDOM)
IF( ALLOCATED (par_SED_RANDOM))      DEALLOCATE(par_SED_RANDOM)
IF( ALLOCATED(FOUTTIME))      DEALLOCATE(FOUTTIME)
if(ALLOCATEd(LoopNumber_CaedymError))       deallocate(LoopNumber_CaedymError)
IF(ALLOCATED(TOTAL_ERRORS%ERROR_TOTAL))    DEALLOCATE(TOTAL_ERRORS%ERROR_TOTAL)
IF(ALLOCATED(TOTAL_ERRORS%SerNumber_ERROR_TOTAL))       &
DEALLOCATE(TOTAL_ERRORS%SerNumber_ERROR_TOTAL)
IF(ALLOCATED(ERROR_ALLerror0))    DEALLOCATE(ERROR_ALLerror0)
IF(ALLOCATED(ERROR_ALLerror1))    DEALLOCATE(ERROR_ALLerror1)
IF(ALLOCATED(number_ERROR_ALLerror0))    DEALLOCATE(number_ERROR_ALLerror0)
IF(ALLOCATED(number_ERROR_ALLerror1))    DEALLOCATE(number_ERROR_ALLerror1)
IF(ALLOCATED(NUMBER_error_SORTED))      DEALLOCATE(NUMBER_error_SORTED)
IF(ALLOCATED(NUMBER_FILESsAVED0))       DEALLOCATE(NUMBER_FILESsAVED0)
IF(ALLOCATED(NUMBER_FILESsAVED1))       DEALLOCATE(NUMBER_FILESsAVED1)
END subroutine VarDeallocation_MAIN
```

```
subroutine VarDeallocation_DYRESM()
IF(ALLOCATED( dyresmLAYER_HTS_Var))     DEALLOCATE(dyresmLAYER_HTS_Var)     ! 1
IF(ALLOCATED(   dyresmTEMPTURE_Var))    DEALLOCATE(dyresmTEMPTURE_Var)     ! 2
IF(ALLOCATED(   dyresmDO_Var))     DEALLOCATE(dyresmDO_Var)                ! 3
IF(ALLOCATED(   dyresmNO3_Var))    DEALLOCATE(dyresmNO3_Var)               ! 4
IF(ALLOCATED(   dyresmNH4_Var))    DEALLOCATE(dyresmNH4_Var)               ! 5
IF(ALLOCATED(   dyresmTN_Var))     DEALLOCATE(dyresmTN_Var)                ! 6
IF(ALLOCATED(   dyresmPO4_Var))    DEALLOCATE(dyresmPO4_Var)               ! 7
IF(ALLOCATED(   dyresmTP_Var))     DEALLOCATE(dyresmTP_Var)                ! 8
IF(ALLOCATED(   dyresmCYANO_Var)) DEALLOCATE(dyresmCYANO_Var)              ! 9
IF(ALLOCATED(   dyresmFDIAT_Var))     DEALLOCATE(dyresmFDIAT_Var)          ! 10
IF(ALLOCATED(   dyresmTCHLA_Var))     DEALLOCATE(dyresmTCHLA_Var)          ! 11
IF(ALLOCATED(      dyresmPOCL_Var ))    DEALLOCATE(dyresmPOCL_Var)        ! 12
IF(ALLOCATED(      dyresmDOCL_Var))     DEALLOCATE(dyresmDOCL_Var)        ! 13
IF(ALLOCATED(      dyresmPOPL_Var))     DEALLOCATE(dyresmPOPL_Var)        ! 14
IF(ALLOCATED(      dyresmDOPL_Var))     DEALLOCATE(dyresmDOPL_Var)        ! 15
IF(ALLOCATED(      dyresmPONL_Var))     DEALLOCATE(dyresmPONL_Var)        ! 16
IF(ALLOCATED(      dyresmDONL_Var))     DEALLOCATE(dyresmDONL_Var)        ! 17
IF(ALLOCATED(      dyresmPOCR_Var))     DEALLOCATE(dyresmPOCR_Var)        ! 18
IF(ALLOCATED(      dyresmDOCR_Var))     DEALLOCATE(dyresmDOCR_Var)        ! 19
IF(ALLOCATED(      dyresmPOPR_Var))     DEALLOCATE(dyresmPOPR_Var)        ! 20
IF(ALLOCATED(      dyresmDOPR_Var))     DEALLOCATE(dyresmDOPR_Var)        ! 21
IF(ALLOCATED(      dyresmPONR_Var))     DEALLOCATE(dyresmPONR_Var)        ! 22
IF(ALLOCATED(      dyresmDONR_Var))     DEALLOCATE(dyresmDONR_Var)        ! 23
IF(ALLOCATED(      dyresmCRYPT_Var))     DEALLOCATE(dyresmCRYPT_Var)      ! 24
IF(ALLOCATED(      dyresmNODUL_Var))     DEALLOCATE(dyresmNODUL_Var)      ! 25
IF(ALLOCATED(      dyresmDINOF_Var))     DEALLOCATE(dyresmDINOF_Var)      ! 26
IF(ALLOCATED(      dyresmCHLOR_Var))     DEALLOCATE(dyresmCHLOR_Var)      ! 27
IF(ALLOCATED(      dyresmMDIAT_Var))     DEALLOCATE(dyresmMDIAT_Var)      ! 28
IF(ALLOCATED(      dyresmZOOP1_Var))     DEALLOCATE(dyresmZOOP1_Var)      ! 29
IF(ALLOCATED(      dyresmZOOP2_Var))     DEALLOCATE(dyresmZOOP2_Var)      ! 30
IF(ALLOCATED(      dyresmZOOP3_Var))     DEALLOCATE(dyresmZOOP3_Var)      ! 31
IF(ALLOCATED(      dyresmZOOP4_Var))     DEALLOCATE(dyresmZOOP4_Var)      ! 32
IF(ALLOCATED(      dyresmZOOP5_Var))     DEALLOCATE(dyresmZOOP5_Var)      ! 33
IF(ALLOCATED(      dyresmSSOL1_Var))     DEALLOCATE(dyresmSSOL1_Var)      ! 34
IF(ALLOCATED(      dyresmSSOL2_Var))     DEALLOCATE(dyresmSSOL2_Var)      ! 35
IF(ALLOCATED(      dyresmFISH1_Var))     DEALLOCATE(dyresmFISH1_Var)      ! 36
IF(ALLOCATED(      dyresmFISH2_Var))     DEALLOCATE(dyresmFISH2_Var)      ! 37
IF(ALLOCATED(      dyresmFISH3_Var))     DEALLOCATE(dyresmFISH3_Var)      ! 38
IF(ALLOCATED(      dyresmBAC_Var))     DEALLOCATE(dyresmBAC_Var)          ! 39
IF(ALLOCATED(      dyresmPAR_Var))     DEALLOCATE(dyresmPAR_Var)          ! 40

END SUBROUTINE VarDeallocation_DYRESM


subroutine
VarDeallocation_Uncertainty(UncertaintyAnaWHOLE,UncertaintyAnaALL,UncertaintyAnaFIRST,UncertaintyAnaBEST)
TYPE (Uncertainty):: UncertaintyAnaWHOLE,UncertaintyAnaALL,UncertaintyAnaFIRST, UncertaintyAnaBEST


IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_BAC))              &
DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_BAC )
IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_CHLOR ))           &
DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_CHLOR )
IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_CRYPT ))           &
DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_CRYPT )
IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_CYANO ))           &
DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_CYANO )
IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_DINOF ))           &
DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_DINOF )
IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_DO ))              &
DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_DO )
IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_DOCL ))            &
DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_DOCL )
IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_DOCR ))            &
DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_DOCR )
IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_DONL ))            &
DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_DONL )
IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_DONR ))            &
DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_DONR )
IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_DOPL ))            &
DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_DOPL )
```

```
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_DOPR ))              &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_DOPR )
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_FDIAT ))             &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_FDIAT )
 5    IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_FISH1 ))             &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_FISH1 )
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_FISH2 ))             &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_FISH2 )
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_FISH3 ))             &
10    DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_FISH3 )
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_MDIAT ))             &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_MDIAT )
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_NH4 ))               &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_NH4 )
15    IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_NO3))                &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_NO3)
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_NODUL))              &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_NODUL)
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_PAR))                &
20    DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_PAR)
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_PO4))                &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_PO4)
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_POCL))               &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_POCL)
25    IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_POCR))               &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_POCR)
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_PONL))               &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_PONL)
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_PONR))               &
30    DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_PONR)
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_POPL))               &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_POPL)
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_POPR))               &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_POPR)
35    IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_SSOL1))              &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_SSOL1)
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_SSOL2))              &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_SSOL2)
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_TCHLA))              &
40    DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_TCHLA)
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_TEMPTURE))           &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_TEMPTURE)
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_TN))                 &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_TN)
45    IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_TP))                 &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_TP)
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_ZOOP1))              &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_ZOOP1)
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_ZOOP2))              &
50    DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_ZOOP2)
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_ZOOP3))              &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_ZOOP3)
      IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_ZOOP4))              &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_ZOOP4)
55    IF(ALLOCATED(UncertaintyAna_WHOLE%Uncertainty_ZOOP5))              &
      DEALLOCATE(UncertaintyAna_WHOLE%Uncertainty_ZOOP5)

      IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_BAC))                  &
      DEALLOCATE(UncertaintyAna_ALL%Uncertainty_BAC)
60    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_CHLOR))                &
      DEALLOCATE(UncertaintyAna_ALL%Uncertainty_CHLOR)
      IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_CRYPT))                &
      DEALLOCATE(UncertaintyAna_ALL%Uncertainty_CRYPT)
      IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_CYANO))                &
65    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_CYANO)
      IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_DINOF))                &
      DEALLOCATE(UncertaintyAna_ALL%Uncertainty_DINOF)
      IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_DO))                   &
      DEALLOCATE(UncertaintyAna_ALL%Uncertainty_DO)
70    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_DOCL))                 &
      DEALLOCATE(UncertaintyAna_ALL%Uncertainty_DOCL)
      IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_DOCR))                 &
      DEALLOCATE(UncertaintyAna_ALL%Uncertainty_DOCR)
      IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_DONL))                 &
75    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_DONL)
```

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    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_DONR))              &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_DONR)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_DOPL))              &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_DOPL)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_DOPR))                  &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_DOPR)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_FDIAT))             &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_FDIAT)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_FISH1))             &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_FISH1)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_FISH2))                 &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_FISH2)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_FISH3))                 &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_FISH3)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_MDIAT))             &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_MDIAT)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_NH4))               &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_NH4)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_NO3))               &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_NO3)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_NODUL))             &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_NODUL)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_PAR))               &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_PAR)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_PO4))               &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_PO4)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_POCL))              &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_POCL)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_POCR))                  &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_POCR)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_PONL))              &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_PONL)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_PONR))                  &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_PONR)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_POPL))                  &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_POPL)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_POPR))                  &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_POPR)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_SSOL1))             &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_SSOL1)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_SSOL2))             &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_SSOL2)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_TCHLA))             &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_TCHLA)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_TEMPTURE))              &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_TEMPTURE)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_TN))            &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_TN)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_TP))            &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_TP)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_ZOOP1))             &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_ZOOP1)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_ZOOP2))             &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_ZOOP2)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_ZOOP3))             &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_ZOOP3)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_ZOOP4))             &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_ZOOP4)
    IF(ALLOCATED(UncertaintyAna_ALL%Uncertainty_ZOOP5))             &
    DEALLOCATE(UncertaintyAna_ALL%Uncertainty_ZOOP5)

    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_BAC))             &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_BAC)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_CHLOR))               &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_CHLOR)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_CRYPT))               &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_CRYPT)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_CYANO))               &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_CYANO)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_DINOF))               &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_DINOF)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_DO))                  &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_DO)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_DOCL))                &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_DOCL)
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    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_DOCR))              &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_DOCR)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_DONL))              &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_DONL)
5   IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_DONR))              &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_DONR)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_DOPL))              &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_DOPL)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_DOPR))              &
10  DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_DOPR)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_FDIAT))             &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_FDIAT)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_FISH1))             &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_FISH1)
15  IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_FISH2))             &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_FISH2)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_FISH3))             &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_FISH3)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_MDIAT))             &
20  DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_MDIAT)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_NH4))               &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_NH4)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_NO3))               &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_NO3)
25  IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_NODUL))             &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_NODUL)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_PAR))               &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_PAR)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_PO4))               &
30  DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_PO4)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_POCL))              &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_POCL)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_POCR))              &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_POCR)
35  IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_PONL))              &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_PONL)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_PONR))              &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_PONR)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_POPL))              &
40  DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_POPL)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_POPR))              &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_POPR)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_SSOL1))             &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_SSOL1)
45  IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_SSOL2))             &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_SSOL2)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_TCHLA))             &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_TCHLA)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_TEMPTURE))          &
50  DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_TEMPTURE)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_TN))                &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_TN)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_TP))                &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_TP)
55  IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_ZOOP1))             &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_ZOOP1)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_ZOOP2))             &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_ZOOP2)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_ZOOP3))             &
60  DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_ZOOP3)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_ZOOP4))             &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_ZOOP4)
    IF(ALLOCATED(UncertaintyAna_FIRST%Uncertainty_ZOOP5))             &
    DEALLOCATE(UncertaintyAna_FIRST%Uncertainty_ZOOP5)
65
    IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_BAC))                &
    DEALLOCATE(UncertaintyAna_BEST%Uncertainty_BAC)
    IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_CHLOR))              &
    DEALLOCATE(UncertaintyAna_BEST%Uncertainty_CHLOR)
70  IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_CRYPT))              &
    DEALLOCATE(UncertaintyAna_BEST%Uncertainty_CRYPT)
    IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_CYANO))              &
    DEALLOCATE(UncertaintyAna_BEST%Uncertainty_CYANO)
    IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_DINOF))              &
75  DEALLOCATE(UncertaintyAna_BEST%Uncertainty_DINOF)
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IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_DO))                &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_DO)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_DOCL))              &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_DOCL)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_DOCR))              &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_DOCR)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_DONL))              &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_DONL)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_DONR))              &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_DONR)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_DOPL))              &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_DOPL)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_DOPR))              &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_DOPR)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_FDIAT))             &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_FDIAT)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_FISH1))             &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_FISH1)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_FISH2))             &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_FISH2)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_FISH3))             &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_FISH3)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_MDIAT))             &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_MDIAT)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_NH4))               &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_NH4)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_NO3))               &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_NO3)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_NODUL))             &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_NODUL)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_PAR))               &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_PAR)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_PO4))               &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_PO4)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_POCL))              &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_POCL)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_POCR))              &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_POCR)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_PONL))              &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_PONL)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_PONR))              &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_PONR)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_POPL))              &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_POPL)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_POPR))              &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_POPR)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_SSOL1))             &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_SSOL1)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_SSOL2))             &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_SSOL2)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_TCHLA))             &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_TCHLA)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_TEMPTURE))          &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_TEMPTURE)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_TN))                &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_TN)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_TP))          &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_TP)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_ZOOP1))             &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_ZOOP1)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_ZOOP2))             &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_ZOOP2)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_ZOOP3))             &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_ZOOP3)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_ZOOP4))             &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_ZOOP4)
IF(ALLOCATED(UncertaintyAna_BEST%Uncertainty_ZOOP5))             &
DEALLOCATE(UncertaintyAna_BEST%Uncertainty_ZOOP5)
!IF(ALLOCATED(NUMBER_UNCERTAINTYana))   DEALLOCATE(NUMBER_UNCERTAINTYana)
IF(ALLOCATED(No_Ser_Var_UNCERTAINTY))          &
DEALLOCATE(No_Ser_Var_UNCERTAINTY)
!(1:num_VAR_UNCERTAINTY))   !THE SERIAL NUMBERS FOR VARIABLES FOR UNCERTAINTY ANALYSIS
IF(ALLOCATED(DEPTH_UNCERTAINTY))          &
DEALLOCATE(DEPTH_UNCERTAINTY)
```

```
end subroutine VarDeallocation_Uncertainty

subroutine VarDeallocation_SENSITIVITY
TYPE (SENSITIVITY):: SENSITIVITY_DYCD
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_BAC))              &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_BAC)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_CHLOR))            &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_CHLOR)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_CRYPT))            &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_CRYPT)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_CYANO))            &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_CYANO)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_DINOF))            &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_DINOF)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_DO))               &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_DO)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_DOCL))             &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_DOCL)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_DOCR))             &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_DOCR)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_DONL))             &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_DONL)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_DONR))             &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_DONR)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_DOPL))             &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_DOPL)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_DOPR))             &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_DOPR)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_FDIAT))            &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_FDIAT)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_FISH1))            &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_FISH1)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_FISH2))            &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_FISH2)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_FISH3))            &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_FISH3)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_MDIAT))            &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_MDIAT)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_NH4))              &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_NH4)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_NO3))              &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_NO3)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_NODUL))            &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_NODUL)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_PAR))              &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_PAR)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_PO4))              &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_PO4)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_POCL))             &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_POCL)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_POCR))             &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_POCR)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_PONL))             &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_PONL)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_PONR))             &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_PONR)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_POPL))             &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_POPL)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_POPR))             &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_POPR)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_SSOL1))            &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_SSOL1)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_SSOL2))            &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_SSOL2)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_TCHLA))            &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_TCHLA)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_TEMPTURE))         &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_TEMPTURE)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_TN))               &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_TN)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_TP))               &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_TP)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_ZOOP1))            &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_ZOOP1)
```

```
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_ZOOP2))               &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_ZOOP2)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_ZOOP3))               &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_ZOOP3)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_ZOOP4))               &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_ZOOP4)
IF(ALLOCATED(SENSITIVITY_DYCD%SENSITIVITY_ZOOP5))               &
DEALLOCATE(SENSITIVITY_DYCD%SENSITIVITY_ZOOP5)
END subroutine VarDeallocation_SENSITIVITY
END module deallocationVariable
```

dyresm_caedym_running.f90

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!-------------------------------------------------------------------------------------------------
!*************************************************************************
!
!   PROGRAM: Auto-calibration of DYRESM-CAEDYM
!
!   MODIFICATION HISTORY:
!   --------------------
!   Original code : Liancong Luo 27/11/2008
!
!*************************************************************************

module DYRESM_RUNNING
use DYRESM_COMMON
use PAR_READING
!USE IFPORT
!use IFCORE
contains

SUBROUTINE DYRESM_CAEDYM_RUNNING (FILENAMES)

!CHARACTER (LEN=40), PARAMETER :: Command_1= 'Del Files/Calibration/*.* /q'
CHARACTER (LEN=1000)       :: Filename(1:4),Commandline(1:4)
Integer(2) :: results
TYPE (INPUT_FILENAME), INTENT (IN) :: FILENAMES

do i=1,3
filename(i)=trim(adjustl(adjustr(FILENAMES%DIRECTORY)))//     &
                '/'//trim(adjustl(adjustr(FILENAMES%command(i))))
enddo

filename(4)=trim(adjustl(adjustr(FILENAMES%DIRECTORY)))//     &
                '/'//trim(adjustl(adjustr(FILENAMES%command(4))))//' >dycd_log.txt'

Commandline(1)= trim(adjustl(adjustr(FILENAMES%stg)))//' '//         &
                trim(adjustl(adjustr(FILENAMES%met)))//' '//         &
                trim(adjustl(adjustr(FILENAMES%inf)))//' '//         &
                trim(adjustl(adjustr(FILENAMES%wdr)))//' DYref.nc >dycd_log.txt'
Commandline(2)= trim(adjustl(adjustr(FILENAMES%pro)))//' '//         &
                trim(adjustl(adjustr(FILENAMES%par)))//' '//         &
                trim(adjustl(adjustr(FILENAMES%con)))//' DYsim.nc >dycd_log.txt'
Commandline(3)= 'DYref.nc DYsim.nc '//trim(adjustl(adjustr(FILENAMES%cfg)))//' >dycd_log.txt'
Commandline(4)= ' >log.txt'

!run the model now
!results = SYSTEMQQ('cls')
results = SYSTEMQQ('rm DYref.nc')
results = SYSTEMQQ('rm DYsim.nc')
INQUIRE(FILE='morphinterp.out',EXIST=FILE_ALIVE)
IF(FILE_ALIVE)THEN
results = SYSTEMQQ('rm morphinterp.out')
else
endif

INQUIRE(FILE='dycd_log.txt',EXIST=FILE_ALIVE)
IF(FILE_ALIVE)THEN
results = SYSTEMQQ('rm dycd_log.txt')
else
endif

do i=1,3
        results = RUNQQ(filename(i), Commandline(i))    ! Run creatDYref
! PAUSE 88
!           write(6,*)filename(i)
```

```
!             write(6,*)commandline(i)
!           results = RUNQQ(Filename2, Commandline2)    ! Run createDYsim
!           results = RUNQQ(Filename3, Commandline3)    ! Run extractDYinfo
!           results = RUNQQ(Filename4, Commandline4)    ! Run dycd
enddo

results = SYSTEMQQ(filename(4))
!pause 89


!call system('abc.exe')
end SUBROUTINE DYRESM_CAEDYM_RUNNING
end module DYRESM_RUNNING
```

Par_file_copy.f90

```
!-------------------------------------------------------------------------------------------------
!*************************************************************************************
!
!   Module: copy the par files
!
!   MODIFICATION HISTORY:
!   --------------------
!   Original code: Liancong Luo    20/12/2008
!
!*************************************************************************************


MODULE file_copy

    USE DYRESM_COMMON

CONTAINS

subroutine file_copying( FILENAME)

TYPE (INPUT_FILENAME) :: FILENAME
character(len=1024) :: filename_temp,filename_temp2,note_temp
filename_temp=trim(adjustl(adjustr(filename%par)))
filename_temp2='Files_BACKUP/copy_of_'//filename_temp
open(11,file=filename_temp)
!WRITE(6,*)filename%par,FILENAME_TEMP

open(12,file=filename_temp2)
do i=1,NN_LINE_par
read(11,'(a)')note_temp
write(12,'(a)')note_temp
enddo
close(11)
close(12)

filename_temp=trim(adjustl(adjustr(filename%cfg)))
filename_temp2='copy_of_'//filename_temp
open(11,file=filename_temp)
open(12,file=filename_temp2)
do i=1,NN_LINE_cfg
read(11,'(a)')note_temp
write(12,'(a)')note_temp
enddo
close(11)
close(12)

filename_temp=trim(adjustl(adjustr(filename%bio)))
filename_temp2='copy_of_'//filename_temp
open(11,file=filename_temp)
open(12,file=filename_temp2)
do i=1,NN_LINE_bio
read(11,'(a)')note_temp
write(12,'(a)')note_temp
enddo
close(11)
close(12)

filename_temp=trim(adjustl(adjustr(filename%sed)))
filename_temp2='copy_of_'//filename_temp
open(11,file=filename_temp)
```

```
open(12,file=filename_temp2)
do i=1,NN_LINE_sed
read(11,'(a)')note_temp
write(12,'(a)')note_temp
enddo
close(11)
close(12)

filename_temp=trim(adjustl(adjustr(filename%chm)))
filename_temp2='copy_of_'//filename_temp
open(11,file=filename_temp)
open(12,file=filename_temp2)
do i=1,NN_LINE_chm
read(11,'(a)')note_temp
write(12,'(a)')note_temp
enddo
close(11)
close(12)

end subroutine file_copying
end MODULE file_copy
```

CAEDYM_NC_STATUS.f90

```
!-------------------------------------------------------------------------------------------------
!*********************************************************************************
!
!   PROGRAM: Auto-calibration of DYRESM-CAEDYM
!
!   MODIFICATION HISTORY:
!   --------------------
!   Original code : Liancong Luo 26 June 2010 NERI
!*********************************************************************************

MODULE CAEDYM_NC_STATUS

use DYRESM_COMMON
contains

SUBROUTINE DYRISM_STATUS (I_STATUS, allVar_alive, I_LINE_NUMBER,INDEX_PHY)
CHARACTER (LEN=3), PARAMETER :: FILE_END='EOF'
INTEGER :: I_STATUS
integer, INTENT (IN) :: INDEX_PHY       !1 MEANS WITH PHYSICAL, 0 MEANS WITHOUT PHYSICAL MODEL
INTEGER :: I_LINE_NUMBER
CHARACTER (LEN=500) ::    CHAR_NC_DYRSIM
logical :: allVar_alive

I_LINE_NUMBER=0
INQUIRE(FILE='AllVar_PAR.txt',EXIST=allVar_alive)
IF(allVar_alive)THEN
open(1,file='AllVar_PAR.txt',STATUS='OLD')
44 READ(1,'(A)')CHAR_NC_DYRSIM
!WRITE(6,*)TRIM(ADJUSTL(ADJUSTR(CHAR_NC_DYRSIM)))
!PAUSE 999
IF(TRIM(ADJUSTL(ADJUSTR(CHAR_NC_DYRSIM))).NE.FILE_END)THEN
I_LINE_NUMBER=I_LINE_NUMBER+1
!WRITE(6,*)TRIM(ADJUSTL((CHAR_NC_DYRSIM))), '             LINE:',I_LINE_NUMBER
!write(6,'(a,i5)')TRIM(ADJUSTL(ADJUSTR(CHAR_NC_DYRSIM)))//file_end,I_LINE_NUMBER
!pause 99
GO TO 44
ELSE
GO TO 55
ENDIF

!WRITE(6,*)
WRITE(6,*)
55 WRITE(6,'(A,I10,A)')'THERE ARE ',I_LINE_NUMBER,' LINES IN THE AllVar.txt FILE'
!PAUSE 100
IF(INDEX_PHY.EQ.0)THEN
IF(I_LINE_NUMBER.GE.3)THEN
I_STATUS=1
ELSE
I_STATUS=0
ENDIF
ELSEIF(INDEX_PHY.EQ.1)THEN
IF(I_LINE_NUMBER.LT.3)THEN
```

```
I_STATUS=1
I_LINE_NUMBER=2
ELSE
I_STATUS=0
ENDIF
ENDIF
CLOSE(1)
else
I_STATUS=0
endif   !IF(allVar_alive)THEN
RETURN

END SUBROUTINE DYRISM_STATUS

END MODULE CAEDYM_NC_STATUS
```

DeletingParameterFiles.f90

```
!-------------------------------------------------------------------------------------------------
!*************************************************************************
!   MODIFICATION HISTORY:
!   --------------------
!   Original code : Liancong Luo 7/7/2010 at NERI
!*************************************************************************
! This subroutine is to delete the paremeter(*.par, *.bio, *.sed, *.chm) files with poor simulations
! noSer_obsPar (Par_number here) is the index number for variables (e.g. 2 represent "TEMPTURE"),
! noSer_obsPar(kk) from main.
! number_par_obs is a COMMON number for different variables, n2 for depth and n3 for time seriers.


MODULE DeletingParameterFiles
use DYRESM_COMMON
!use ifort

contains

subroutine DeletingParBioChmSedFiles(n_loop,error_n_loop,number_error,NUMBER_FILESsAVED,      &
                                     number_ERROR_ALLerror1, number_ERROR_ALLerror0,          &
                                     ERROR_ALLerror1,ERROR_ALLerror0,number_temp)


Integer, intent (in) :: n_loop,number_error, NUMBER_FILESsAVED
real (kind=8), intent(in) :: error_n_loop, ERROR_ALLerror0(1:NUMBER_FILESsAVED)
real (kind=8), intent(out) :: ERROR_ALLerror1(1:NUMBER_FILESsAVED)
integer, intent (out) :: number_ERROR_ALLerror1(1:NUMBER_FILESsAVED)
integer, intent (in) :: number_ERROR_ALLerror0(1:NUMBER_FILESsAVED)
integer, intent (out) :: number_temp
!HERE N_LOOP IS THE LOOP NUMBER FROM MAIN PROGRAM, NUM_LOOP IS THE WHOLE NUMBER OF ALL
!LOOPS, NUMBER_ERROR REPRESENTS THE ERROR PARAMETER (RMSE, MBE...)

number_temp=88888888
IF(number_error.LE.8)THEN    !INCREASING

IF(error_n_loop.LE.ERROR_ALLerror0(1))THEN
number_temp=number_ERROR_ALLerror0(NUMBER_FILESsAVED)
DO I=NUMBER_FILESsAVED-1,1,-1
ERROR_ALLerror1(I+1)=ERROR_ALLerror0(I)
number_ERROR_ALLerror1(I+1)=number_ERROR_ALLerror0(I)
ENDDO
ERROR_ALLerror1(1)=error_n_loop
number_ERROR_ALLerror1(1)=n_loop

ELSEIF(error_n_loop.GE.ERROR_ALLerror0(NUMBER_FILESsAVED))THEN
number_temp=n_loop

ELSE
DO I=1,NUMBER_FILESsAVED-1
IF((error_n_loop.GE.ERROR_ALLerror0(I)).AND.(error_n_loop.LE.ERROR_ALLerror0(I+1)))THEN
  number_temp=number_ERROR_ALLerror0(NUMBER_FILESsAVED )
 DO J=1,I
 ERROR_ALLerror1(J)= ERROR_ALLerror0(J)
 number_ERROR_ALLerror1(J)= number_ERROR_ALLerror0(J)
 ENDDO
 ERROR_ALLerror1(I+1)= error_n_loop
 number_ERROR_ALLerror1(I+1)= n_loop
 DO J=NUMBER_FILESsAVED-1,I+1,-1
```

```
 number_ERROR_ALLerror1(J+1)= number_ERROR_ALLerror0(J)
 ERROR_ALLerror1(J+1)= ERROR_ALLerror0(J)
 ENDDO
ELSE
ENDIF
ENDDO

ENDIF    !IF(error_n_loop.LE.ERROR_ALLerror1(1))THEN

ELSEIF(number_error==9.OR.number_error==10)THEN    !DECREASING

IF(error_n_loop.LE.ERROR_ALLerror0(NUMBER_FILESsAVED))THEN
 number_temp=n_loop
ELSEIF(error_n_loop.GE.ERROR_ALLerror0(1))THEN
 number_temp=number_ERROR_ALLerror0(NUMBER_FILESsAVED)
DO I=NUMBER_FILESsAVED-1,1,-1
ERROR_ALLerror1(I+1)=ERROR_ALLerror0(I)
number_ERROR_ALLerror1(I+1)=number_ERROR_ALLerror0(I)
ENDDO
ERROR_ALLerror1(1)=error_n_loop
number_ERROR_ALLerror1(1)=n_loop
ELSE
DO I=1,NUMBER_FILESsAVED-1
IF((error_n_loop.GE.ERROR_ALLerror0(I+1)).AND.(error_n_loop.LE.ERROR_ALLerror0(I)))THEN
 number_temp=number_ERROR_ALLerror0(NUMBER_FILESsAVED)
DO J=1,I
 ERROR_ALLerror1(J)= ERROR_ALLerror0(J)
 number_ERROR_ALLerror1(J)= number_ERROR_ALLerror0(J)
 ENDDO
  ERROR_ALLerror1(I+1)= error_n_loop
 number_ERROR_ALLerror1(I+1)= n_loop
 DO J=NUMBER_FILESsAVED-1,I+1,-1
 ERROR_ALLerror1(J+1)= ERROR_ALLerror0(J)
  number_ERROR_ALLerror1(J+1)=    number_ERROR_ALLerror0(J)
 ENDDO
ELSE
ENDIF
ENDDO    !DO I=1,NUMBER_FILESsAVED-1

ENDIF    !IF(error_n_loop.LE.ERROR_ALLerror0(NUMBER_FILESsAVED))THEN

ENDIF    !IF(ERROR_NUMBER.LE.8)THEN    !INCREASING

call DeletingParameterFile(number_temp)
END SUBROUTINE DeletingParBioChmSedFiles


SUBROUTINE DeletingParameterFile(number_temp)
CHARACTER (LEN=100)      :: Commandline, char_temp
CHARACTER (LEN=500)    :: FILENAME
Integer(2) :: results
LOGICAL :: FILE_EXIST
integer, intent (in) :: number_temp

write(char_temp,*) number_temp
FILENAME='FILES_PARAMETER/PAR_'//TRIM(ADJUSTL(ADJUSTR(char_temp)))//'.PAR'
INQUIRE(FILE=FILENAME,EXIST=FILE_EXIST)
IF(FILE_EXIST)THEN
Commandline = 'rm '//FILENAME
results = SYSTEMQQ(Commandline)
ENDIF

FILENAME='FILES_PARAMETER/CHM_'//TRIM(ADJUSTL(ADJUSTR(char_temp)))//'.CHM'
INQUIRE(FILE=FILENAME,EXIST=FILE_EXIST)
IF(FILE_EXIST)THEN
Commandline = 'rm '//FILENAME
results = SYSTEMQQ(Commandline)
ENDIF

FILENAME='FILES_PARAMETER/BIO_'//TRIM(ADJUSTL(ADJUSTR(char_temp)))//'.BIO'
INQUIRE(FILE=FILENAME,EXIST=FILE_EXIST)
IF(FILE_EXIST)THEN
Commandline = 'rm '//FILENAME
results = SYSTEMQQ(Commandline)
ENDIF
```

```
FILENAME='FILES_PARAMETER/SED_'//TRIM(ADJUSTL(ADJUSTR(char_temp)))//'.SED'
INQUIRE(FILE=FILENAME,EXIST=FILE_EXIST)
IF(FILE_EXIST)THEN
Commandline = 'rm '//FILENAME
results = SYSTEMQQ(Commandline)
ENDIF

end SUBROUTINE DeletingParameterFile

END MODULE DeletingParameterFiles
```

NETCDF_running.f90

```
!-------------------------------------------------------------------------------------------------
!*************************************************************************
!
!   PROGRAM: Auto-calibration of DYRESM-CAEDYM
!
!   MODIFICATION HISTORY:
!   --------------------
!   Original code : Liancong Luo 27/11/2008
!   Change date: 25 JUNE 2010 (NERI)
!*************************************************************************

module NETCDF_RUNNING_PAR
use DYRESM_COMMON
include 'netcdf.inc'

contains

SUBROUTINE NETCDF_RUNNING (CURRENT_DIR)

!CHARACTER (LEN=40), PARAMETER :: Command_1= 'Del Files/Calibration/*.* /q'
CHARACTER (LEN=600)      :: Filename1,Commandline,filename2
!CHARACTER (LEN=200) , INTENT(IN)    :: CURRENT_DIR
Integer(2) :: results
LOGICAL :: FILE_ALIVE
  CHARACTER(LEN=500), INTENT(IN) :: CURRENT_DIR

!Integer(2) :: results
filename1='AllVar_PAR.txt'
filename2=trim(adjustl(adjustr(CURRENT_DIR)))//"/NETCDF_TEST.exe"
INQUIRE(FILE=trim(adjustl(adjustr(filename1))),EXIST=FILE_ALIVE)
IF(FILE_ALIVE)THEN
Commandline = 'rm ' // filename1
   results = SYSTEMQQ(Commandline)    ! Delete all old files in the folder '.Files/Calibration'

else
endif

!run the model now
INQUIRE(FILE='NETCDF_TEST.exe',EXIST=FILE_ALIVE)
IF(FILE_ALIVE)THEN
results = SYSTEMQQ(trim(adjustl(adjustr(filename2))))

else
WRITE(6,*)'NETCDF_TEST DOES NOT EXIST'
write(6,'(A)')trim(adjustl(adjustr(filename2)))
STOP
endif

end SUBROUTINE NETCDF_RUNNING
end module NETCDF_RUNNING_PAR
```

CLIBRATION_GEOCHM.f90

```
!-------------------------------------------------------------------------------------------------
!   PROGRAM: Auto-calibration of DYRESM-CAEDYM
!
!   MODIFICATION HISTORY:
!   --------------------
!   Original code : Liancong Luo 27/11/2008
!   Modified by Liancong Luo on 1/7/2010 at (NERI).
!*************************************************************************
```

```
module AUTO_CALIBRATION_BIO_CHM
use DYRESM_COMMON
USE DYRESM_RUNNING
use random
      !USE IFCORE

contains

SUBROUTINE CALIBRATION_BIOCHM
(NO_LOOP,I_SWITEH_CHM,I_SWITEH_BIO,I_SWITEH_SED,RANDOM_NO,FILENAMES, par_chm,     &
            par_bio,par_sed, par_chm_RANDOM,par_bio_RANDOM,par_sed_RANDOM,          &
             Line_NO_chm_note,Line_NO_chm_number,                                   &
             Line_NO_bio_note,Line_NO_bio_number,                                   &
             Line_NO_sed_note,Line_NO_sed_number,                                   &
             Note_chm,Note_BIO,Note_SED,i_fileoutput)

  character (len=100) :: fileName_temp
INTEGER, INTENT (IN) :: NO_LOOP,I_SWITEH_CHM,I_SWITEH_BIO,I_SWITEH_SED,i_fileoutput
REAL*8    RANDOM_NO
real*8 random_no2
!integer :: i_fileoutput
TYPE (INPUT_FILENAME), INTENT (IN) :: FILENAMES
  real(kind=8)    :: par_chm(1:NN_LINE_CHM,1:2)      !chm parameter
  real(kind=8)    :: par_BIO(1:NN_LINE_BIO,1:2)      !BIO parameter
  real(kind=8)    :: par_SED(1:NN_LINE_SED,1:2)      !SED parameter
real(kind=8)    :: par_chm_RANDOM(1:NUM_LOOP,1:NN_LINE_CHM_par)
real(kind=8)    :: par_bio_RANDOM(1:NUM_LOOP,1:NN_LINE_BIO_par)
real(kind=8)    :: par_SED_RANDOM(1:NUM_LOOP,1:NN_LINE_SED_par)
   integer :: Line_NO_chm_note(1:NN_Line_chm_par),Line_NO_chm_number(1:NN_Line_chm_par)
   integer :: Line_NO_BIO_note(1:NN_Line_BIO_par),Line_NO_BIO_number(1:NN_Line_BIO_par)
   integer :: Line_NO_SED_note(1:NN_Line_SED_par),Line_NO_SED_number(1:NN_Line_SED_par)
   character(len=1024) :: Note_chm(1:NN_LINE_CHM),Note_BIO(1:NN_LINE_BIO), Note_SED(1:NN_LINE_SED)

  !CALL SEED(RND$TIMESEED)
DO I=1,NN_Line_chm_par
IF(Line_NO_chm_number(I).EQ.I)THEN
call randomnumber(RANDOM_NO2)
par_chm_RANDOM(NO_LOOP,I)=par_chm(I,1)+(par_chm(I,2)-par_chm(I,1))*random_no2
ELSE
ENDIF
ENDDO

!IF(I==13.OR.I==14.OR.I==22.OR.I==23.OR.I==25.OR.I==26.OR.I==38.OR.I==39) THEN
!WRITE(6,*)"LOOP=",NO_LOOP,I,par_chm(I,1),par_chm(I,2),par_chm_RANDOM(NO_LOOP,I),random_no2
!PAUSE 999
!ENDIF



DO I=1,NN_Line_BIO_par
call randomnumber(RANDOM_NO2)
IF(Line_NO_BIO_number(I).EQ.I)THEN
par_BIO_RANDOM(NO_LOOP,I)=par_BIO(I,1)+(par_BIO(I,2)-par_BIO(I,1))*random_no2
ELSE
ENDIF
ENDDO

DO I=1,NN_Line_SED_par
call randomnumber(RANDOM_NO2)
IF(Line_NO_SED_number(I).EQ.I)THEN
par_SED_RANDOM(NO_LOOP,I)=par_SED(I,1)+(par_SED(I,2)-par_SED(I,1))*random_no2
ELSE
ENDIF
ENDDO


IF(I_SWITCH_BIO.EQ.1)THEN
OPEN(1,FILE=FILENAMES%BIO)
DO I=1,NN_Line_BIO
IF(I.LE.NN_Line_BIO_PAR)THEN
IF(Line_NO_BIO_number(I).EQ.I)THEN
IF(I.GE.272.AND.I.LE.278)THEN
WRITE(1,'(F20.8,A)')par_BIO_RANDOM(NO_LOOP,I),'             0.0'    !,Note_BIO(I)
ELSE
WRITE(1,*)par_BIO_RANDOM(NO_LOOP,I)    !,'0.0'    !,Note_BIO(I)
```

```
ENDIF
ELSEif(Line_NO_BIO_note(I).EQ.I)THEN
WRITE(1,'(a)')Note_BIO(I)
else
ENDIF
ELSEif(I.gt.NN_Line_BIO_PAR)THEN
WRITE(1,'(a)')Note_BIO(I)
ENDIF
ENDDO
CLOSE(1)
ELSE
ENDIF

IF(I_SWITCH_CHM.EQ.1)THEN
OPEN(2,FILE=FILENAMES%CHM)
!OPEN(3,FILE=FILENAMES%SED)
DO I=1,NN_Line_CHM
IF(I.LE.NN_Line_CHM_PAR)THEN
IF(Line_NO_CHM_number(I).EQ.I)THEN
WRITE(2,*)par_CHM_RANDOM(NO_LOOP,I)     !,"0.0"    !,Note_BIO(I)
ELSEif(Line_NO_CHM_note(I).EQ.I)THEN
WRITE(2,'(a)')Note_CHM(I)
else
ENDIF
ELSEif(I.gt.NN_Line_CHM_PAR)THEN
WRITE(2,'(a)')Note_CHM(I)
ENDIF
ENDDO
CLOSE(2)
ELSE
ENDIF

IF(I_SWITCH_SED.EQ.1)THEN
OPEN(3,FILE=FILENAMES%SED)
DO I=1,NN_Line_SED
IF(I.LE.NN_Line_SED_PAR)THEN
IF(Line_NO_SED_number(I).EQ.I)THEN
WRITE(3,*)par_SED_RANDOM(NO_LOOP,I)    !,Note_BIO(I)
ELSEif(Line_NO_SED_note(I).EQ.I)THEN
WRITE(3,'(a)')Note_SED(I)
else
ENDIF
ELSEif(I.gt.NN_Line_SED_PAR)THEN
WRITE(3,'(a)')Note_SED(I)
ENDIF
ENDDO
CLOSE(3)
ELSE
ENDIF

if(i_fileoutput.eq.1.AND.I_SWITCH_BIO.eq.1)then
write(char_temp,*)NO_loop
filename_temp='FILES_PARAMETER/BIO_'//trim(ADJUSTL(ADJUSTR(char_temp)))//'.BIO'
OPEN(1,FILE=filename_temp)
DO I=1,NN_Line_BIO
IF(I.LE.NN_Line_BIO_PAR)THEN
IF(Line_NO_BIO_number(I).EQ.I)THEN
IF(I.GE.272.AND.I.LE.278)THEN
WRITE(1,'(F20.8,A)')par_BIO_RANDOM(NO_LOOP,I),'              0.0'    !,Note_BIO(I)
ELSE
WRITE(1,*)par_BIO_RANDOM(NO_LOOP,I)    !,'0.0'    !,Note_BIO(I)
ENDIF
ELSEif(Line_NO_BIO_note(I).EQ.I)THEN
WRITE(1,'(a)')Note_BIO(I)
else
ENDIF
ELSEif(I.gt.NN_Line_BIO_PAR)THEN
WRITE(1,'(a)')Note_BIO(I)
ENDIF
ENDDO
close(1)
endif

if(i_fileoutput.eq.1.AND.I_SWITCH_chm.eq.1)then
write(char_temp,*)NO_loop
```

```
filename_temp='FILES_PARAMETER/CHM_'//trim(ADJUSTL(ADJUSTR(char_temp)))//'.CHM'
OPEN(2,FILE=filename_temp)
DO I=1,NN_Line_CHM
IF(I.LE.NN_Line_CHM_PAR)THEN
IF(Line_NO_CHM_number(I).EQ.I)THEN
WRITE(2,*)par_CHM_RANDOM(NO_LOOP,I)     !,"0.0"    !,Note_BIO(I)
ELSEif(Line_NO_CHM_note(I).EQ.I)THEN
WRITE(2,'(a)')Note_CHM(I)
else
ENDIF
ELSEif(I.gt.NN_Line_CHM_PAR)THEN
WRITE(2,'(a)')Note_CHM(I)
ENDIF
ENDDO
close(2)
endif

if(i_fileoutput.eq.1.AND.I_SWITCH_sed.eq.1)then
write(char_temp,*)NO_loop
filename_temp='FILES_PARAMETER/SED_'//trim(ADJUSTL(ADJUSTR(char_temp)))//'.SED'
OPEN(3,FILE=filename_temp)
DO I=1,NN_Line_SED
IF(I.LE.NN_Line_SED_PAR)THEN
IF(Line_NO_SED_number(I).EQ.I)THEN
WRITE(3,*)par_SED_RANDOM(NO_LOOP,I)    !,Note_BIO(I)
ELSEif(Line_NO_SED_note(I).EQ.I)THEN
WRITE(3,'(a)')Note_SED(I)
else
ENDIF
ELSEif(I.gt.NN_Line_SED_PAR)THEN
WRITE(3,'(a)')Note_SED(I)
ENDIF
ENDDO
close(3)
endif

end SUBROUTINE CALIBRATION_BIOCHM

SUBROUTINE BEST_BIOCHM_PAR (FILENAMES, par_chm_RANDOM,par_bio_RANDOM,par_sed_RANDOM，&
      Line_NO_chm_note,Line_NO_chm_number，  Line_NO_bio_note,Line_NO_bio_number,                    &
      Line_NO_sed_note,Line_NO_sed_number, Note_chm,Note_BIO,Note_SED, LOOP_BESTNO)

TYPE (INPUT_FILENAME), INTENT (IN) :: FILENAMES
real(kind=8)    :: par_chm_RANDOM(1:NUM_LOOP,1:NN_LINE_CHM_par)
real(kind=8)    :: par_bio_RANDOM(1:NUM_LOOP,1:NN_LINE_BIO_par)
real(kind=8)    :: par_SED_RANDOM(1:NUM_LOOP,1:NN_LINE_SED_par)
   integer :: Line_NO_chm_note(1:NN_Line_chm_par),Line_NO_chm_number(1:NN_Line_chm_par)
   integer :: Line_NO_BIO_note(1:NN_Line_BIO_par),Line_NO_BIO_number(1:NN_Line_BIO_par)
   integer :: Line_NO_SED_note(1:NN_Line_SED_par),Line_NO_SED_number(1:NN_Line_SED_par)
   character(len=1024) :: Note_chm(1:NN_LINE_CHM),Note_BIO(1:NN_LINE_BIO), Note_SED(1:NN_LINE_SED)
   INTEGER, INTENT(IN):: LOOP_BESTNO

OPEN(1,FILE=FILENAMES%BIO)
OPEN(2,FILE=FILENAMES%CHM)
OPEN(3,FILE=FILENAMES%SED)
DO I=1,NN_Line_BIO
IF(I.LE.NN_Line_BIO_PAR)THEN
IF(Line_NO_BIO_number(I).EQ.I)THEN
IF(I.GE.272.AND.I.LE.278)THEN
WRITE(1,'(F20.8,A)')par_BIO_RANDOM(LOOP_BESTNO,I),'            0.0'    !,Note_BIO(I)
ELSE
WRITE(1,*)par_BIO_RANDOM(LOOP_BESTNO,I)    !,'0.0'    !,Note_BIO(I)
ENDIF
ELSEif(Line_NO_BIO_note(I).EQ.I)THEN
WRITE(1,'(a)')Note_BIO(I)
else
ENDIF
ELSEif(I.gt.NN_Line_BIO_PAR)THEN
WRITE(1,'(a)')Note_BIO(I)
ENDIF
ENDDO

DO I=1,NN_Line_CHM
IF(I.LE.NN_Line_CHM_PAR)THEN
IF(Line_NO_CHM_number(I).EQ.I)THEN
```

```
WRITE(2,*)par_CHM_RANDOM(LOOP_BESTNO,I)     !,"0.0"    !,Note_BIO(I)
ELSEif(Line_NO_CHM_note(I).EQ.I)THEN
WRITE(2,'(a)')Note_CHM(I)
else
ENDIF
ELSEif(I.gt.NN_Line_CHM_PAR)THEN
WRITE(2,'(a)')Note_CHM(I)
ENDIF
ENDDO

DO I=1,NN_Line_SED
IF(I.LE.NN_Line_SED_PAR)THEN
IF(Line_NO_SED_number(I).EQ.I)THEN
WRITE(3,*)par_SED_RANDOM(LOOP_BESTNO,I)    !,Note_BIO(I)
ELSEif(Line_NO_SED_note(I).EQ.I)THEN
WRITE(3,'(a)')Note_SED(I)
else
ENDIF
ELSEif(I.gt.NN_Line_SED_PAR)THEN
WRITE(3,'(a)')Note_SED(I)
ENDIF
ENDDO

CLOSE(1)
CLOSE(2)
CLOSE(3)

end SUBROUTINE BEST_BIOCHM_PAR
end module AUTO_CALIBRATION_BIO_CHM
```

DYRESM_ncData.f90

```
!-----------------------------------------------------------------------------------------------------
module dyresm_data_reading
use DYRESM_COMMON
!USE IFCore
!use IFPORT
USE netcdf_inc
!include 'netcdf.inc'

contains

subroutine dycd_data_reading(n2,n3,dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var,                    &
                             dyresmDO_Var, NUM_AllVarTxt,                                     &
                             dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var,          &
                             dyresmTP_Var,dyresmCYANO_Var,dyresmFDIAT_Var,                    &
                             dyresmTCHLA_Var,dyresmPOCL_Var,dyresmDOCL_Var,dyresmPOPL_Var,    &
                             dyresmDOPL_Var,dyresmPONL_Var,dyresmDONL_Var,dyresmPOCR_Var,     &
                             dyresmDOCR_Var, dyresmPOPR_Var,dyresmDOPR_Var, dyresmPONR_Var,   &
                             dyresmDONR_Var, dyresmCRPYT_Var,dyresmNODUL_Var,dyresmDINOF_Var, &
                             dyresmCHLOR_Var,dyresmMDIAT_Var,dyresmZOOP1_Var,dyresmZOOP2_Var, &
                             dyresmZOOP3_Var, dyresmZOOP4_Var,dyresmZOOP5_Var,dyresmSSOL1_Var, &
                             dyresmSSOL2_Var,dyresmFISH1_Var,dyresmFISH2_Var,dyresmFISH3_Var, &
                             dyresmBAC_Var,dyresmPAR_Var,NO_DIM_NETCDF,modelTime,             &
                             I_SWITCH_PHY,I_SWITCH_CHM,I_SWITCH_BIO,I_SWITCH_SED)


!INTEGER :: NUM_SerVar
INTEGER, INTENT (IN)    ::    NUM_AllVarTxt
INTEGER :: N2,N3,i_switch,I_SWITCH_CHM,I_SWITCH_BIO,I_SWITCH_SED !for physical calibration (1=YES, 0=NO)
INTEGER :: NO_DIM_NETCDF(1:NUM_AllVarTxt,1:4)    !N2,N3
real(kind=8) :: modelTime(1:n3)

real*4    ::    dyresmLAYER_HTS_Var( 1:n2,1:n3 )
real*4    ::    dyresmTEMPTURE_Var( 1:n2,1:n3 )
real*4    ::    dyresmDO_Var( 1:n2,1:n3 )
real*4    ::    dyresmNO3_Var( 1:n2,1:n3 )
real*4    ::    dyresmNH4_Var( 1:n2,1:n3 )
real*4    ::    dyresmTN_Var( 1:n2,1:n3 )
real*4    ::                dyresmPONL_Var( 1:n2,1:n3 )
real*4    ::                dyresmDONL_Var( 1:n2,1:n3 )
real*4    ::                dyresmPONR_Var( 1:n2,1:n3 )
real*4    ::                dyresmDONR_Var( 1:n2,1:n3 )
real*4    ::    dyresmPO4_Var( 1:n2,1:n3 )
real*4    ::    dyresmTP_Var( 1:n2,1:n3 )
```

```
real*4   ::              dyresmPOPR_Var( 1:n2,1:n3 )
real*4   ::              dyresmDOPR_Var( 1:n2,1:n3 )
real*4   ::              dyresmPOPL_Var( 1:n2,1:n3 )
real*4   ::              dyresmDOPL_Var( 1:n2,1:n3 )
real*4   ::              dyresmPOCL_Var ( 1:n2,1:n3 )
real*4   ::              dyresmDOCL_Var( 1:n2,1:n3 )
real*4   ::              dyresmPOCR_Var( 1:n2,1:n3 )
real*4   ::              dyresmDOCR_Var( 1:n2,1:n3 )
real*4   ::              dyresmDINOF_Var( 1:n2,1:n3 )
real*4   ::   dyresmCYANO_Var( 1:n2,1:n3 )
real*4   ::              dyresmNODUL_Var( 1:n2,1:n3 )
real*4   ::              dyresmCHLOR_Var( 1:n2,1:n3 )
real*4   ::              dyresmCRPYT_Var( 1:n2,1:n3 )
real*4   ::              dyresmMDIAT_Var( 1:n2,1:n3 )
real*4   ::   dyresmFDIAT_Var( 1:n2,1:n3 )
real*4   ::   dyresmTCHLA_Var( 1:n2,1:n3 )
!Liancong Luo added some variables here in June 2010 (Denmark)
real*4   ::              dyresmZOOP1_Var( 1:n2,1:n3 )
real*4   ::              dyresmZOOP2_Var( 1:n2,1:n3 )
real*4   ::              dyresmZOOP3_Var( 1:n2,1:n3 )
real*4   ::              dyresmZOOP4_Var( 1:n2,1:n3 )
real*4   ::              dyresmZOOP5_Var( 1:n2,1:n3 )
real*4   ::              dyresmSSOL1_Var( 1:n2,1:n3 )
real*4   ::              dyresmSSOL2_Var( 1:n2,1:n3 )
real*4   ::              dyresmFISH1_Var( 1:n2,1:n3 )
real*4   ::              dyresmFISH2_Var( 1:n2,1:n3 )
real*4   ::              dyresmFISH3_Var( 1:n2,1:n3 )
real*4   ::              dyresmBAC_Var( 1:n2,1:n3 )
real*4   ::              dyresmPAR_Var( 1:n2,1:n3 )

        INQUIRE(FILE='DYsim.nc',EXIST=FILE_ALIVE)
IF(.NOT. FILE_ALIVE)THEN
WRITE(6,*)'DYSIM.NC DOES NOT EXIST'
ELSE
ENDIF

!DO KK=1,NUM_AllVarTxt
!WRITE(6,*)NO_DIM_NETCDF(KK,1),NO_DIM_NETCDF(KK,2),NO_DIM_NETCDF(KK,3) !
NUM_ALLVARTXT,NDIM,IX,KK
!ENDDO
!PAUSE 122


!----------------------reading data from netcdf file--------------------

            status=nf_open('DYsim.nc',nf_nowrite,ncid)
              if ( status/=nf_noerr ) write (*,*) nf_strerror(status)

IF(    (I_SWITCH_PHY==1).and.(I_SWITCH_CHM==0).AND.(I_SWITCH_BIO==0).AND.(I_SWITCH_SED==0) )THEN
!There are only 2 variables, dyresmLAYER_HTS_Var and dyresmTEMPTURE_Var

DO KK=1,2
IX=NO_DIM_NETCDF(KK,1)
KKIX=NO_DIM_NETCDF(KK,4)
!write(6,*)kk,ix,ndim
!pause 555
        status=nf_inq_var(ncid, IX,dummy,xtype,ndim,dimids,natts)
              if ( status/=nf_noerr ) write (*,*) nf_strerror(status)
        do j=1,ndim
        status=nf_inq_dim(ncid,dimids(j),dummy,len)
               if ( status/=nf_noerr ) write (*,*) nf_strerror(status)
        start(j)=1 ; count(j)=len
        end do
IF(KKIX.EQ.1)THEN
        status=nf_get_vara_real(ncid, IX,start,count,dyresmLAYER_HTS_Var)
ELSEIF(KKIX.EQ.2)THEN
        status=nf_get_vara_real(ncid, IX,start,count,dyresmTEMPTURE_Var)
ENDIF

!WRITE(6,*)KKIX,
NO_DIM_NETCDF(KK,1),NO_DIM_NETCDF(KK,2),NO_DIM_NETCDF(KK,3),NO_DIM_NETCDF(KK,4)
!PAUSE 44

WRITE(CHAR_TEMP,*)NO_DIM_NETCDF(KK,2)
FMT='(f15.4,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F25.8)'
```

```
CHAR_TEMP='FILES_NCDATA/'//TRIM(ADJUSTL(ADJUSTR(DYRESM_VARname(KKIX))))//'.txt'

OPEN (KK+10,FILE=CHAR_TEMP)
IF(KKIX.EQ.1)THEN
DO J=1,NO_DIM_NETCDF(KK,3)
WRITE(KK+10,FMT) modeltime(j), (dyresmLAYER_HTS_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
ENDDO

ELSEIF(KKIX.EQ.2)THEN
DO J=1,NO_DIM_NETCDF(KK,3)
WRITE(KK+10,FMT) modeltime(j), (dyresmTEMPTURE_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
ENDDO

ELSE
ENDIF

CLOSE(KK+10)
ENDDO
ENDIF !IF((I_SWITCH_CHM.NE.1).AND.(I_SWITCH_BIO.NE.1).AND.(I_SWITCH_SED.NE.1))THEN

IF((I_SWITCH_CHM==1).or.(I_SWITCH_BIO==1).or.(I_SWITCH_SED==1))THEN !all variables


DO KK=1,NUM_AllVarTxt

IX=NO_DIM_NETCDF(KK,1)
KKIX=NO_DIM_NETCDF(KK,4)

      status=nf_inq_var(ncid, IX, dummy,xtype,ndim,dimids,natts)
            if ( status/=nf_noerr ) write (*,*) nf_strerror(status)


        do j=1,ndim
        status=nf_inq_dim(ncid,dimids(j),dummy,len)
              if ( status/=nf_noerr ) write (*,*) nf_strerror(status)
        start(j)=1 ; count(j)=len
        end do

IF(KKIX.EQ.1)THEN
      status=nf_get_vara_real(ncid, IX,start,count,dyresmLAYER_HTS_Var)
ELSEIF(KKIX.EQ.2)THEN
      status=nf_get_vara_real(ncid, IX,start,count,dyresmTEMPTURE_Var)
!ELSEIF(KKIX.EQ.3)THEN
!       status=nf_get_vara_real(ncid, IX,start,count,dyresmDENSITY_Var)
!ELSEIF(KKIX.EQ.4)THEN
!       status=nf_get_vara_real(ncid, IX,start,count,dyresmSALINITY_Var)
ELSEIF(KKIX.EQ.3)THEN
      status=nf_get_vara_real(ncid, IX,start,count,dyresmDO_Var)
ELSEIF(KKIX.EQ.4)THEN
      status=nf_get_vara_real(ncid, IX,start,count,dyresmNO3_Var)
ELSEIF(KKIX.EQ.5)THEN
      status=nf_get_vara_real(ncid, IX,start,count,dyresmNH4_Var)
ELSEIF(KKIX.EQ.6)THEN
      status=nf_get_vara_real(ncid, IX,start,count,dyresmTN_Var)
ELSEIF(KKIX.EQ.7)THEN
      status=nf_get_vara_real(ncid, IX,start,count,dyresmPONL_Var)
ELSEIF(KKIX.EQ.8)THEN
      status=nf_get_vara_real(ncid, IX,start,count,dyresmPONR_Var)
ELSEIF(KKIX.EQ.9)THEN
      status=nf_get_vara_real(ncid, IX,start,count,dyresmDONL_Var)
ELSEIF(KKIX.EQ.10)THEN
      status=nf_get_vara_real(ncid, IX,start,count,dyresmDONR_Var)
ELSEIF(KKIX.EQ.11)THEN
      status=nf_get_vara_real(ncid, IX,start,count,dyresmPO4_Var)
ELSEIF(KKIX.EQ.12)THEN
      status=nf_get_vara_real(ncid, IX,start,count, dyresmTP_Var)
ELSEIF(KKIX.EQ.13)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmPOPL_Var)
ELSEIF(KKIX.EQ.14)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmPOPR_Var)
ELSEIF(KKIX.EQ.15)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmDOPL_Var)
ELSEIF(KKIX.EQ.16)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmDOPR_Var)
ELSEIF(KKIX.EQ.17)THEN
```

```
status=nf_get_vara_real(ncid, IX,start,count, dyresmPOCL_Var)
ELSEIF(KKIX.EQ.18)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmPOCR_Var)
ELSEIF(KKIX.EQ.19)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmDOCL_Var)
ELSEIF(KKIX.EQ.20)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmDOCR_Var)
ELSEIF(KKIX.EQ.21)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmDINOF_Var)
ELSEIF(KKIX.EQ.22)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmCYANO_Var)
ELSEIF(KKIX.EQ.23)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmNODUL_Var)
ELSEIF(KKIX.EQ.24)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmCHLOR_Var)
ELSEIF(KKIX.EQ.25)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmCRPYT_Var)
ELSEIF(KKIX.EQ.26)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmMDIAT_Var)
ELSEIF(KKIX.EQ.27)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmFDIAT_Var)
ELSEIF(KKIX.EQ.28)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmZOOP1_Var)
ELSEIF(KKIX.EQ.29)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmZOOP2_Var)
ELSEIF(KKIX.EQ.30)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmZOOP3_Var)
ELSEIF(KKIX.EQ.31)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmZOOP4_Var)
ELSEIF(KKIX.EQ.32)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmZOOP5_Var)
ELSEIF(KKIX.EQ.33)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmSSOL1_Var)
ELSEIF(KKIX.EQ.34)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmSSOL2_Var)
ELSEIF(KKIX.EQ.35)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmFISH1_Var)
ELSEIF(KKIX.EQ.36)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmFISH2_Var)
ELSEIF(KKIX.EQ.37)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmFISH3_Var)
ELSEIF(KKIX.EQ.38)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmBAC_Var)
ELSEIF(KKIX.EQ.39)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmPAR_Var)
ELSEIF(KKIX.EQ.40)THEN
status=nf_get_vara_real(ncid, IX,start,count, dyresmTCHLA_Var)
ENDIF


WRITE(CHAR_TEMP,*)NO_DIM_NETCDF(KK,2)
FMT='(f15.4,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F25.10)'
CHAR_TEMP='FILES_NCDATA/'//TRIM(ADJUSTL(ADJUSTR(DYRESM_VARname(KKIX))))//'.txt'

OPEN (KK+10,FILE=CHAR_TEMP)
IF(KKIX.EQ.1)THEN
DO J=1,NO_DIM_NETCDF(KK,3)
WRITE(KK+10,FMT) modeltime(j), (dyresmLAYER_HTS_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
ENDDO

ELSEIF(KKIX.EQ.2)THEN
DO J=1,NO_DIM_NETCDF(KK,3)
WRITE(KK+10,FMT) modeltime(j), (dyresmTEMPTURE_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
ENDDO

!ELSEIF(KKIX.EQ.3)THEN
!DO J=1,NO_DIM_NETCDF(KK,3)
!WRITE(KK+10,FMT) modeltime(j), (dyresmDENSITY_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
!ENDDO
!
!ELSEIF(KKIX.EQ.4)THEN
!DO J=1,NO_DIM_NETCDF(KK,3)
!WRITE(KK+10,FMT) modeltime(j), (dyresmSALINITY_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
!ENDDO
```

```
      ELSEIF(KKIX.EQ.3)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmDO_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.4)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmNO3_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.5)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmNH4_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.6)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmTN_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.7)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmPONL_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.8)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmPONR_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.9)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmDONL_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.10)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmDONR_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.11)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmPO4_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.12)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmTP_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.13)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmPOPL_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.14)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmPOPR_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.15)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmDOPL_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.16)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmDOPR_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.17)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmPOCL_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO
```

```
      ELSEIF(KKIX.EQ.18)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmPOCR_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.19)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmDOCL_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.20)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmDOCR_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.21)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmDINOF_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.22)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmCYANO_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.23)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmNODUL_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.24)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmCHLOR_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.25)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmCRPYT_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.26)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmMDIAT_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.27)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmFDIAT_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.28)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmZOOP1_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.29)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmZOOP2_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.30)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmZOOP3_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.31)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmZOOP4_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO

      ELSEIF(KKIX.EQ.32)THEN
      DO J=1,NO_DIM_NETCDF(KK,3)
      WRITE(KK+10,FMT) modeltime(j), (dyresmZOOP5_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
      ENDDO
```

```
ELSEIF(KKIX.EQ.33)THEN
DO J=1,NO_DIM_NETCDF(KK,3)
WRITE(KK+10,FMT) modeltime(j), (dyresmSSOL1_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
ENDDO

ELSEIF(KKIX.EQ.34)THEN
DO J=1,NO_DIM_NETCDF(KK,3)
WRITE(KK+10,FMT) modeltime(j), (dyresmSSOL2_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
ENDDO

ELSEIF(KKIX.EQ.35)THEN
DO J=1,NO_DIM_NETCDF(KK,3)
WRITE(KK+10,FMT) modeltime(j), (dyresmFISH1_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
ENDDO

ELSEIF(KKIX.EQ.36)THEN
DO J=1,NO_DIM_NETCDF(KK,3)
WRITE(KK+10,FMT) modeltime(j), (dyresmFISH2_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
ENDDO

ELSEIF(KKIX.EQ.37)THEN
DO J=1,NO_DIM_NETCDF(KK,3)
WRITE(KK+10,FMT) modeltime(j), (dyresmFISH3_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
ENDDO

ELSEIF(KKIX.EQ.38)THEN
DO J=1,NO_DIM_NETCDF(KK,3)
WRITE(KK+10,FMT) modeltime(j), (dyresmBAC_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
ENDDO

ELSEIF(KKIX.EQ.39)THEN
DO J=1,NO_DIM_NETCDF(KK,3)
WRITE(KK+10,FMT) modeltime(j), (dyresmPAR_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
ENDDO

ELSEIF(KKIX.EQ.40)THEN
DO J=1,NO_DIM_NETCDF(KK,3)
WRITE(KK+10,FMT) modeltime(j), (dyresmTCHLA_Var(I,J),I=1,NO_DIM_NETCDF(KK,2))
ENDDO

ELSE
ENDIF

CLOSE(KK+10)

ENDDO

ELSE    !
write(6,*)'You have input a wrong number (should be 0 or 1) for SWITCH_PHY'
ENDIF

  status=nf_close(ncid)
end subroutine dycd_data_reading

end module dyresm_data_reading
```

CreateDirectory.f90

```
!-------------------------------------------------------------------------------------------
!*******************************************************************************
!
!   PROGRAM: Auto-calibration of DYRESM-CAEDYM
!
!   MODIFICATION HISTORY:
!   --------------------
!   Original code : Liancong Luo 27/11/2008
!
!*******************************************************************************

module create_dir
!       USE IFPORT
  !     use IFCORE

contains
subroutine create_directory()
Integer(2) :: results
```

```
results = SYSTEMQQ('rm -f FILES_PARAMETER/*.*')
results = SYSTEMQQ('rm -f FILES_BACKUP/*.*')
results = SYSTEMQQ('rm -f FILES_ERROR/*.*')
results = SYSTEMQQ('rm -f FILES_ncDATA/*.*')
results = SYSTEMQQ('rm -f UNCERTAINTY/*.*')
results = SYSTEMQQ('rm -f SENSITIVITY/*.*')
results = SYSTEMQQ('rm -f DYRESM_VAR_LoopValues/*.*')
results = SYSTEMQQ('rm -f PHY_PAR_LoopValues/*.*')
results = SYSTEMQQ('rm -f CHM_PAR_LoopValues/*.*')
results = SYSTEMQQ('rm -f BIO_PAR_LoopValues/*.*')
results = SYSTEMQQ('rm -f SED_PAR_LoopValues/*.*')
end subroutine create_directory
end module create_dir
```

JulianTime_calculation.f90

```
!-------------------------------------------------------------------------------------------
!*******************************************************************************************
 !-------------- Routine to generate modelled output time in julian day-------------------
 !*******************************************************************************************
 module Julian_time
 use DYRESM_COMMON
 contains

  SUBROUTINE OutTime(FoutTime,nn,Start_day, Switch, Timestep,Output_intervals)

      REAL (kind=8):: FoutTime(1:nn),Start_day, Timestep
      INTEGER, intent (in) :: Switch,nn,Output_intervals

open(85,file='FILES_ERROR/JulianTime.txt')

!      WRITE(6,*)NN
!      PAUSE 89

  IF(switch.eq.1.and.int(Output_intervals)>=1)THEN
      FoutTime(1)=Start_day
      iyear=int(FoutTime(1)/1000)
      iday=FoutTime(1)-1000*iyear
     IF (    ((MOD(iyear,4).eq.0).and.(MOD(iyear,100).ne.0)    ) .or. (MOD(iyear,400).eq.0)      ) THEN
       IF(iday.ge.367)THEN
       iday=iday-366
       iyear=iyear+1
       FoutTime(1)= iyear*1000+iday
       ELSE
       ENDIF
     ELSE ! If not a leap year
       IF(iday.ge.366)THEN
       iday=iday-365
       iyear=iyear+1
       FoutTime(1)= iyear*1000+iday
       ELSE
       ENDIF
     ENDIF    ! End leap year if

      DO i=2,nn
      FoutTime(i)=FoutTime(i-1)+Output_intervals    ! ff_temp
      iyear=int(FoutTime(i)/1000)
      iday=FoutTime(i)-1000*iyear

      ! Leap year: every year which is multiple of 4 but not multiple of 100, or multiple of 400;
      ! Find leap year using the Gregorian "4, 100, 400" rule
      IF (    ((MOD(iyear,4).eq.0).and.(MOD(iyear,100).ne.0)    ) .or. (MOD(iyear,400).eq.0)      ) THEN
       IF(iday.ge.367)THEN
       iday=iday-366
       iyear=iyear+1
       FoutTime(i)= iyear*1000+iday
       ELSE
       ENDIF
      ELSE ! If not a leap year
       IF(iday.ge.366)THEN
       iday=iday-365
       iyear=iyear+1
       FoutTime(i)= iyear*1000+iday
       ELSE
       ENDIF
      ENDIF ! End leap year if
```

```
        ENDDO

    ENDIF ! End switch 1

    IF(switch.eq.0)THEN    !hourly or sub-hourly
          FoutTime(1)=Start_day
            ff_temp=Timestep/3600./24.
       DO i=2,nn
       FoutTime(i)=FoutTime(i-1)+ ff_temp
       iyear=int(FoutTime(i)/1000)
       iday=FoutTime(i)-1000*iyear

       ! Leap year: every year which is multiple of 4 but not multiple of 100, or multiple of 400;
       ! Find leap year using the Gregorian "4, 100, 400" rule
       IF (    ((MOD(iyear,4).eq.0).and.(MOD(iyear,100).ne.0)    ) .or. (MOD(iyear,400).eq.0)      ) THEN
         IF(iday.ge.367)THEN
         iday=iday-366
         iyear=iyear+1
         FoutTime(i)= iyear*1000+iday
         ELSE
         ENDIF
       ELSE ! If not a leap year
         IF(iday.ge.366)THEN
         iday=iday-365
         iyear=iyear+1
         FoutTime(i)= iyear*1000+iday
         ELSE
         ENDIF
       ENDIF ! End leap year if

       ENDDO

   Endif
do i=1,nn
   write(85,*)i,FoutTime(i)
   enddo
   close(85)

   END SUBROUTINE OutTime
   end    module Julian_time
```

DepthInterpolation.f90

```
!-----------------------------------------------------------------------------------------------------
module DEPTH_INTERPOLATION

USE DYRESM_COMMON,      ONLY: default_value

CONTAINS

SUBROUTINE VERTICAL_INTERPOLATION(DATA0,DATA1,HEIGHT0,HEIGHT1,N_HT0,N_HT1,NN_TIME_STEP )
INTEGER , INTENT (IN) :: N_HT0,N_HT1,NN_TIME_STEP
REAL(KIND=8), INTENT (IN) :: DATA0(1:N_HT0,1:NN_TIME_STEP),HEIGHT1(1:N_HT1)
REAL*4, INTENT (IN) :: HEIGHT0(1:N_HT0,1:NN_TIME_STEP)
REAL(KIND=8), INTENT (OUT) :: DATA1(1:N_HT1,1:NN_TIME_STEP)
REAL (KIND=8) :: DEPTH(1:N_HT0)
!HEIGHT0 IS THE DYRESM HEIGHT ARRAY, HEIGHT1 IS THE USER-SPECIFIED HEIGHT FOR UNCERTAINTY
ANALYSIS
!N_HT0 = N2 (LAYERS),    NN_TIME_STEP    = N3 (TIME_SERIALS)

!open(57,file='UNCERTAINTY/UNCERTAINTY2.txt',POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
!open(58,file='UNCERTAINTY/UNCERTAINTY3.txt',POSITION='APPEND',ACTION='WRITE')    !record the wrong loop


DO J=1,NN_TIME_STEP
DO I=1,N_HT1

IX=1
FF=0.0
do L=1,N_HT0
DEPTH(L)=HEIGHT0(L,J)
ENDDO

do L=1,N_HT0
```

```
IF(DEPTH(L).GE.0.0)THEN
IX=L
FF=DEPTH(L)
GO TO 55
ENDIF
ENDDO

55 DO L=IX,N_HT0
DEPTH(L)=ABS(DEPTH(L)-FF)
ENDDO

!-----------get the average depth intervals from model----------
ff_temp=0.0
ix_ff_temp=0
DO L=IX,N_HT0-1
ff_temp=ff_temp+DEPTH(L+1)-DEPTH(L)
ix_ff_temp=ix_ff_temp+1
enddo
ff_temp=ff_temp/ix_ff_temp       !THIS IS THE AVERAGE DEPTH, BUT NOT USED IN THIS SUBROUTINE

!----------depth interpolation---------------------------------------
I_DEPTH=0
DO L=IX,N_HT0-1
if(HEIGHT1(I)==DEPTH(L))    THEN    !.AND.HEIGHT1(I).LE.DEPTH(L+1))THEN
DATA1(I,J)=DATA0(L,J)
I_DEPTH=1
ENDIF
ENDDO

IF(I_DEPTH==0)THEN    !THERE IS NO SAME DEPTH WITH USER-SPECIFIED DEPTH
L_TEMP=0
DO L=IX,N_HT0-1
if(HEIGHT1(I).gT.DEPTH(L).AND.HEIGHT1(I).LT.DEPTH(L+1))THEN
L_TEMP=L
FFA=DEPTH(L)
FFB=DEPTH(L+1)
FFC=0.5*(DEPTH(L)+DEPTH(L+1))
!DATA1(I,J)=DATA0(L+1,J)-(DATA0(l+1,J)-DATA0(l,J))*((FFB-HEIGHT1(I))/(FFB-FFA))
!0.5*(data_dycd(l)+data_dycd(l+1))
DATA1(I,J)=DATA0(L,J)+(DATA0(L+1,J)-DATA0(L,J))*((HEIGHT1(I)-FFA)/(FFB-FFA))
!0.5*(data_dycd(l)+data_dycd(l+1))
ENDIF
ENDDO

IF(L_TEMP==0)THEN
DATA1(I,J)=99999999.0
ENDIF

ENDIF    !IF(I_DEPTH==0)THEN    !THERE IS NO SAME DEPTH WITH USER-SPECIFIED DEPTH


ENDDO    !DO IX=1,NX1

!WRITE(58,'(74F10.2)')(DEPTH(L),L=1,N_HT0)

ENDDO    !DO IY=1,NN_TIME_STEP

END SUBROUTINE
VERTICAL_INTERPOLATION    !(DATA0,DATA1,HEIGHT0,HEIGHT1,N_HT0,N_HT1,NN_TIME_STEP )
END module DEPTH_INTERPOLATION
```

obs_data_reading.f90

```
!-------------------------------------------------------------------------------------------------
!*************************************************************************
!
!    Module: reading the observation data
!
!    MODIFICATION HISTORY:
!    --------------------
!    Original code: Liancong Luo    20/12/2008
!
!*************************************************************************
```

```
MODULE Observation_reading

    USE DYRESM_COMMON

CONTAINS

subroutine obs_data_reading(obsVar_data,NUMBER_obsVar)

integer, intent(in) :: NUMBER_obsVar
character(len=100) :: filename
real (kind=8) :: real_temp

TYPE (OBS_DATASET) :: obsVar_data(1:NUMBER_obsVar)

do i=1,NUMBER_obsVar
filename='Observation/'//trim(adjustl(adjustr(obsVar_data(i)%name)))//'.txt'
INQUIRE(FILE=filename,EXIST=FILE_ALIVE)
IF(FILE_ALIVE)THEN
open(11,file=filename, status='old')


read(11,*)real_temp,(obsVar_data(i)%WATER_DEPTH(j),j=1,obsVar_data(i)%NN_DEPTH)
do ii=1,obsVar_data(i)%NN_DATLINE
read(11,*)obsVar_data(i)%DATA_TIME(ii),(obsVar_data(i)%OBS_DATA(ii,j),j=1,obsVar_data(i)%NN_DEPTH)
!write(6,'(i10,2f30.10)')ii,obsVar_data(i)%DATA_TIME(ii),obsVar_data(i)%OBS_DATA(ii,1)
!if(i.eq.2)then
! write(6,*)ii,obsVar_data(i)%DATA_TIME(ii)    !,(obsVar_data(i)%OBS_DATA(ii,j),j=1,obsVar_data(i)%NN_DEPTH)
!endif
enddo
close(11)
else
write(6,'(a)')filename//' does not exist'
PAUSE 55
endif
enddo    !do i=1,NUMBER_obsVar

end subroutine obs_data_reading
end MODULE Observation_reading
```

CLIBRATION_PHY.f90

```
!-----------------------------------------------------------------------------------------------------

!*****************************************************************************
!
!    PROGRAM: Auto-calibration of DYRESM-CAEDYM
!
!    MODIFICATION HISTORY:
!    --------------------
!    Original code : Liancong Luo 27/11/2008
!    Modification: Liancong Luo 28/06/2010 NERI      Add "USE DFLIB" to this module
!*****************************************************************************

module AUTO_CALIBRATION_PHY
use DYRESM_COMMON
USE DYRESM_RUNNING
USE RANDOM
!USE IFLIB
!USE IFCore
!use IFPORT
!USE IFPort
!USE IFQWin

contains

SUBROUTINE CALIBRATION_PHY (NO_LOOP,FILENAMES,PARA0,PARA1,I_fileSwitch)
INTEGER, intent (in) :: NO_LOOP,I_fileSwitch
REAL*8    RANDOM_NO2
TYPE (INPUT_FILENAME), INTENT (IN) :: FILENAMES
TYPE (PARA_phy) :: PARa0
TYPE (PARA_FILE) :: para1
character (len=100) :: fileName_temp, char_temp
logical :: PAR_FILE_ALIVE
CHARACTER (LEN=20)      ::Commandline
Integer(2) :: results
```

```
RANDOM_NO2=0.5
call randomnumber(RANDOM_NO2)
PARA1%PAR_BULK(NO_LOOP)=PARa0%PAR_BULK(1)+(PARa0%PAR_BULK(2)-PARa0%PAR_BULK(1))*random_no2
call randomnumber(RANDOM_NO2)

PARA1%PAR_albedo(NO_LOOP)=PARa0%PAR_albedo(1)+(PARa0%PAR_albedo(2)-PARa0%PAR_albedo(1))*    &
random_no2
!call randomnumber(RANDOM_NO2)
call randomnumber(RANDOM_NO2)

PARA1%PAR_emission(NO_LOOP)=PARa0%PAR_emission(1)+(PARa0%PAR_emission(2)-PARa0%PAR_emission(1))* &
random_no2
!call randomnumber(RANDOM_NO2)
call randomnumber(RANDOM_NO2)
PARA1%PAR_CriticalWind(NO_LOOP)=PARa0%PAR_CriticalWind(1)+(PARa0%PAR_CriticalWind(2)-    &
PARa0%PAR_CriticalWind(1))*random_no2
call randomnumber(RANDOM_NO2)
PARA1%PAR_output(NO_LOOP)=PARa0%PAR_output(1)+(PARa0%PAR_output(2)-PARa0%PAR_output(1))*    &
random_no2
call randomnumber(RANDOM_NO2)
PARA1%PAR_bubbler(NO_LOOP)=PARa0%PAR_bubbler(1)+(PARa0%PAR_bubbler(2)-PARa0%PAR_bubbler(1))*    &
random_no2
call randomnumber(RANDOM_NO2)
PARA1%PAR_buoyant(NO_LOOP)=PARa0%PAR_buoyant(1)+(PARa0%PAR_buoyant(2)-PARa0%PAR_buoyant(1))*    &
random_no2
call randomnumber(RANDOM_NO2)
PARA1%PAR_shear(NO_LOOP)=PARa0%PAR_shear(1)+(PARa0%PAR_shear(2)-PARa0%PAR_shear(1))*       &
random_no2
call randomnumber(RANDOM_NO2)
PARA1%PAR_energy(NO_LOOP)=PARa0%PAR_energy(1)+(PARa0%PAR_energy(2)-PARa0%PAR_energy(1))*    &
random_no2
call randomnumber(RANDOM_NO2)
PARA1%PAR_windStiring(NO_LOOP)=PARa0%PAR_windStiring(1)+(PARa0%PAR_windStiring(2)-       &
PARa0%PAR_windStiring(1))*random_no2
call randomnumber(RANDOM_NO2)
PARA1%PAR_surface(NO_LOOP)=PARa0%PAR_surface(1)+(PARa0%PAR_surface(2)-PARa0%PAR_surface(1))*    &
random_no2
call randomnumber(RANDOM_NO2)
PARA1%PAR_BBL(NO_LOOP)=PARa0%PAR_BBL(1)+(PARa0%PAR_BBL(2)-PARa0%PAR_BBL(1))*       &
random_no2
call randomnumber(RANDOM_NO2)
PARA1%PAR_VerticalMixing(NO_LOOP)=PARa0%PAR_VerticalMixing(1)+(PARa0%PAR_VerticalMixing(2)-       &
PARa0%PAR_VerticalMixing(1))*random_no2
call randomnumber(RANDOM_NO2)
PARA1%MinLayerThickness(NO_LOOP)=PARa0%MinLayerThickness(1)+(PARa0%MinLayerThickness(2)-       &
PARa0%MinLayerThickness(1))*random_no2
call randomnumber(RANDOM_NO2)
PARA1%MaxLayerThickness(NO_LOOP)=PARa0%MaxLayerThickness(1)+(PARa0%MaxLayerThickness(2)-       &
PARa0%MaxLayerThickness(1))*random_no2

INQUIRE(FILE=FILENAMES%PAR,EXIST=PAR_FILE_ALIVE)
IF(PAR_FILE_ALIVE)THEN
Commandline = 'rm ' // TRIM(ADJUSTL(ADJUSTR(FILENAMES%PAR)))

results = SYSTEMQQ(Commandline)

!call SYSTEMQQ (Commandline)
OPEN(1,FILE=FILENAMES%PAR)
WRITE(1,'(A)')'<#7>'
WRITE(1,'(A)')'PHYSICAL Parameters File.'
WRITE(1,*)PARA1%PAR_BULK(NO_LOOP) !=PARa0%PAR_BULK(1)+(PARa0%PAR_BULK(2)-       &
PARa0%PAR_BULK(1))*random_no
WRITE(1,*)PARA1%PAR_albedo(NO_LOOP) !=PARa0%PAR_albedo(1)+(PARa0%PAR_albedo(2)-       &
PARa0%PAR_albedo(1))*random_no
WRITE(1,*)PARA1%PAR_emission(NO_LOOP) !=PARa0%PAR_emission(1)+(PARa0%PAR_emission(2)-       &
PARa0%PAR_emission(1))*random_no
WRITE(1,*)PARA1%PAR_CriticalWind(NO_LOOP) !=PARa0%PAR_CriticalWind(1)+(PARa0%PAR_CriticalWind(2)-    &
PARa0%PAR_CriticalWind(1))*random_no
WRITE(1,*)PARA1%PAR_output(NO_LOOP) !=PARa0%PAR_output(1)+(PARa0%PAR_output(2)-       &
PARa0%PAR_output(1))*random_no
WRITE(1,*)PARA1%PAR_bubbler(NO_LOOP) !=PARa0%PAR_bubbler(1)+(PARa0%PAR_bubbler(2)-       &
PARa0%PAR_bubbler(1))*random_no
WRITE(1,*)PARA1%PAR_buoyant(NO_LOOP) !=PARa0%PAR_buoyant(1)+(PARa0%PAR_buoyant(2)-       &
PARa0%PAR_buoyant(1))*random_no
```

```
WRITE(1,*)PARA1%PAR_shear(NO_LOOP) !=PARa0%PAR_shear(1)+(PARa0%PAR_shear(2)-        &
PARa0%PAR_shear(1))*random_no
WRITE(1,*)PARA1%PAR_energy(NO_LOOP) !=PARa0%PAR_energy(1)+(PARa0%PAR_energy(2)-      &
PARa0%PAR_energy(1))*random_no
WRITE(1,*)PARA1%PAR_windStiring(NO_LOOP) !=PARa0%PAR_windStiring(1)+(PARa0%PAR_windStiring(2)-   &
PARa0%PAR_windStiring(1))*random_no
WRITE(1,*)PARA1%PAR_surface(NO_LOOP) !=PARa0%PAR_surface(1)+(PARa0%PAR_surface(2)-      &
PARa0%PAR_surface(1))*random_no
WRITE(1,*)PARA1%PAR_BBL(NO_LOOP) !=PARa0%PAR_BBL(1)+(PARa0%PAR_BBL(2)-      &
PARa0%PAR_BBL(1))*random_no
WRITE(1,*)PARA1%PAR_VerticalMixing(NO_LOOP) !=PARa0%PAR_VerticalMixing(1)+      &
(PARa0%PAR_VerticalMixing(2)-PARa0%PAR_VerticalMixing(1))*random_no
WRITE(1,'(a)')'=========================='     !
close(1)
ELSE
ENDIF

! CODE IS AMENDED BY LIANCONG LUO ON 15/06/2017 NANJING, CHINA
! OUTPUTS OF EVERY VARIABLE VALUES FOR EACH LOOP IN ONE-FILE
! open(1,file='CONFIGURE_FLUX.txt',status='old',action='read')

OPEN(1,FILE= 'FILES_PARAMETER/PHY_PAR_LoopValues.par', POSITION='APPEND' , ACTION='WRITE')
WRITE(1,'(A)') 'LOOP_NUMBER  BULK  ALBEDO  EMISSION  CRITICAL_WINDSPD  BUBBLER  &
BUOYANT  SHEAR  ENERGY  WIND_STIRING  SUFFER_AREA_COE  BBL  VERTICAL_MIXING'
WRITE(1,*)NO_LOOP,PARA1%PAR_BULK(NO_LOOP),PARA1%PAR_albedo(NO_LOOP),   &
          PARA1%PAR_emission(NO_LOOP),   &

PARA1%PAR_CriticalWind(NO_LOOP),PARA1%PAR_bubbler(NO_LOOP),PARA1%PAR_buoyant(NO_LOOP),   &
PARA1%PAR_shear(NO_LOOP), PARA1%PAR_energy(NO_LOOP),PARA1%PAR_windStiring(NO_LOOP),          &
PARA1%PAR_surface(NO_LOOP),PARA1%PAR_BBL(NO_LOOP), PARA1%PAR_VerticalMixing(NO_LOOP)
CLOSE(1)


if(I_fileSwitch.eq.1)then
write(char_temp,*)NO_loop
filename_temp='FILES_PARAMETER/PAR_'//trim(ADJUSTL(ADJUSTR(char_temp)))//'.par'
OPEN(1,FILE=filename_temp)
WRITE(1,'(A)')'<#7>'
WRITE(1,'(A)')'PHYSICAL Parameters File.'
WRITE(1,*)PARA1%PAR_BULK(NO_LOOP)
WRITE(1,*)PARA1%PAR_albedo(NO_LOOP)
WRITE(1,*)PARA1%PAR_emission(NO_LOOP)
WRITE(1,*)PARA1%PAR_CriticalWind(NO_LOOP)
WRITE(1,*)PARA1%PAR_output(NO_LOOP)
WRITE(1,*)PARA1%PAR_bubbler(NO_LOOP)
WRITE(1,*)PARA1%PAR_buoyant(NO_LOOP)
WRITE(1,*)PARA1%PAR_shear(NO_LOOP)
WRITE(1,*)PARA1%PAR_energy(NO_LOOP)
WRITE(1,*)PARA1%PAR_windStiring(NO_LOOP)
WRITE(1,*)PARA1%PAR_surface(NO_LOOP)
WRITE(1,*)PARA1%PAR_BBL(NO_LOOP)
WRITE(1,*)PARA1%PAR_VerticalMixing(NO_LOOP)
WRITE(1,'(a)')'=========================='     !
close(1)
else
endif
end SUBROUTINE CALIBRATION_PHY


SUBROUTINE CALIBRATION_PHY_CFG
(FILENAMES,I_caedymSwitch,NUM_SIMULATED_VAR,Simulated_CAEYM_VARname,I_Output_Interval,time_step,     &
Output_intervals)
INTEGER, intent (in) :: I_caedymSwitch, I_Output_Interval,Output_intervals
character(len=8) :: Simulated_CAEYM_VARname(1:num_CAEDYM_VARname)    !!    Modified: LLC 28/06/2010 NERI
real (kind=8), intent(in) :: time_step
TYPE (INPUT_FILENAME), INTENT (IN) :: FILENAMES

OPEN(1,FILE=FILENAMES%CFG)
DO I=1,NN_line_cfg
READ(1,'(A)')NOTE_CFG(I)
ENDDO
CLOSE(1)

OPEN(1,FILE=FILENAMES%CFG)
DO I=1,NN_line_cfg
```

```
if(i.eq.3)then
write(1,'(i7)')int(Start_day)
elseif(i.eq.4)then
write(char_temp,*)model_days
write(1,'(A)')trim(adjustl(char_temp))
elseIF(I.EQ.5)THEN
if(I_caedymSwitch.eq.0)then
WRITE(1,'(A)')'.FALSE.                          # Run CAEDYM (.TRUE. or .FALSE.)'
elseif(I_caedymSwitch.eq.1)then
WRITE(1,'(A)')'.TRUE.                           # Run CAEDYM (.TRUE. or .FALSE.)'
endif

elseIF(I.EQ.6)then    !daily
WRITE(CHAR_TEMP,*)int(Output_intervals)
write(1,'(a)')TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'       # Output Interval (in days, or -9999 for every time step)'
!elseIF(I.EQ.5.and.I_Output_Interval==0)then    !daily
!write(1,'(a)')'-9999                # Output Interval (in days, or -9999 for every time step)'

elseIF(I.EQ.10)then    !.and.I_Output_Interval==1)then    !daily
WRITE(CHAR_TEMP,*)int(time_step)
write(1,'(a)')TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'                                    # Time Step [s]'


ELSEif(I.EQ.11)THEN
if(I_caedymSwitch.eq.0)then
WRITE(1,'(A)')'1                                # Number of Output Selections'
elseif(I_caedymSwitch.eq.1)then
WRITE(CHAR_TEMP,*)NUM_SIMULATED_VAR
WRITE(1,'(A)')TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'            # Number of Output Selections'
endif

ELSEif(I.EQ.12)THEN
if(I_caedymSwitch.eq.1)then
!WRITE(1,'(A)')'TEMPTURE                         # DO NO3 NH4 TN PO4 TP CYANO FDIAT TCHLA # List of Output
Selections'
do ii=1,NUM_SIMULATED_VAR
Simulated_CAEYM_VARname2(ii) = Simulated_CAEYM_VARname(ii)//' '
enddo

WRITE(CHAR_TEMP,*)NUM_SIMULATED_VAR
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'A)'
!write(6,*)fmt
WRITE(1,fmt)(Simulated_CAEYM_VARname2(ii),ii=1,NUM_SIMULATED_VAR)     !'TEMPTURE DO NO3 NH4 TN PO4
TP CYANO FDIAT TCHLA    # List of Output Selections'
!WRITE(6,'(5a)')(trim(adjustl(adjustr(Simulated_CAEYM_VARname2(ii)))),ii=1,5)     !'TEMPTURE DO NO3 NH4 TN PO4
TP CYANO FDIAT TCHLA    # List of Output Selections'

elseif(I_caedymSwitch.eq.0)then
WRITE(1,'(A)')'TEMPTURE             # DO NO3 NH4 TN PO4 TP CYANO FDIAT TCHLA # List of Output Selections'
!WRITE(1,fmt)'TEMPTURE DO NO3 NH4 TN PO4 TP CYANO FDIAT TCHLA    # List of Output Selections'
!WRITE(1,'(A)')(Simulated_CAEYM_VARname2(ii),ii=1,NUM_SIMULATED_VAR)
!'TEMPTURE DO NO3 NH4 TN PO4 TP CYANO FDIAT TCHLA    # List of Output Selections'
endif

else
write(1,'(a)')NOTE_CFG(I)
ENDIF

ENDDO

CLOSE(1)

end SUBROUTINE CALIBRATION_PHY_CFG


SUBROUTINE BEST_PHY_PAR (LOOP_BEST,PARA1,FILENAMES)
INTEGER :: LOOP_BEST
TYPE (INPUT_FILENAME), INTENT (IN) :: FILENAMES
TYPE (PARA_FILE) :: para1
character (len=100) :: fileName_temp, char_temp

OPEN(1,FILE=FILENAMES%PAR)
WRITE(1,'(A)')'<#7>'
WRITE(1,'(A)')'PHYSICAL Parameters File.'
```

```
WRITE(1,*)PARA1%PAR_BULK(LOOP_BEST)
WRITE(1,*)PARA1%PAR_albedo(LOOP_BEST)
WRITE(1,*)PARA1%PAR_emission(LOOP_BEST)
WRITE(1,*)PARA1%PAR_CriticalWind(LOOP_BEST)
WRITE(1,*)PARA1%PAR_output(LOOP_BEST)
WRITE(1,*)PARA1%PAR_bubbler(LOOP_BEST)
WRITE(1,*)PARA1%PAR_buoyant(LOOP_BEST)
WRITE(1,*)PARA1%PAR_shear(LOOP_BEST)
WRITE(1,*)PARA1%PAR_energy(LOOP_BEST)
WRITE(1,*)PARA1%PAR_windStiring(LOOP_BEST)
WRITE(1,*)PARA1%PAR_surface(LOOP_BEST)
WRITE(1,*)PARA1%PAR_BBL(LOOP_BEST)
WRITE(1,*)PARA1%PAR_VerticalMixing(LOOP_BEST)
WRITE(1,'(a)')'=========================='     !

close(1)

end SUBROUTINE BEST_PHY_PAR
end module AUTO_CALIBRATION_PHY
```

DyresmDataAllocation.f90

```
!-----------------------------------------------------------------------------------------------------------
module dyresm_data_allocation
use DYRESM_COMMON

contains

subroutine dycd_data_allocation(n2,n3,dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var, dyresmDO_Var,          &
dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var, &
dyresmTP_Var,dyresmCYANO_Var,dyresmFDIAT_Var,                  &
                                    dyresmTCHLA_Var,dyresmPOCL_Var,dyresmDOCL_Var,dyresmPOPL_Var,      &
                                    dyresmDOPL_Var,dyresmPONL_Var,dyresmDONL_Var,dyresmPOCR_Var,       &
                                    dyresmDOCR_Var, dyresmPOPR_Var,dyresmDOPR_Var, dyresmPONR_Var,     &
                                    dyresmDONR_Var, dyresmCRYPT_Var,dyresmNODUL_Var,dyresmDINOF_Var,    &
                                    dyresmCHLOR_Var,dyresmMDIAT_Var,dyresmZOOP1_Var,dyresmZOOP2_Var,    &
                                    dyresmZOOP3_Var, dyresmZOOP4_Var,dyresmZOOP5_Var,dyresmSSOL1_Var,   &
                                    dyresmSSOL2_Var,dyresmFISH1_Var,dyresmFISH2_Var,dyresmFISH3_Var,    &
                                    dyresmBAC_Var,dyresmPAR_Var,NUM_AllVarTxt,NO_DIM_NETCDF,            &
                                    I_SWITCH_PHY,I_SWITCH_CHM,I_SWITCH_BIO,I_SWITCH_SED)

INTEGER, intent(in) ::    I_SWITCH_PHY,I_SWITCH_CHM,I_SWITCH_BIO,I_SWITCH_SED,NUM_AllVarTxt
!for physical calibration (1=YES, 0=NO)
INTEGER :: NO_DIM_NETCDF(1:NUM_AllVarTxt,1:4)
character(len=100) :: char_tempSUB,DYCDfilename


real*4, ALLOCATABLE             ::   dyresmLAYER_HTS_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmTEMPTURE_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmDO_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmNO3_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmNH4_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmTN_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmPO4_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmTP_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmCYANO_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmFDIAT_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmTCHLA_Var( :,: )
!Liancong Luo added some variables here in June 2010 (Denmark)
real*4, ALLOCATABLE             ::   dyresmPOCL_Var ( :,: )
real*4, ALLOCATABLE             ::   dyresmDOCL_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmPOPL_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmDOPL_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmPONL_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmDONL_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmPOCR_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmDOCR_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmPOPR_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmDOPR_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmPONR_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmDONR_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmCRYPT_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmNODUL_Var( :,: )
real*4, ALLOCATABLE             ::   dyresmDINOF_Var( :,: )
```

```
real*4, ALLOCATABLE             ::  dyresmCHLOR_Var( :,: )
real*4, ALLOCATABLE             ::  dyresmMDIAT_Var( :,: )
real*4, ALLOCATABLE             ::  dyresmZOOP1_Var( :,: )
real*4, ALLOCATABLE             ::  dyresmZOOP2_Var( :,: )
real*4, ALLOCATABLE             ::  dyresmZOOP3_Var( :,: )
real*4, ALLOCATABLE             ::  dyresmZOOP4_Var( :,: )
real*4, ALLOCATABLE             ::  dyresmZOOP5_Var( :,: )
real*4, ALLOCATABLE             ::  dyresmSSOL1_Var( :,: )
real*4, ALLOCATABLE             ::  dyresmSSOL2_Var( :,: )
real*4, ALLOCATABLE             ::  dyresmFISH1_Var( :,: )
real*4, ALLOCATABLE             ::  dyresmFISH2_Var( :,: )
real*4, ALLOCATABLE             ::  dyresmFISH3_Var( :,: )
real*4, ALLOCATABLE             ::  dyresmBAC_Var( :,: )
real*4, ALLOCATABLE             ::  dyresmPAR_Var( :,: )

!-----------------OPEN THE PARAMETER FILES----------------------------

LOGICAL :: FILE_ALIVE_TEMP
!Integer(2) :: results
DYCDfilename='AllVar_PAR.txt'

!run the model now
INQUIRE(FILE=DYCDfilename,EXIST=FILE_ALIVE_TEMP)

IF(.NOT.FILE_ALIVE_TEMP)THEN
WRITE(6,*)'AllVar_PAR.txt DOES NOT EXIST, MAKE SURE YOU HAVE RUNNED NET'
ELSE

!WRITE(6,*)I_SWITCH
!PAUSE 100

open(1,file='AllVar_PAR.txt',STATUS='OLD')
IF(    (I_SWITCH_PHY==1).and.(I_SWITCH_CHM==0).AND.(I_SWITCH_BIO==0).AND.(I_SWITCH_SED==0) )THEN
DO I=1,2
!DO I=1,NUM_AllVarTxt
READ(1,*)N1,N2,N3,char_tempSUB
DO KK=1,NUMBER_VAR      !NUM_AllVarTxt
IF(TRIM(ADJUSTL(ADJUSTR(char_tempSUB))).EQ.TRIM(ADJUSTL(ADJUSTR(DYRESM_VARname(KK)))))THEN
NO_DIM_NETCDF(I,1)=N1
NO_DIM_NETCDF(I,2)=N2
NO_DIM_NETCDF(I,3)=N3
NO_DIM_NETCDF(I,4)=KK
ENDIF
ENDDO
ENDDO

!PAUSE 55

elseIF((I_SWITCH_CHM==1).or.(I_SWITCH_BIO==1).or.(I_SWITCH_SED==1))THEN !all variables
!elseif(i_switch.EQ.0)THEN !There are NUM_AllVarTxt variables depending on the configuration
DO I=1,NUM_AllVarTxt      !THE NUMBER DEPENDS ON THE LINE NUMBER OF AllVar.txt
READ(1,*)N1 ,N2,N3,CHAR_TEMPSUB

II_TEMP=0

DO KK=1,NUMBER_Var
IF(TRIM(ADJUSTL(ADJUSTR(char_tempSUB))).EQ.TRIM(ADJUSTL(ADJUSTR(DYRESM_VARname(KK)))))THEN
II_TEMP=KK
NO_DIM_NETCDF(I,1)=N1
NO_DIM_NETCDF(I,2)=N2
NO_DIM_NETCDF(I,3)=N3
NO_DIM_NETCDF(I,4)=KK
ENDIF
ENDDO
ENDDO
endif      !IF(i_switch.EQ.1)THEN


!DO KK=1,NUM_AllVarTxt
!WRITE(6,*)NO_DIM_NETCDF(KK,1),NO_DIM_NETCDF(KK,2),NO_DIM_NETCDF(KK,3) !
NUM_ALLVARTXT,NDIM,IX,KK
!ENDDO
!PAUSE 123
CLOSE(1)
```

```
ENDIF    ! INQURE THE ALLVAR_PAR.TXT

ALLOCATE( dyresmLAYER_HTS_Var( 1:N2,1:N3 ) )     ! 1
ALLOCATE(    dyresmTEMPTURE_Var( 1:N2,1:N3 ) )    ! 2
ALLOCATE(    dyresmDO_Var( 1:N2,1:N3 ))           ! 3
ALLOCATE(    dyresmNO3_Var( 1:N2,1:N3 ))          ! 4
ALLOCATE(    dyresmNH4_Var( 1:N2,1:N3 ))          ! 5
ALLOCATE(    dyresmTN_Var( 1:N2,1:N3 ))           ! 6
ALLOCATE(    dyresmPO4_Var( 1:N2,1:N3 ))          ! 7
ALLOCATE(    dyresmTP_Var( 1:N2,1:N3 ))           ! 8
ALLOCATE(    dyresmCYANO_Var( 1:N2,1:N3) )        ! 9
ALLOCATE(    dyresmFDIAT_Var( 1:N2,1:N3 ))        ! 10
ALLOCATE(    dyresmTCHLA_Var( 1:N2,1:N3 ))        ! 11

!Liancong Luo added some variables here in June 2010 (Denmark)
ALLOCATE(       dyresmPOCL_Var ( 1:N2,1:N3 ))     ! 12
ALLOCATE(       dyresmDOCL_Var( 1:N2,1:N3 ))      ! 13
ALLOCATE(       dyresmPOPL_Var( 1:N2,1:N3 ))      ! 14
ALLOCATE(       dyresmDOPL_Var( 1:N2,1:N3 ))      ! 15
ALLOCATE(       dyresmPONL_Var( 1:N2,1:N3 ))      ! 16
ALLOCATE(       dyresmDONL_Var( 1:N2,1:N3 ))      ! 17
ALLOCATE(       dyresmPOCR_Var( 1:N2,1:N3 ))      ! 18
ALLOCATE(       dyresmDOCR_Var( 1:N2,1:N3 ))      ! 19
ALLOCATE(       dyresmPOPR_Var( 1:N2,1:N3 ))      ! 20
ALLOCATE(       dyresmDOPR_Var( 1:N2,1:N3 ))      ! 21
ALLOCATE(       dyresmPONR_Var( 1:N2,1:N3 ))      ! 22
ALLOCATE(       dyresmDONR_Var( 1:N2,1:N3 ))      ! 23
ALLOCATE(       dyresmCRYPT_Var( 1:N2,1:N3 ))     ! 24
ALLOCATE(       dyresmNODUL_Var( 1:N2,1:N3 ))     ! 25
ALLOCATE(       dyresmDINOF_Var( 1:N2,1:N3 ))     ! 26
ALLOCATE(       dyresmCHLOR_Var( 1:N2,1:N3 ))     ! 27
ALLOCATE(       dyresmMDIAT_Var( 1:N2,1:N3 ))     ! 28
ALLOCATE(       dyresmZOOP1_Var( 1:N2,1:N3 ))     ! 29
ALLOCATE(       dyresmZOOP2_Var( 1:N2,1:N3 ))     ! 30
ALLOCATE(       dyresmZOOP3_Var( 1:N2,1:N3 ))     ! 31
ALLOCATE(       dyresmZOOP4_Var( 1:N2,1:N3 ))     ! 32
ALLOCATE(       dyresmZOOP5_Var( 1:N2,1:N3 ))     ! 33
ALLOCATE(       dyresmSSOL1_Var( 1:N2,1:N3 ))     ! 34
ALLOCATE(       dyresmSSOL2_Var( 1:N2,1:N3 ))     ! 35
ALLOCATE(       dyresmFISH1_Var( 1:N2,1:N3 ))     ! 36
ALLOCATE(       dyresmFISH2_Var( 1:N2,1:N3 ))     ! 37
ALLOCATE(       dyresmFISH3_Var( 1:N2,1:N3 ))     ! 38
ALLOCATE(       dyresmBAC_Var( 1:N2,1:N3 ))       ! 39
ALLOCATE(       dyresmPAR_Var( 1:N2,1:N3 ))       ! 40

end subroutine dycd_data_allocation
end module dyresm_data_allocation
```

RMSE_sorting.f90

```
!-------------------------------------------------------------------------------------------------
!*************************************************************************
!
!   Module: This module calculate the follow errors:
!   1. standard deviation for obs and mod data - STD
!   2. Average error (mean bias error)- AE / MBE
!   3. Mean normalized bias error - MNBE
!   4. mean absolute gross error - MAGE
!   5. Mean absolute nornamized gross error - MANGE
!   6. sum squared error - SSE
!   7. mean squared error - MSE
!   8. Root mean squared error - RMSE
!   9. Normalized root mean squared error - NRMSE
!   10.Nash-sutcliffe efficient coefficient - E
!   11.pearson Correlation coefficient - R
!   the formulas for all the above parameters:
!   MODIFICATION HISTORY:
!   --------------------
!   Original code : Liancong Luo 10/1/2009
!   Modification: Liancong Luo 7/7/2010
!*************************************************************************
!real :: STD, MBE, NMBE, MAGE, NMAGE, SSE, MSE, RMSE, NRMSE, E, R
MODULE sorting_Error
use DYRESM_COMMON
! parameter for model evaluation
```

```
! STD = sqrt [(sum(dd-dd_avg)**2
!Number_error is the number above from 1-10, the parmeter for error calculation.
CONTAINS

subroutine sorting(obsVar_data,nn_obs,NUMBER_obsVar,num_loop,Loop_best,NUMBER_ERROR)
integer, intent (in) :: nn_obs,NUMBER_obsVar,num_loop
integer, intent (out) ::Loop_best
integer, intent (in) :: NUMBER_ERROR

TYPE (OBS_DATASET) :: obsVar_data(1:NUMBER_obsVar)
!nn_obs will be inputted by a number of observation data in confirguation. (successive number).

 ALLOCATE(RMSE_TEMP(1:NUM_LOOP))
 ALLOCATE(R_Pearson_TEMP(1:NUM_LOOP))
 ALLOCATE(RMSE_TEMP2(1:NUM_LOOP))
 ALLOCATE(R_Pearson_TEMP2(1:NUM_LOOP))
 ALLOCATE(RMSE_TEMP_no(1:NUM_LOOP),RMSE_TEMP_no0(1:NUM_LOOP))
 ALLOCATE(R_Pearson_TEMP_no(1:NUM_LOOP),R_Pearson_TEMP_no0(1:NUM_LOOP))

!open(1,file='ttt.txt')

!correlation=abs(correlation)
!OPEN(1,FILE='TTT.TXT')

do j=1,NUM_LOOP
RMSE_TEMP_no0(J)=J
R_Pearson_TEMP_no0(J)=J
R_Pearson_TEMP(j)=0.0
RMSE_TEMP(j)=0.0
do i=1,obsVar_data(nn_obs)%NN_DEPTH
R_Pearson_TEMP(j)=R_Pearson_TEMP(j)+obsVar_data(nn_obs)%R_Pearson(I,j)/obsVar_data(nn_obs)%NN_DEPTH
RMSE_TEMP(j)=RMSE_TEMP(j)+obsVar_data(nn_obs)%RMSE(I,j)/obsVar_data(nn_obs)%NN_DEPTH

enddo
!write(6,*)
!write(1,*)R_Pearson_TEMP(j),RMNSE_TEMP(j)
enddo
!close(1)
!sorting all the parameters
call SORT_DECREASING(NUM_LOOP,RMSE_TEMP,RMSE_TEMP2,RMSE_TEMP_no0,RMSE_TEMP_no)
call SORT_INCREASING(NUM_LOOP,R_Pearson_TEMP,R_Pearson_TEMP2,R_Pearson_TEMP_no0,R_Pearson_TEMP_no)

Loop_best=RMSE_TEMP_no(1)
write(*,*)"The best loop number is " , Loop_best
open(80,file='Files_error/RMSE_sorting.txt')
write(80,'(a)')'SerNumber        RMSE          OriginalNumber'
do i=1,num_loop
write(80,*)i,RMSE_TEMP2(i),RMSE_TEMP_no(i)
enddo
close(80)

DEALLOCATE(RMSE_TEMP,R_Pearson_TEMP,RMSE_TEMP2,R_Pearson_TEMP2,RMSE_TEMP_no,    &
R_Pearson_TEMP_no)

end subroutine sorting

!CALL
SORT_INCREASING(NUMBER_FILESsAVED,ERROR_ALLerror0,ERROR_ALLerror1,number_ERROR_ALLerror1)


SUBROUTINE
SORT_INCREASING(nn,DATA0,DATA1,number0,NUMBER1)       !IF(ALLOCATED(NUMBER_FILESsAVED0))
DEALLOCATE(NUMBER_FILESsAVED0)
real(kind=8) :: DATA0(1:NN)    !including the serial number
real(kind=8), INTENT (OUT) :: DATA1(1:NN)
INTEGER , INTENT(IN) :: number0(1:NN)
INTEGER , INTENT(OUT) :: number1(1:NN)
INTEGER, intent (in) :: nn

do i=1,nn
number1(i)=NUMBER0(I)
data1(i)=data0(i)
enddo

DO I=1,NN
```

```
DO J=I+1,NN
IF(DATA1(I).gE.DATA1(J))then
a=data1(i)
data1(i)=data1(j)
data1(j)=a
ia=number1(i)
number1(i)=number1(j)
number1(j)=ia
endif
enddo
enddo

END SUBROUTINE SORT_INCREASING

SUBROUTINE SORT_DECREASING(nn,DATA0,DATA1,number0,NUMBER1)
real(kind=8) :: DATA0(1:NN)    !including the serial number
real(kind=8), INTENT (OUT) :: DATA1(1:NN)
INTEGER , INTENT(IN) :: number0(1:NN)
INTEGER , INTENT(OUT) :: number1(1:NN)
INTEGER, intent (in) :: nn

do i=1,nn
number1(i)=NUMBER0(I)
data1(i)=data0(i)
enddo

DO I=1,NN
DO J=I+1,NN
IF(DATA1(I).le.DATA1(J))then
a=data1(i)
data1(i)=data1(j)
data1(j)=a
ia=number1(i)
number1(i)=number1(j)
number1(j)=ia
endif
enddo
enddo

END SUBROUTINE SORT_DECREASING
END MODULE sorting_Error
```

Error_calculation.f90

```
!-----------------------------------------------------------------------------------------------
!*****************************************************************************
!
!   Module: This module calculate the follow errors:
!   1. standard deviation for obs and mod data - STD
!   2. Average error (mean bias error)- AE / MBE
!   3. Mean normalized bias error - MNBE
!   4. mean absolute gross error - MAGE
!   5. Mean absolute nornamized gross error - MANGE
!   6. sum squared error - SSE
!   7. mean squared error - MSE
!   8. Root mean squared error - RMSE
!   9. Normalized root mean squared error - NRMSE
!   10.Nash-sutcliffe efficient coefficient - E
!   11.pearson Correlation coefficient - R
!   12.t-TEST: T=(SQRT(((N-1)*MNBE)/(RMSE*RMSE-MNBE*MNBE)))
!   the formulas for all the above parameters:
!   MODIFICATION HISTORY:
!   --------------------
!   Original code : Liancong Luo 10/1/2009
!   Modification: Liancong Luo 1/7/2010
!*****************************************************************************
!real :: STD, MBE, NMBE, MAGE, NMAGE, SSE, MSE, RMSE, NRMSE, E, R
! This module is to
!

MODULE ErrorCalculation
use DYRESM_COMMON
USE sorting_Error
!use dFPORT
!USE IFCore
```

```
!USE IFPort

! parameter for model evaluation
! STD = sqrt [(sum(dd-dd_avg)**2

CONTAINS
!
!This subroutine is to select the model data for comparison with observatons
!Specific variable and specific depth (interpolated), time seriers
subroutine ComparisonDataSeclection(dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var,dyresmDO_Var,
&
dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var,                    &
dyresmTP_Var,dyresmCYANO_Var,dyresmFDIAT_Var,                              &
dyresmTCHLA_Var,dyresmPOCL_Var,dyresmDOCL_Var,dyresmPOPL_Var,              &
                                    dyresmDOPL_Var,dyresmPONL_Var,dyresmDONL_Var,dyresmPOCR_Var,          &
                                    dyresmDOCR_Var, dyresmPOPR_Var,dyresmDOPR_Var, dyresmPONR_Var,        &
                                    dyresmDONR_Var, dyresmCRYPT_Var,dyresmNODUL_Var,dyresmDINOF_Var,      &
                                    dyresmCHLOR_Var,dyresmMDIAT_Var,dyresmZOOP1_Var,dyresmZOOP2_Var,      &
                                    dyresmZOOP3_Var, dyresmZOOP4_Var,dyresmZOOP5_Var,dyresmSSOL1_Var,     &
                                    dyresmSSOL2_Var,dyresmFISH1_Var,dyresmFISH2_Var,dyresmFISH3_Var,      &
                                    dyresmBAC_Var,dyresmPAR_Var, modelTime,n2,n3,Par_number,number_loop,  &
                                   obsVar_data,number_par_obs,NUMBER_obsVar)


! number_par_obs is a COMMON number for different variables, n2 for depth and n3 for time seriers.

character(len=1024) , parameter :: Error_title=' SampleNo STDO STDM MBE MNBE MAGE MANGE SSE MSE RMSE    &
RMNSE E_Nash R_Pearson T_TEST'
!real(kind=8) :: default_value=99999999.0,big_value=1.0E+25
!!*************************************************************************
!! This subroutine calculates model error based on model output and field data
!!*************************************************************************
INTEGER , INTENT (IN) :: N2,    N3
real*4        ::   dyresmLAYER_HTS_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmTEMPTURE_Var( 1:n2,1:n3 )      !n3-time serials,    n2-layers
!real*4        ::   dyresmDENSITY_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
!real*4        ::   dyresmSALINITY_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmDO_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmNO3_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmNH4_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmTN_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmPO4_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmTP_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmCYANO_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmFDIAT_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmTCHLA_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers

!Liancong Luo added some variables here in June 2010 (Denmark)
real*4        ::   dyresmPOCL_Var ( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmDOCL_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmPOPL_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmDOPL_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmPONL_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers    !n3-time serials,    n2-layers
real*4        ::   dyresmDONL_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmPOCR_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmDOCR_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmPOPR_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmDOPR_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers    !n3-time serials,    n2-layers
real*4        ::   dyresmPONR_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmDONR_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmCRYPT_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmNODUL_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmDINOF_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmCHLOR_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmMDIAT_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmZOOP1_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmZOOP2_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmZOOP3_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmZOOP4_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmZOOP5_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmSSOL1_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmSSOL2_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmFISH1_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmFISH2_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4        ::   dyresmFISH3_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
```

```
      real*4         ::    dyresmBAC_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
      real*4         ::    dyresmPAR_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
      real*4    ::    depth(1:n2),data_dycd(1:n2)
      real(kind=8) :: modelTime(1:n3)
      integer, intent(in) :: par_number, number_par_obs,NUMBER_obsVar!for the above pars
      REAL(KIND=8), ALLOCATABLE :: COMPARISON_DATAO (:),COMPARISON_DATAM(:),comparison_time(:)
      TYPE (OBS_DATASET) :: obsVar_data(1:NUMBER_obsVar)
      integer, intent (in) :: number_loop
      character (len=100) :: error_filename,error_filename_total,CHAR_TEMP
      character (len=1020) :: FMT1,FMT2,FMT3,FMT4,FMT5
      real(kind=8) :: STDO, STDM, MBE, MNBE, MAGE, MANGE, SSE, MSE, RMSE, RMNSE, E_Nash, R_Pearson,T_TEST
      !    real(kind=8) :: default_value=999999.0,big_value=1.0E+20,default_value0=9999.0

      !**********************************************************************
      !open(15,file='tempd.txt',POSITION='APPEND',ACTION='WRITE')

      do I=1,obsVar_data(number_par_obs)%NN_DEPTH       !FOR a specified depth
      obsVar_data(number_par_obs)%errors_title(i)=error_title
      !write(6,'(a)')obsVar_data(number_par_obs)%errors_title(i)
      !pause 55
      enddo


      obsVar_data(number_par_obs)%STDO_TOT(number_loop)=0.0          !STDO       number_par_obs--SPECIFIED VARIABLE
      obsVar_data(number_par_obs)%STDM_TOT(number_loop)=0.0          !STDM
      obsVar_data(number_par_obs)%MBE_TOT(number_loop)=0.0          !MBE
      obsVar_data(number_par_obs)%MNBE_TOT(number_loop)=0.0          !MNBE
      obsVar_data(number_par_obs)%MAGE_TOT(number_loop)=0.0          !MAGE
      obsVar_data(number_par_obs)%MANGE_TOT(number_loop)=0.0          !MANGE
      obsVar_data(number_par_obs)%SSE_TOT(number_loop)=0.0          !SSE
      obsVar_data(number_par_obs)%MSE_TOT(number_loop)=0.0          !MSE
      obsVar_data(number_par_obs)%RMSE_TOT(number_loop)=0.0          !RMSE
      obsVar_data(number_par_obs)%RMNSE_TOT(number_loop)=0.0          !RMNSE
      obsVar_data(number_par_obs)%E_NASH_TOT(number_loop)=0.0          !E_NASH
      obsVar_data(number_par_obs)%R_Pearson_TOT(number_loop)=0.0          !R_PEARSON
      obsVar_data(number_par_obs)%T_TEST_TOT(number_loop)=0.0          !T_TEST


      !FOR A SPECIFIC DEPTH, SPECIFIC VAR       number_par_obs IS THE NUMBER FOR A SPECIFIC VARIABLE
      !WRITE(6,*)number_par_obs,obsVar_data(number_par_obs)%NN_DEPTH
      !PAUSE 67

      do I=1,obsVar_data(number_par_obs)%NN_DEPTH       !FOR a specified depth
      NUMBER_TEMP=0
      DO J=1,obsVar_data(number_par_obs)%NN_DATLINE    !for a specified obsveration variable
      DO k=1,N3                                                !all the model data
      FF=ABS(obsVar_data(number_par_obs)%DATA_TIME(j)-modelTime(k))

      IF(FF.LE.small_value_TIME)THEN     !FIND THE MODEL DATA AT THE SAME TIME WITH OBS DATA
      if((obsVar_data(number_par_obs)%OBS_DATA(j,i).ne.default_value).and.      &
      (obsVar_data(number_par_obs)%OBS_DATA(j,i).ne.default_value0))then
      NUMBER_TEMP=NUMBER_TEMP+1
      else
      endif
      else
      endif
      enddo !DO k=1,N3                                                !all the model data
      enddo    !DO J=1,obsVar_data(number_par_obs)%NN_DATLINE    !for a specified obsveration variable
      allocate(COMPARISON_DATAo (1:NUMBER_TEMP))
      allocate(COMPARISON_DATAm (1:NUMBER_TEMP))
      allocate(COMPARISON_time (1:NUMBER_TEMP))

      !write the data into COMPARISON_DATA
      NUMBER_TEMP=0

      DO J=1,obsVar_data(number_par_obs)%NN_DATLINE    !for a specified obsveration variable
      DO k=1,N3                                                !all the model data,    daily or hourly
      FF=ABS(obsVar_data(number_par_obs)%DATA_TIME(j)-modelTime(k))
      IF(FF.LE.small_value_TIME)THEN
        !FIND THE MODEL DATA AT THE SAME TIME WITH OBS DATA (depth interpolation)
      !if(obsVar_data(number_par_obs)%OBS_DATA(j,i).ne.default_value)then
      if((obsVar_data(number_par_obs)%OBS_DATA(j,i).ne.default_value).and.       &
      (obsVar_data(number_par_obs)%OBS_DATA(j,i).ne.default_value0))then
      NUMBER_TEMP=NUMBER_TEMP+1
      comparison_time(number_temp)=modelTime(k)
```

```
COMPARISON_DATAo(NUMBER_TEMP)=obsVar_data(number_par_obs)%OBS_DATA(j,i)

!get the model data now
do l=1,n2
depth(l)=dyresmLAYER_HTS_Var(l,k)
if(Par_number.eq.2)then    !temperature
data_dycd(l)=dyresmTEMPTURE_Var(l,k)
elseif(Par_number.eq.3)then    !DO
data_dycd(l)=dyresmDO_Var(l,k)
elseif(Par_number.eq.4)then    !temperature
data_dycd(l)=dyresmNO3_Var(l,k)
elseif(Par_number.eq.5)then    !temperature
data_dycd(l)=dyresmNH4_Var(l,k)
elseif(Par_number.eq.6)then    !temperature
data_dycd(l)=dyresmTN_Var(l,k)
elseif(Par_number.eq.7)then    !temperature
data_dycd(l)=dyresmPONL_Var(l,k)
elseif(Par_number.eq.8)then    !temperature
data_dycd(l)=dyresmPONR_Var(l,k)
elseif(Par_number.eq.9)then    !temperature
data_dycd(l)=dyresmDONL_Var(l,k)
elseif(Par_number.eq.10)then    !temperature
data_dycd(l)=dyresmDONR_Var(l,k)
elseif(Par_number.eq.11)then
data_dycd(l)=dyresmPO4_Var(l,k)
elseif(Par_number.eq.12)then
data_dycd(l)=dyresmTP_Var(l,k)
elseif(Par_number.eq.13)then
data_dycd(l)=dyresmPOPL_Var(l,k)
elseif(Par_number.eq.14)then
data_dycd(l)=dyresmPOPR_Var(l,k)
elseif(Par_number.eq.15)then
data_dycd(l)=dyresmDOPL_Var(l,k)
elseif(Par_number.eq.16)then
data_dycd(l)=dyresmDOPR_Var(l,k)
elseif(Par_number.eq.17)then
data_dycd(l)=dyresmPOCL_Var(l,k)
elseif(Par_number.eq.17)then
data_dycd(l)=dyresmPOCR_Var(l,k)
elseif(Par_number.eq.19)then
data_dycd(l)=dyresmDOCL_Var(l,k)
elseif(Par_number.eq.20)then
data_dycd(l)=dyresmDOCR_Var(l,k)
elseif(Par_number.eq.21)then
data_dycd(l)=dyresmDINOF_Var(l,k)
elseif(Par_number.eq.22)then
data_dycd(l)=dyresmCYANO_Var(l,k)
elseif(Par_number.eq.23)then
data_dycd(l)=dyresmNODUL_Var(l,k)
elseif(Par_number.eq.24)then
data_dycd(l)=dyresmCHLOR_Var(l,k)
elseif(Par_number.eq.25)then
data_dycd(l)=dyresmCRYPT_Var(l,k)
elseif(Par_number.eq.26)then
data_dycd(l)=dyresmMDIAT_Var(l,k)
elseif(Par_number.eq.27)then
data_dycd(l)=dyresmFDIAT_Var(l,k)
elseif(Par_number.eq.28)then
data_dycd(l)=dyresmZOOP1_Var(l,k)
elseif(Par_number.eq.29)then
data_dycd(l)=dyresmZOOP2_Var(l,k)
elseif(Par_number.eq.30)then
data_dycd(l)=dyresmZOOP3_Var(l,k)
elseif(Par_number.eq.31)then
data_dycd(l)=dyresmZOOP4_Var(l,k)
elseif(Par_number.eq.32)then
data_dycd(l)=dyresmZOOP5_Var(l,k)
elseif(Par_number.eq.33)then
data_dycd(l)=dyresmSSOL1_Var(l,k)
elseif(Par_number.eq.34)then
data_dycd(l)=dyresmSSOL2_Var(l,k)
elseif(Par_number.eq.35)then
data_dycd(l)=dyresmFISH1_Var(l,k)
elseif(Par_number.eq.36)then
data_dycd(l)=dyresmFISH2_Var(l,k)
```

```
elseif(Par_number.eq.37)then
data_dycd(l)=dyresmFISH3_Var(l,k)
elseif(Par_number.eq.38)then
data_dycd(l)=dyresmBAC_Var(l,k)
elseif(Par_number.eq.39)then
data_dycd(l)=dyresmPAR_Var(l,k)
elseif(Par_number.eq.40)then
data_dycd(l)=dyresmTCHLA_Var(l,k)
ELSE
ENDIF
ENDDO    !do l=1,n2

!DEPTH INTERPOLATION TO GET THE RIGHT MODEL DATA
IX=1
FF=0.0
do l=1,n2
IF(depth(l).GE.0.0)THEN
IX=L
FF=DEPTH(L)
!write(6,*)ix,ff
GO TO 55
ENDIF
ENDDO

55 DO L=IX,N2
DEPTH(L)=ABS(DEPTH(L)-FF)
ENDDO

!-----------get the average depth intervals from model----------
ff_temp=0.0
ix_ff_temp=0
DO L=IX,N2-1
ff_temp=ff_temp+DEPTH(L+1)-DEPTH(L)
ix_ff_temp=ix_ff_temp+1
enddo
ff_temp=ff_temp/ix_ff_temp

!----------depth interpolation---------------------------------------
obsDepth=obsVar_data(number_par_obs)%WATER_DEPTH(I)
DO L=IX,N2-1
if(obsDepth.ge.DEPTH(L).AND.OBSDEPTH.LE.DEPTH(L+1))THEN
FFA=DEPTH(L)
FFB=DEPTH(L+1)
FFC=0.5*(DEPTH(L)+DEPTH(L+1))
!FF_DATA=0.5*(data_dycd(l)+data_dycd(l+1))
!
!IF(obsDepth.ge.FFA.AND.obsDepth.Le.FFC)THEN
!FF_DATA=0.5*(FF_DATA+data_dycd(l))
!ELSEIF(obsDepth.ge.FFC.AND.obsDepth.Le.FFB)THEN
!FF_DATA=0.5*(FF_DATA+data_dycd(l+1))
!ELSE
!ENDIF

FF_DATA=data_dycd(l+1)-(data_dycd(l+1)-data_dycd(l))*((FFB-OBSDEPTH)/(FFB-FFA))

!write(6,*)ff_data
GO TO 56
elseif(obsDepth.ge.DEPTH(n2))then
go to 57
ENDIF
ENDDO    !DO L=IX,N2-1      DEPTH INTERPOLATION FOR TWICE

56 COMPARISON_DATAm(NUMBER_TEMP)=FF_DATA
57 if((obsDepth-DEPTH(n2)).le.ff_temp)then        !ff_temp is the average depth interval in the model
    ff1=data_dycd(n2)-data_dycd(n2-1)
    ff2=data_dycd(n2-1)-data_dycd(n2-2)
    ff3=0.5*(ff1+ff2)
    COMPARISON_DATAm(NUMBER_TEMP)=data_dycd(n2)+ff3
    else
    ff1=data_dycd(n2)-data_dycd(n2-1)
    ff2=data_dycd(n2-1)-data_dycd(n2-2)
    ff3=0.5*(ff1+ff2)
    COMPARISON_DATAm(NUMBER_TEMP)=data_dycd(n2)+ff3
    endif
```

```
      endif   !if(obsVar_data(number_par_obs)%OBS_DATA(j,i).ne.default_value)then
      endif   !IF(FF.LE.small_value_TIME)THEN
       !FIND THE MODEL DATA AT THE SAME TIME WITH OBS DATA (depth interpolation)
      enddo   !DO k=1,N3                                          !all the model data
      enddo   !DO J=1,obsVar_data(number_par_obs)%NN_DATLINE   !for a specified obsveration variable

      call Error_calculation(NUMBER_TEMP,COMPARISON_DATAo,COMPARISON_DATAm,COMPARISON_time,   &
                  STDO, STDM, MBE, MNBE, MAGE, MANGE, SSE, MSE, RMSE, RMNSE, E_Nash, R_Pearson,t_TEST)

      DEallocate(comparison_time,COMPARISON_DATAo,COMPARISON_DATAm)

      obsVar_data(number_par_obs)%STDO(I,number_loop)=STDO     !I-DEPTH,    number_par_obs--SPECIFIED VARIABLE
      obsVar_data(number_par_obs)%STDM(I,number_loop)=STDM
      obsVar_data(number_par_obs)%MBE(I,number_loop)=MBE
      obsVar_data(number_par_obs)%MNBE(I,number_loop)=MNBE
      obsVar_data(number_par_obs)%MAGE(I,number_loop)=MAGE
      obsVar_data(number_par_obs)%MANGE(I,number_loop)=MANGE
      obsVar_data(number_par_obs)%SSE(I,number_loop)=SSE
      obsVar_data(number_par_obs)%MSE(I,number_loop)=MSE
      obsVar_data(number_par_obs)%RMSE(I,number_loop)=RMSE
      obsVar_data(number_par_obs)%RMNSE(I,number_loop)=RMNSE
      obsVar_data(number_par_obs)%E_NASH(I,number_loop)=E_NASH
      obsVar_data(number_par_obs)%R_Pearson(I,number_loop)=R_PEARSON
      obsVar_data(number_par_obs)%T_TEST(I,number_loop)=T_TEST
      obsVar_data(number_par_obs)%number_data(I,number_loop)=number_temp


      !CALCULATE THE MEAN ERROR AT VERTICAL DIRECTION
      obsVar_data(number_par_obs)%STDO_TOT(number_loop)=obsVar_data(number_par_obs)%STDO_TOT(number_loop)+ &
      STDO*obsVar_data(number_par_obs)%WeightFactorVertical(I)/obsVar_data(number_par_obs)%NN_DEPTH

      obsVar_data(number_par_obs)%STDM_TOT(number_loop)=obsVar_data(number_par_obs)%STDM_TOT(number_loop)+ &
      STDM*obsVar_data(number_par_obs)%WeightFactorVertical(I)/obsVar_data(number_par_obs)%NN_DEPTH          !STDM

      obsVar_data(number_par_obs)%MBE_TOT(number_loop)=obsVar_data(number_par_obs)%MBE_TOT(number_loop)+ &
      MBE*obsVar_data(number_par_obs)%WeightFactorVertical(I)/obsVar_data(number_par_obs)%NN_DEPTH            !MBE

      obsVar_data(number_par_obs)%MNBE_TOT(number_loop)=obsVar_data(number_par_obs)%MNBE_TOT(number_loop)+ &
      MNBE*obsVar_data(number_par_obs)%WeightFactorVertical(I)/obsVar_data(number_par_obs)%NN_DEPTH           !MNBE

      obsVar_data(number_par_obs)%MAGE_TOT(number_loop)=obsVar_data(number_par_obs)%MAGE_TOT(number_loop)+ &
      MAGE*obsVar_data(number_par_obs)%WeightFactorVertical(I)/obsVar_data(number_par_obs)%NN_DEPTH        !MAGE

      obsVar_data(number_par_obs)%MANGE_TOT(number_loop)=     &
      obsVar_data(number_par_obs)%MANGE_TOT(number_loop)      &
      +MANGE*obsVar_data(number_par_obs)%WeightFactorVertical(I)/obsVar_data(number_par_obs)%NN_DEPTH

      obsVar_data(number_par_obs)%SSE_TOT(number_loop)=obsVar_data(number_par_obs)%SSE_TOT(number_loop)+   &
      SSE*obsVar_data(number_par_obs)%WeightFactorVertical(I)/obsVar_data(number_par_obs)%NN_DEPTH           !SSE

      obsVar_data(number_par_obs)%MSE_TOT(number_loop)=obsVar_data(number_par_obs)%MSE_TOT(number_loop)+   &
      MSE*obsVar_data(number_par_obs)%WeightFactorVertical(I)/obsVar_data(number_par_obs)%NN_DEPTH           !MSE

      obsVar_data(number_par_obs)%RMSE_TOT(number_loop)=obsVar_data(number_par_obs)%RMSE_TOT(number_loop)+ &
      RMSE*obsVar_data(number_par_obs)%WeightFactorVertical(I)/obsVar_data(number_par_obs)%NN_DEPTH           !RMSE

      obsVar_data(number_par_obs)%RMNSE_TOT(number_loop)=     &
      obsVar_data(number_par_obs)%RMNSE_TOT(number_loop)+   &
      RMNSE*obsVar_data(number_par_obs)%WeightFactorVertical(I)/obsVar_data(number_par_obs)%NN_DEPTH

      obsVar_data(number_par_obs)%E_NASH_TOT(number_loop)=     &
      obsVar_data(number_par_obs)%E_NASH_TOT(number_loop)+     &
      E_NASH*obsVar_data(number_par_obs)%WeightFactorVertical(I)/obsVar_data(number_par_obs)%NN_DEPTH

      obsVar_data(number_par_obs)%R_Pearson_TOT(number_loop)=   &
      obsVar_data(number_par_obs)%R_Pearson_TOT(number_loop)+   &
      R_PEARSON*obsVar_data(number_par_obs)%WeightFactorVertical(I)/obsVar_data(number_par_obs)%NN_DEPTH

      obsVar_data(number_par_obs)%T_TEST_TOT(number_loop)=     &
      obsVar_data(number_par_obs)%T_TEST_TOT(number_loop)+     &
      T_TEST*obsVar_data(number_par_obs)%WeightFactorVertical(I)/obsVar_data(number_par_obs)%NN_DEPTH     !T_TEST


      if(abs(obsVar_data(number_par_obs)%MBE_TOT(number_loop))>=1.0E25)then
      obsVar_data(number_par_obs)%MBE_TOT(number_loop)=99999999.0
```

```
endif

if(abs(obsVar_data(number_par_obs)%MNBE_TOT(number_loop))>=1.0E25)then
obsVar_data(number_par_obs)%MNBE_TOT(number_loop)=99999999.0
endif

if(abs(obsVar_data(number_par_obs)%MAGE_TOT(number_loop))>=1.0E25)then
obsVar_data(number_par_obs)%MAGE_TOT(number_loop)=99999999.0
endif

if(abs(obsVar_data(number_par_obs)%MANGE_TOT(number_loop))>=1.0E25)then
obsVar_data(number_par_obs)%MANGE_TOT(number_loop)=99999999.0
endif

if(abs(obsVar_data(number_par_obs)%SSE_TOT(number_loop))>=1.0E25)then
obsVar_data(number_par_obs)%SSE_TOT(number_loop)=99999999.0
endif

if(abs(obsVar_data(number_par_obs)%MSE_TOT(number_loop))>=1.0E25)then
obsVar_data(number_par_obs)%MSE_TOT(number_loop)=99999999.0
endif

if(abs(obsVar_data(number_par_obs)%RMSE_TOT(number_loop))>=1.0E25)then
obsVar_data(number_par_obs)%RMSE_TOT(number_loop)=99999999.0
endif

if(abs(obsVar_data(number_par_obs)%RMNSE_TOT(number_loop))>=1.0E25)then
obsVar_data(number_par_obs)%RMNSE_TOT(number_loop)=99999999.0
endif

if(abs(obsVar_data(number_par_obs)%E_NASH_TOT(number_loop))>=1.0E25)then
obsVar_data(number_par_obs)%E_NASH_TOT(number_loop)=99999999.0*(-1)
endif

if(abs(obsVar_data(number_par_obs)%R_Pearson_TOT(number_loop))>=1.0E25)then
obsVar_data(number_par_obs)%R_Pearson_TOT(number_loop)=99999999.0*(-1)
endif

ENDDO !do I=1,obsVar_data(number_par_obs)%NN_DEPTH       !FOR a specified depth
!ERROR OUTPUT INTO A FILE
error_filename='FILES_ERROR/'//trim(adjustl(adjustr(obsVar_data(number_par_obs)%name)))//'_Error_Layers.TXT'
error_filename_total='FILES_ERROR/'//trim(adjustl(adjustr(obsVar_data(number_par_obs)%name)))//'_Error.TXT'
OPEN(1,FILE=error_filename,POSITION='APPEND',ACTION='WRITE')
OPEN(2,FILE=error_filename_total,POSITION='APPEND',ACTION='WRITE')


iix=12*obsVar_data(number_par_obs)%NN_DEPTH
iix=obsVar_data(number_par_obs)%NN_DEPTH
WRITE(CHAR_TEMP,*)iix
FMT='(I10,1X,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'(I8,F25.8,F25.8,F25.8,F25.8,F25.8,F15.5,F25.4,F25.8,     &
F25.8,F25.5,F25.8,F25.8,F25.8,2x))'
FMT_TEMP='(I10,1X,I8,F35.5,F35.5,F35.5,F35.5,F35.5,F25.5,F35.5,F35.5,F35.5,F35.5,F35.5,F35.5,F35.5,2x)'
!if(Number_loop.eq.1)then
FMT1='(A,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'(A))'
FMT2='(A)'
if(Number_loop.eq.1)then
write(1,fmt1)' LoopNumber ',(trim((((obsVar_data(number_par_obs)%errors_title(Id))))),Id=1,     &
obsVar_data(number_par_obs)%NN_DEPTH )
write(2,fmt2)' LoopNumber '//trim(obsVar_data(number_par_obs)%errors_title(1))
endif

WRITE(1,FMT) NUMBER_LOOP, ((obsVar_data(number_par_obs)%number_data(1,number_loop),
&
obsVar_data(number_par_obs)%STDO(I,number_loop),      &       !STDO      number_par_obs--SPECIFIED VARIABLE
obsVar_data(number_par_obs)%STDM(I,number_loop),       &       !STDM
obsVar_data(number_par_obs)%MBE(I,number_loop),        &       !MBE
obsVar_data(number_par_obs)%MNBE(I,number_loop),       &       !MNBE
obsVar_data(number_par_obs)%MAGE(I,number_loop),       &       !MAGE
obsVar_data(number_par_obs)%MANGE(I,number_loop),      &       !MANGE
obsVar_data(number_par_obs)%SSE(I,number_loop),        &       !SSE
obsVar_data(number_par_obs)%MSE(I,number_loop),        &       !MSE
obsVar_data(number_par_obs)%RMSE(I,number_loop),       &       !RMSE
obsVar_data(number_par_obs)%RMNSE(I,number_loop),      &       !RMNSE
obsVar_data(number_par_obs)%E_NASH(I,number_loop),     &       !E_NASH
obsVar_data(number_par_obs)%R_Pearson(I,number_loop),  &
```

```
obsVar_data(number_par_obs)%T_TEST(I,number_loop)),       &
obsVar_data(number_par_obs)%NN_DEPTH )         !R_PEARSON

WRITE(2,FMT_TEMP) NUMBER_LOOP, obsVar_data(number_par_obs)%number_data(1,number_loop),
&
obsVar_data(number_par_obs)%STDO_TOT(number_loop),     & !STDO, I-DEPTH,
obsVar_data(number_par_obs)%STDM_TOT(number_loop),          &         !STDM
obsVar_data(number_par_obs)%MBE_TOT(number_loop),           &         !MBE
obsVar_data(number_par_obs)%MNBE_TOT(number_loop),          &         !MNBE
obsVar_data(number_par_obs)%MAGE_TOT(number_loop),          &         !MAGE
obsVar_data(number_par_obs)%MANGE_TOT(number_loop),         &         !MANGE
obsVar_data(number_par_obs)%SSE_TOT(number_loop),           &         !SSE
obsVar_data(number_par_obs)%MSE_TOT(number_loop),           &         !MSE
obsVar_data(number_par_obs)%RMSE_TOT(number_loop),          &         !RMSE
obsVar_data(number_par_obs)%RMNSE_TOT(number_loop),         &         !RMNSE
obsVar_data(number_par_obs)%E_NASH_TOT(number_loop),        &         !E_NASH
obsVar_data(number_par_obs)%R_Pearson_TOT(number_loop),     &
obsVar_data(number_par_obs)%T_TEST_TOT(number_loop) ,       &
obsVar_data(number_par_obs)%NN_DEPTH )         !R_PEARSON
CLOSE(1)
CLOSE(2)


END subroutine ComparisonDataSeclection      !obsVar_data,NUMBER_obsVar,

subroutine TOTAL_ERROR_CALCULATION(obsVar_data,NumberOfTotalLoops,NumberOfErrorLoop,    &
Number_TotalErrorLoop, NUMBER_obsVar,NUMBER_ERROR,TOTAL_ERROR,NUMBER_error_SORTED)

Integer, intent (in) :: NUMBER_obsVar,NumberOfTotalLoops, NumberOfErrorLoop(1:NumberOfTotalLoops),       &
                                Number_TotalErrorLoop,NUMBER_ERROR          !,TOTAL_ERROR    !,I_SWITCH
character(len=1024) , parameter :: Error_title=' SampleNo      MBE      MNBE      MAGE      MANGE      SSE        MSE      &
RMSE        RMNSE        E_Nash        R_Pearson'
character(len=1024) ::    error_filename_TOT
!real(kind=8) :: default_value=99999999.0,big_value=1.0E+25

INTEGER :: I_SWITCH_TEMP          !WRONG LOOP SWITCH
!TYPE(TOTAL_ERROR_SIMULAITONS), INTENT(OUT) :: TOTAL_ERROR
TYPE(TOTAL_ERROR_SIMULAITONS) :: TOTAL_ERROR
TYPE (OBS_DATASET) :: obsVar_data(1:NUMBER_obsVar)

REAL(KIND=8) :: DATA1(1:NumberOfTotalLoops),DATA0(1:NumberOfTotalLoops)
INTEGER :: NUMBER(1:NumberOfTotalLoops),NUMBER0(1:NumberOfTotalLoops)
INTEGER, intent(out) :: NUMBER_error_SORTED(1:NumberOfTotalLoops)

FMT='(I10,1X,F25.8,F25.8,F25.8,F15.5,F25.4,F25.8,F25.8,F25.5,F25.8,F25.8,2x)'
error_filename_TOT='FILES_ERROR/ERROR_TOTAL.TXT'
OPEN(1,FILE=error_filename_TOT)    !,POSITION='APPEND',ACTION='WRITE')
WRITE(1,'(A)')Error_title

!WRITE(6,*)NumberOfTotalLoops,(NumberOfErrorLoop(IX),IX=1,NumberOfTotalLoops)
!PAUSE 88


DO II=1,NumberOfTotalLoops      !FOR ALL THE LOOPS
I_SWITCH_TEMP=0

!WRITE(6,*)II,obsVar_data(1)%RMSE_TOT(II)
!PAUSE 55

IF(Number_TotalErrorLoop.GE.1)THEN
do IX=1,Number_TotalErrorLoop    !WRONG LOOPS WITH NETCDF FILE
IF(II.EQ.NumberOfErrorLoop(IX))THEN
I_SWITCH_TEMP=I_SWITCH_TEMP+1
DO KK=1,10
TOTAL_ERROR%ERROR_TOTAL(II,KK)=99999999.0
ENDDO    !DO KK=1,10
!GO TO 135
ELSE
!I_SWITCH_TEMP=0
ENDIF
ENDDO

ELSE

I_SWITCH_TEMP=0
```

```
      ENDIF

      !WRITE(6,*)II,I_SWITCH_TEMP,Number_TotalErrorLoop,(NumberOfErrorLoop(IX),IX=1,Number_TotalErrorLoop)
      !PAUSE 89

      !135 WRITE(6,*)"THIS IS THE WRONG SIMULATION", II

      DO KK=1,10
      TOTAL_ERROR%SerNumber_ERROR_TOTAL(II,KK)=II
      ENDDO    !DO KK=1,10

      IF(I_SWITCH_TEMP.EQ.0)THEN

      DO KK=1,10
      !DELETE THE WRONG LOOP NUMBERS HERE.
      IF(KK.EQ.1)THEN
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=0
      DO JJ=1,NUMBER_obsVar
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=TOTAL_ERROR%ERROR_TOTAL(II,KK)+                    &
                                  obsVar_data(JJ)%MBE_TOT(II)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar
      ENDDO
      ELSEIF(KK.EQ.2)THEN
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=0
      DO JJ=1,NUMBER_obsVar
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=TOTAL_ERROR%ERROR_TOTAL(II,KK)+                    &
                                  obsVar_data(JJ)%MNBE_TOT(II)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar
      ENDDO
      ELSEIF(KK.EQ.3)THEN
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=0
      DO JJ=1,NUMBER_obsVar
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=TOTAL_ERROR%ERROR_TOTAL(II,KK)+                    &
                                  obsVar_data(JJ)%MAGE_TOT(II)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar
      ENDDO
      ELSEIF(KK.EQ.4)THEN
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=0
      DO JJ=1,NUMBER_obsVar
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=TOTAL_ERROR%ERROR_TOTAL(II,KK)+                    &
                                  obsVar_data(JJ)%MANGE_TOT(II)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar
      ENDDO
      ELSEIF(KK.EQ.5)THEN
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=0
      DO JJ=1,NUMBER_obsVar
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=TOTAL_ERROR%ERROR_TOTAL(II,KK)+                    &
                                  obsVar_data(JJ)%SSE_TOT(II)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar
      ENDDO
      ELSEIF(KK.EQ.6)THEN
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=0
      DO JJ=1,NUMBER_obsVar
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=TOTAL_ERROR%ERROR_TOTAL(II,KK)+                    &
                                  obsVar_data(JJ)%MSE_TOT(II)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar
      ENDDO
      ELSEIF(KK.EQ.7)THEN
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=0
      DO JJ=1,NUMBER_obsVar
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=TOTAL_ERROR%ERROR_TOTAL(II,KK)+                    &
                                  obsVar_data(JJ)%RMSE_TOT(II)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar

      !write(6,*)jj,TOTAL_ERROR%ERROR_TOTAL(II,KK),obsVar_data(JJ)%WeightFactor,number_obsvar
      !pause 89

      ENDDO


      !WRITE(6,*)TOTAL_ERROR%ERROR_TOTAL(II,KK),obsVar_data(2)%WeightFactor,NUMBER_obsVar
      !PAUSE 66
      ELSEIF(KK.EQ.8)THEN
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=0
      DO JJ=1,NUMBER_obsVar
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=TOTAL_ERROR%ERROR_TOTAL(II,KK)+                    &
                                  obsVar_data(JJ)%RMNSE_TOT(II)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar
      ENDDO
      ELSEIF(KK.EQ.9)THEN
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=0
      DO JJ=1,NUMBER_obsVar
```

```
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=TOTAL_ERROR%ERROR_TOTAL(II,KK)+                    &
                                    obsVar_data(JJ)%E_NASH_TOT(II)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar
      ENDDO
      ELSEIF(KK.EQ.10)THEN
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=0
      DO JJ=1,NUMBER_obsVar
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=TOTAL_ERROR%ERROR_TOTAL(II,KK)+                    &
                                    obsVar_data(JJ)%R_Pearson_TOT(II)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar

      ENDDO
      ENDIF

      ENDDO    !DO KK=1,10

          !FOR WRONG LOOPS - SET TO BE DEFAULT_VALUE      IF(I_SWITCH_TEMP.EQ.0)THEN

      ELSEif(I_SWITCH_TEMP==1)then
      DO KK=1,10
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=99999999.0
      ENDDO    !DO KK=1,10


      ENDIF

      DO KK=1,8
      IF(ABS(TOTAL_ERROR%ERROR_TOTAL(II,KK)).GE.BIG_VALUE)THEN
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=99999999.0
      ELSEIF(ABS(TOTAL_ERROR%ERROR_TOTAL(II,KK))==99999999.0)THEN
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=99999999.0
      ENDIF
      ENDDO


      DO KK=9,10
      IF(ABS(TOTAL_ERROR%ERROR_TOTAL(II,KK)).GE.BIG_VALUE)THEN
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=99999999.0*(-1.)
      ELSEIF(ABS(TOTAL_ERROR%ERROR_TOTAL(II,KK))==99999999.0)THEN
      TOTAL_ERROR%ERROR_TOTAL(II,KK)=99999999.0*(-1.)
      ENDIF
      ENDDO


      WRITE(1,FMT)TOTAL_ERROR%SerNumber_ERROR_TOTAL(II,1),(TOTAL_ERROR%ERROR_TOTAL(II,KK),KK=1,10)
      ENDDO    !DO II=1,NumberOfTotalLoops      !FOR ALL THE LOOPS
      CLOSE(1)

      !SELECT THE BEST LOOP BASED ON THE USER-DEFINED ERROR PARAMETER FOR MODEL EVALUATION.

      IF(NUMBER_ERROR.EQ.1)THEN
      DO II=1,NumberOfTotalLoops
      DATA0(II)=TOTAL_ERROR%ERROR_TOTAL(II,1)
      number0(II)=II
      ENDDO
      CALL SORT_INCREASING(NumberOfTotalLoops,DATA0,DATA1,number0,number)
      ELSEIF(NUMBER_ERROR.EQ.2)THEN
      DO II=1,NumberOfTotalLoops
      DATA0(II)=TOTAL_ERROR%ERROR_TOTAL(II,2)
      number0(II)=II
      ENDDO
      CALL SORT_INCREASING(NumberOfTotalLoops,DATA0,DATA1,number0,NUMBER)
      ELSEIF(NUMBER_ERROR.EQ.3)THEN
      DO II=1,NumberOfTotalLoops
      DATA0(II)=TOTAL_ERROR%ERROR_TOTAL(II,3)
      number0(II)=II
      ENDDO
      CALL SORT_INCREASING(NumberOfTotalLoops,DATA0,DATA1,number0,NUMBER)
      ELSEIF(NUMBER_ERROR.EQ.4)THEN
      DO II=1,NumberOfTotalLoops
      DATA0(II)=TOTAL_ERROR%ERROR_TOTAL(II,4)
      number0(II)=II
      ENDDO
      CALL SORT_INCREASING(NumberOfTotalLoops,DATA0,DATA1,number0,NUMBER)
      ELSEIF(NUMBER_ERROR.EQ.5)THEN
      DO II=1,NumberOfTotalLoops
      DATA0(II)=TOTAL_ERROR%ERROR_TOTAL(II,5)
```

```
number0(II)=II
ENDDO
CALL SORT_INCREASING(NumberOfTotalLoops,DATA0,DATA1,number0,NUMBER)
ELSEIF(NUMBER_ERROR.EQ.6)THEN
DO II=1,NumberOfTotalLoops
DATA0(II)=TOTAL_ERROR%ERROR_TOTAL(II,6)
ENDDO
CALL SORT_INCREASING(NumberOfTotalLoops,DATA0,DATA1,number0,NUMBER)
ELSEIF(NUMBER_ERROR.EQ.7)THEN
DO II=1,NumberOfTotalLoops
DATA0(II)=TOTAL_ERROR%ERROR_TOTAL(II,7)
number0(II)=II
!WRITE(*,*)II,TOTAL_ERROR%ERROR_TOTAL(II,7)
!!PAUSE 44
ENDDO
CALL SORT_INCREASING(NumberOfTotalLoops,DATA0,DATA1,number0,NUMBER)
ELSEIF(NUMBER_ERROR.EQ.8)THEN
DO II=1,NumberOfTotalLoops
DATA0(II)=TOTAL_ERROR%ERROR_TOTAL(II,8)
number0(II)=II
ENDDO
CALL SORT_INCREASING(NumberOfTotalLoops,DATA0,DATA1,number0,NUMBER)
ELSEIF(NUMBER_ERROR.EQ.9)THEN
DO II=1,NumberOfTotalLoops
DATA0(II)=TOTAL_ERROR%ERROR_TOTAL(II,9)
number0(II)=II
ENDDO
CALL SORT_DECREASING(NumberOfTotalLoops,DATA0,DATA1,number0,NUMBER)
ELSEIF(NUMBER_ERROR.EQ.10)THEN
DO II=1,NumberOfTotalLoops
DATA0(II)=TOTAL_ERROR%ERROR_TOTAL(II,10)
number0(II)=II
ENDDO
CALL SORT_DECREASING(NumberOfTotalLoops,DATA0,DATA1,number0,NUMBER)
ENDIF

error_filename_TOT='FILES_ERROR/TheBestLoop_CAEDYM.TXT'
OPEN(1,FILE=error_filename_TOT)    !,POSITION='APPEND',ACTION='WRITE')
DO IX=1,NumberOfTotalLoops
WRITE(1,*)ix,number(IX),DATA1(IX)
NUMBER_error_SORTED(IX)=NUMBER(IX)
ENDDO
CLOSE(1)
!DEALLOCATE(NUMBER,DATA1)


END subroutine TOTAL_ERROR_CALCULATION


!*****************************************************************************************
!*****************************************************************************************
!-------------------THIS SUBROUTINE IS TO calculate the total error for every loop----------
!*****************************************************************************************
!*****************************************************************************************

subroutine ERRORforEveryLoop(obsVar_data,NumberOfTotalLoops,       &

NUMBER_obsVar,NUMBER_ERROR,TOTAL_ERROR_everyLoop,II_loop)    !,I_switch_del,NumberOfFiles)

Integer, intent (in) ::
NUMBER_obsVar,NumberOfTotalLoops,NUMBER_ERROR,II_LOOP      !,TOTAL_ERROR    !,I_SWITCH
!INTEGER :: NumberOfFiles      !WRONG LOOP SWITCH
real(kind=8), intent (out) ::    TOTAL_ERROR_everyLoop
TYPE (OBS_DATASET) :: obsVar_data(1:NUMBER_obsVar)

OPEN(1,FILE='FILES_ERROR/TOTAL_ERROR_everyLoop.txt',POSITION='APPEND',ACTION='WRITE')

KK=NUMBER_ERROR

IF(KK.EQ.1)THEN
TOTAL_ERROR_everyLoop=0
DO JJ=1,NUMBER_obsVar
TOTAL_ERROR_everyLoop=TOTAL_ERROR_everyLoop+                        &
                                obsVar_data(JJ)%MBE_TOT(II_LOOP)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar
```

```
ENDDO
ELSEIF(KK.EQ.2)THEN
TOTAL_ERROR_everyLoop=0
DO JJ=1,NUMBER_obsVar
TOTAL_ERROR_everyLoop=TOTAL_ERROR_everyLoop+                    &
                      obsVar_data(JJ)%MNBE_TOT(II_LOOP)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar
ENDDO
ELSEIF(KK.EQ.3)THEN
TOTAL_ERROR_everyLoop=0
DO JJ=1,NUMBER_obsVar
TOTAL_ERROR_everyLoop=TOTAL_ERROR_everyLoop+                    &
                      obsVar_data(JJ)%MAGE_TOT(II_LOOP)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar
ENDDO
ELSEIF(KK.EQ.4)THEN
TOTAL_ERROR_everyLoop=0
DO JJ=1,NUMBER_obsVar
TOTAL_ERROR_everyLoop=TOTAL_ERROR_everyLoop+                    &
                      obsVar_data(JJ)%MANGE_TOT(II_LOOP)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar
ENDDO
ELSEIF(KK.EQ.5)THEN
TOTAL_ERROR_everyLoop=0
DO JJ=1,NUMBER_obsVar
TOTAL_ERROR_everyLoop=TOTAL_ERROR_everyLoop+                    &
                      obsVar_data(JJ)%SSE_TOT(II_LOOP)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar
ENDDO
ELSEIF(KK.EQ.6)THEN
TOTAL_ERROR_everyLoop=0
DO JJ=1,NUMBER_obsVar
TOTAL_ERROR_everyLoop=TOTAL_ERROR_everyLoop+                    &
                      obsVar_data(JJ)%MSE_TOT(II_LOOP)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar
ENDDO
ELSEIF(KK.EQ.7)THEN
TOTAL_ERROR_everyLoop=0
DO JJ=1,NUMBER_obsVar
TOTAL_ERROR_everyLoop=TOTAL_ERROR_everyLoop+                    &
                      obsVar_data(JJ)%RMSE_TOT(II_LOOP)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar

ENDDO

ELSEIF(KK.EQ.8)THEN
TOTAL_ERROR_everyLoop=0
DO JJ=1,NUMBER_obsVar
TOTAL_ERROR_everyLoop=TOTAL_ERROR_everyLoop+                    &
                      obsVar_data(JJ)%RMNSE_TOT(II_LOOP)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar
ENDDO
ELSEIF(KK.EQ.9)THEN
TOTAL_ERROR_everyLoop=0
DO JJ=1,NUMBER_obsVar
TOTAL_ERROR_everyLoop=TOTAL_ERROR_everyLoop+                    &
                      obsVar_data(JJ)%E_NASH_TOT(II_LOOP)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar
ENDDO
ELSEIF(KK.EQ.10)THEN
TOTAL_ERROR_everyLoop=0
DO JJ=1,NUMBER_obsVar
TOTAL_ERROR_everyLoop=TOTAL_ERROR_everyLoop+                    &
                      obsVar_data(JJ)%R_Pearson_TOT(II_LOOP)*obsVar_data(JJ)%WeightFactor/NUMBER_obsVar

ENDDO

ENDIF


IF(ABS(TOTAL_ERROR_everyLoop).GE.BIG_VALUE)THEN
TOTAL_ERROR_everyLoop=99999999.0
ENDIF

write(1,*) II_loop,TOTAL_ERROR_everyLoop
close(1)
END subroutine ERRORforEveryLoop


!*************************************************************************
! This subroutine calculates model error based on model output and field data
!*************************************************************************
```

```
      SUBROUTINE Error_calculation(nn,ObservationData,ModelData, time,    &
                        STDO, STDM, MBE, MNBE, MAGE, MANGE, SSE, MSE, RMSE, RMNSE,       &
                        E_Nash, R_Pearson,    T_TEST)

 5    real(kind=8) :: STDO, STDM, MBE, MNBE, MAGE, MANGE, SSE, MSE, RMSE, RMNSE, E_Nash, R_Pearson,T_TEST
      INTEGER, intent (in) :: nn
      real(kind=8), intent (in) :: ObservationData (1:nn),ModelData(1:nn),time(1:nn)

      ffo_avg=0.0
10    ffm_avg=0.0
      fo_max=0.0
      fo_min=0.0
      fm_max=0.0
      fm_min=0.0
15    do i=1,nn
      ffo_avg=ffo_avg+ObservationData(i)/nn
      ffm_avg=ffm_avg+ModelData(i)/nn

      if(ObservationData(i).ge.fo_max)then
20    fo_max=ObservationData(i)
      endif

      if(ObservationData(i).le.fo_min)then
      fo_min=ObservationData(i)
25    endif

      if(ModelData(i).ge.fm_max)then
      fm_max=ModelData(i)
      endif
30
      if(ModelData(i).le.fm_min)then
      fm_min=ModelData(i)
      endif

35    enddo

      stdo=0.0
      stdm=0.0
      do i=1,nn
40    stdo=STDO+((ObservationData(i)-ffo_avg)**2)/NN
      stdM=STDM+((ModelData(i)-ffM_avg)**2)/NN
      ENDDO
      stdo=sqrt(stdo)
      stdm=sqrt(stdm)
45
      MBE=0.0
      MNBE=0.0
      MAGE=0.0
      MANGE=0.0
50    SSE=0.0
      MSE=0.0
      RMSE=0.0
      RMnSE=0.0
      E_NASH1=0.0
55    E_Nash2=0.0
      R_Pearson1=0.0
      R_Pearson2=0.0
      R_Pearson3=0.0

60    EXY=0.0
      EX2=0.0
      EY2=0.0
      EX=0.0
      EY=0.0
65
      i_nn=0
      do i=1,nn
      MBE=MBE+(ObservationData(i)-ModelData(i))/NN
      if(ObservationData(i).ne.0.and.ObservationData(i).ne.default_value.and.ObservationData(i).ne.default_value0)then
70    MNBE=MNBE+(((ObservationData(i)-ModelData(i))/ObservationData(i))*100)
      MANGE=MANGE+((ABS(ObservationData(i)-ModelData(i)))/ObservationData(i))*100
      else
      i_nn=i_nn+1
      endif
75
```

```
MAGE=MAGE+(ABS(ObservationData(i)-ModelData(i)))/NN
SSE=SSE+(ObservationData(i)-ModelData(i))**2
RMSE=RMSE+((ObservationData(i)-ModelData(i))**2)/NN
E_Nash1=E_Nash1+(ObservationData(i)-ModelData(i))**2
E_Nash2=E_Nash2+(ObservationData(i)-ffo_avg)**2
R_Pearson1=R_Pearson1+(ObservationData(i)-ffo_avg)*(ModelData(i)-ffM_avg)
R_Pearson2=R_Pearson2+(ObservationData(i)-ffo_avg)**2
R_Pearson3=R_Pearson3+(ModelData(i)-ffM_avg)**2

EXY=EXY+ObservationData(i)*ModelData(i)
EX=EX+ObservationData(i)
EY=EY+ModelData(i)
EX2=EX2+ObservationData(i)**2
EY2=EY2+ModelData(i)**2
ENDDO

MNBE=MNBE/(NN-I_NN)
MANGE=MANGE/(NN-I_NN)
MSE=SSE/NN
RMSE=SQRT(RMSE)
RMNSE=RMSE/(fo_max-fo_min)*100.0
E_Nash=1-E_Nash1/E_Nash2
R_Pearson=R_Pearson1/SQRT(R_Pearson2*R_Pearson3)
R_Pearson=(EXY-EX*EY/NN)/SQRT( (EX2-EX**2/NN)*(EY2-EY**2/NN)      )
T_TEST=(SQRT(((NN-1)*(MNBE/100)**2)/(RMSE*RMSE-MNBE*MNBE/10000.)         ))
END SUBROUTINE Error_calculation

END MODULE ErrorCalculation
```

UncertaintyAnalysisl.f90

```
!-----------------------------------------------------------------------------------------------
!    --------------------
!    Original code : Liancong Luo 26/7/2010
!    Modified by Liancong Luo May 01/06/2017
!    MODIFIED BY LIANCONG LUO 15/06/2017
!*******************************************************************************
!!******************************************************************************
!! This subroutine is obtaning the model data for uncertainty analysis on the ground of specified paramenters
!    MODIFIED BY LIANCONG LUO 15/06/2017
!!******************************************************************************
MODULE UncertaintyAnalysis
USE DYRESM_COMMON
USE DEPTH_INTERPOLATION

CONTAINS

subroutine Uncertainty_Data(UncertaintyAnalysis00, UncertaintyAnalysis0,UncertaintyAnalysis1, UncertaintyAnalysis2,      &
                            nUNC_loop,nUNC_loopFirst,nUNC_loopBest,nUNC_layer,                                          &
                            No_Ser_Var_UNCERTAINTY, num_VAR_UNCERTAINTY,DEPTH_UNCERTAINTY, &
                             dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var,dyresmDO_Var,                                       &
                             dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var,                                    &
                             dyresmTP_Var,dyresmCYANO_Var,dyresmFDIAT_Var,                                              &
                             dyresmTCHLA_Var,dyresmPOCL_Var,dyresmDOCL_Var,dyresmPOPL_Var,                              &
                             dyresmDOPL_Var,dyresmPONL_Var,dyresmDONL_Var,dyresmPOCR_Var,                               &
                             dyresmDOCR_Var, dyresmPOPR_Var,dyresmDOPR_Var, dyresmPONR_Var,                             &
                             dyresmDONR_Var, dyresmCRYPT_Var,dyresmNODUL_Var,dyresmDINOF_Var,                           &
                             dyresmCHLOR_Var,dyresmMDIAT_Var,dyresmZOOP1_Var,dyresmZOOP2_Var,                           &
                             dyresmZOOP3_Var, dyresmZOOP4_Var,dyresmZOOP5_Var,dyresmSSOL1_Var,                          &
                             dyresmSSOL2_Var,dyresmFISH1_Var,dyresmFISH2_Var,dyresmFISH3_Var,                           &
                             dyresmBAC_Var,dyresmPAR_Var, modelTime,n2,N3,II_LOOP,                                      &
                             LoopNumber_CaedymError,NumberOfLoopNumber_CaedymError)

INTEGER , INTENT (IN) :: N2,    N3, II_LOOP, No_Ser_Var_UNCERTAINTY(1:num_VAR_UNCERTAINTY)
integer, intent(in) :: nUNC_loop,nUNC_loopFirst,nUNC_loopBest,nUNC_layer    !, N3 = N3
integer :: No_uncertainty(1:nUNC_loop)
!INTEGER ,ALLOCATABLE    :: No_Ser_Var_UNCERTAINTY(:)
!REAL (KIND=8), ALLOCATABLE :: DEPTH_UNCERTAINTY(:)
REAL (KIND=8), INTENT (IN) ::    DEPTH_UNCERTAINTY(1:nUNC_layer)
CHARACTER (LEN=30) :: FMT, CHAR_TEMP
!INTEGER, INTENT(IN) ::      NumberOfLoopNumber_CaedymError
INTEGER, INTENT(IN) ::NumberOfLoopNumber_CaedymError,
LoopNumber_CaedymError(1:NumberOfLoopNumber_CaedymError)
```

```
TYPE (Uncertainty) :: UncertaintyAnalysis00
TYPE (Uncertainty) :: UncertaintyAnalysis0
TYPE (Uncertainty) :: UncertaintyAnalysis1
TYPE (Uncertainty) :: UncertaintyAnalysis2 !this is the total error for all the error parmeters (MBE, MNBE...)


!this is the model data from
REAL(KIND=8) :: TEMP_MODEL_DATA0(1:n2,1:n3),TEMP_MODEL_DATA1(1:nUNC_layer,1:N3)

Real*4      ::   dyresmLAYER_HTS_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmTEMPTURE_Var( 1:n2,1:n3 )      !n3-time serials,    n2-layers
real*4      ::   dyresmDO_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmNO3_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmNH4_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmTN_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmPO4_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmTP_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmCYANO_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmFDIAT_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmTCHLA_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers

!Liancong Luo added some variables here in June 2010 (Denmark)
real*4      ::   dyresmPOCL_Var ( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmDOCL_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmPOPL_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmDOPL_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmPONL_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers    !n3-time serials,    n2-layers
real*4      ::   dyresmDONL_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmPOCR_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmDOCR_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmPOPR_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmDOPR_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers    !n3-time serials,    n2-layers
real*4      ::   dyresmPONR_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmDONR_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmCRYPT_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmNODUL_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmDINOF_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmCHLOR_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmMDIAT_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmZOOP1_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmZOOP2_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmZOOP3_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmZOOP4_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmZOOP5_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmSSOL1_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmSSOL2_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmFISH1_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmFISH2_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmFISH3_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmBAC_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
real*4      ::   dyresmPAR_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
!real*4    ::    depth(1:n2),data_dycd(1:n2)
real(kind=8) :: modelTime(1:n3)
!integer, intent(in) :: par_number !the serial number of variable (2-temperatur, 1-height)
!!integer, intent (in) :: II_LOOP    !the loop number
!WRITE(6,*)nUNC_loop
!PAUSE 33


! UncertaintyAnalysis00%Uncertainty_TEMPTURE (1:nUNC_loop,1:N3,1:nUNC_layer) LOOPS, TIME-SERIALS, LAYERS
! --- ALL RAW DATA FROM DYRESM


IF(II_LOOP==1)THEN
ALLOCATE(UncertaintyAnalysis00%NUMBER_UNCERTAINTY(1:nUNC_loop))
ENDIF

!------ TRANSFER ALL THE LOOP NUMBERS TO UncertaintyAnalysis00%NUMBER_UNCERTAINTY
UncertaintyAnalysis00%NUMBER_UNCERTAINTY(II_LOOP)=II_LOOP
IF(II_LOOP==1)THEN
DO IKK=1,num_VAR_UNCERTAINTY       ! THE NUMBER OF VARIABLES FOR UNCERTAINCY ANALYSIS,
USER-SPECIFIED
KK=No_Ser_Var_UNCERTAINTY(IKK)    ! THE SERIAL NUMBER FOA EACH VARIABLE USED FOR UNCERTAINTY
ANALYSIS (VARY FROM 1 TO 40)
IF(KK.EQ.1)THEN
```

```
ELSEIF(KK.EQ.2)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_TEMPTURE(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_TEMPTURE(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.3)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_DO(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_DO(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.4)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_NO3(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_NO3(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.5)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_NH4(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_NH4(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.6)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_TN(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_TN(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.7)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_PONL(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_PONL(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.8)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_PONR(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_PONR(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.9)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_DONL(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
```

```
UncertaintyAnalysis00%Uncertainty_DONL(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.10)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_DONR(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_DONR(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.11)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_PO4(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_PO4(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.12)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_TP(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_TP(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.13)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_POPL(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_POPL(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.14)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_POPR(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_POPR(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.15)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_DOPL(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_DOPL(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.16)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_DOPR(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_DOPR(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO
```

```
ELSEIF(KK.EQ.17)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_POCL(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_POCL(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO
ELSEIF(KK.EQ.18)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_POCR(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_POCR(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.19)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_DOCL(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_DOCL(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.20)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_DOCR(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_DOCR(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO


ELSEIF(KK.EQ.21)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_DINOF(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_DINOF(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.22)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_CYANO(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_CYANO(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.23)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_NODUL(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_NODUL(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.24)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_CHLOR(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
```

```
UncertaintyAnalysis00%Uncertainty_CHLOR(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.25)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_CRYPT(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_CRYPT(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.26)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_MDIAT(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_MDIAT(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.27)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_FDIAT(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_FDIAT(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.28)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_ZOOP1(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_ZOOP1(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.29)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_ZOOP2(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_ZOOP2(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.30)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_ZOOP3(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_ZOOP3(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.31)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_ZOOP4(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_ZOOP4(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO
```

```
ELSEIF(KK.EQ.32)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_ZOOP5(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_ZOOP5(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.33)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_SSOL1(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_SSOL1(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.34)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_SSOL2(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_SSOL2(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.35)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_FISH1(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_FISH1(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.36)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_FISH2(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_FISH2(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO
ELSEIF(KK.EQ.37)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_FISH3(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_FISH3(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.38)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_BAC(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_BAC(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.39)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_PAR(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
```

```
UncertaintyAnalysis00%Uncertainty_PAR(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSEIF(KK.EQ.40)THEN
ALLOCATE(UncertaintyAnalysis00%Uncertainty_TCHLA(1:nUNC_loop,1:N3,1:nUNC_layer))
DO IX=1,nUNC_loop
DO JX=1,N3
DO KX=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_TCHLA(IX,JX,KX)=default_value
ENDDO
ENDDO
ENDDO

ELSE
WRITE(6,*)'YOU HAVE INPUTTED A WRONG SERIAL NUMBER FOR VARIABLES (1-40)'
ENDIF


IF(KK.EQ.1)THEN

ELSEIF(KK.EQ.2)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_TEMPTURE(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.3)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_DO(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.4)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_NO3(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.5)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_NH4(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.6)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_TN(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.7)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_PONL(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.8)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_PONR(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.9)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_DONL(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.10)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_DONR(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.11)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_PO4(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.12)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_TP(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.13)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_POPL(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.14)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_POPR(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.15)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_DOPL(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.16)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_DOPR(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.17)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_POCL(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.18)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_POCR(1:nUNC_loopFirst,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.19)THEN
ALLOCATE(UncertaintyAnalysis1%Uncertainty_DOCL(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
```

```
      ELSEIF(KK.EQ.20)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_DOCR(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.21)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_DINOF(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.22)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_CYANO(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.23)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_NODUL(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.24)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_CHLOR(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.25)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_CRYPT(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.26)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_MDIAT(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.27)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_FDIAT(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.28)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_ZOOP1(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.29)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_ZOOP2(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.30)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_ZOOP3(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.31)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_ZOOP4(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.32)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_ZOOP5(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.33)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_SSOL1(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.34)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_SSOL2(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.35)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_FISH1(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.36)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_FISH2(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.37)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_FISH3(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.38)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_BAC(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.39)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_PAR(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.40)THEN
      ALLOCATE(UncertaintyAnalysis1%Uncertainty_TCHLA(1:nUNC_loopFirst,1:N3,1:nUNC_layer))
      ELSE
      WRITE(6,*)'YOU HAVE INPUTTED A WRONG SERIAL NUMBER FOR VARIABLES (1-40)'
      ENDIF

      IF(KK.EQ.1)THEN
      ELSEIF(KK.EQ.2)THEN
      ALLOCATE(UncertaintyAnalysis2%Uncertainty_TEMPTURE(1:nUNC_loopbest,1:N3,1:nUNC_layer))
      ELSEIF(KK.EQ.3)THEN
      ALLOCATE(UncertaintyAnalysis2%Uncertainty_DO(1:nUNC_loopbest,1:N3,1:nUNC_layer))
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ELSEIF(KK.EQ.4)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_NO3(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.5)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_NH4(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.6)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_TN(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.7)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_PONL(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.8)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_PONR(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.9)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_DONL(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.10)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_DONR(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.11)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_PO4(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.12)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_TP(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.13)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_POPL(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.14)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_POPR(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.15)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_DOPL(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.16)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_DOPR(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.17)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_POCL(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.18)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_POCR(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.19)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_DOCL(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.20)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_DOCR(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.21)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_DINOF(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.22)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_CYANO(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.23)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_NODUL(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.24)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_CHLOR(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.25)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_CRYPT(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.26)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_MDIAT(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.27)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_FDIAT(1:nUNC_loopbest,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.28)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_ZOOP1(1:nUNC_loopbest,1:N3,1:nUNC_layer))
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ELSEIF(KK.EQ.29)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_ZOOP2(1:nUNC_loopbest,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.30)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_ZOOP3(1:nUNC_loopbest,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.31)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_ZOOP4(1:nUNC_loopbest,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.32)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_ZOOP5(1:nUNC_loopbest,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.33)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_SSOL1(1:nUNC_loopbest,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.34)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_SSOL2(1:nUNC_loopbest,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.35)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_FISH1(1:nUNC_loopbest,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.36)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_FISH2(1:nUNC_loopbest,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.37)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_FISH3(1:nUNC_loopbest,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.38)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_BAC(1:nUNC_loopbest,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.39)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_PAR(1:nUNC_loopbest,1:N3,1:nUNC_layer))

ELSEIF(KK.EQ.40)THEN
ALLOCATE(UncertaintyAnalysis2%Uncertainty_TCHLA(1:nUNC_loopbest,1:N3,1:nUNC_layer))

ELSE
WRITE(6,*)'YOU HAVE INPUTTED A WRONG SERIAL NUMBER FOR VARIABLES (1-40)'
ENDIF

ENDDO !THE END OF ALLOCATION
ENDIF !ALLOCATE AT THE FIRST STEP

!OBTAINING THE MODEL DATE HERE   ----------    modelTime,n2,n3,II_LOOP
! n2 - layers,    n3 - time serials,

I_WRONG_INDEX=0      !INDEX FOR WRONG SIMULATIONS
IF(NumberOfLoopNumber_CaedymError>=1)THEN
DO I_WRONG = 1,NumberOfLoopNumber_CaedymError
IF(II_LOOP==LoopNumber_CaedymError(I_WRONG))THEN
!FIND THE LOOP NUMBER WITH WRONG CAEDYM RUNNING (UNSUCESSFUL RUNNING)
I_WRONG_INDEX=I_WRONG_INDEX+1
ELSE
ENDIF
ENDDO
ENDIF

! WAITING ..... EDITING .....

IF(I_WRONG_INDEX>=1)THEN
ELSE     !NO WRONG SIMULATION

DO IKK=1,num_VAR_UNCERTAINTY
KK=No_Ser_Var_UNCERTAINTY(IKK)
IF(KK.EQ.1)THEN
!-------------------------------------TEMPERATURE-----------------------------------------------
ELSEIF(KK.EQ.2)THEN
DO IX=1,N2
DO JX=1,N3
TEMP_MODEL_DATA0(IX,JX)=dyresmTEMPTURE_Var(IX,JX)
ENDDO
ENDDO
!ALLOCATE(UncertaintyAnalysis00%Uncertainty_TP(1:nUNC_loop,1:N3,1:nUNC_layer))
```

```
      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      !LoopNumber_CaedymError(1:NumberOfLoopNumber_CaedymError)
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_TEMPTURE(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO

      ! real*4        ::    dyresmNO3_Var( 1:n2,1:n3 )     !n3-time serials,    n2-layers
      !---------------------------------------dyresmDO_Var-----------------------------------------------------
      ELSEIF(KK.EQ.3)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=dyresmDO_Var(IX,JX)
      ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_DO(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO

      !---------------------------------------dyresmNO3_Var-----------------------------------------------------
      ELSEIF(KK.EQ.4)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=dyresmNO3_Var(IX,JX)
      ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_NO3(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO

      !---------------------------------------dyresmNH4_Var-----------------------------------------------------
      ELSEIF(KK.EQ.5)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=dyresmNH4_Var(IX,JX)
      ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_NH4(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO

      !---------------------------------------dyresmTN_Var-----------------------------------------------------
      ELSEIF(KK.EQ.6)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=dyresmTN_Var(IX,JX)
      ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
```

```
                                    dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
 5    DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_TN(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO

10    !---------------------------------------dyresmPONL_Var-----------------------------------------------
      ELSEIF(KK.EQ.7)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=dyresmPONL_Var(IX,JX)
15    ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,          &
                                    dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)
20
      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_PONL(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
25    ENDDO
      ENDDO

      !---------------------------------------dyresmPONR_Var-----------------------------------------------
      ELSEIF(KK.EQ.8)THEN
30    DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=dyresmPONR_Var(IX,JX)
      ENDDO
      ENDDO
35
      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,          &
                                    dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
40    DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_PONR(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO
45
      !---------------------------------------dyresmDONL_Var-----------------------------------------------
      ELSEIF(KK.EQ.9)THEN
      DO IX=1,N2
      DO JX=1,N3
50    TEMP_MODEL_DATA0(IX,JX)=dyresmDONL_Var(IX,JX)
      ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,          &
55                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
60    UncertaintyAnalysis00%Uncertainty_DONL(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO

      !---------------------------------------dyresmDONR_Var-----------------------------------------------
65    ELSEIF(KK.EQ.10)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=dyresmDONR_Var(IX,JX)
      ENDDO
70    ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,          &
                                    dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

75    !DATA TRANSFER FROM THE INTERPOLATED DATASET
```

```
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_DONR(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
5     ENDDO

      !---------------------------------------dyresmPO4_Var-----------------------------------------------------
      ELSEIF(KK.EQ.11)THEN
      DO IX=1,N2
10    DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=dyresmPO4_Var(IX,JX)
      ENDDO
      ENDDO

15    CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,          &
                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
20    DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_PO4(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO

25    !---------------------------------------dyresmTP_Var-----------------------------------------------------
      ELSEIF(KK.EQ.12)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=dyresmTP_Var(IX,JX)
30    ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,          &
                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)
35
      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_TP(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
40    ENDDO
      ENDDO

      !---------------------------------------dyresmPOPL_Var-----------------------------------------------------
      ELSEIF(KK.EQ.13)THEN
45    DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=dyresmPOPL_Var(IX,JX)
      ENDDO
      ENDDO
50
      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,          &
                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
55    DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_POPL(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO
60
      !---------------------------------------dyresmPOPR_Var-----------------------------------------------------
      ELSEIF(KK.EQ.14)THEN
      DO IX=1,N2
      DO JX=1,N3
65    TEMP_MODEL_DATA0(IX,JX)=dyresmPOPR_Var(IX,JX)
      ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,          &
70                                dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
75    UncertaintyAnalysis00%Uncertainty_POPR(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
```

```
      ENDDO
      ENDDO

      !---------------------------------------dyresmDOPL_Var-----------------------------------------------
      ELSEIF(KK.EQ.15)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=dyresmDOPL_Var(IX,JX)
      ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,          &
                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_DOPL(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO

      !---------------------------------------dyresmDOPR_Var-----------------------------------------------
      ELSEIF(KK.EQ.16)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=dyresmDOPR_Var(IX,JX)
      ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,          &
                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_DOPR(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO

      !---------------------------------------dyresmPOCL_Var-----------------------------------------------
      ELSEIF(KK.EQ.17)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=dyresmPOCL_Var(IX,JX)
      ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,          &
                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_POCL(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO

      !---------------------------------------dyresmPOCR_Var-----------------------------------------------
      ELSEIF(KK.EQ.18)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=dyresmPOCR_Var(IX,JX)
      ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,          &
                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_POCR(II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO
```

```
!---------------------------------------dyresmDOCL_Var-----------------------------------------------
ELSEIF(KK.EQ.19)THEN
DO IX=1,N2
DO JX=1,N3
TEMP_MODEL_DATA0(IX,JX)=    dyresmDOCL_Var (IX,JX)
ENDDO
ENDDO

CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                            dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

!DATA TRANSFER FROM THE INTERPOLATED DATASET
DO I3=1,N3
DO J3=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_DOCL    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
ENDDO
ENDDO

!---------------------------------------dyresmDOCR_Var-----------------------------------------------
ELSEIF(KK.EQ.20)THEN
DO IX=1,N2
DO JX=1,N3
TEMP_MODEL_DATA0(IX,JX)=    dyresmDOCR_Var (IX,JX)
ENDDO
ENDDO

CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                            dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

!DATA TRANSFER FROM THE INTERPOLATED DATASET
DO I3=1,N3
DO J3=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_DOCR    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
ENDDO
ENDDO

!---------------------------------------dyresmDINOF_Var-----------------------------------------------
ELSEIF(KK.EQ.21)THEN
DO IX=1,N2
DO JX=1,N3
TEMP_MODEL_DATA0(IX,JX)=    dyresmDINOF_Var (IX,JX)
ENDDO
ENDDO

CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                            dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

!DATA TRANSFER FROM THE INTERPOLATED DATASET
DO I3=1,N3
DO J3=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_DINOF    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
ENDDO
ENDDO

!---------------------------------------dyresmCYANO_Var-----------------------------------------------
ELSEIF(KK.EQ.22)THEN
DO IX=1,N2
DO JX=1,N3
TEMP_MODEL_DATA0(IX,JX)=    dyresmCYANO_Var (IX,JX)
ENDDO
ENDDO

CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                            dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

!DATA TRANSFER FROM THE INTERPOLATED DATASET
DO I3=1,N3
DO J3=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_CYANO    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
ENDDO
ENDDO

!---------------------------------------dyresmNODUL_Var-----------------------------------------------
ELSEIF(KK.EQ.23)THEN
DO IX=1,N2
```

```
DO JX=1,N3
TEMP_MODEL_DATA0(IX,JX)=    dyresmNODUL_Var (IX,JX)
ENDDO
ENDDO

CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                            dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

!DATA TRANSFER FROM THE INTERPOLATED DATASET
DO I3=1,N3
DO J3=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_NODUL    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
ENDDO
ENDDO

!---------------------------------------dyresmCHLOR_Var-----------------------------------------------
ELSEIF(KK.EQ.24)THEN
DO IX=1,N2
DO JX=1,N3
TEMP_MODEL_DATA0(IX,JX)=    dyresmCHLOR_Var (IX,JX)
ENDDO
ENDDO

CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                            dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

!DATA TRANSFER FROM THE INTERPOLATED DATASET
DO I3=1,N3
DO J3=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_CHLOR    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
ENDDO
ENDDO

!---------------------------------------dyresmCRYPT_Var-----------------------------------------------
ELSEIF(KK.EQ.25)THEN
DO IX=1,N2
DO JX=1,N3
TEMP_MODEL_DATA0(IX,JX)=    dyresmCRYPT_Var (IX,JX)
ENDDO
ENDDO

CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                            dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

!DATA TRANSFER FROM THE INTERPOLATED DATASET
DO I3=1,N3
DO J3=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_CRYPT    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
ENDDO
ENDDO

!---------------------------------------dyresmMDIAT_Var-----------------------------------------------
ELSEIF(KK.EQ.26)THEN
DO IX=1,N2
DO JX=1,N3
TEMP_MODEL_DATA0(IX,JX)=    dyresmMDIAT_Var (IX,JX)
ENDDO
ENDDO

CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                            dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

!DATA TRANSFER FROM THE INTERPOLATED DATASET
DO I3=1,N3
DO J3=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_MDIAT    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
ENDDO
ENDDO

!---------------------------------------dyresmFDIAT_Var-----------------------------------------------
ELSEIF(KK.EQ.27)THEN
DO IX=1,N2
DO JX=1,N3
TEMP_MODEL_DATA0(IX,JX)=    dyresmFDIAT_Var (IX,JX)
ENDDO
```

```
ENDDO

CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                            dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

!DATA TRANSFER FROM THE INTERPOLATED DATASET
DO I3=1,N3
DO J3=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_FDIAT    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
ENDDO
ENDDO

!---------------------------------------dyresmZOOP1_Var-----------------------------------------------
ELSEIF(KK.EQ.28)THEN
DO IX=1,N2
DO JX=1,N3
TEMP_MODEL_DATA0(IX,JX)=    dyresmZOOP1_Var (IX,JX)
ENDDO
ENDDO

CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                            dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

!DATA TRANSFER FROM THE INTERPOLATED DATASET
DO I3=1,N3
DO J3=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_ZOOP1    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
ENDDO
ENDDO

!---------------------------------------dyresmZOOP2_Var-----------------------------------------------
ELSEIF(KK.EQ.29)THEN
DO IX=1,N2
DO JX=1,N3
TEMP_MODEL_DATA0(IX,JX)=    dyresmZOOP2_Var (IX,JX)
ENDDO
ENDDO

CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                            dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

!DATA TRANSFER FROM THE INTERPOLATED DATASET
DO I3=1,N3
DO J3=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_ZOOP2    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
ENDDO
ENDDO

!---------------------------------------dyresmZOOP3_Var-----------------------------------------------
ELSEIF(KK.EQ.30)THEN
DO IX=1,N2
DO JX=1,N3
TEMP_MODEL_DATA0(IX,JX)=    dyresmZOOP3_Var (IX,JX)
ENDDO
ENDDO

CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                            dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

!DATA TRANSFER FROM THE INTERPOLATED DATASET
DO I3=1,N3
DO J3=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_ZOOP3    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
ENDDO
ENDDO

!---------------------------------------dyresmZOOP4_Var-----------------------------------------------
ELSEIF(KK.EQ.31)THEN
DO IX=1,N2
DO JX=1,N3
TEMP_MODEL_DATA0(IX,JX)=    dyresmZOOP4_Var (IX,JX)
ENDDO
ENDDO

CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
```

```
                                    dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
 5    DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_ZOOP4    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO

10    !---------------------------------------dyresmZOOP5_Var-----------------------------------------------
      ELSEIF(KK.EQ.32)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=    dyresmZOOP5_Var (IX,JX)
15    ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                                    dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)
20
      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_ZOOP5    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
25    ENDDO
      ENDDO

      !---------------------------------------dyresmSSOL1_Var-----------------------------------------------
      ELSEIF(KK.EQ.33)THEN
30    DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=    dyresmSSOL1_Var (IX,JX)
      ENDDO
      ENDDO
35
      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                                    dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
40    DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_SSOL1    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO
45
      !---------------------------------------dyresmSSOL2_Var-----------------------------------------------
      ELSEIF(KK.EQ.34)THEN
      DO IX=1,N2
      DO JX=1,N3
50    TEMP_MODEL_DATA0(IX,JX)=    dyresmSSOL2_Var (IX,JX)
      ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
55                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
60    UncertaintyAnalysis00%Uncertainty_SSOL2    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO

      !---------------------------------------dyresmFISH1_Var-----------------------------------------------
65    ELSEIF(KK.EQ.35)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=    dyresmFISH1_Var (IX,JX)
      ENDDO
70    ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                                    dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

75    !DATA TRANSFER FROM THE INTERPOLATED DATASET
```

```
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_FISH1    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO

      !---------------------------------------dyresmFISH2_Var-----------------------------------------------
      ELSEIF(KK.EQ.36)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=    dyresmFISH2_Var (IX,JX)
      ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_FISH2    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO

      !---------------------------------------dyresmFISH3_Var-----------------------------------------------
      ELSEIF(KK.EQ.37)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=    dyresmFISH3_Var (IX,JX)
      ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_FISH3    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO

      !---------------------------------------dyresmBAC_Var-----------------------------------------------
      ELSEIF(KK.EQ.38)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=    dyresmBAC_Var (IX,JX)
      ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_BAC    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
      ENDDO
      ENDDO

      !---------------------------------------dyresmPAR_Var-----------------------------------------------
      ELSEIF(KK.EQ.39)THEN
      DO IX=1,N2
      DO JX=1,N3
      TEMP_MODEL_DATA0(IX,JX)=    dyresmPAR_Var (IX,JX)
      ENDDO
      ENDDO

      CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                                  dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

      !DATA TRANSFER FROM THE INTERPOLATED DATASET
      DO I3=1,N3
      DO J3=1,nUNC_layer
      UncertaintyAnalysis00%Uncertainty_PAR    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
```

```
ENDDO
ENDDO

!---------------------------------------dyresmTCHLA_Var-------------------------------------------------
ELSEIF(KK.EQ.40)THEN
DO IX=1,N2
DO JX=1,N3
TEMP_MODEL_DATA0(IX,JX)=    dyresmTCHLA_Var (IX,JX)
ENDDO
ENDDO


CALL VERTICAL_INTERPOLATION(TEMP_MODEL_DATA0,TEMP_MODEL_DATA1,              &
                            dyresmLAYER_HTS_Var,DEPTH_UNCERTAINTY,N2,nUNC_layer,N3)

!DATA TRANSFER FROM THE INTERPOLATED DATASET
DO I3=1,N3
DO J3=1,nUNC_layer
UncertaintyAnalysis00%Uncertainty_TCHLA    (II_LOOP,I3,J3)= TEMP_MODEL_DATA1(J3,I3)
ENDDO
ENDDO

ELSE
ENDIF    !IF(KK.EQ.1)THEN
ENDDO    !DO IKK=1,num_VAR_UNCERTAINTY


ENDIF    !IF(I_WRONG_INDEX>=1)THEN



!open(57,file='UNCERTAINTY/UNCERTAINTY.txt',POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
!WRITE(57,*)II_LOOP
!!DO I3=1,N3
!!WRITE(57,'(3F20.8)')(UncertaintyAnalysis00%Uncertainty_TEMPTURE(II_LOOP,I3,J3),J3=1,nUNC_layer)
!!ENDDO
!WRITE(57,*)

!WRITE(CHAR_TEMP,*)N2
!FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F10.2)'
!DO I3=1,N3
!WRITE(57,FMT)(TEMP_MODEL_DATA1(J3,I3),J3=1,nUNC_layer)
!ENDDO


!CLOSE(57)



end subroutine Uncertainty_Data


!THIS SUBROUTINE IS TO GET THE VALID SIMULATION DATA FROM THE RAW DATASET (UncertaintyAnalysis00)
!BY DELETING THE WRONG SIMULATION DATA

subroutine Uncertainty_ALL(UncertaintyAnalysis00,UncertaintyAnalysis0, nUNC_loop, nUNC_layer, N3,                  &
                           No_Ser_Var_UNCERTAINTY, num_VAR_UNCERTAINTY,TIME,                                       &
                           LoopNumber_CaedymError,NumberOfLoopNumber_CaedymError,nUNC_loop_VALID,                  &
                UncertaintyAnalysis1, nUNC_loopFIRST,UncertaintyAnalysis2, nUNC_loopBEST, NUMBER_error_SORTED)

INTEGER, INTENT(IN) ::NumberOfLoopNumber_CaedymError,
LoopNumber_CaedymError(1:NumberOfLoopNumber_CaedymError)
integer, intent(in) :: nUNC_loop, nUNC_loopFIRST, nUNC_loopBEST,nUNC_layer, N3      !, II_LOOP
INTEGER ,INTENT (IN) :: No_Ser_Var_UNCERTAINTY(1:num_VAR_UNCERTAINTY),       &
NUMBER_error_SORTED(1:nUNC_loop)
TYPE (Uncertainty) :: UncertaintyAnalysis00,UncertaintyAnalysis0,UncertaintyAnalysis1,UncertaintyAnalysis2
  !this is the total error for all the error parmeters (MBE, MNBE...)
REAL (KIND=8) :: TEMP_DATA(1:nUNC_loop), TEMP_DATA_STATISTIC(1:N3,1:nUNC_layer,1:5)
REAL (KIND=8) , INTENT (IN) :: TIME(1:N3)
CHARACTER (LEN=100) :: CHAR_TEMP, FMT, CHAR_TEMP1,CHAR_TEMP2,CHAR_TEMP3
INTEGER , INTENT (OUT) :: nUNC_loop_VALID
```

```
nUNC_loop_VALID=nUNC_loop-NumberOfLoopNumber_CaedymError
!ALLOCATE ALL THE UncertaintyAnalysis0

ALLOCATE(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(1:nUNC_loop_VALID))    !LoopNumber_CaedymError(JJ)
ALLOCATE(UncertaintyAnalysis1%NUMBER_UNCERTAINTY(1:nUNC_loopFIRST))     !LoopNumber_CaedymError(JJ)
ALLOCATE(UncertaintyAnalysis2%NUMBER_UNCERTAINTY(1:nUNC_loopBEST))      !LoopNumber_CaedymError(JJ)

DO IKK=1,num_VAR_UNCERTAINTY
KK=No_Ser_Var_UNCERTAINTY(IKK)
IF(KK.EQ.1)THEN
ELSEIF(KK.EQ.2)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_TEMPTURE(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.3)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_DO(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.4)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_NO3(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.5)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_NH4(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.6)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_TN(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.7)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_PONL(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.8)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_PONR(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.9)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_DONL(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.10)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_DONR(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.11)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_PO4(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.12)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_TP(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.13)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_POPL(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.14)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_POPR(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.15)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_DOPL(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.16)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_DOPR(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.17)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_POCL(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.18)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_POCR(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.19)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_DOCL(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.20)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_DOCR(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.21)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_DINOF(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.22)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_CYANO(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.23)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_NODUL(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.24)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_CHLOR(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.25)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_CRYPT(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.26)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_MDIAT(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.27)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_FDIAT(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.28)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_ZOOP1(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.29)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_ZOOP2(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.30)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_ZOOP3(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.31)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_ZOOP4(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.32)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_ZOOP5(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.33)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_SSOL1(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.34)THEN
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ALLOCATE(UncertaintyAnalysis0%Uncertainty_SSOL2(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.35)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_FISH1(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.36)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_FISH2(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.37)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_FISH3(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.38)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_BAC(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.39)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_PAR(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSEIF(KK.EQ.40)THEN
ALLOCATE(UncertaintyAnalysis0%Uncertainty_TCHLA(1:nUNC_loop_VALID,1:N3,1:nUNC_layer))
ELSE
WRITE(6,*)'YOU HAVE INPUTTED A WRONG SERIAL NUMBER FOR VARIABLES (1-40)'
ENDIF
ENDDO !DO IKK=1,num_VAR_UNCERTAINTY


!TRANSFER THE DATA FROM UncertaintyAnalysis00 TO UncertaintyAnalysis0
IIX=0
DO II=1,nUNC_loop
II_TEMP=0
DO JJ=1,NumberOfLoopNumber_CaedymError
IF(II==LoopNumber_CaedymError(JJ))THEN
II_TEMP=II_TEMP+1
ENDIF
ENDDO
IF(II_TEMP>=1)THEN
ELSE
IIX=IIX+1
UncertaintyAnalysis0%NUMBER_UNCERTAINTY(IIX)=II     !LoopNumber_CaedymError(JJ)
ENDIF
ENDDO    !DO II=1,nUNC_loop


!---------------------- CALCULATING THE UNCERTAINTY FOR ALL THE LOOPS ------------------------------

!-------------------------------------------------------------------------------------------------
DO IKK=1,num_VAR_UNCERTAINTY
KKX=No_Ser_Var_UNCERTAINTY(IKK)
IF(KKX.EQ.1)THEN
ELSEIF(KKX.EQ.2)THEN
!--------------------------------TEMPERATURE DATA DND UNCERTAINTY ANALYSIS---------------------------- 2
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_TEMPTURE(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_TEMPTURE(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_CONFIDENCE_95.TXT'

open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'

open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_KUTOSIS.TXT'

open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_SKEWNESS.TXT'

open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'

open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                        !DAYS
```

```
DO J3=1,nUNC_layer            !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_TEMPTURE(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'

open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID

WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_TEMPTURE(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO

ELSEIF(KKX.EQ.3)THEN
!--------------------------------DO DATA DND UNCERTAINTY ANALYSIS---------------------------- 3
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_DO(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_DO(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'

open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'

open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'

open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'

open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'

open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                    !DAYS
DO J3=1,nUNC_layer            !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_DO(IX,I3,J3)
ENDDO
```

```
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'

open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID

WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_DO(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO

ELSEIF(KKX.EQ.4)THEN
!-------------------------------NO3 DATA DND UNCERTAINTY ANALYSIS---------------------------- 4
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_NO3(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_NO3(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'

open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'

open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'

open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'

open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'

open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_NO3(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
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```
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'

open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID

WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_NO3(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO

ELSEIF(KKX.EQ.5)THEN
!--------------------------------NH4 DATA DND UNCERTAINTY ANALYSIS---------------------------- 5
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_NH4(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_NH4(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'

open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'

open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'

open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'

open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_NH4(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
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WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'

open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID

WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_NH4(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO

ELSEIF(KKX.EQ.6)THEN
!-------------------------------TN DATA DND UNCERTAINTY ANALYSIS---------------------------- 6
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_TN(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_TN(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'

open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'

open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'

open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'

open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'

open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_TN(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
```

```
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'

open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID

WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_TN(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.7)THEN
!--------------------------------PONL DATA DND UNCERTAINTY ANALYSIS---------------------------- 7
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_PONL(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_PONL(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'

open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//’_STD.TXT’

open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'

open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'

open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// ‘_MEAN.TXT’

open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_PONL(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
```

```
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//          &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'

open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_PONL(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.8)THEN
!--------------------------------PONR DATA DND UNCERTAINTY ANALYSIS---------------------------- 8
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_PONR(II,JJ,KK)=        &
UncertaintyAnalysis00%Uncertainty_PONR(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//          &
'_CONFIDENCE_95.TXT'

open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//’_STD.TXT’

open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//          &
'_KUTOSIS.TXT'

open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//          &
'_SKEWNESS.TXT'

open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// ‘_MEAN.TXT’

open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_PONR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)
```

```
WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'

open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID

WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_PONR(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.9)THEN
!-------------------------------DONL DATA DND UNCERTAINTY ANALYSIS--------------------------- 9
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_DONL(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_DONL(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'

open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'

open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'

open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'

open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'

open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_DONL(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
```

```
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'

      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_LOOP_VALID

      WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_DONL(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO


      ELSEIF(KKX.EQ.10)THEN
      !--------------------------------DONR DATA DND UNCERTAINTY ANALYSIS---------------------------- 10
      DO II=1,nUNC_LOOP_VALID
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis0%Uncertainty_DONR(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_DONR(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_CONFIDENCE_95.TXT'

      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'

      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS.TXT'

      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_SKEWNESS.TXT'

      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'

      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                      !DAYS
      DO J3=1,nUNC_layer              !LAYERS
      DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
      TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_DONR(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
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```
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_LOOP_VALID
      WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_DONR(IX,I3,I_L),I3=1,N3 )
 5    ENDDO
      CLOSE(16)
      ENDDO


10    ELSEIF(KKX.EQ.11)THEN
      !--------------------------------PO4 DATA DND UNCERTAINTY ANALYSIS---------------------------- 11
      DO II=1,nUNC_LOOP_VALID
      DO JJ=1,N3
      DO KK=1,nUNC_layer
15    UncertaintyAnalysis0%Uncertainty_PO4(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_PO4(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO
20
      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_CONFIDENCE_95.TXT'
25
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'

      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
30    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_KUTOSIS.TXT'

      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
35    '_SKEWNESS.TXT'

      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'

40    open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                        !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
45    TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_PO4(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
50    TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
55    WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
60    CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)
65
      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
70    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'

      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

75    DO IX=1,nUNC_LOOP_VALID
```

```
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_PO4(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO

ELSEIF(KKX.EQ.12)THEN
!--------------------------------TP DATA DND UNCERTAINTY ANALYSIS---------------------------- 12
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_TP(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_TP(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_CONFIDENCE_95.TXT'

open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'

open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_KUTOSIS.TXT'

open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_SKEWNESS.TXT'

open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'

open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                        !DAYS
DO J3=1,nUNC_layer            !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_TP(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_TP(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO
```

```
      ELSEIF(KKX.EQ.13)THEN
      !--------------------------------POPL DATA DND UNCERTAINTY ANALYSIS---------------------------- 13
      DO II=1,nUNC_LOOP_VALID
 5    DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis0%Uncertainty_POPL(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_POPL(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
10    ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
15    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_CONFIDENCE_95.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'

20    open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_KUTOSIS.TXT'

      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
25    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_SKEWNESS.TXT'

      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
30
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
35    DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
      TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_POPL(IX,I3,J3)
      ENDDO

      CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
40    TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
45    ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
50    WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
55    CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
60    DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'

65    open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_LOOP_VALID
      WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_POPL(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
70    ENDDO


      ELSEIF(KKX.EQ.14)THEN
      !--------------------------------POPR DATA DND UNCERTAINTY ANALYSIS---------------------------- 14
75    DO II=1,nUNC_LOOP_VALID
```

```
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_POPR(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_POPR(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_CONFIDENCE_95.TXT'

open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'

open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_KUTOSIS.TXT'

open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_SKEWNESS.TXT'

open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                        !DAYS
DO J3=1,nUNC_layer            !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_POPR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'

open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID

WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_POPR(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.15)THEN
!------------------------------DOPL DATA DND UNCERTAINTY ANALYSIS---------------------------- 15
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_DOPL(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_DOPL(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
```

```
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'

open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'

open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'

open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'

open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_DOPL(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_DOPL(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.16)THEN
!--------------------------------DOPR DATA DND UNCERTAINTY ANALYSIS---------------------------- 16
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_DOPR(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_DOPR(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
```

```
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'

open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'

open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'

open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'

open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'

open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_DOPR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'

open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_DOPR(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.17)THEN
!-------------------------------POCL DATA DND UNCERTAINTY ANALYSIS---------------------------- 17
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_POCL(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_POCL(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'
```

```
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'

      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_KUTOSIS.TXT'

      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_SKEWNESS.TXT'

      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'

      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                        !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
      TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_POCL(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'

      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO IX=1,nUNC_LOOP_VALID
      WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_POCL(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO



      ELSEIF(KKX.EQ.18)THEN
      !-------------------------------POCR DATA DND UNCERTAINTY ANALYSIS---------------------------- 18
      DO II=1,nUNC_LOOP_VALID
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis0%Uncertainty_POCR(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_POCR(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_CONFIDENCE_95.TXT'

      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
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```
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'

open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_KUTOSIS.TXT'

open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_SKEWNESS.TXT'

open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'

open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_POCR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'

open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_POCR(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO



ELSEIF(KKX.EQ.19)THEN
!--------------------------------DOCL DATA DND UNCERTAINTY ANALYSIS---------------------------- 19
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_DOCL(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_DOCL(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_CONFIDENCE_95.TXT'

open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
```

```
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_KUTOSIS.TXT'

 5    open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_SKEWNESS.TXT'

      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
10    FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// ‘_MEAN.TXT’

      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                        !DAYS
15    DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
      TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_DOCL(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
20    TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
25    ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
30    WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
35    CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
40    DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
45    DO IX=1,nUNC_LOOP_VALID
      WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_DOCL(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO
50

      ELSEIF(KKX.EQ.20)THEN
      !--------------------------------DOCR DATA DND UNCERTAINTY ANALYSIS---------------------------- 20
      DO II=1,nUNC_LOOP_VALID
55    DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis0%Uncertainty_DOCR(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_DOCR(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
60    ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
65    FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_CONFIDENCE_95.TXT'

      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//’_STD.TXT’
70
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_KUTOSIS.TXT'

75    open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
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```
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'

open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'

open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                    !DAYS
DO J3=1,nUNC_layer            !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_DOCR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_DOCR(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.21)THEN
!------------------------------    DINOF DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 21
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_DINOF(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_DINOF(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                    !DAYS
DO J3=1,nUNC_layer            !LAYERS
```

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      DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
      TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_DINOF(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_LOOP_VALID
      WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_DINOF(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO


      ELSEIF(KKX.EQ.22)THEN
      !------------------------------  CYANO DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 22
      DO II=1,nUNC_LOOP_VALID
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis0%Uncertainty_CYANO(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_CYANO(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_CONFIDENCE_95.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_SKEWNESS.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
      TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_CYANO(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
```

```
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_CYANO(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.23)THEN
!------------------------------    NODUL DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 23
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_NODUL(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_NODUL(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_NODUL(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
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CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_NODUL(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.24)THEN
!-------------------------------    CHLOR DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 24
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_CHLOR(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_CHLOR(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_CHLOR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
```

```
      DO IX=1,nUNC_LOOP_VALID
      WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_CHLOR(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
5     ENDDO


      ELSEIF(KKX.EQ.25)THEN
10    !------------------------------  CRYPT DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 25
      DO II=1,nUNC_LOOP_VALID
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis0%Uncertainty_CRYPT(II,JJ,KK)=      &
15    UncertaintyAnalysis00%Uncertainty_CRYPT(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

20    WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_CONFIDENCE_95.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
25    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
30    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_SKEWNESS.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
35
      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_LOOP_VALID   !nUNC_LOOP_VALID
      TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_CRYPT(IX,I3,J3)
40    ENDDO
      CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
45    TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
50    WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
55    CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

60    WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
65    '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
      open(16,file=FILE_NAME_TEMP)   !,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
      DO IX=1,nUNC_LOOP_VALID
      WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_CRYPT(IX,I3,I_L),I3=1,N3 )
      ENDDO
70    CLOSE(16)
      ENDDO


75    ELSEIF(KKX.EQ.26)THEN
```

```
!------------------------------  MDIAT DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 26
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_MDIAT(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_MDIAT(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_CONFIDENCE_95.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_KUTOSIS.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_SKEWNESS.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID   !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_MDIAT(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_MDIAT(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.27)THEN
!------------------------------  FDIAT DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 27
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_FDIAT(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_FDIAT(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO
```

```
      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_CONFIDENCE_95.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_SKEWNESS.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                        !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
      TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_FDIAT(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_LOOP_VALID
      WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_FDIAT(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO



      ELSEIF(KKX.EQ.28)THEN
      !------------------------------    ZOOP1 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 28
      DO II=1,nUNC_LOOP_VALID
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis0%Uncertainty_ZOOP1(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_ZOOP1(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_CONFIDENCE_95.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS.TXT'
```

```
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_SKEWNESS.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
 5    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                        !DAYS
      DO J3=1,nUNC_layer            !LAYERS
10    DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
      TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_ZOOP1(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
15    TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
20    WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
25    ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
30    CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
35    WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_LOOP_VALID
40    WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_ZOOP1(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO

45

      ELSEIF(KKX.EQ.29)THEN
      !------------------------------    ZOOP2 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 29
      DO II=1,nUNC_LOOP_VALID
      DO JJ=1,N3
50    DO KK=1,nUNC_layer
      UncertaintyAnalysis0%Uncertainty_ZOOP2(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_ZOOP2(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
      ENDDO
55    ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
60    '_CONFIDENCE_95.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
65    '_KUTOSIS.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_SKEWNESS.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
70    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                        !DAYS
      DO J3=1,nUNC_layer            !LAYERS
75    DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
```

```
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_ZOOP2(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_ZOOP2(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO

ELSEIF(KKX.EQ.30)THEN
!------------------------------    ZOOP1 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 30
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_ZOOP3(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_ZOOP3(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_ZOOP3(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
```

```
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
 5    ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
10    CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
15    WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_LOOP_VALID
20    WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_ZOOP3(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO

25

      ELSEIF(KKX.EQ.31)THEN
      !------------------------------    ZOOP4 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 31
      DO II=1,nUNC_LOOP_VALID
      DO JJ=1,N3
30    DO KK=1,nUNC_layer
      UncertaintyAnalysis0%Uncertainty_ZOOP4(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_ZOOP4(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
      ENDDO
35    ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
40    '_CONFIDENCE_95.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
45    '_KUTOSIS.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_SKEWNESS.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
50    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
55    DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
      TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_ZOOP4(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
60    TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
65    WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
70    ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
75    CLOSE(15)
```

```
WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_ZOOP4(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO



ELSEIF(KKX.EQ.32)THEN
!------------------------------    ZOOP5 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 32
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_ZOOP5(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_ZOOP5(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_ZOOP5(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
```

```
DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_ZOOP5(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.33)THEN
!------------------------------  SSOL1 DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 33
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_SSOL1(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_SSOL1(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_CONFIDENCE_95.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_KUTOSIS.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_SKEWNESS.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_SSOL1(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_SSOL1(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.34)THEN
!------------------------------  SSOL2 DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 34
DO II=1,nUNC_LOOP_VALID
```

```
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_SSOL2(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_SSOL2(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_CONFIDENCE_95.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_KUTOSIS.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_SKEWNESS.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_SSOL2(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_SSOL2(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.35)THEN
!------------------------------    FISH1 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 35
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_FISH1(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_FISH1(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
```

```
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_FISH1(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_FISH1(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO



ELSEIF(KKX.EQ.36)THEN
!------------------------------    FISH2 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 36
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_FISH2(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_FISH2(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
```

```
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_FISH2(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_FISH2(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.37)THEN
!------------------------------  FISH3 DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 37
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_FISH3(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_FISH3(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_MEAN.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
```

```
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_FISH3(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_FISH3(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.38)THEN
!-------------------------------    BAC DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 38
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_BAC(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_BAC(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_BAC(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
```

```
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//          &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_LOOP_VALID
WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_BAC(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.39)THEN
!------------------------------    PAR DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 39
DO II=1,nUNC_LOOP_VALID
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis0%Uncertainty_PAR(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_PAR(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//          &
'_CONFIDENCE_95.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_STD.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_KUTOSIS.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_SKEWNESS.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_PAR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)
```

```
      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
 5    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//         &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_LOOP_VALID
      WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_PAR(IX,I3,I_L),I3=1,N3 )
10    ENDDO
      CLOSE(16)
      ENDDO

      ELSEIF(KKX.EQ.40)THEN
15    !------------------------------    TCHLA DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 40
      DO II=1,nUNC_LOOP_VALID
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis0%Uncertainty_TCHLA(II,JJ,KK)=       &
20    UncertaintyAnalysis00%Uncertainty_TCHLA(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

25    WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_CONFIDENCE_95.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
30    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_STD.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//'_KUTOSIS.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_SKEWNESS.TXT'
35    open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// '_MEAN.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      !FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))// 'temp.TXT'
      !open(18,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
40


      DO I3=1,N3                        !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
45    TEMP_DATA(IX) = UncertaintyAnalysis0%Uncertainty_TCHLA(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_LOOP_VALID,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
50    TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
55    WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)

60    DO IX=1,nUNC_LOOP_VALID    !nUNC_LOOP_VALID
      !WRITE(18,*)
      !WRITE(18,*)
      !WRITE(18,*)IX
      !WRITE(18,FMT)TIME(I3),(UncertaintyAnalysis0%Uncertainty_TCHLA_Var(IX,I3,II),II=1,nUNC_layer)
65    ENDDO

      ENDDO
      CLOSE(11)
      CLOSE(12)
70    CLOSE(13)
      CLOSE(14)
      CLOSE(15)


75    !close(18)
```

```
      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_LOOP_VALID
      WRITE(16,FMT)(UncertaintyAnalysis0%Uncertainty_TCHLA(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO

      ENDIF    !IF(KK.EQ.1)THEN
      ENDDO     !DO IKK=1,num_VAR_UNCERTAINTY



      !---------- CALCULATING THE UNCERTAINTY FOR THE FIRST USER-DEFINED LOOPS (100) -----------

      !-------------------------------------------------------------------------------------------
      DO IKK=1,num_VAR_UNCERTAINTY
      KKX=No_Ser_Var_UNCERTAINTY(IKK)
      IF(KKX.EQ.1)THEN
      ELSEIF(KKX.EQ.2)THEN
      !-------------------------------TEMPERATURE DATA DND UNCERTAINTY ANALYSIS---------------------------- 2
      DO II=1,nUNC_loopFirst
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis1%Uncertainty_TEMPTURE(II,JJ,KK)=       &
      UncertaintyAnalysis0%Uncertainty_TEMPTURE(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_CONFIDENCE_95_FIRST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_STD_FIRST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS_FIRST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_SKEWNESS_FIRST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_MEAN_FIRST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                        !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopFirst    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_TEMPTURE(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
```

```
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_TEMPTURE(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO

ELSEIF(KKX.EQ.3)THEN
!--------------------------------DO DATA DND UNCERTAINTY ANALYSIS---------------------------- 3
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_DO(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_DO(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_DO(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
```

```
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_DO(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO

ELSEIF(KKX.EQ.4)THEN
!------------------------------NO3 DATA DND UNCERTAINTY ANALYSIS---------------------------- 4
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_NO3(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_NO3(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_NO3(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_NO3(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO
```

```
      ELSEIF(KKX.EQ.5)THEN
      !-------------------------------NH4 DATA DND UNCERTAINTY ANALYSIS--------------------------- 5
      DO II=1,nUNC_loopFirst
      DO JJ=1,N3
 5    DO KK=1,nUNC_layer
      UncertaintyAnalysis1%Uncertainty_NH4(II,JJ,KK)=       &
      UncertaintyAnalysis0%Uncertainty_NH4(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
      ENDDO
10    ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
15    '_CONFIDENCE_95_FIRST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_STD_FIRST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
20    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_KUTOSIS_FIRST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_SKEWNESS_FIRST.TXT'
25    open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_MEAN_FIRST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

30    DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopFirst    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_NH4(IX,I3,J3)
      ENDDO
35    CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
40    TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
45    WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
50    CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
55    FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
60    open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopFirst
      WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_NH4(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
65    ENDDO

      ELSEIF(KKX.EQ.6)THEN
      !-------------------------------TN DATA DND UNCERTAINTY ANALYSIS--------------------------- 6
      DO II=1,nUNC_loopFirst
70    DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis1%Uncertainty_TN(II,JJ,KK)=       &
      UncertaintyAnalysis0%Uncertainty_TN(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
75    ENDDO
```

```
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//  &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')  !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//  &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')  !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//  &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')  !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//  &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')  !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//  &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')  !record the wrong loop

DO I3=1,N3                    !DAYS
DO J3=1,nUNC_layer            !LAYERS
DO IX=1,nUNC_loopFirst   !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_TN(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//  &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)  !,POSITION='APPEND',ACTION='WRITE')  !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_TN(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.7)THEN
!-------------------------------PONL DATA DND UNCERTAINTY ANALYSIS---------------------------- 7
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_PONL(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_PONL(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//  &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')  !record the wrong loop
```

```
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_PONL(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_PONL(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO

ELSEIF(KKX.EQ.8)THEN
!--------------------------------PONR DATA DND UNCERTAINTY ANALYSIS---------------------------- 8
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_PONR(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_PONR(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_SKEWNESS_FIRST.TXT'
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open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                        !DAYS
DO J3=1,nUNC_layer            !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_PONR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_PONR(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.9)THEN
!--------------------------------DONL DATA DND UNCERTAINTY ANALYSIS---------------------------- 9
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_DONL(II,JJ,KK)=        &
UncertaintyAnalysis0%Uncertainty_DONL(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                        !DAYS
DO J3=1,nUNC_layer            !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
```

```
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_DONL(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_DONL(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.10)THEN
!--------------------------------DONR DATA DND UNCERTAINTY ANALYSIS---------------------------- 10
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_DONR(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_DONR(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_DONR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
```

```
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_DONR(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.11)THEN
!--------------------------------PO4 DATA DND UNCERTAINTY ANALYSIS---------------------------- 11
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_PO4(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_PO4(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_PO4(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
```

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CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_PO4(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.12)THEN
!--------------------------------TP DATA DND UNCERTAINTY ANALYSIS---------------------------- 12
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_TP(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_TP(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_TP(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
```

```
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_TP(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.13)THEN
!--------------------------------POPL DATA DND UNCERTAINTY ANALYSIS---------------------------- 13
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_POPL(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_POPL(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_POPL(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_POPL(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
```

```
ENDDO

ELSEIF(KKX.EQ.14)THEN
!------------------------------POPR DATA DND UNCERTAINTY ANALYSIS---------------------------- 14
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_POPR(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_POPR(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_POPR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_POPR(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.15)THEN
!------------------------------DOPL DATA DND UNCERTAINTY ANALYSIS---------------------------- 15
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
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UncertaintyAnalysis1%Uncertainty_DOPL(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_DOPL(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_DOPL(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_DOPL(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.16)THEN
!--------------------------------DOPR DATA DND UNCERTAINTY ANALYSIS---------------------------- 16
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_DOPR(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_DOPR(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
```

```
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                          !DAYS
DO J3=1,nUNC_layer                  !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_DOPR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_DOPR(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO



ELSEIF(KKX.EQ.17)THEN
!--------------------------------POCL DATA DND UNCERTAINTY ANALYSIS---------------------------- 17
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_POCL(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_POCL(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
```

```
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                        !DAYS
DO J3=1,nUNC_layer            !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_POCL(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_POCL(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.18)THEN
!--------------------------------POCR DATA DND UNCERTAINTY ANALYSIS---------------------------- 18
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_POCR(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_POCR(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
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FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_POCR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_POCR(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.19)THEN
!--------------------------------DOCL DATA DND UNCERTAINTY ANALYSIS---------------------------- 19
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_DOCL(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_DOCL(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
```

```
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_DOCL(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_DOCL(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.20)THEN
!--------------------------------DOCR DATA DND UNCERTAINTY ANALYSIS---------------------------- 20
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_DOCR(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_DOCR(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_DOCR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
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```
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_DOCR(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.21)THEN
!-------------------------------    DINOF DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 21
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_DINOF(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_DINOF(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_DINOF(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
```

```
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_DINOF(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.22)THEN
!-------------------------------    CYANO DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 22
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_CYANO(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_CYANO(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_CYANO(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
```

```
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopFirst
      WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_CYANO(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO

      ELSEIF(KKX.EQ.23)THEN
      !------------------------------  NODUL DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 23
      DO II=1,nUNC_loopFirst
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis1%Uncertainty_NODUL(II,JJ,KK)=       &
      UncertaintyAnalysis0%Uncertainty_NODUL(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_CONFIDENCE_95_FIRST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_STD_FIRST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_KUTOSIS_FIRST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_SKEWNESS_FIRST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_MEAN_FIRST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                      !DAYS
      DO J3=1,nUNC_layer              !LAYERS
      DO IX=1,nUNC_loopFirst    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_NODUL(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopFirst
      WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_NODUL(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
```

```
ENDDO


ELSEIF(KKX.EQ.24)THEN
!------------------------------  CHLOR DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 24
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_CHLOR(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_CHLOR(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                        !DAYS
DO J3=1,nUNC_layer            !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_CHLOR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_CHLOR(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.25)THEN
!------------------------------  CRYPT DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 25
DO II=1,nUNC_loopFirst
```

```
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_CRYPT(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_CRYPT(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_CRYPT(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_CRYPT(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.26)THEN
!------------------------------    MDIAT DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 26
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_MDIAT(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_MDIAT(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO
```

```
      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
 5    '_CONFIDENCE_95_FIRST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_STD_FIRST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
10    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_KUTOSIS_FIRST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_SKEWNESS_FIRST.TXT'
15    open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_MEAN_FIRST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

20    DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopFirst    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_MDIAT(IX,I3,J3)
      ENDDO
25    CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
30    TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
35    WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
40    CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
45    FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
50    open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopFirst
      WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_MDIAT(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
55    ENDDO


      ELSEIF(KKX.EQ.27)THEN
      !------------------------------    FDIAT DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 27
60    DO II=1,nUNC_loopFirst
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis1%Uncertainty_FDIAT(II,JJ,KK)=       &
      UncertaintyAnalysis0%Uncertainty_FDIAT(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
65    ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
70    FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_CONFIDENCE_95_FIRST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
75    '_STD_FIRST.TXT'
```

```
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS_FIRST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
 5    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_SKEWNESS_FIRST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_MEAN_FIRST.TXT'
10    open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopFirst    !nUNC_loop
15    TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_FDIAT(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
20    TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
25    WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
30    CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)
35
      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
40    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopFirst
      WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_FDIAT(IX,I3,I_L),I3=1,N3 )
45    ENDDO
      CLOSE(16)
      ENDDO


50
      ELSEIF(KKX.EQ.28)THEN
      !------------------------------    ZOOP1 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 28
      DO II=1,nUNC_loopFirst
      DO JJ=1,N3
55    DO KK=1,nUNC_layer
      UncertaintyAnalysis1%Uncertainty_ZOOP1(II,JJ,KK)=       &
      UncertaintyAnalysis0%Uncertainty_ZOOP1(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
      ENDDO
60    ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
65    '_CONFIDENCE_95_FIRST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_STD_FIRST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
70    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS_FIRST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_SKEWNESS_FIRST.TXT'
75    open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
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FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_ZOOP1(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_ZOOP1(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.29)THEN
!------------------------------    ZOOP2 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 29
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_ZOOP2(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_ZOOP2(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_ZOOP2(IX,I3,J3)
```

```
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_ZOOP2(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.30)THEN
!------------------------------    ZOOP1 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 30
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_ZOOP3(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_ZOOP3(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_ZOOP3(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
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WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_ZOOP3(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.31)THEN
!------------------------------    ZOOP4 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 31
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_ZOOP4(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_ZOOP4(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_ZOOP4(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
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      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopFirst
      WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_ZOOP4(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO



      ELSEIF(KKX.EQ.32)THEN
      !------------------------------   ZOOP5 DATA DND UNCERTAINTY ANALYSIS   ---------------------------- 32
      DO II=1,nUNC_loopFirst
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis1%Uncertainty_ZOOP5(II,JJ,KK)=       &
      UncertaintyAnalysis0%Uncertainty_ZOOP5(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_CONFIDENCE_95_FIRST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_STD_FIRST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_KUTOSIS_FIRST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_SKEWNESS_FIRST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_MEAN_FIRST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                      !DAYS
      DO J3=1,nUNC_layer              !LAYERS
      DO IX=1,nUNC_loopFirst    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_ZOOP5(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
```

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      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
 5    open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopFirst
      WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_ZOOP5(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
10    ENDDO


      ELSEIF(KKX.EQ.33)THEN
      !------------------------------  SSOL1 DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 33
15    DO II=1,nUNC_loopFirst
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis1%Uncertainty_SSOL1(II,JJ,KK)=       &
      UncertaintyAnalysis0%Uncertainty_SSOL1(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
20    ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
25    FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_CONFIDENCE_95_FIRST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
30    '_STD_FIRST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS_FIRST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
35    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_SKEWNESS_FIRST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_MEAN_FIRST.TXT'
40    open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                      !DAYS
      DO J3=1,nUNC_layer              !LAYERS
      DO IX=1,nUNC_loopFirst    !nUNC_loop
45    TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_SSOL1(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
50    TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
55    WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
60    CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)
65
      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
70    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopFirst
      WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_SSOL1(IX,I3,I_L),I3=1,N3 )
75    ENDDO
```

```
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.34)THEN
!------------------------------  SSOL2 DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 34
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_SSOL2(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_SSOL2(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                        !DAYS
DO J3=1,nUNC_layer            !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_SSOL2(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_SSOL2(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.35)THEN
!------------------------------  FISH1 DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 35
DO II=1,nUNC_loopFirst
DO JJ=1,N3
```

```
      DO KK=1,nUNC_layer
      UncertaintyAnalysis1%Uncertainty_FISH1(II,JJ,KK)=       &
      UncertaintyAnalysis0%Uncertainty_FISH1(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
 5    ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
10    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_CONFIDENCE_95_FIRST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_STD_FIRST.TXT'
15    open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_KUTOSIS_FIRST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
20    '_SKEWNESS_FIRST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_MEAN_FIRST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
25

      DO I3=1,N3                        !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopFirst    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_FISH1(IX,I3,J3)
30    ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
35    TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
40    WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
45    CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

50    WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
55    '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopFirst
      WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_FISH1(IX,I3,I_L),I3=1,N3 )
      ENDDO
60    CLOSE(16)
      ENDDO


65    ELSEIF(KKX.EQ.36)THEN
      !------------------------------    FISH2 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 36
      DO II=1,nUNC_loopFirst
      DO JJ=1,N3
      DO KK=1,nUNC_layer
70    UncertaintyAnalysis1%Uncertainty_FISH2(II,JJ,KK)=       &
      UncertaintyAnalysis0%Uncertainty_FISH2(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO
75
```

```
WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_FISH2(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_FISH2(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.37)THEN
!------------------------------    FISH3 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 37
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_FISH3(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_FISH3(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_STD_FIRST.TXT'
```

```
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS_FIRST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_SKEWNESS_FIRST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_MEAN_FIRST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                        !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopFirst    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_FISH3(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopFirst
      WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_FISH3(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO


      ELSEIF(KKX.EQ.38)THEN
      !------------------------------    BAC DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 38
      DO II=1,nUNC_loopFirst
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis1%Uncertainty_BAC(II,JJ,KK)=       &
      UncertaintyAnalysis0%Uncertainty_BAC(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_CONFIDENCE_95_FIRST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_STD_FIRST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS_FIRST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_SKEWNESS_FIRST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
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FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_BAC(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_BAC(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.39)THEN
!------------------------------    PAR DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 39
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_PAR(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_PAR(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_PAR(IX,I3,J3)
```

```
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_PAR(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.40)THEN
!------------------------------    TCHLA DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 40
DO II=1,nUNC_loopFirst
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis1%Uncertainty_TCHLA(II,JJ,KK)=       &
UncertaintyAnalysis0%Uncertainty_TCHLA(UncertaintyAnalysis0%NUMBER_UNCERTAINTY(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_FIRST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_FIRST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_FIRST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_FIRST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_FIRST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopFirst    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis1%Uncertainty_TCHLA(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
```

```
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_FIRST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopFirst
WRITE(16,FMT)(UncertaintyAnalysis1%Uncertainty_TCHLA(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO

ENDIF    !IF(KK.EQ.1)THEN
ENDDO     !DO IKK=1,num_VAR_UNCERTAINTY


!------- CALCULATING THE UNCERTAINTY FOR THE BEST USER_DEFINED LOOPS (100 OR 1000 LOOPS) ----------
!NUMBER_error_SORTED(1:nUNC_loop)

!-------------------------------------------------------------------------------------------------
DO IKK=1,num_VAR_UNCERTAINTY
KKX=No_Ser_Var_UNCERTAINTY(IKK)
IF(KKX.EQ.1)THEN
ELSEIF(KKX.EQ.2)THEN
!--------------------------------TEMPERATURE DATA DND UNCERTAINTY ANALYSIS---------------------------- 2
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_TEMPTURE(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_TEMPTURE(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopBEST    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_TEMPTURE(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
```

```
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_TEMPTURE(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO

ELSEIF(KKX.EQ.3)THEN
!--------------------------------DO DATA DND UNCERTAINTY ANALYSIS---------------------------- 3
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_DO(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_DO(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopBEST    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_DO(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
```

```
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_DO(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO

ELSEIF(KKX.EQ.4)THEN
!--------------------------------NO3 DATA DND UNCERTAINTY ANALYSIS---------------------------- 4
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_NO3(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_NO3(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopBEST    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_NO3(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
```

```
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_NO3(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO

      ELSEIF(KKX.EQ.5)THEN
      !--------------------------------NH4 DATA DND UNCERTAINTY ANALYSIS---------------------------- 5
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_NH4(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_NH4(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_NH4(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_NH4(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO
```

```
      ELSEIF(KKX.EQ.6)THEN
      !-------------------------------TN DATA DND UNCERTAINTY ANALYSIS---------------------------- 6
      DO II=1,nUNC_loopBEST
 5    DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_TN(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_TN(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
10    ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
15    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_STD_BEST.TXT'
20    open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
25    '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
30
      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_TN(IX,I3,J3)
35    ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
40    TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
45    WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
50    CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

55    WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
60    '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_TN(IX,I3,I_L),I3=1,N3 )
      ENDDO
65    CLOSE(16)
      ENDDO


      ELSEIF(KKX.EQ.7)THEN
70    !-------------------------------PONL DATA DND UNCERTAINTY ANALYSIS---------------------------- 7
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_PONL(II,JJ,KK)=       &
75    UncertaintyAnalysis00%Uncertainty_PONL(NUMBER_error_SORTED(II),JJ,KK)
```

```
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopBEST    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_PONL(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_PONL(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.8)THEN
!--------------------------------PONR DATA DND UNCERTAINTY ANALYSIS---------------------------- 8
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_PONR(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_PONR(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_CONFIDENCE_95_BEST.TXT'
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      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_PONR(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_PONR(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO


      ELSEIF(KKX.EQ.9)THEN
      !-------------------------------DONL DATA DND UNCERTAINTY ANALYSIS---------------------------- 9
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_DONL(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_DONL(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
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      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_DONL(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_DONL(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO


      ELSEIF(KKX.EQ.10)THEN
      !--------------------------------DONR DATA DND UNCERTAINTY ANALYSIS---------------------------- 10
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_DONR(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_DONR(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
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      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST   !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_DONR(IX,I3,J3)
      ENDDO
 5    CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
10    TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
15    WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
20    CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
25    FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
30    open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_DONR(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
35    ENDDO


      ELSEIF(KKX.EQ.11)THEN
      !--------------------------------PO4 DATA DND UNCERTAINTY ANALYSIS---------------------------- 11
40    DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_PO4(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_PO4(NUMBER_error_SORTED(II),JJ,KK)
45    ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
50    FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
55    '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
60    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_MEAN_BEST.TXT'
65    open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST   !nUNC_loop
70    TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_PO4(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
75    TEMP_DATA_STATISTIC(I3,J3,3)=Std
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      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_PO4(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO


      ELSEIF(KKX.EQ.12)THEN
      !-------------------------------TP DATA DND UNCERTAINTY ANALYSIS---------------------------- 12
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_TP(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_TP(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_TP(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
```

```
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_TP(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.13)THEN
!--------------------------------POPL DATA DND UNCERTAINTY ANALYSIS---------------------------- 13
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_POPL(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_POPL(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopBEST    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_POPL(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
```

```
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_POPL(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.14)THEN
!--------------------------------POPR DATA DND UNCERTAINTY ANALYSIS---------------------------- 14
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_POPR(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_POPR(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopBEST    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_POPR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_POPR(IX,I3,I_L),I3=1,N3 )
```

```
ENDDO
CLOSE(16)
ENDDO

ELSEIF(KKX.EQ.15)THEN
!--------------------------------DOPL DATA DND UNCERTAINTY ANALYSIS---------------------------- 15
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_DOPL(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_DOPL(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopBEST    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_DOPL(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_DOPL(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO

ELSEIF(KKX.EQ.16)THEN
!--------------------------------DOPR DATA DND UNCERTAINTY ANALYSIS---------------------------- 16
DO II=1,nUNC_loopBEST
```

```
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_DOPR(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_DOPR(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopBEST    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_DOPR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_DOPR(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.17)THEN
!--------------------------------POCL DATA DND UNCERTAINTY ANALYSIS---------------------------- 17
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_POCL(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_POCL(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO
```

```
      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
 5    '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
10    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_SKEWNESS_BEST.TXT'
15    open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

20    DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_POCL(IX,I3,J3)
      ENDDO
25    CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
30    TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
35    WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
40    CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
45    FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
50    open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_POCL(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
55    ENDDO



      ELSEIF(KKX.EQ.18)THEN
60    !------------------------------POCR DATA DND UNCERTAINTY ANALYSIS---------------------------- 18
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_POCR(II,JJ,KK)=       &
65    UncertaintyAnalysis00%Uncertainty_POCR(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

70    WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
```

```
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_POCR(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_POCR(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO


      ELSEIF(KKX.EQ.19)THEN
      !------------------------------DOCL DATA DND UNCERTAINTY ANALYSIS---------------------------- 19
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_DOCL(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_DOCL(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
```

```
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_DOCL(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_DOCL(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO


      ELSEIF(KKX.EQ.20)THEN
      !--------------------------------DOCR DATA DND UNCERTAINTY ANALYSIS---------------------------- 20
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_DOCR(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_DOCR(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
```

```
DO J3=1,nUNC_layer            !LAYERS
DO IX=1,nUNC_loopBEST    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_DOCR(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_DOCR(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.21)THEN
!------------------------------    DINOF DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 21
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_DINOF(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_DINOF(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                    !DAYS
DO J3=1,nUNC_layer            !LAYERS
DO IX=1,nUNC_loopBEST    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_DINOF(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
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TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_DINOF(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.22)THEN
!------------------------------    CYANO DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 22
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_CYANO(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_CYANO(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopBEST    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_CYANO(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
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ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_CYANO(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.23)THEN
!------------------------------    NODUL DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 23
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_NODUL(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_NODUL(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopBEST    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_NODUL(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
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```
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
 5    '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_NODUL(IX,I3,I_L),I3=1,N3 )
      ENDDO
10    CLOSE(16)
      ENDDO


15    ELSEIF(KKX.EQ.24)THEN
      !------------------------------    CHLOR DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 24
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
20    UncertaintyAnalysis2%Uncertainty_CHLOR(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_CHLOR(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO
25
      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_CONFIDENCE_95_BEST.TXT'
30    open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
35    '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
40    FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                      !DAYS
45    DO J3=1,nUNC_layer              !LAYERS
      DO IX=1,nUNC_loopBEST    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_CHLOR(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
50    TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
55    ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
60    WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
65    CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
70    DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP=‘UNCERTAINTY/’//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
75    DO IX=1,nUNC_loopBEST
```

```
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_CHLOR(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO
 5
      ELSEIF(KKX.EQ.25)THEN
      !------------------------------  CRYPT DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 25
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
10    DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_CRYPT(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_CRYPT(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
15    ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
20    '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
25    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_SKEWNESS_BEST.TXT'
30    open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop

35    DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST   !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_CRYPT(IX,I3,J3)
      ENDDO
40    CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
45    TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
50    WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
55    CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
60    FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
65    open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_CRYPT(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
70    ENDDO



      ELSEIF(KKX.EQ.26)THEN
75    !------------------------------  MDIAT DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 26
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```
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_MDIAT(II,JJ,KK)=       &
 5    UncertaintyAnalysis00%Uncertainty_MDIAT(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

10    WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
15    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_KUTOSIS_BEST.TXT'
20    open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
25    '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
30    DO IX=1,nUNC_loopBEST    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_MDIAT(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
35    TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
40    WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
45    ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
50    CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
55    WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
60    WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_MDIAT(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO

65

      ELSEIF(KKX.EQ.27)THEN
      !------------------------------    FDIAT DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 27
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
70    DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_FDIAT(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_FDIAT(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
75    ENDDO
```

```
      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
 5    '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
10    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_SKEWNESS_BEST.TXT'
15    open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

20    DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_FDIAT(IX,I3,J3)
      ENDDO
25    CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
30    TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
35    WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
40    CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
45    FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
50    open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_FDIAT(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
55    ENDDO



      ELSEIF(KKX.EQ.28)THEN
60    !------------------------------    ZOOP1 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 28
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_ZOOP1(II,JJ,KK)=       &
65    UncertaintyAnalysis00%Uncertainty_ZOOP1(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

70    WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
```

```
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_ZOOP1(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_ZOOP1(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO

      ELSEIF(KKX.EQ.29)THEN
      !-------------------------------    ZOOP2 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 29
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_ZOOP2(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_ZOOP2(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_SKEWNESS_BEST.TXT'
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```
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
 5
      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_ZOOP2(IX,I3,J3)
10    ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
15    TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
20    WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
25    CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

30    WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
35    '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_ZOOP2(IX,I3,I_L),I3=1,N3 )
      ENDDO
40    CLOSE(16)
      ENDDO


      ELSEIF(KKX.EQ.30)THEN
45    !--------------------------------    ZOOP1 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 30
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_ZOOP3(II,JJ,KK)=       &
50    UncertaintyAnalysis00%Uncertainty_ZOOP3(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

55    WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
60    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS_BEST.TXT'
65    open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
70    '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
75    DO IX=1,nUNC_loopBEST    !nUNC_loop
```

```
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_ZOOP3(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_ZOOP3(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.31)THEN
!-------------------------------    ZOOP4 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 31
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_ZOOP4(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_ZOOP4(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopBEST    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_ZOOP4(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
```

```
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_ZOOP4(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO



ELSEIF(KKX.EQ.32)THEN
!------------------------------    ZOOP5 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 32
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_ZOOP5(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_ZOOP5(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopBEST    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_ZOOP5(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
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```
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_ZOOP5(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.33)THEN
!-------------------------------    SSOL1 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 33
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_SSOL1(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_SSOL1(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopBEST    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_SSOL1(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
```

```
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_SSOL1(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.34)THEN
!------------------------------    SSOL2 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 34
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_SSOL2(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_SSOL2(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopBEST    !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_SSOL2(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_SSOL2(IX,I3,I_L),I3=1,N3 )
```

```
ENDDO
CLOSE(16)
ENDDO

ELSEIF(KKX.EQ.35)THEN
!------------------------------  FISH1 DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 35
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_FISH1(II,JJ,KK)=       &
UncertaintyAnalysis00%Uncertainty_FISH1(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')   !record the wrong loop

DO I3=1,N3                      !DAYS
DO J3=1,nUNC_layer              !LAYERS
DO IX=1,nUNC_loopBEST   !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_FISH1(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_FISH1(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO


ELSEIF(KKX.EQ.36)THEN
!------------------------------  FISH2 DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 36
```

```
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_FISH2(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_FISH2(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_FISH2(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//       &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_FISH2(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO


      ELSEIF(KKX.EQ.37)THEN
      !------------------------------    FISH3 DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 37
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_FISH3(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_FISH3(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
```

```
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//  &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')  !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//  &
'_STD_BEST.TXT'
open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')  !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//  &
'_KUTOSIS_BEST.TXT'
open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')  !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//  &
'_SKEWNESS_BEST.TXT'
open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')  !record the wrong loop
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//  &
'_MEAN_BEST.TXT'
open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')  !record the wrong loop

DO I3=1,N3                  !DAYS
DO J3=1,nUNC_layer          !LAYERS
DO IX=1,nUNC_loopBEST       !nUNC_loop
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_FISH3(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//  &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)  !,POSITION='APPEND',ACTION='WRITE')  !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_FISH3(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO



ELSEIF(KKX.EQ.38)THEN
!-------------------------------  BAC DATA DND UNCERTAINTY ANALYSIS  ---------------------------- 38
DO II=1,nUNC_loopBEST
DO JJ=1,N3
DO KK=1,nUNC_layer
UncertaintyAnalysis2%Uncertainty_BAC(II,JJ,KK)=      &
UncertaintyAnalysis00%Uncertainty_BAC(NUMBER_error_SORTED(II),JJ,KK)
ENDDO
ENDDO
ENDDO

WRITE(CHAR_TEMP,*)nUNC_layer
FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//  &
'_CONFIDENCE_95_BEST.TXT'
open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')  !record the wrong loop
```

```
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                        !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_BAC(IX,I3,J3)
      ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
      TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
      WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
      CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

      WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_BAC(IX,I3,I_L),I3=1,N3 )
      ENDDO
      CLOSE(16)
      ENDDO

      ELSEIF(KKX.EQ.39)THEN
      !-------------------------------    PAR DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 39
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_PAR(II,JJ,KK)=       &
      UncertaintyAnalysis00%Uncertainty_PAR(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

      WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_KUTOSIS_BEST.TXT'
      open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//      &
      '_SKEWNESS_BEST.TXT'
```

```
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
 5
      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
      DO IX=1,nUNC_loopBEST    !nUNC_loop
      TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_PAR(IX,I3,J3)
10    ENDDO
      CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
      TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
      TEMP_DATA_STATISTIC(I3,J3,2)=Average
      TEMP_DATA_STATISTIC(I3,J3,3)=Std
15    TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
      TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
      ENDDO
      WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
      WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
20    WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
      WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
      WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
      ENDDO
      CLOSE(11)
25    CLOSE(12)
      CLOSE(13)
      CLOSE(14)
      CLOSE(15)

30    WRITE(CHAR_TEMP2,*)N3
      FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
      DO I_L=1,nUNC_layer
      WRITE(CHAR_TEMP1,*)I_L
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
35    '_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
      open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      DO IX=1,nUNC_loopBEST
      WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_PAR(IX,I3,I_L),I3=1,N3 )
      ENDDO
40    CLOSE(16)
      ENDDO


      ELSEIF(KKX.EQ.40)THEN
45    !-------------------------------    TCHLA DATA DND UNCERTAINTY ANALYSIS    ---------------------------- 40
      DO II=1,nUNC_loopBEST
      DO JJ=1,N3
      DO KK=1,nUNC_layer
      UncertaintyAnalysis2%Uncertainty_TCHLA(II,JJ,KK)=       &
50    UncertaintyAnalysis00%Uncertainty_TCHLA(NUMBER_error_SORTED(II),JJ,KK)
      ENDDO
      ENDDO
      ENDDO

55    WRITE(CHAR_TEMP,*)nUNC_layer
      FMT='(F15.3,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F20.8)'
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_CONFIDENCE_95_BEST.TXT'
      open(11,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
60    FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_STD_BEST.TXT'
      open(12,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_KUTOSIS_BEST.TXT'
65    open(13,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
      '_SKEWNESS_BEST.TXT'
      open(14,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
      FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//        &
70    '_MEAN_BEST.TXT'
      open(15,file=FILE_NAME_TEMP,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop

      DO I3=1,N3                    !DAYS
      DO J3=1,nUNC_layer            !LAYERS
75    DO IX=1,nUNC_loopBEST    !nUNC_loop
```

```
TEMP_DATA(IX) = UncertaintyAnalysis2%Uncertainty_TCHLA(IX,I3,J3)
ENDDO
CALL StatisticsPAR(nUNC_loop,TEMP_DATA,confidenceInt,Average,Std, F_KUTOSIS, Skewness)
TEMP_DATA_STATISTIC(I3,J3,1)=confidenceInt
TEMP_DATA_STATISTIC(I3,J3,2)=Average
TEMP_DATA_STATISTIC(I3,J3,3)=Std
TEMP_DATA_STATISTIC(I3,J3,4)=F_KUTOSIS
TEMP_DATA_STATISTIC(I3,J3,5)=Skewness
ENDDO
WRITE(11,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,1),JX=1,nUNC_layer)
WRITE(12,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,3),JX=1,nUNC_layer)
WRITE(13,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,4),JX=1,nUNC_layer)
WRITE(14,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,5),JX=1,nUNC_layer)
WRITE(15,FMT)TIME(I3),(TEMP_DATA_STATISTIC(I3,JX,2),JX=1,nUNC_layer)
ENDDO
CLOSE(11)
CLOSE(12)
CLOSE(13)
CLOSE(14)
CLOSE(15)

WRITE(CHAR_TEMP2,*)N3
FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP2)))//'F20.8)'
DO I_L=1,nUNC_layer
WRITE(CHAR_TEMP1,*)I_L
FILE_NAME_TEMP='UNCERTAINTY/'//TRIM(ADJUSTL(ADJUSTR(CAEYM_VARname(KKX))))//          &
'_LAYER_'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP1)))//'_BEST.TXT'
open(16,file=FILE_NAME_TEMP)    !,POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
DO IX=1,nUNC_loopBEST
WRITE(16,FMT)(UncertaintyAnalysis2%Uncertainty_TCHLA(IX,I3,I_L),I3=1,N3 )
ENDDO
CLOSE(16)
ENDDO

ENDIF    !IF(KK.EQ.1)THEN
ENDDO     !DO IKK=1,num_VAR_UNCERTAINTY


!DEALLOCATE ALL THE VARIABLE

IF(ALLOCATED(UncertaintyAnalysis00%NUMBER_UNCERTAINTY))                &
DEALLOCATE(UncertaintyAnalysis00%NUMBER_UNCERTAINTY)
IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_BAC))                   &
DEALLOCATE(UncertaintyAnalysis00%Uncertainty_BAC)
IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_CHLOR))                 &
DEALLOCATE(UncertaintyAnalysis00%Uncertainty_CHLOR)
IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_CRYPT))                 &
DEALLOCATE(UncertaintyAnalysis00%Uncertainty_CRYPT)
IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_CYANO))                 &
DEALLOCATE(UncertaintyAnalysis00%Uncertainty_CYANO)
IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_DINOF))                 &
DEALLOCATE(UncertaintyAnalysis00%Uncertainty_DINOF)
IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_DO))                    &
DEALLOCATE(UncertaintyAnalysis00%Uncertainty_DO)
IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_DOCL))                  &
DEALLOCATE(UncertaintyAnalysis00%Uncertainty_DOCL)
IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_DOCR))                  &
DEALLOCATE(UncertaintyAnalysis00%Uncertainty_DOCR)
IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_DONL))                  &
DEALLOCATE(UncertaintyAnalysis00%Uncertainty_DONL)
IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_DONR))                  &
DEALLOCATE(UncertaintyAnalysis00%Uncertainty_DONR)
IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_DOPL))                  &
DEALLOCATE(UncertaintyAnalysis00%Uncertainty_DOPL)
IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_DOPR))                  &
DEALLOCATE(UncertaintyAnalysis00%Uncertainty_DOPR)
IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_FDIAT))                 &
DEALLOCATE(UncertaintyAnalysis00%Uncertainty_FDIAT)
IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_FISH1))                 &
DEALLOCATE(UncertaintyAnalysis00%Uncertainty_FISH1)
IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_FISH2))                 &
DEALLOCATE(UncertaintyAnalysis00%Uncertainty_FISH2)
IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_FISH3))                 &
DEALLOCATE(UncertaintyAnalysis00%Uncertainty_FISH3)
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      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_MDIAT))                &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_MDIAT)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_NH4))                  &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_NH4)
 5    IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_NO3))                  &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_NO3)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_NODUL))                &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_NODUL)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_PAR))                  &
10    DEALLOCATE(UncertaintyAnalysis00%Uncertainty_PAR)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_PO4))                  &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_PO4)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_POCL))                 &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_POCL)
15    IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_POCR))                 &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_POCR)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_PONL))                 &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_PONL)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_PONR))                 &
20    DEALLOCATE(UncertaintyAnalysis00%Uncertainty_PONR)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_POPL))                 &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_POPL)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_POPR))                 &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_POPR)
25    IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_SSOL1))                &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_SSOL1)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_SSOL2))                &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_SSOL2)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_TCHLA))                &
30    DEALLOCATE(UncertaintyAnalysis00%Uncertainty_TCHLA)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_TEMPTURE))             &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_TEMPTURE)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_TN))                   &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_TN)
35    IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_TP))                   &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_TP)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_ZOOP1))                &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_ZOOP1)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_ZOOP2))                &
40    DEALLOCATE(UncertaintyAnalysis00%Uncertainty_ZOOP2)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_ZOOP3))                &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_ZOOP3)
      IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_ZOOP4))                &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_ZOOP4)
45    IF(ALLOCATED(UncertaintyAnalysis00%Uncertainty_ZOOP5))                &
      DEALLOCATE(UncertaintyAnalysis00%Uncertainty_ZOOP5)
      IF(ALLOCATED(UncertaintyAnalysis00%NUMBER_UNCERTAINTY))               &
      DEALLOCATE(UncertaintyAnalysis00%NUMBER_UNCERTAINTY)
      IF(ALLOCATED(UncertaintyAnalysis0%NUMBER_UNCERTAINTY))                &
50    DEALLOCATE(UncertaintyAnalysis0%NUMBER_UNCERTAINTY)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_BAC))                   &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_BAC)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_CHLOR))                 &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_CHLOR)
55    IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_CRYPT))                 &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_CRYPT)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_CYANO))                 &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_CYANO)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_DINOF))                 &
60    DEALLOCATE(UncertaintyAnalysis0%Uncertainty_DINOF)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_DO))                    &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_DO)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_DOCL))                  &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_DOCL)
65    IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_DOCR))                  &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_DOCR)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_DONL))                  &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_DONL)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_DONR))                  &
70    DEALLOCATE(UncertaintyAnalysis0%Uncertainty_DONR)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_DOPL))                  &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_DOPL)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_DOPR))                  &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_DOPR)
```

```
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_FDIAT))                &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_FDIAT)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_FISH1))                &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_FISH1)
 5    IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_FISH2))                &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_FISH2)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_FISH3))                &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_FISH3)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_MDIAT))                &
10    DEALLOCATE(UncertaintyAnalysis0%Uncertainty_MDIAT)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_NH4))                  &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_NH4)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_NO3))                  &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_NO3)
15    IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_NODUL))                &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_NODUL)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_PAR))                  &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_PAR)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_PO4))                  &
20    DEALLOCATE(UncertaintyAnalysis0%Uncertainty_PO4)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_POCL))                 &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_POCL)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_POCR))                 &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_POCR)
25    IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_PONL))                 &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_PONL)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_PONR))                 &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_PONR)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_POPL))                 &
30    DEALLOCATE(UncertaintyAnalysis0%Uncertainty_POPL)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_POPR))                 &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_POPR)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_SSOL1))                &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_SSOL1)
35    IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_SSOL2))                &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_SSOL2)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_TCHLA))                &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_TCHLA)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_TEMPTURE))             &
40    DEALLOCATE(UncertaintyAnalysis0%Uncertainty_TEMPTURE)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_TN))                   &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_TN)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_TP))                   &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_TP)
45    IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_ZOOP1))                &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_ZOOP1)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_ZOOP2))                &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_ZOOP2)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_ZOOP3))                &
50    DEALLOCATE(UncertaintyAnalysis0%Uncertainty_ZOOP3)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_ZOOP4))                &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_ZOOP4)
      IF(ALLOCATED(UncertaintyAnalysis0%Uncertainty_ZOOP5))                &
      DEALLOCATE(UncertaintyAnalysis0%Uncertainty_ZOOP5)
55    IF(ALLOCATED(UncertaintyAnalysis0%NUMBER_UNCERTAINTY))               &
      DEALLOCATE(UncertaintyAnalysis0%NUMBER_UNCERTAINTY)
      IF(ALLOCATED(UncertaintyAnalysis1%NUMBER_UNCERTAINTY))                    &
      DEALLOCATE(UncertaintyAnalysis1%NUMBER_UNCERTAINTY)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_BAC))                  &
60    DEALLOCATE(UncertaintyAnalysis1%Uncertainty_BAC)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_CHLOR))                &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_CHLOR)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_CRYPT))                &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_CRYPT)
65    IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_CYANO))                &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_CYANO)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_DINOF))                &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_DINOF)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_DO))                   &
70    DEALLOCATE(UncertaintyAnalysis1%Uncertainty_DO)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_DOCL))                 &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_DOCL)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_DOCR))                 &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_DOCR)
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      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_DONL))                &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_DONL)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_DONR))                &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_DONR)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_DOPL))                &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_DOPL)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_DOPR))                &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_DOPR)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_FDIAT))               &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_FDIAT)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_FISH1))               &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_FISH1)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_FISH2))               &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_FISH2)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_FISH3))               &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_FISH3)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_MDIAT))               &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_MDIAT)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_NH4))                 &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_NH4)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_NO3))                 &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_NO3)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_NODUL))               &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_NODUL)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_PAR))                 &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_PAR)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_PO4))                 &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_PO4)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_POCL))                &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_POCL)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_POCR))                &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_POCR)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_PONL))                &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_PONL)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_PONR))                &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_PONR)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_POPL))                &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_POPL)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_POPR))                &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_POPR)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_SSOL1))               &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_SSOL1)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_SSOL2))               &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_SSOL2)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_TCHLA))               &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_TCHLA)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_TEMPTURE))            &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_TEMPTURE)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_TN))                  &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_TN)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_TP))                  &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_TP)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_ZOOP1))               &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_ZOOP1)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_ZOOP2))               &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_ZOOP2)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_ZOOP3))               &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_ZOOP3)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_ZOOP4))               &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_ZOOP4)
      IF(ALLOCATED(UncertaintyAnalysis1%Uncertainty_ZOOP5))               &
      DEALLOCATE(UncertaintyAnalysis1%Uncertainty_ZOOP5)
      IF(ALLOCATED(UncertaintyAnalysis1%NUMBER_UNCERTAINTY))              &
      DEALLOCATE(UncertaintyAnalysis1%NUMBER_UNCERTAINTY)
      IF(ALLOCATED(UncertaintyAnalysis2%NUMBER_UNCERTAINTY))              &
      DEALLOCATE(UncertaintyAnalysis2%NUMBER_UNCERTAINTY)
      IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_BAC))                 &
      DEALLOCATE(UncertaintyAnalysis2%Uncertainty_BAC)
      IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_CHLOR))               &
      DEALLOCATE(UncertaintyAnalysis2%Uncertainty_CHLOR)
      IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_CRYPT))               &
      DEALLOCATE(UncertaintyAnalysis2%Uncertainty_CRYPT)
      IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_CYANO))               &
      DEALLOCATE(UncertaintyAnalysis2%Uncertainty_CYANO)
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IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_DINOF))          &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_DINOF)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_DO))             &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_DO)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_DOCL))           &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_DOCL)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_DOCR))           &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_DOCR)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_DONL))           &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_DONL)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_DONR))           &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_DONR)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_DOPL))           &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_DOPL)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_DOPR))           &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_DOPR)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_FDIAT))          &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_FDIAT)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_FISH1))          &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_FISH1)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_FISH2))          &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_FISH2)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_FISH3))          &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_FISH3)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_MDIAT))          &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_MDIAT)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_NH4))            &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_NH4)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_NO3))            &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_NO3)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_NODUL))          &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_NODUL)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_PAR))            &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_PAR)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_PO4))            &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_PO4)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_POCL))           &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_POCL)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_POCR))           &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_POCR)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_PONL))           &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_PONL)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_PONR))           &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_PONR)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_POPL))           &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_POPL)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_POPR))           &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_POPR)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_SSOL1))          &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_SSOL1)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_SSOL2))          &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_SSOL2)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_TCHLA))          &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_TCHLA)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_TEMPTURE))       &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_TEMPTURE)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_TN))             &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_TN)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_TP))             &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_TP)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_ZOOP1))          &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_ZOOP1)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_ZOOP2))          &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_ZOOP2)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_ZOOP3))          &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_ZOOP3)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_ZOOP4))          &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_ZOOP4)
IF(ALLOCATED(UncertaintyAnalysis2%Uncertainty_ZOOP5))          &
DEALLOCATE(UncertaintyAnalysis2%Uncertainty_ZOOP5)
IF(ALLOCATED(UncertaintyAnalysis2%NUMBER_UNCERTAINTY))         &
DEALLOCATE(UncertaintyAnalysis2%NUMBER_UNCERTAINTY)

end subroutine Uncertainty_ALL
```

```
subroutine Uncertainty_First(UncertaintyAnalysis1,nUNC_loopFIRST, nUNC_layer, N3,       &
                        No_Ser_Var_UNCERTAINTY, num_VAR_UNCERTAINTY)

integer, intent(in) :: nUNC_loopFIRST,nUNC_layer, N3
INTEGER ,INTENT (IN) :: No_Ser_Var_UNCERTAINTY(1:num_VAR_UNCERTAINTY)
TYPE (Uncertainty) :: UncertaintyAnalysis1 !this is the total error for all the error parmeters (MBE, MNBE...)

end subroutine Uncertainty_First

subroutine Uncertainty_Best(UncertaintyAnalysis2,nUNC_loopBEST, nUNC_layer, N3,       &
                                        No_Ser_Var_UNCERTAINTY, num_VAR_UNCERTAINTY)

integer, intent(in) :: nUNC_loopBEST,nUNC_layer, N3
INTEGER ,INTENT (IN) :: No_Ser_Var_UNCERTAINTY(1:num_VAR_UNCERTAINTY)
TYPE (Uncertainty) :: UncertaintyAnalysis2 !this is the total error for all the error parmeters (MBE, MNBE...)

end subroutine Uncertainty_Best

subroutine StatisticsPAR(nn,data0,confidenceInt,Average,Std, F_kutosis, Skewness)
integer, intent (in) :: nn
real (kind=8), intent (in) :: data0 (1:nn)
real (kind=8), intent (out) :: confidenceInt,Average,Std, F_kutosis, Skewness
!real (kind=8), parameter :: default_value=999999.0
if(nn>=20)then
ff=0.0
do i=1,nn
ff=ff+data0(i)/(nn*1.0)
ENDDO

Average=ff

ff1=0.0
do i=1,nn
ff1=ff1+(data0(i)-ff)**2/(nn*1.0-1.)
ENDDO

Std=sqrt(ff1)
confidenceInt=1.96*StD/sqrt(nn*1.0)

ff1=0.0
do i=1,nn
ff1=ff1+(data0(i)-Average)**4
ENDDO

F_kutosis=(1./(nn-1))*(ff1/(nn-1)/std**4)-3

ff1=0.0
do i=1,nn
ff1=ff1+(data0(i)-Average)**3
ENDDO

skewness=(1./(nn-1))*(ff1/(nn-1)/std**3)
else
confidenceInt=default_value
skewness=default_value
F_kutosis=default_value
Std=default_value
Average=default_value
ENDIF

END SUBROUTINE StatisticsPAR
END MODULE UncertaintyAnalysis
```

MAIN_Calibration.f90

```
!-------------------------------------------------------------------------------

!*******************************************************************************
!
!   PROGRAM: Auto-calibration of DYRESM-CAEDYM
!
!   MODIFICATION HISTORY:
!   --------------------
!   Original code : Liancong Luo 27/11/2008
!   Modified by Liancong Luo 28/05/2017
```

```
!*************************************************************************

 PROGRAM Main_Calibration

      USE DYRESM_COMMON
      USE RANDOM
!       USE DFLIB
!      use dFPORT
!USE IFCore
!USE IFPort
      USE PAR_READING
        use file_copy
      use Observation_reading
        use DYRESM_RUNNING
        use Julian_time
!       use netcdf
        use dyresm_data_reading
        USE NETCDF_RUNNING_PAR
        USE AUTO_CALIBRATION_PHY
        USE AUTO_CALIBRATION_BIO_CHM
        use dyresm_data_allocation
        USE ErrorCalculation
        USE create_dir
        use sorting_Error
      USE CAEDYM_NC_STATUS     !
      USE DeletingParameterFiles
      USE UncertaintyAnalysis
      USE DEPTH_INTERPOLATION
      USE deallocationVariable
CHARACTER(LEN=50) :: FMTT

   ! 5----------------read the dysim.nc data-------------------------------------
   ! 6----------------calculate the error (correlation) between model and obs data -----
   ! 7----------------change the par, chm, bio and sed parameters-----------------
   ! 8----------------output the error table--------------------------------------
   ! 9----------------select the best parameters for different target simulation (chla, TN, TP, Tem)---

call randomnumber(random_no)
 ! 1 ---------------get the parameters from auto-calibration config file -----------------

CALL parameter_input(NN_LINE_CHM,NN_LINE_BIO,NN_LINE_SED, Output_intervals,                &
                                  NN_LINE_CHM_PAR,NN_LINE_BIO_PAR,NN_LINE_SED_PAR,     &
                                   Note_chm,Note_BIO,Note_SED,      CURRENT_DIR,                          &
                                  Line_NO_chm_note,Line_NO_chm_number,                                    &
                                  Line_NO_BIO_note,Line_NO_BIO_NUMBER,                                    &
                                   Line_NO_SED_note,Line_NO_SED_NUMBER,                                   &
                                  par_chm,par_BIO,par_SED,NUM_LOOP,                                       &
       I_SWITCH_PHY,I_SWITCH_BIO,I_SWITCH_CHM,I_SWITCH_SED,I_fileSwitch,                                  &
       obsVar_data,NUMBER_obsVar,NUM_SIMULATED_VAR,Simulated_CAEYM_VARname,                               &
       FILENAME,PARa1,PARa0, Start_day,I_SWITCH_NC_DAILY_HOURLY,MODEL_DAYS,                               &
       timestep_DYRESM,NUMBER_ERROR,noSer_obsPar,no_obsPar,NUMBER_FILESsAVED,                             &
       nUNC_loopFirst,nUNC_loopBest,nUNC_layer,num_VAR_UNCERTAINTY,                                       &
DEPTH_UNCERTAINTY,BDAY_UNCERTAINTY,EDAY_UNCERTAINTY,No_Ser_Var_UNCERTAINTY,      &
                    I_SWITCH_UNCERTAINTY)

 ALLOCATE (par_chm_RANDOM(1:NUM_LOOP,1:NN_LINE_CHM_par))     !chm parameter
 ALLOCATE (par_BIO_RANDOM(1:NUM_LOOP,1:NN_LINE_BIO_par))     !BIO parameter
 ALLOCATE (par_SED_RANDOM(1:NUM_LOOP,1:NN_LINE_SED_par))     !SED parameter
 ALLOCATE(TOTAL_ERRORS%ERROR_TOTAL(1:NUM_LOOP,1:10),      &
TOTAL_ERRORS%SerNumber_ERROR_TOTAL(1:NUM_LOOP,1:10))
 ALLOCATE(NUMBER_error_SORTED(1:NUM_LOOP))

allocate(PARa1%PAR_BULK(1:NUM_LOOP))
allocate(PARa1%PAR_albedo(1:NUM_LOOP))
allocate(PARa1%PAR_emission(1:NUM_LOOP))
allocate(PARa1%PAR_CriticalWind(1:NUM_LOOP))
allocate(PARa1%PAR_output(1:NUM_LOOP))
allocate(PARa1%PAR_bubbler(1:NUM_LOOP))
allocate(PARa1%PAR_buoyant(1:NUM_LOOP))
allocate(PARa1%PAR_shear(1:NUM_LOOP))
allocate(PARa1%PAR_energy(1:NUM_LOOP))
allocate(PARa1%PAR_windStiring(1:NUM_LOOP))
allocate(PARa1%PAR_surface(1:NUM_LOOP))
allocate(PARa1%PAR_BBL(1:NUM_LOOP))
allocate(PARa1%PAR_VerticalMixing(1:NUM_LOOP))
```

```
allocate(PARa1%MinLayerThickness(1:NUM_LOOP))
allocate(PARa1%MaxLayerThickness(1:NUM_LOOP))
allocate(LoopNumber_CaedymError(1:NUM_loop))
!allocate(ERROR_ALLerror1(1:NUMBER_FILESsAVED))
!allocate(number_ERROR_ALLerror1(1:NUMBER_FILESsAVED))
allocate(ERROR_ALLerror0(1:NUMBER_FILESsAVED),ERROR_ALLerror1(1:NUMBER_FILESsAVED))
allocate(number_ERROR_ALLerror0(1:NUMBER_FILESsAVED),number_ERROR_ALLerror1(1:NUMBER_FILESsAVED))


! ALLOCATE THE ARRAY FOR UNCERTAINTY ANALYSIS
! INTEGER :: nUNC_loopFirst,nUNC_loopBest,nUNC_layer,num_VAR_UNCERTAINTY
! integer :: No_Ser_Var_UNCERTAINTY(1:num_VAR_UNCERTAINTY)
! real (kind=8) ::DEPTH_UNCERTAINTY(1:nUNC_layer),BDAY_UNCERTAINTY,EDAY_UNCERTAINTY

DO I=1,NUM_loop
LoopNumber_CaedymError(I)=0
ENDDO

NumberOfLoopNumber_CaedymError=0    !the number of Caedym Crash loops

 ! 2----------make a copy of the par, chm, bio and sed files ----------
 call    create_directory()
 ! 3----------read the observation data ----------
 call obs_data_reading(obsVar_data,NUMBER_obsVar)    !obsVar_data,NUMBER_obsVar


 ! 3----------run the model----------


open(77,file='FILES_ERROR/LoopNumber_Error.txt',POSITION='APPEND',ACTION='WRITE')    !record the wrong loop
open(911,file='FILES_ERROR/LoopNumber_deleted.txt',POSITION='APPEND',ACTION='WRITE')
open(912,file='FILES_ERROR/LoopNumber_NUMBER_FILESsAVED.txt',POSITION='APPEND',ACTION='WRITE')
open(913,file='FILES_ERROR/ERROR_NUMBER_FILESsAVED.txt',POSITION='APPEND',ACTION='WRITE')

!----------Physical and            chem or Bio or Sed----------

IF(I_SWITCH_PHY.EQ.1.AND.((I_SWITCH_CHM.EQ.1).OR.(I_SWITCH_BIO.EQ.1).OR.(I_SWITCH_SED.EQ.1)))THEN
    !PHYSICAL CALIBRATION

CALL CALIBRATION_PHY_CFG
(FILENAME,1,NUM_SIMULATED_VAR,Simulated_CAEYM_VARname,I_Output_Interval,timestep_DYRESM,     &
Output_intervals)    !RUNING WITH CAEDYM
!CALL RANDOM_SEED(RND$TIMESEED)
 I_ALLOCATED=0
 I_LOOP=1
 I_SWITCH_NCfileOK=0

 !$acc region

100 IF(I_LOOP.Le.NUM_LOOP)THEN
call randomnumber(random_no)

!call randomnumber(random_no)
!cALL DATE_AND_TIME(values=time)
!seed(1)=time(4)*(360000*time(5)+6000*time(6)+100*time(7)+time(8))
!call RANDOM_SEED()
!call RANDOM_NUMBER(AAA)
!write(6,*)RANDOM_NO
!! PAUSE 888
! CALL RANDOM_number(RANDOM_NO)


 call CALIBRATION_PHY (I_LOOP,FILENAME,PARA0,PARA1,I_fileSwitch)
!CAEDYM SWITCH, only physical model not including caedym
call CALIBRATION_BIOCHM (I_LOOP,I_SWITEH_CHM,I_SWITEH_BIO,I_SWITEH_SED,RANDOM_NO,      &
 FILENAME,par_chm,par_bio,par_sed,    par_chm_RANDOM,par_bio_RANDOM,par_sed_RANDOM,                &
          Line_NO_chm_note,Line_NO_chm_number, Line_NO_bio_note,Line_NO_bio_number,                 &
          Line_NO_sed_note,Line_NO_sed_number, Note_chm,Note_BIO,Note_SED,I_fileSwitch)

WRITE(*,*)'LOOP:----------',I_LOOP
call DYRESM_CAEDYM_RUNNING (FILENAME)

call NETCDF_RUNNING(CURRENT_DIR)
CALL DYRISM_STATUS ( NC_STATUS_DYSIM, AllVarTxt_alive, NUM_AllVarTxt,0)    !PRODUCING A NEW
ALLVAR_PAR.TXT
```

```
      if(NC_STATUS_DYSIM.eq.1.and.AllVarTxt_alive)then     !the nc file exists and is right.
      I_SWITCH_NCfileOK=1

      IF(I_ALLOCATED.EQ.0)THEN
 5    call dycd_data_allocation(n2,n3,dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var,                                    &
                                dyresmDO_Var,   dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var, &
                                dyresmTP_Var,dyresmCYANO_Var,dyresmFDIAT_Var,                                  &
                                dyresmTCHLA_Var,dyresmPOCL_Var,dyresmDOCL_Var,dyresmPOPL_Var,          &
                                dyresmDOPL_Var,dyresmPONL_Var,dyresmDONL_Var,dyresmPOCR_Var,           &
10                              dyresmDOCR_Var, dyresmPOPR_Var,dyresmDOPR_Var, dyresmPONR_Var,         &
                                dyresmDONR_Var, dyresmCRYPT_Var,dyresmNODUL_Var,dyresmDINOF_Var,       &
                                dyresmCHLOR_Var,dyresmMDIAT_Var,dyresmZOOP1_Var,dyresmZOOP2_Var,       &
                                dyresmZOOP3_Var, dyresmZOOP4_Var,dyresmZOOP5_Var,dyresmSSOL1_Var,      &
                                dyresmSSOL2_Var,dyresmFISH1_Var,dyresmFISH2_Var,dyresmFISH3_Var,       &
15                              dyresmBAC_Var,dyresmPAR_Var,NUM_AllVarTxt,NO_DIM_NETCDF,               &
                                I_SWITCH_PHY,I_SWITCH_CHM,I_SWITCH_BIO,I_SWITCH_SED)

      ALLOCATE(FOUTTIME(1:n3))
      CALL OutTime(FoutTime,n3,Start_day,I_SWITCH_NC_DAILY_HOURLY,timestep_DYRESM,Output_intervals)
20    I_ALLOCATED=1
      ELSE
      !I_ALLOCATED=0
      ENDIF

25    IF(I_ALLOCATED.EQ.1)THEN
      CALL dycd_data_reading(n2,n3,dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var,                                  &
                                dyresmDO_Var, NUM_AllVarTxt,                                                &
                                dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var,                &
                                dyresmTP_Var,dyresmCYANO_Var,dyresmFDIAT_Var,                          &
30                              dyresmTCHLA_Var,dyresmPOCL_Var,dyresmDOCL_Var,dyresmPOPL_Var,          &
                                dyresmDOPL_Var,dyresmPONL_Var,dyresmDONL_Var,dyresmPOCR_Var,           &
                                dyresmDOCR_Var, dyresmPOPR_Var,dyresmDOPR_Var, dyresmPONR_Var,         &
                                dyresmDONR_Var, dyresmCRYPT_Var,dyresmNODUL_Var,dyresmDINOF_Var,       &
                                dyresmCHLOR_Var,dyresmMDIAT_Var,dyresmZOOP1_Var,dyresmZOOP2_Var,       &
35                              dyresmZOOP3_Var, dyresmZOOP4_Var,dyresmZOOP5_Var,dyresmSSOL1_Var,      &
                                dyresmSSOL2_Var,dyresmFISH1_Var,dyresmFISH2_Var,dyresmFISH3_Var,       &
                                dyresmBAC_Var,dyresmPAR_Var,NO_DIM_NETCDF,FoutTime,                    &
                                I_SWITCH_PHY,I_SWITCH_CHM,I_SWITCH_BIO,I_SWITCH_SED)

40    !------------------- ERROR CALCULATION ------------------------------------

      do kk=1,NUMBER_obsVar     !for every VARIABLE

      CALL ComparisonDataSeclection(dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var,dyresmDO_Var,                     &
45                              dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var,                &
                                dyresmTP_Var,dyresmCYANO_Var,dyresmFDIAT_Var,                          &
                                dyresmTCHLA_Var,dyresmPOCL_Var,dyresmDOCL_Var,dyresmPOPL_Var,          &
                                dyresmDOPL_Var,dyresmPONL_Var,dyresmDONL_Var,dyresmPOCR_Var,           &
50                              dyresmDOCR_Var, dyresmPOPR_Var,dyresmDOPR_Var, dyresmPONR_Var,         &
                                dyresmDONR_Var, dyresmCRYPT_Var,dyresmNODUL_Var,dyresmDINOF_Var,       &
                                dyresmCHLOR_Var,dyresmMDIAT_Var,dyresmZOOP1_Var,dyresmZOOP2_Var,       &
                                dyresmZOOP3_Var, dyresmZOOP4_Var,dyresmZOOP5_Var,dyresmSSOL1_Var,      &
                                dyresmSSOL2_Var,dyresmFISH1_Var,dyresmFISH2_Var,dyresmFISH3_Var,       &
                                dyresmBAC_Var,dyresmPAR_Var,FoutTime,n2,n3,noSer_obsPar(kk),I_loop,    &
55                              obsVar_data, no_obsPar(kk),NUMBER_obsVar)     !wate rquality
      enddo
      !----------------------------CALCULATE THE TOTAL ERROR-----------------------------------
      !----------------------------CALCULATE THE TOTAL ERROR-----------------------------------
      IF(I_SWITCH_DELEparFile==1)THEN     !GET THE TOTAL ERROR FOR EVERY LOOP
60
      CALL
      ERORforEveryLoop(obsVar_data,NUM_LOOP,NUMBER_obsVar,NUMBER_ERROR,TOTAL_ERROR_everyLoop,I_loop)

      !-------------------------------------------------------------------------------
65    if(abs(TOTAL_ERROR_everyLoop)>=1.0E25)then

      IF(NUMBER_ERROR.LE.8)THEN
      TOTAL_ERROR_everyLoop=ABS(TOTAL_ERROR_everyLoop)
      else
70    TOTAL_ERROR_everyLoop=TOTAL_ERROR_everyLoop
      endif

      endif
      !-------------------------------------------------------------------------------
75
```

```
!-------------------------------------------------------------------------------
if(I_LOOP<=NUMBER_FILESsAVED)THEN
ERROR_ALLerror0(I_LOOP)=TOTAL_ERROR_everyLoop
number_ERROR_ALLerror0(I_LOOP)=I_Loop

IF(I_LOOP==NUMBER_FILESsAVED)THEN    !GET THE FIRST 500 ERRORS
write(911,'(i5,a30,f15.8)')i_loop,"               NOT_DELETED",TOTAL_ERROR_everyLoop


WRITE(CHAR_TEMP,*)NUMBER_FILESsAVED
FMT='(I8,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'I10)'
write(912,FMT)i_loop,(number_ERROR_ALLerror0(IIX),IIX=1,NUMBER_FILESsAVED)
FMT='(I8,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F30.5)'
write(913,FMT)i_loop,(ERROR_ALLerror0(IIX),IIX=1,NUMBER_FILESsAVED)

!write(911,'(i5,i30,F15.8)')i_loop,NUMBER_TEMP_delete,TOTAL_ERROR_everyLoop
!WRITE(CHAR_TEMP,*)I_LOOP
!FMT='('//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'I10)'

IF(NUMBER_ERROR.LE.8)THEN
CALL SORT_INCREASING(NUMBER_FILESsAVED,ERROR_ALLerror0,ERROR_ALLerror1,      &
                     number_ERROR_ALLerror0, number_ERROR_ALLerror1)
DO IXX=1,NUMBER_FILESsAVED
number_ERROR_ALLerror0(IXX)=number_ERROR_ALLerror1(IXX)
ERROR_ALLerror0(IXX)=ERROR_ALLerror1(IXX)
ENDDO


ELSE
CALL SORT_DECREASING(NUMBER_FILESsAVED,ERROR_ALLerror0,ERROR_ALLerror1,          &
                     number_ERROR_ALLerror0,number_ERROR_ALLerror1)
DO IXX=1,NUMBER_FILESsAVED
number_ERROR_ALLerror0(IXX)=number_ERROR_ALLerror1(IXX)
ERROR_ALLerror0(IXX)=ERROR_ALLerror1(IXX)
ENDDO
ENDIF

else
write(911,'(i5,a30,f15.8)')i_loop,"               NOT_DELETED",TOTAL_ERROR_everyLoop
WRITE(CHAR_TEMP,*)I_LOOP
FMT='(I8,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'I10)'
write(912,FMT)i_loop,(number_ERROR_ALLerror0(IIX),IIX=1,I_LOOP)
FMT='(I8,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F30.5)'
write(913,FMT)i_loop,(ERROR_ALLerror0(IIX),IIX=1,I_LOOP)


ENDIF     !IF(I_LOOP==NUMBER_FILESsAVED)THEN    !GET THE FIRST 500 ERRORS

endif

IF(I_LOOP>NUMBER_FILESsAVED)THEN    !GET THE FIRST 500 ERRORS
CALL DeletingParBioChmSedFiles(I_loop,TOTAL_ERROR_everyLoop,number_error,NUMBER_FILESsAVED,   &
                               number_ERROR_ALLerror1, number_ERROR_ALLerror0,                 &
                               ERROR_ALLerror1,ERROR_ALLerror0,NUMBER_TEMP_delete)

write(911,'(i5,i30,F15.8)')i_loop,NUMBER_TEMP_delete,TOTAL_ERROR_everyLoop

DO IXX=1,NUMBER_FILESsAVED
number_ERROR_ALLerror0(IXX)=number_ERROR_ALLerror1(IXX)
ERROR_ALLerror0(IXX)=ERROR_ALLerror1(IXX)
ENDDO


!write(911,'(i5,i30,F15.8)')i_loop,NUMBER_TEMP_delete,TOTAL_ERROR_everyLoop
WRITE(CHAR_TEMP,*)NUMBER_FILESsAVED
FMT='(I8,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'I10)'
write(912,FMT)i_loop,(number_ERROR_ALLerror0(IIX),IIX=1,NUMBER_FILESsAVED)
FMT='(I8,'//TRIM(ADJUSTL(ADJUSTR(CHAR_TEMP)))//'F30.5)'
write(913,FMT)i_loop,(ERROR_ALLerror0(IIX),IIX=1,NUMBER_FILESsAVED)


ENDIF
!-------------------------------------------------------------------------------
ENDIF    !IF(I_SWITCH_DELEparFile==1)THEN
!--------------------------END OF THE CALCULATION OF TOTAL ERROR-----------------------------------
```

```
!----------------------------END OF THE CALCULATION OF TOTAL ERROR-----------------------------------


!-------HERE TRANSFER THE MODEL DATA TO THE UNCERTAINTY ARRAY WITH VARIABLES SPECIFIED ------
!-------HERE TRANSFER THE MODEL DATA TO THE UNCERTAINTY ARRAY WITH VARIABLES SPECIFIED ------
!Main step: read the data from nc file, vertical interpolation, and data transfer------------

NO_OUTPUT_data=MODEL_DAYS*24.*3600./timestep_DYRESM      !how many output data, equal N3

CALL Uncertainty_Data(UncertaintyAna_WHOLE,UncertaintyAna_ALL,UncertaintyAna_FIRST,                    &
                      UncertaintyAna_BEST, NUM_loop,nUNC_loopFirst,nUNC_loopBest,nUNC_layer,           &
                      No_Ser_Var_UNCERTAINTY, num_VAR_UNCERTAINTY,DEPTH_UNCERTAINTY,                   &
                      dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var,dyresmDO_Var,                             &
                      dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var,                          &
                      dyresmTP_Var,dyresmCYANO_Var,dyresmFDIAT_Var,                                    &
                      dyresmTCHLA_Var,dyresmPOCL_Var,dyresmDOCL_Var,dyresmPOPL_Var,                    &
                      dyresmDOPL_Var,dyresmPONL_Var,dyresmDONL_Var,dyresmPOCR_Var,                     &
                            dyresmDOCR_Var, dyresmPOPR_Var,dyresmDOPR_Var, dyresmPONR_Var,             &
                            dyresmDONR_Var, dyresmCRYPT_Var,dyresmNODUL_Var,dyresmDINOF_Var,           &
                            dyresmCHLOR_Var,dyresmMDIAT_Var,dyresmZOOP1_Var,dyresmZOOP2_Var,           &
                            dyresmZOOP3_Var, dyresmZOOP4_Var,dyresmZOOP5_Var,dyresmSSOL1_Var,          &
                            dyresmSSOL2_Var,dyresmFISH1_Var,dyresmFISH2_Var,dyresmFISH3_Var,           &
                            dyresmBAC_Var,dyresmPAR_Var, FoutTime,n2,n3,I_loop,                        &
                            LoopNumber_CaedymError,NumberOfLoopNumber_CaedymError)

!------------------------ END OF AQUIRING DATA FOR UNCERTAINTY ANALYSIS --------------------------

ELSE
ENDIF !IF(I_ALLOCATED.EQ.1)THEN

elseif(NC_STATUS_DYSIM.eq.0.AND.AllVarTxt_alive)    THEN      !the nc file exists but is not right.
write(77,*)I_LOOP

NumberOfLoopNumber_CaedymError=NumberOfLoopNumber_CaedymError+1    !the number of Caedym Crash loops
LoopNumber_CaedymError(NumberOfLoopNumber_CaedymError)=I_LOOP
CALL DeletingParameterFile(I_LOOP)
write(911,'(i5,a30,a15)')i_loop,"      DELETED_WRONG_PAR","                  99999999"

WRITE(*,*)'LOOP:----------------------------------------------------------------',I_LOOP


WRITE(*,*)
I_SWITCH_NCfileOK=0
I_LOOP=I_LOOP+1
GO TO 100
elseif(.not.AllVarTxt_alive)then      !the nc file doesn't exists.
!WRITE(6,*)'LOOP',I_LOOP
WRITE(*,*)
WRITE(*,*)'LOOP:----------------------------------------------------------------',I_LOOP
WRITE(*,*)'LOOP:----------------------------------------------------------------',I_LOOP
WRITE(*,*)
write(77,*)I_LOOP

NumberOfLoopNumber_CaedymError=NumberOfLoopNumber_CaedymError+1    !the number of Caedym Crash loops
LoopNumber_CaedymError(NumberOfLoopNumber_CaedymError)=I_LOOP
CALL DeletingParameterFile(I_LOOP)
write(911,'(i5,a30,a15)')i_loop,"      DELETED_WRONG_PAR","                  99999999"
!IF(NUMBER_ERROR.LE.8)THEN
!TOTAL_ERROR_everyLoop=99999999.0
!else
!TOTAL_ERROR_everyLoop=99999999.0*(-1.)
!endif


I_SWITCH_NCfileOK=0
I_LOOP=I_LOOP+1
GO TO 100    !GO TO LOOP
ENDIF    !if(NC_STATUS_DYSIM.eq.1.and.AllVarTxt_alive)

WRITE(*,*)
WRITE(*,*)'LOOP:------------------------------',I_LOOP, "       IS    OK"
WRITE(*,*)

!WRITE(*,*)'LOOP:----------------------------------------------------',I_LOOP, "       IS    OK"
```

```
      WRITE(*,*)
      I_LOOP=I_LOOP+1
      GO TO 100    !GO TO LOOP
 5    ENDIF    !if(NC_STATUS_DYSIM.eq.1.and.AllVarTxt_alive)then      !the nc file exists and is right.

      !-------------------------START BIO-CHM CALIBRATION NOW ----------------------------
      !ENDIF      ! IF(RANDOM_NO.GE.0.0.AND.RANDOM_NO.LE.1.0)THEN
      !endif     !100 IF(I_LOOP.LT.NUM_LOOP)THEN
10    !ENDDO     ! DO I_LOOP=1,NUM_LOOP
      Deallocate(PARa1%PAR_BULK,PARa1%PAR_albedo,PARa1%PAR_emission,PARa1%PAR_CriticalWind,       &
      PARa1%PAR_output,PARa1%PAR_bubbler,PARa1%PAR_buoyant,PARa1%PAR_shear,PARa1%PAR_energy,    &
      PARa1%PAR_windStiring,PARa1%PAR_surface,PARa1%PAR_BBL,PARa1%PAR_VerticalMixing,                 &
      PARa1%MinLayerThickness,PARa1%MaxLayerThickness,par_chm_RANDOM,par_BIO_RANDOM,par_SED_RANDOM)
15    endif

      !CALCULATE ERROR AND SORT THE ERROR VALUES
      CALL TOTAL_ERROR_CALCULATION(obsVar_data,NUM_LOOP,LoopNumber_CaedymError,       &
                                   NumberOfLoopNumber_CaedymError,
20    &
                                   NUMBER_obsVar,NUMBER_ERROR,TOTAL_ERRORS,NUMBER_error_SORTED)

      !Uncertainty Analysis here by calling StatisticPar subtoutine.
      CALL Uncertainty_ALL(UncertaintyAna_WHOLE, UncertaintyAna_ALL, NUM_loop, nUNC_layer, N3,                    &
25                                 No_Ser_Var_UNCERTAINTY, num_VAR_UNCERTAINTY,FOUTTIME,                  &
                                   LoopNumber_CaedymError,NumberOfLoopNumber_CaedymError,nUNC_loop_VALID,  &
      UncertaintyAna_FIRST, nUNC_loopFirst,UncertaintyAna_BEST, nUNC_loopBEST, NUMBER_error_SORTED)


30    !end of Uncertainty Analysis here by calling StatisticPar subtoutine.

      !--------------------------------- PHYSICAL ONLY ----------------------------------------------------

      !HERE ONLY THE PHYSICAL MODEL IS CALIBRATED
35    ELSEIF(I_SWITCH_PHY.EQ.1.AND.((I_SWITCH_CHM.EQ.0).AND.(I_SWITCH_BIO.EQ.0).AND.      &
            (I_SWITCH_SED.EQ.0)))THEN       !PHYSICAL CALIBRATION

      CALL CALIBRATION_PHY_CFG
      (FILENAME,0,NUM_SIMULATED_VAR,Simulated_CAEYM_VARname,I_Output_Interval,timestep_DYRESM,     &
40                  Output_intervals)
      ! CALL SEED(RND$TIMESEED)

       DO I_LOOP=1,NUM_LOOP
      !call random_number (RANDOM_XX)    !  √ø¥€µƒÀÊª · ″æÕ∂º≤ª “ª —¯¡ À
45    call randomnumber(random_no)
      !CALL DATE_AND_TIME(values=TIME)
      !seed(1)=time(4)*(36000*time(5)+6000*time(6)+100*time(7)+time(8))
      !call random_seed(PUT=seed)
      !call random_number(HARVEST = RANDOM_NO)
50    !write(6,*)RANDOM_NO


      !CALL RANDOM(RANDOM_NO)
      call CALIBRATION_PHY (I_LOOP,FILENAME,PARA0,PARA1,I_fileSwitch)
55    !CAEDYM SWITCH, only physical model not including caedym
      WRITE(*,*)'LOOP:-----------------------------------------------------------',I_LOOP
      call DYRESM_CAEDYM_RUNNING (FILENAME)

      IF(I_LOOP.EQ.1)THEN
60    call NETCDF_RUNNING(CURRENT_DIR)

      CALL DYRISM_STATUS ( NC_STATUS_DYSIM, AllVarTxt_alive, NUM_AllVarTxt,1)
      call dycd_data_allocation(n2,n3,dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var,                                  &
                                dyresmDO_Var, dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var,    &
65                              dyresmTP_Var,dyresmCYANO_Var,dyresmFDIAT_Var,                            &
                                dyresmTCHLA_Var,dyresmPOCL_Var,dyresmDOCL_Var,dyresmPOPL_Var,        &
                                dyresmDOPL_Var,dyresmPONL_Var,dyresmDONL_Var,dyresmPOCR_Var,         &
                                dyresmDOCR_Var, dyresmPOPR_Var,dyresmDOPR_Var, dyresmPONR_Var,       &
                                dyresmDONR_Var, dyresmCRYPT_Var,dyresmNODUL_Var,dyresmDINOF_Var,     &
70                              dyresmCHLOR_Var,dyresmMDIAT_Var,dyresmZOOP1_Var,dyresmZOOP2_Var,     &
                                dyresmZOOP3_Var, dyresmZOOP4_Var,dyresmZOOP5_Var,dyresmSSOL1_Var,    &
                                dyresmSSOL2_Var,dyresmFISH1_Var,dyresmFISH2_Var,dyresmFISH3_Var,     &
                                dyresmBAC_Var,dyresmPAR_Var,NUM_AllVarTxt,NO_DIM_NETCDF    ,         &
                                I_SWITCH_PHY,I_SWITCH_CHM,I_SWITCH_BIO,I_SWITCH_SED)
75
```

```
ALLOCATE(FOUTTIME(1:n3))
CALL OutTime(FoutTime,n3,Start_day,I_SWITCH_NC_DAILY_HOURLY,timestep_DYRESM,Output_intervals)
ELSE
ENDIF

CALL dycd_data_reading(n2,n3,dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var,                    &
                       dyresmDO_Var, NUM_AllVarTxt,                                    &
                       dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var,         &
                       dyresmTP_Var,dyresmCYANO_Var,dyresmFDIAT_Var,                   &
                       dyresmTCHLA_Var,dyresmPOCL_Var,dyresmDOCL_Var,dyresmPOPL_Var,   &
                       dyresmDOPL_Var,dyresmPONL_Var,dyresmDONL_Var,dyresmPOCR_Var,    &
                       dyresmDOCR_Var, dyresmPOPR_Var,dyresmDOPR_Var, dyresmPONR_Var,  &
                       dyresmDONR_Var, dyresmCRYPT_Var,dyresmNODUL_Var,dyresmDINOF_Var,&
                       dyresmCHLOR_Var,dyresmMDIAT_Var,dyresmZOOP1_Var,dyresmZOOP2_Var,&
                       dyresmZOOP3_Var, dyresmZOOP4_Var,dyresmZOOP5_Var,dyresmSSOL1_Var,&
                       dyresmSSOL2_Var,dyresmFISH1_Var,dyresmFISH2_Var,dyresmFISH3_Var,&
                       dyresmBAC_Var,dyresmPAR_Var,NO_DIM_NETCDF,FoutTime,             &
                       I_SWITCH_PHY,I_SWITCH_CHM,I_SWITCH_BIO,I_SWITCH_SED)

!------------------- ERROR CALCULATION -----------------------------------
DO JJ=1,NUMBER_obsVar
if(trim(adjustl(adjustr(obsVar_data(jj)%name))).eq.trim(adjustl(adjustr(obs_VARname(2)))))then
if(noSer_obsPar(jj).eq.2)then
I_temp=jj
endif
endif
enddo

CALL ComparisonDataSeclection(dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var,dyresmDO_Var,      &
                       dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var,         &
                       dyresmTP_Var,dyresmCYANO_Var,dyresmFDIAT_Var,                   &
                       dyresmTCHLA_Var,dyresmPOCL_Var,dyresmDOCL_Var,dyresmPOPL_Var,   &
                       dyresmDOPL_Var,dyresmPONL_Var,dyresmDONL_Var,dyresmPOCR_Var,    &
                       dyresmDOCR_Var, dyresmPOPR_Var,dyresmDOPR_Var, dyresmPONR_Var,  &
                       dyresmDONR_Var, dyresmCRYPT_Var,dyresmNODUL_Var,dyresmDINOF_Var,&
                       dyresmCHLOR_Var,dyresmMDIAT_Var,dyresmZOOP1_Var,dyresmZOOP2_Var,&
                       dyresmZOOP3_Var, dyresmZOOP4_Var,dyresmZOOP5_Var,dyresmSSOL1_Var,&
                       dyresmSSOL2_Var,dyresmFISH1_Var,dyresmFISH2_Var,dyresmFISH3_Var,&
                       dyresmBAC_Var,dyresmPAR_Var,FoutTime,n2,n3,2,I_loop,            &
                       obsVar_data, I_temp,NUMBER_obsVar)     !TEMPERATURE

!---------------------------CALCULATE THE TOTAL ERROR-----------------------------------
!---------------------------CALCULATE THE TOTAL ERROR-----------------------------------
!---------------------------CALCULATE THE TOTAL ERROR-----------------------------------
IF(I_SWITCH_DELEparFile==1)THEN      !GET THE TOTAL ERROR FOR EVERY LOOP

CALL
ERRORforEveryLoop(obsVar_data,NUM_LOOP,NUMBER_obsVar,NUMBER_ERROR,TOTAL_ERROR_everyLoop,I_loop)

!-------------------------------------------------------------------------------
if(abs(TOTAL_ERROR_everyLoop)>=1.0E25)then
IF(NUMBER_ERROR.LE.8)THEN
TOTAL_ERROR_everyLoop=99999999.0
else
TOTAL_ERROR_everyLoop=99999999.0*(-1.)
endif
endif
!-------------------------------------------------------------------------------

!-------------------------------------------------------------------------------
if(I_LOOP<=NUMBER_FILESsAVED)THEN
ERROR_ALLerror0(I_LOOP)=TOTAL_ERROR_everyLoop
number_ERROR_ALLerror0(I_LOOP)=I_Loop

IF(I_LOOP==NUMBER_FILESsAVED)THEN    !GET THE FIRST 500 ERRORS

IF(NUMBER_ERROR.LE.8)THEN
CALL SORT_INCREASING (NUMBER_FILESsAVED,ERROR_ALLerror0,ERROR_ALLerror1,          &
number_ERROR_ALLerror0,number_ERROR_ALLerror1)
DO IXX=1,NUMBER_FILESsAVED
number_ERROR_ALLerror0(IXX)=number_ERROR_ALLerror1(IXX)
ERROR_ALLerror0(IXX)=ERROR_ALLerror1(IXX)
ENDDO
ELSE
```

```
      CALL SORT_DECREASING(NUMBER_FILESsAVED,ERROR_ALLerror0,ERROR_ALLerror1,     &
      number_ERROR_ALLerror0,number_ERROR_ALLerror1)
      DO IXX=1,NUMBER_FILESsAVED
      number_ERROR_ALLerror0(IXX)=number_ERROR_ALLerror1(IXX)
 5    ERROR_ALLerror0(IXX)=ERROR_ALLerror1(IXX)
      ENDDO
      ENDIF
      write(911,'(i5,a30,f15.8)')i_loop,"              NOT_DELETED",TOTAL_ERROR_everyLoop
      ELSE
10    write(911,'(i5,a30,f15.8)')i_loop,"              NOT_DELETED",TOTAL_ERROR_everyLoop
      ENDIF

      endif
      !-------------------------------------------------------------------------------
15
      !-------------------------------------------------------------------------------
      IF(I_LOOP>NUMBER_FILESsAVED)THEN    !GET THE FIRST 500 ERRORS
      CALL DeletingParBioChmSedFiles(I_loop,TOTAL_ERROR_everyLoop,number_error,NUMBER_FILESsAVED,   &
                                     number_ERROR_ALLerror1, number_ERROR_ALLerror0,                 &
20                                   ERROR_ALLerror1,ERROR_ALLerror0,NUMBER_TEMP_delete)
      !write(911,'(i5,a30,f15.8)')i_loop,"              NOT_DELETED",TOTAL_ERROR_everyLoop
      write(911,'(i5,i30,F15.8)')i_loop,NUMBER_TEMP_delete,TOTAL_ERROR_everyLoop

      DO IXX=1,NUMBER_FILESsAVED
25    number_ERROR_ALLerror0(IXX)=number_ERROR_ALLerror1(IXX)
      ERROR_ALLerror0(IXX)=ERROR_ALLerror1(IXX)
      ENDDO
      ENDIF
      !-------------------------------------------------------------------------------
30    ENDIF    !IF(I_SWITCH_DELEparFile==1)THEN



      !---------------------------END OF THE CALCULATION OF TOTAL ERROR-----------------------------------
35    !---------------------------END OF THE CALCULATION OF TOTAL ERROR-----------------------------------



      !-------HERE TRANSFER THE MODEL DATA TO THE UNCERTAINTY ARRAY WITH VARIABLES SPECIFIED ------
40    !-------HERE TRANSFER THE MODEL DATA TO THE UNCERTAINTY ARRAY WITH VARIABLES SPECIFIED ------
      !Main step: read the data from nc file, vertical interpolation, and data transfer------------

      NO_OUTPUT_data=MODEL_DAYS*24.*3600./timestep_DYRESM      !how many output data, equal N3
      CALL Uncertainty_Data(UncertaintyAna_WHOLE,UncertaintyAna_ALL,UncertaintyAna_FIRST,              &
45    UncertaintyAna_BEST, NUM_loop,nUNC_loopFirst,nUNC_loopBest,nUNC_layer,                           &
                  No_Ser_Var_UNCERTAINTY, num_VAR_UNCERTAINTY,DEPTH_UNCERTAINTY,                     &
                  dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var,dyresmDO_Var,                               &
                  dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var,                            &
                  dyresmTP_Var,dyresmCYANO_Var,dyresmFDIAT_Var,                                      &
50                dyresmTCHLA_Var,dyresmPOCL_Var,dyresmDOCL_Var,dyresmPOPL_Var,                      &
                                  dyresmDOPL_Var,dyresmPONL_Var,dyresmDONL_Var,dyresmPOCR_Var,       &
                                  dyresmDOCR_Var, dyresmPOPR_Var,dyresmDOPR_Var, dyresmPONR_Var,     &
                                  dyresmDONR_Var, dyresmCRYPT_Var,dyresmNODUL_Var,dyresmDINOF_Var,   &
                                  dyresmCHLOR_Var,dyresmMDIAT_Var,dyresmZOOP1_Var,dyresmZOOP2_Var,   &
55                                dyresmZOOP3_Var, dyresmZOOP4_Var,dyresmZOOP5_Var,dyresmSSOL1_Var,  &
                                  dyresmSSOL2_Var,dyresmFISH1_Var,dyresmFISH2_Var,dyresmFISH3_Var,   &
                                  dyresmBAC_Var,dyresmPAR_Var, FoutTime,n2,n3,I_loop,                &
                                  LoopNumber_CaedymError,NumberOfLoopNumber_CaedymError)

60    WRITE(*,*)
      WRITE(*,*)'LOOP:',I_LOOP
      WRITE(*,*)

      ENDDO ! DO I_LOOP=1,NUM_LOOP                              !END OF THE PHYSICAL CALIBRATION
65
      !THIS IS THE END OF PHYSICLA MODEL RUNNING.....................................
      !-----------------------GET THE BEST PHYSICAL PAREMETERS HERE--------------------------
      ! Get the best physical parameters based on the correlation, RMSE, MSE, E and other pars.
      ! NUMBER_ERROR IS THE ERROR FOR SORTING (E.G. RMSE, RMNSE, MBE ET AL.)
70
      !call sorting(obsVar_data,I_temp,NUMBER_obsVar,num_loop,LOOPnum_BEST,NUMBER_ERROR)
      !open(88,file='./Files_error/LoopNumber_BEST.txt',POSITION='APPEND',ACTION='WRITE')
      !
      !CALL BEST_PHY_PAR (LOOPnum_BEST,PARA1,FILENAME)
75    !write(88,*)"The loop number for BEST PAR is", LOOPnum_BEST
```

```
!close(88)

NumberOfLoopNumber_CaedymError=0 !the number of Caedym Crash loops
!LoopNumber_CaedymError(NumberOfLoopNumber_CaedymError)=I_LOOP

DEallocate(PARa1%PAR_BULK,PARa1%PAR_albedo,PARa1%PAR_emission,PARa1%PAR_CriticalWind,       &
PARa1%PAR_output,PARa1%PAR_bubbler,PARa1%PAR_buoyant,PARa1%PAR_shear,PARa1%PAR_energy,    &
PARa1%PAR_windStiring,PARa1%PAR_surface,PARa1%PAR_BBL,PARa1%PAR_VerticalMixing,                &
PARa1%MinLayerThickness,PARa1%MaxLayerThickness,par_chm_RANDOM,par_BIO_RANDOM,par_SED_RANDOM)

!CALCULATE ERROR AND SORT THE ERROR VALUES
CALL TOTAL_ERROR_CALCULATION(obsVar_data,NUM_LOOP,LoopNumber_CaedymError,0,      &
                             NUMBER_obsVar,NUMBER_ERROR,TOTAL_ERRORS,NUMBER_error_SORTED)

!Uncertainty Analysis here by calling StatisticPar subtoutine.
CALL Uncertainty_ALL(UncertaintyAna_WHOLE, UncertaintyAna_ALL, NUM_loop, nUNC_layer, N3,                  &
                                    No_Ser_Var_UNCERTAINTY, num_VAR_UNCERTAINTY,FOUTTIME,                  &
                                LoopNumber_CaedymError,NumberOfLoopNumber_CaedymError,nUNC_loop_VALID,     &
      UncertaintyAna_FIRST, nUNC_loopFirst,UncertaintyAna_BEST, nUNC_loopBEST, NUMBER_error_SORTED)

!DEALLOCATE(dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var)

!--------------------No physical, Only chm or bio or sed-----------------------------------------
!--------------------No physical, Only chm or bio or sed-----------------------------------------
!--------------------No physical, Only chm or bio or sed-----------------------------------------

Elseif(I_SWITCH_PHY.EQ.0.AND.((I_SWITCH_CHM.EQ.1).OR.(I_SWITCH_BIO.EQ.1).OR.(I_SWITCH_SED.EQ.1)))   &
THEN       !ALL CALIBRATED.

 CALL CALIBRATION_PHY_CFG (FILENAME,1,NUM_SIMULATED_VAR,Simulated_CAEYM_VARname,       &
                           I_Output_Interval,timestep_DYRESM, Output_intervals)    !RUNING WITH CAEDYM
 !CALL SEED(RND$TIMESEED)

!LOOP-------------------------------------------------------------------------------
I_ALLOCATED=0
I_LOOP=1
I_SWITCH_NCfileOK=0
250 IF(I_LOOP.LE.NUM_LOOP)THEN
call randomnumber(random_no)
!CALL DATE_AND_TIME(values=TIME)
!seed(1)=time(4)*(36000*time(5)+6000*time(6)+100*time(7)+time(8))
!call random_seed(PUT=seed)
!call random_number(HARVEST = RANDOM_NO)
!write(6,*)RANDOM_NO
!! PAUSE 888

!CALL RANDOM(RANDOM_NO)
call CALIBRATION_BIOCHM (I_LOOP,I_SWITEH_CHM,I_SWITEH_BIO,I_SWITEH_SED,RANDOM_NO,     &
                         FILENAME, par_chm,par_bio,par_sed,                                  &
                         par_chm_RANDOM,par_bio_RANDOM,par_sed_RANDOM,                       &
                          Line_NO_chm_note,Line_NO_chm_number,                          &
                           Line_NO_bio_note,Line_NO_bio_number,                         &
                          Line_NO_sed_note,Line_NO_sed_number,                          &
                          Note_chm,Note_BIO,Note_SED,I_fileSwitch)
  WRITE(*,*)'LOOP:----------------------------------------------------------------',I_LOOP
call DYRESM_CAEDYM_RUNNING (FILENAME)


!WRITE(6,*)NC_STATUS_DYSIM, AllVarTxt_alive
!! PAUSE 88

!IF(I_LOOP.EQ.1)THEN
call NETCDF_RUNNING(CURRENT_DIR)
!ENDIF

CALL DYRISM_STATUS ( NC_STATUS_DYSIM, AllVarTxt_alive,NUM_AllVarTxt,0)

!WRITE(6,*)!     "I_LOOP",I_LOOP     !,NC_STATUS_DYSIM,AllVarTxt_alive
WRITE(6,*)      !"I_LOOP",I_LOOP     !,NC_STATUS_DYSIM,AllVarTxt_alive
WRITE(6,*)"THIS IS THE LOOP",I_LOOP,"              THE NC FILE IS",
NC_STATUS_DYSIM    !,NC_STATUS_DYSIM,AllVarTxt_alive
!WRITE(6,*)"THIS IS THE LOOP",I_LOOP,"              THE NC FILE IS",
NC_STATUS_DYSIM    !,NC_STATUS_DYSIM,AllVarTxt_alive
!WRITE(6,*)!     "I_LOOP",I_LOOP     !,NC_STATUS_DYSIM,AllVarTxt_alive
```

```
      WRITE(6,*)!     "I_LOOP",I_LOOP     !,NC_STATUS_DYSIM,AllVarTxt_alive

      !PAUSE 6666

 5    if(NC_STATUS_DYSIM.eq.1.and.AllVarTxt_alive)then     !the nc file exists and is right.
      I_SWITCH_NCfileOK=1
      IF(I_ALLOCATED.EQ.0)THEN
      call dycd_data_allocation(n2,n3,dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var,                                  &
                        dyresmDO_Var, dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var,                  &
10                      dyresmTP_Var,dyresmCYANO_Var,dyresmFDIAT_Var,                                          &
                        dyresmTCHLA_Var,dyresmPOCL_Var,dyresmDOCL_Var,dyresmPOPL_Var,                          &
                                  dyresmDOPL_Var,dyresmPONL_Var,dyresmDONL_Var,dyresmPOCR_Var,                 &
                                  dyresmDOCR_Var, dyresmPOPR_Var,dyresmDOPR_Var, dyresmPONR_Var,               &
                                  dyresmDONR_Var, dyresmCRYPT_Var,dyresmNODUL_Var,dyresmDINOF_Var,             &
15                                dyresmCHLOR_Var,dyresmMDIAT_Var,dyresmZOOP1_Var,dyresmZOOP2_Var,             &
                                  dyresmZOOP3_Var, dyresmZOOP4_Var,dyresmZOOP5_Var,dyresmSSOL1_Var,            &
                                  dyresmSSOL2_Var,dyresmFISH1_Var,dyresmFISH2_Var,dyresmFISH3_Var,             &
                                  dyresmBAC_Var,dyresmPAR_Var,NUM_AllVarTxt,NO_DIM_NETCDF,                     &
                                  I_SWITCH_PHY,I_SWITCH_CHM,I_SWITCH_BIO,I_SWITCH_SED)
20    ALLOCATE(FOUTTIME(1:n3))
      I_ALLOCATED=1
      ELSE
      ENDIF    !IF(I_ALLOCATED.EQ.0)THEN

25

      !call NETCDF_RUNNING(CURRENT_DIR)
      !write(*,*)'Loop',I_loop,'                    I_ALLOCATED IS',I_ALLOCATED
      !write(*,*)
      !write(*,*)
30
      !WRITE(6,*)I_ALLOCATED
      !! PAUSE 888

      IF(I_ALLOCATED.EQ.1)THEN
35    CALL OutTime(FoutTime,n3,Start_day,I_SWITCH_NC_DAILY_HOURLY,timestep_DYRESM,Output_intervals)
      CALL dycd_data_reading(n2,n3,dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var,                                     &
              dyresmDO_Var, NUM_AllVarTxt, dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var,             &
                        dyresmTP_Var,dyresmCYANO_Var,dyresmFDIAT_Var,                                          &
                        dyresmTCHLA_Var,dyresmPOCL_Var,dyresmDOCL_Var,dyresmPOPL_Var,                          &
40                                dyresmDOPL_Var,dyresmPONL_Var,dyresmDONL_Var,dyresmPOCR_Var,                 &
                                  dyresmDOCR_Var, dyresmPOPR_Var,dyresmDOPR_Var, dyresmPONR_Var,               &
                                  dyresmDONR_Var, dyresmCRYPT_Var,dyresmNODUL_Var,dyresmDINOF_Var,             &
                                  dyresmCHLOR_Var,dyresmMDIAT_Var,dyresmZOOP1_Var,dyresmZOOP2_Var,             &
                                  dyresmZOOP3_Var, dyresmZOOP4_Var,dyresmZOOP5_Var,dyresmSSOL1_Var,            &
45                                dyresmSSOL2_Var,dyresmFISH1_Var,dyresmFISH2_Var,dyresmFISH3_Var,             &
                                  dyresmBAC_Var,dyresmPAR_Var,NO_DIM_NETCDF,FoutTime,                          &
                                  I_SWITCH_PHY,I_SWITCH_CHM,I_SWITCH_BIO,I_SWITCH_SED)


50    !------------------- ERROR CALCULATION ----------------------------------
      do kk=1,NUMBER_obsVar
      if(trim(adjustl(adjustr(obsVar_data(kk)%name))).ne.trim(adjustl(adjustr(obs_VARname(2)))))then
      if(noSer_obsPar(kk).ne.2)then

55
      CALL ComparisonDataSeclection(dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var,dyresmDO_Var,                       &
                              dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var,                          &
                              dyresmTP_Var,dyresmCYANO_Var,dyresmFDIAT_Var,                                    &
                              dyresmTCHLA_Var,dyresmPOCL_Var,dyresmDOCL_Var,dyresmPOPL_Var,                    &
60                                dyresmDOPL_Var,dyresmPONL_Var,dyresmDONL_Var,dyresmPOCR_Var,                 &
                                  dyresmDOCR_Var, dyresmPOPR_Var,dyresmDOPR_Var, dyresmPONR_Var,               &
                                  dyresmDONR_Var, dyresmCRYPT_Var,dyresmNODUL_Var,dyresmDINOF_Var,             &
                                  dyresmCHLOR_Var,dyresmMDIAT_Var,dyresmZOOP1_Var,dyresmZOOP2_Var,             &
                                  dyresmZOOP3_Var, dyresmZOOP4_Var,dyresmZOOP5_Var,dyresmSSOL1_Var,            &
65                                dyresmSSOL2_Var,dyresmFISH1_Var,dyresmFISH2_Var,dyresmFISH3_Var,             &
                                dyresmBAC_Var,dyresmPAR_Var,FoutTime,n2,n3,noSer_obsPar(kk),I_loop,            &
                               obsVar_data, no_obsPar(kk),NUMBER_obsVar)     !wate rquality


70    !---------------------------CALCULATE THE TOTAL ERROR-----------------------------------
      !---------------------------CALCULATE THE TOTAL ERROR-----------------------------------
      !---------------------------CALCULATE THE TOTAL ERROR-----------------------------------

      CALL ERRORforEveryLoop(obsVar_data,NUM_LOOP,NUMBER_obsVar,NUMBER_ERROR,          &
75          TOTAL_ERROR_everyLoop,I_loop)
```

```
!-------------------------------------------------------------------------------
if(I_LOOP<=NUMBER_FILESsAVED)THEN
ERROR_ALLerror0(I_LOOP)=TOTAL_ERROR_everyLoop
number_ERROR_ALLerror0(I_LOOP)=I_Loop
IF(I_LOOP==NUMBER_FILESsAVED)THEN    !GET THE FIRST 500 ERRORS
write(911,'(i5,a30,f15.8)')i_loop,"                NOT_DELETED",TOTAL_ERROR_everyLoop
!write(911,'(i5,i30,F15.8)')i_loop,NUMBER_TEMP_delete,TOTAL_ERROR_everyLoop

IF(NUMBER_ERROR.LE.8)THEN
CALL SORT_INCREASING(NUMBER_FILESsAVED,ERROR_ALLerror0,ERROR_ALLerror1,        &
            number_ERROR_ALLerror0,number_ERROR_ALLerror1)
DO IXX=1,NUMBER_FILESsAVED
number_ERROR_ALLerror0(IXX)=number_ERROR_ALLerror1(IXX)
ERROR_ALLerror0(IXX)=ERROR_ALLerror1(IXX)
ENDDO
ELSE
CALL SORT_DECREASING(NUMBER_FILESsAVED,ERROR_ALLerror0,ERROR_ALLerror1,       &
            number_ERROR_ALLerror0,number_ERROR_ALLerror1)
DO IXX=1,NUMBER_FILESsAVED
number_ERROR_ALLerror0(IXX)=number_ERROR_ALLerror1(IXX)
ERROR_ALLerror0(IXX)=ERROR_ALLerror1(IXX)
ENDDO
ENDIF
else
write(911,'(i5,a30,f15.8)')i_loop,"                NOT_DELETED",TOTAL_ERROR_everyLoop
!write(911,'(i5,i30,F15.8)')i_loop,NUMBER_TEMP_delete,TOTAL_ERROR_everyLoop
ENDIF
endif
!-------------------------------------------------------------------------------

!-------------------------------------------------------------------------------
IF(I_LOOP>NUMBER_FILESsAVED)THEN    !GET THE FIRST 500 ERRORS
CALL DeletingParBioChmSedFiles(I_loop,TOTAL_ERROR_everyLoop,number_error,NUMBER_FILESsAVED,    &
                                    number_ERROR_ALLerror1, number_ERROR_ALLerror0,                    &
                                    ERROR_ALLerror1,ERROR_ALLerror0,NUMBER_TEMP_delete)
!write(911,'(i5,a30,f15.8)')i_loop,"                NOT_DELETED",TOTAL_ERROR_everyLoop
write(911,'(i5,i30,F15.8)')i_loop,NUMBER_TEMP_delete,TOTAL_ERROR_everyLoop


DO IXX=1,NUMBER_FILESsAVED
number_ERROR_ALLerror0(IXX)=number_ERROR_ALLerror1(IXX)
ERROR_ALLerror0(IXX)=ERROR_ALLerror1(IXX)
ENDDO
ENDIF
!-------------------------------------------------------------------------------
ENDIF    !IF(I_SWITCH_DELEparFile==1)THEN
!--------------------------END OF THE CALCULATION OF TOTAL ERROR-----------------------------------
!--------------------------END OF THE CALCULATION OF TOTAL ERROR-----------------------------------


!-------HERE TRANSFER THE MODEL DATA TO THE UNCERTAINTY ARRAY WITH VARIABLES SPECIFIED ------
!-------HERE TRANSFER THE MODEL DATA TO THE UNCERTAINTY ARRAY WITH VARIABLES SPECIFIED ------
!Main step: read the data from nc file, vertical interpolation, and data transfer------------

NO_OUTPUT_data=MODEL_DAYS*24.*3600./timestep_DYRESM      !how many output data, equal N3
CALL Uncertainty_Data(UncertaintyAna_WHOLE,UncertaintyAna_ALL,UncertaintyAna_FIRST,                &
UncertaintyAna_BEST, NUM_loop,nUNC_loopFirst,nUNC_loopBest,nUNC_layer,                              &
                        No_Ser_Var_UNCERTAINTY, num_VAR_UNCERTAINTY,DEPTH_UNCERTAINTY,      &
                      dyresmLAYER_HTS_Var,dyresmTEMPTURE_Var,dyresmDO_Var,                          &
                        dyresmNO3_Var,dyresmNH4_Var,dyresmTN_Var,dyresmPO4_Var,                     &
                        dyresmTP_Var,dyresmCYANO_Var,dyresmFDIAT_Var,                               &
                        dyresmTCHLA_Var,dyresmPOCL_Var,dyresmDOCL_Var,dyresmPOPL_Var,               &
                                dyresmDOPL_Var,dyresmPONL_Var,dyresmDONL_Var,dyresmPOCR_Var,        &
                                dyresmDOCR_Var, dyresmPOPR_Var,dyresmDOPR_Var, dyresmPONR_Var,      &
                                dyresmDONR_Var, dyresmCRYPT_Var,dyresmNODUL_Var,dyresmDINOF_Var,    &
                                dyresmCHLOR_Var,dyresmMDIAT_Var,dyresmZOOP1_Var,dyresmZOOP2_Var,    &
                                dyresmZOOP3_Var, dyresmZOOP4_Var,dyresmZOOP5_Var,dyresmSSOL1_Var,    &
                                dyresmSSOL2_Var,dyresmFISH1_Var,dyresmFISH2_Var,dyresmFISH3_Var,    &
                                dyresmBAC_Var,dyresmPAR_Var, FoutTime,n2,n3,I_loop,                 &
                                LoopNumber_CaedymError,NumberOfLoopNumber_CaedymError)

!------------------------ END OF AQUIRING DATA FOR UNCERTAINTY ANALYSIS --------------------------
!------------------------ END OF AQUIRING DATA FOR UNCERTAINTY ANALYSIS --------------------------
```

```
endif
enddo

ELSE    !IF(I_ALLOCATED.EQ.1)
ENDIF    !IF(I_ALLOCATED.EQ.1)
elseif(NC_STATUS_DYSIM.eq.0.AND.AllVarTxt_alive)    THEN      !.and.AllVarTxt_alive)then !the nc file exists and is right.
  !problem with AllVar.txt, actually problem with the model running
!WRITE(6,*)'LOOP',I_LOOP
!write(6,*)'Allvar.txt is wrong with CAEDYM Variable listing'
write(77,*)I_LOOP
NumberOfLoopNumber_CaedymError=NumberOfLoopNumber_CaedymError+1    !the number of Caedym Crash loops
LoopNumber_CaedymError(NumberOfLoopNumber_CaedymError)=I_LOOP
CALL DeletingParameterFile(I_LOOP)
write(911,'(i5,a30,a15)')i_loop,"      DELETED_WRONG_PAR","                  99999999"

!write(911,'(i5,i30,F15.8)')i_loop,NUMBER_TEMP_delete,TOTAL_ERROR_everyLoop


WRITE(*,*)
WRITE(*,*)'LOOP (IN THE SIMULATION):',I_LOOP
WRITE(*,*)
I_SWITCH_NCfileOK=0
I_LOOP=I_LOOP+1
GO TO 250
elseif(.not.AllVarTxt_alive)then      !the nc file doesn't exists.
!WRITE(6,*)'LOOP',I_LOOP
write(77,*)I_LOOP
NumberOfLoopNumber_CaedymError=NumberOfLoopNumber_CaedymError+1    !the number of Caedym Crash loops
LoopNumber_CaedymError(NumberOfLoopNumber_CaedymError)=I_LOOP
CALL DeletingParameterFile(I_LOOP)
write(911,'(i5,a30,a15)')i_loop,"      DELETED_WRONG_PAR","                  99999999"


WRITE(*,*)
WRITE(*,*)'LOOP (IN THE MAIN SIMULATION) :',I_LOOP
WRITE(*,*)
I_SWITCH_NCfileOK=0
I_LOOP=I_LOOP+1
GO TO 250    !GO TO LOOP
ENDIF    !if(NC_STATUS_DYSIM.eq.1.and.AllVarTxt_alive)

WRITE(*,*)
WRITE(*,*)'LOOP:------------------------------',I_LOOP, "        IS    OK"
WRITE(*,*)

WRITE(*,*)
I_LOOP=I_LOOP+1
GO TO 250    !GO TO LOOP
endif    !THIS IS THE END OF LOOP SIMULATIONS


!$acc end region


!ENDDO !200 DO I_LOOP=1,NUM_LOOP
!------------------------START BIO-CHM CALIBRATION NOW ----------------------------


!call sorting(obsVar_data,nn_obs,NUMBER_obsVar,num_loop,LOOPnum_BEST,NUMBER_ERROR)
!CALL BEST_BIOCHM_PAR (FILENAME, par_chm_RANDOM,par_bio_RANDOM,par_sed_RANDOM,                    &
!                                        Line_NO_chm_note,Line_NO_chm_number,                    &
!                                        Line_NO_bio_note,Line_NO_bio_number,                    &
!                                        Line_NO_sed_note,Line_NO_sed_number,                    &
!                                        Note_chm,Note_BIO,Note_SED, LOOPnum_BEST)
IF(I_LOOP.GE.NUM_LOOP)THEN
!DEALLOCATE (par_chm_RANDOM,par_BIO_RANDOM,par_SED_RANDOM)
DEallocate(PARa1%PAR_BULK,PARa1%PAR_albedo,PARa1%PAR_emission,PARa1%PAR_CriticalWind,       &
PARa1%PAR_output,PARa1%PAR_bubbler,PARa1%PAR_buoyant,PARa1%PAR_shear,PARa1%PAR_energy,    &
PARa1%PAR_windStiring,PARa1%PAR_surface,PARa1%PAR_BBL,PARa1%PAR_VerticalMixing,                &
PARa1%MinLayerThickness,PARa1%MaxLayerThickness,par_chm_RANDOM,par_BIO_RANDOM,par_SED_RANDOM)
ENDIF
CALL TOTAL_ERROR_CALCULATION(obsVar_data,NUM_LOOP,LoopNumber_CaedymError,    &
                                NumberOfLoopNumber_CaedymError,                                &
```

```
                    NUMBER_obsVar,NUMBER_ERROR,TOTAL_ERRORS,NUMBER_error_SORTED)

!Uncertainty Analysis here by calling StatisticPar subtoutine.
CALL Uncertainty_ALL(UncertaintyAna_WHOLE, UncertaintyAna_ALL, NUM_loop, nUNC_layer, N3,                &
                        No_Ser_Var_UNCERTAINTY, num_VAR_UNCERTAINTY,FOUTTIME,                &
                    LoopNumber_CaedymError,NumberOfLoopNumber_CaedymError,nUNC_loop_VALID,     &
                    UncertaintyAna_FIRST, nUNC_loopFirst,UncertaintyAna_BEST, nUNC_loopBEST,          &
                    NUMBER_error_SORTED)

endif    !IF(I_SWITCH_PHY.EQ.1)THEN      !PHYSICAL CALIBRATION

!DEALLOCATE (par_chm_RANDOM,par_BIO_RANDOM,par_SED_RANDOM)

CLOSE(911)
CLOSE(912)
CLOSE(913)
CLOSE(77)

write(6,*)
write(6,*)'THERE ARE',NumberOfLoopNumber_CaedymError,'LOOPS WITH CAEDYM ERROR'
write(6,*)
!NumberOfLoopNumber_CaedymError=NumberOfLoopNumber_CaedymError+1    !the number of Caedym Crash loops
!LoopNumber_CaedymError(NumberOfLoopNumber_CaedymError)=I_LOOP

!HERE SORTING ALL THE ERRORS.


call VarDeallocation_MAIN()
call VarDeallocation_DYRESM()
CALL VarDeallocation_PARAMETER(NUMBER_obsVar)
CALL
VarDeallocation_Uncertainty(UncertaintyAna_WHOLE,UncertaintyAna_ALL,UncertaintyAna_FIRST,UncertaintyAna_BEST)

end program Main_Calibration
```