

Supplement of
**The Detailed Emissions Scaling, Isolation, and Diagnostic (DESID)
module in the Community Multiscale Air Quality (CMAQ) Modeling
System version 5.3**

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Supplemental Material

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15 Figure S2: a) Average 1-hr TOL emissions input for June 3-10, 2016. b) Change in 1-hr TOL emissions for CMAQ run with ECI shown in section S3. c) Average TOL surface concentrations predicted by CMAQ for June 3-10, 2016. d) Change in average TOL concentration for ECI shown in section S3.

Figure S3: a) Average 1-hr NO emissions input for June 3-10, 2016. b) Change in 1-hr NO emissions for CMAQ run with ECI shown in section S3. c) Average NO surface concentrations predicted by CMAQ for June 3-10, 2016. d) Change in average

20 NO concentration for ECI shown in section S3.

S1: Default Emission Control Interface for CMAQ v5.3.2 for chemical mechanism CB6r3_ae7_aq

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!-----!
! EMISSION CONTROL INPUT FILE                                     !
25 ! FOR THE                                                       !
! COMMUNITY MULTISCALE AIR QUALITY (CMAQ) MODEL                 !
! DEVELOPED AND MAINTAINED BY THE                               !
! NATIONAL EXPOSURE RESEARCH LABORATORY, OFFICE OF RESEARCH AND DEVELOPMENT !
! UNITED STATES ENVIRONMENTAL PROTECTION AGENCY                 !
30 !                                                               !
! THIS VERSION CONSISTENT WITH THE RELEASE OF CMAQv5.3.2 (FALL 2020) !
!-----!

!-----!
35 ! Emissions Scaling Specification Section                       !
!-----!
&EmissionScalingRules
EM_NML=
! Region      | Stream Label | Emission | CMAQ-      | Phase/ | Scale | Basis | Op
40 ! Label      |              | Variable | Species    | Mode   | Factor|       |
!
!> DEFAULT MAPPING <!
! Note: Without default mapping for a species,
!       there is no emission of that species.
45
! Default Gases
'EVERYWHERE', 'ALL'      , 'NO2'      , 'NO2'      , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'NO'        , 'NO'        , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'HONO'      , 'HONO'      , 'GAS'      ,1.  , 'UNIT', 'a',
50 'EVERYWHERE', 'ALL'      , 'SO2'      , 'SO2'      , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'NH3'      , 'NH3'      , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'AACD'      , 'AACD'      , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ALD2'      , 'ALD2'      , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'FORM'      , 'FORM'      , 'GAS'      ,1.  , 'UNIT', 'a',
55 'EVERYWHERE', 'ALL'      , 'MEOH'      , 'MEOH'      , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'FACD'      , 'FACD'      , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'CO'        , 'CO'        , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ALDX'      , 'ALDX'      , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ETHA'      , 'ETHA'      , 'GAS'      ,1.  , 'UNIT', 'a',
60 'EVERYWHERE', 'ALL'      , 'ETOH'      , 'ETOH'      , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'KET'       , 'KET'       , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PAR'       , 'PAR'       , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ACET'      , 'ACET'      , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PRPA'      , 'PRPA'      , 'GAS'      ,1.  , 'UNIT', 'a',
65 'EVERYWHERE', 'ALL'      , 'ETHY'      , 'ETHY'      , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ETH'       , 'ETH'       , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'OLE'       , 'OLE'       , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'IOLE'      , 'IOLE'      , 'GAS'      ,1.  , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ISOP'      , 'ISOP'      , 'GAS'      ,1.  , 'UNIT', 'a',

```

```

70  'EVERYWHERE', 'ALL'      , 'APIN'   , 'APIN'   , 'GAS' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'TERP'   , 'TERP'   , 'GAS' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'CH4'    , 'ECH4'    , 'GAS' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'CL2'    , 'CL2'    , 'GAS' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'HCL'    , 'HCL'    , 'GAS' ,1. , 'UNIT', 'a',
75  'EVERYWHERE', 'ALL'      , 'SESQ'   , 'SESQ'   , 'GAS' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'SOAALK' , 'SOAALK' , 'GAS' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'ACROLEIN', 'ACROLEIN', 'GAS' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'ALD2_PRIMARY', 'ALD2_PRIMARY', 'GAS' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'FORM_PRIMARY', 'FORM_PRIMARY', 'GAS' ,1. , 'UNIT', 'a',
80  'EVERYWHERE', 'ALL'      , 'ACROLEIN', 'ACRO_PRIMARY', 'GAS' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'BUTADIENE13', 'BUTADIENE13', 'GAS' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'SULF'   , 'SULF'   , 'GAS' ,0. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'TOL'    , 'TOL'    , 'GAS' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'XYLMN'  , 'XYLMN'  , 'GAS' ,1. , 'UNIT', 'a',
85  'EVERYWHERE', 'ALL'      , 'NAPH'   , 'NAPH'   , 'GAS' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'BENZ'   , 'BENZENE', 'GAS' ,1. , 'UNIT', 'a',

```

! Default Aerosols

```

    'EVERYWHERE', 'ALL'      , 'SULF'   , 'ASO4'   , 'FINE' ,1. , 'MASS', 'a',
90  'EVERYWHERE', 'ALL'      , 'PSO4'   , 'ASO4'   , 'FINE' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'PNH4'   , 'ANH4'   , 'FINE' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'PNO3'   , 'ANO3'   , 'FINE' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'PCL'    , 'ACL'    , 'FINE' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'PNA'    , 'ANA'    , 'FINE' ,1. , 'UNIT', 'a',
95  'EVERYWHERE', 'ALL'      , 'PEC'    , 'AEC'    , 'FINE' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'PMOTHR' , 'AOTHR'  , 'FINE' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'PFE'    , 'AFE'    , 'FINE' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'PAL'    , 'AAL'    , 'FINE' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'PSI'    , 'ASI'    , 'FINE' ,1. , 'UNIT', 'a',
100 'EVERYWHERE', 'ALL'      , 'PTI'    , 'ATI'    , 'FINE' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'PCA'    , 'ACA'    , 'FINE' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'PMG'    , 'AMG'    , 'FINE' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'PK'     , 'AK'     , 'FINE' ,1. , 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'PMN'    , 'AMN'    , 'FINE' ,1. , 'UNIT', 'a',
105 'EVERYWHERE', 'ALL'      , 'PH2O'   , 'AH2O'   , 'FINE' ,1. , 'UNIT', 'a',

```

! Coarse-Mode Inorganic Ions Scaling

```

    'EVERYWHERE', 'ALL'      , 'PMC'    , 'ACORS'  , 'COARSE',0.99675, 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'PMC'    , 'ASO4'   , 'COARSE',0.001 , 'UNIT', 'a',
110 'EVERYWHERE', 'ALL'      , 'PMC'    , 'ANO3'   , 'COARSE',0.00048, 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'PMC'    , 'ACL'    , 'COARSE',0.00145, 'UNIT', 'a',
    'EVERYWHERE', 'ALL'      , 'PMC'    , 'AH2O'   , 'COARSE',0.00032, 'UNIT', 'a',

```

! Fine-Mode Primary Organic Aerosol Scaling

```

115 ! There are a series of species available for propagating emissions of primary
    ! organic particles and vapor. APOC and APNCOM are nonvolatile species that
    ! age chemically in the particle phase. Traditionally, all POC (primary organic
    ! carbon) and PNCOM (primary non-carbon organic matter) have been represented

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```

!   by these species.
120 !   It is more correct to use semivolatile species to account for the gas-particle
!   partitioning of this POA mass. Several particle and gas-phase species are
!   provided for this task, and these species vary in their volatility, which is
!   quantified with the metric C*. See Donahue et al. (ES&T, 2006).
!   Gas Species :      VLVPO1  VSVPO1  VSVPO2  VSVPO3  VIVPO1
125 !   Particle Species : ALVPO1  ASVPO1  ASVPO2  ASVPO3  AIVPO1
!   C* (ug m-3) :      0.1     1       10     100     1000
!
!                   (Mostly Particle)                   (Mostly Vapor)
!   To enable semivolatile partitioning, you may direct a fraction of mass from the
!   nonvolatile emission variables (POC and PNCOM) to each of these semivolatile
130 !   CMAQ species. To conserve mass, the total of the scale factors should sum to 1.
!   Note: Each of the semivolatile species accounts for both OC and NCOM mass, so
!   rules should come in pairs (one for POC and one for PNCOM) in order to
!   conserve the total. For Example,
!
!   'EVERYWHERE', 'ALL' , 'POC'   , 'VSVPO2'   , 'GAS' , 0.14 , 'MASS', 'a',
135 !   'EVERYWHERE', 'ALL' , 'PNCOM', 'VSVPO2'   , 'GAS' , 0.14 , 'MASS', 'a',
!   Note: To avoid large swings in repartitioning after emission, it's a good idea
!   to split mass between gas and particle phases, with all mass going to
!   the particle in the C* = 0.1-1 range and all gas for C* = 100-1000.
!   Species with C*=10 can generally have mass split between gas and particle
140 !   or be put in all gas if conditions are very clean. If too much mass
!   evaporates or condenses upon emission, the aerosol size distribution
!   will be affected.
!   Note: It is common to specify different volatility distributions for different
!   emission sources. Please use this interface to specify your model
145 !   parameters.
!
! --> Nonvolatile POA
! 'EVERYWHERE', 'ALL'           , 'POC'      , 'APOC'      , 'FINE', 0.    , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'PNCOM'    , 'APNCOM'    , 'FINE', 0.    , 'MASS', 'a',
150 ! --> Semivolatile POA
! 'EVERYWHERE', 'ALL'           , 'POC'      , 'VLVP01'    , 'GAS' , 0.    , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'PNCOM'    , 'VLVP01'    , 'GAS' , 0.    , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'POC'      , 'VSVPO1'    , 'GAS' , 0.045, 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'PNCOM'    , 'VSVPO1'    , 'GAS' , 0.045, 'MASS', 'a',
155 ! 'EVERYWHERE', 'ALL'           , 'POC'      , 'VSVPO2'    , 'GAS' , 0.14  , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'PNCOM'    , 'VSVPO2'    , 'GAS' , 0.14  , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'POC'      , 'VSVPO3'    , 'GAS' , 0.18  , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'PNCOM'    , 'VSVPO3'    , 'GAS' , 0.18  , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'POC'      , 'VIVPO1'    , 'GAS' , 0.50  , 'MASS', 'a',
160 ! 'EVERYWHERE', 'ALL'           , 'PNCOM'    , 'VIVPO1'    , 'GAS' , 0.50  , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'POC'      , 'ALVPO1'    , 'FINE' , 0.09  , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'PNCOM'    , 'ALVPO1'    , 'FINE' , 0.09  , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'POC'      , 'ASVPO1'    , 'FINE' , 0.045 , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'PNCOM'    , 'ASVPO1'    , 'FINE' , 0.045 , 'MASS', 'a',
165 ! 'EVERYWHERE', 'ALL'           , 'POC'      , 'ASVPO2'    , 'FINE' , 0.    , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'PNCOM'    , 'ASVPO2'    , 'FINE' , 0.    , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'POC'      , 'ASVPO3'    , 'FINE' , 0.    , 'MASS', 'a',

```

```

170 'EVERYWHERE', 'ALL'      , 'PNCOM'  , 'ASVPO3'  , 'FINE',0.    , 'MASS','a',
      'EVERYWHERE', 'ALL'      , 'POC'    , 'AIVPO1'  , 'FINE',0.    , 'MASS','a',
      'EVERYWHERE', 'ALL'      , 'PNCOM'  , 'AIVPO1'  , 'FINE',0.    , 'MASS','a',

```

```

! pcSOA is a CMAQ species introduced to account for missing pathways for SOA
! formation from combustion sources. It includes IVOC oxidation as well as other
! phenomena (Murphy et al., ACP, 2017). It was parameterized primarily in LA,
175 ! where vehicle exhaust continues to dominate.

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```

      'EVERYWHERE', 'ALL'      , 'POC'    , 'PCVOC'   , 'GAS' ,6.579,'MASS','a',
      'EVERYWHERE', 'ALL'      , 'PNCOM'  , 'PCVOC'   , 'GAS' ,6.579,'MASS','a',
! However, the added pcSOA is probably inappropriate for Fire sources, especially
! in its current configuration. This pathway should be zeroed out for all fire
180 ! and wood-burning related sources.

```

```

      'EVERYWHERE', 'PT_FIRES'  , 'ALL'    , 'PCVOC'   , 'GAS' ,0.0  , 'MASS','o',
      'EVERYWHERE', 'PT_RXFIRES' , 'ALL'    , 'PCVOC'   , 'GAS' ,0.0  , 'MASS','o',
      'EVERYWHERE', 'PT_AGFIRES' , 'ALL'    , 'PCVOC'   , 'GAS' ,0.0  , 'MASS','o',
      'EVERYWHERE', 'PT_OTHFIRES', 'ALL'    , 'PCVOC'   , 'GAS' ,0.0  , 'MASS','o',
185 'EVERYWHERE', 'PT_FIRES_MXCA', 'ALL'    , 'PCVOC'   , 'GAS' ,0.0  , 'MASS','o',
      'EVERYWHERE', 'GR_RES_FIRES', 'ALL'    , 'PCVOC'   , 'GAS' ,0.0  , 'MASS','o',

```

```

! Wind-Blown Dust and Sea Spray Scaling
! Fine Components

```

```

190 'EVERYWHERE', 'ALL'      , 'PMFINE_S04' , 'ASO4'    , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_NO3' , 'ANO3'    , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_CL'  , 'ACL'     , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_NH4' , 'ANH4'    , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_NA'  , 'ANA'     , 'FINE',1.    , 'UNIT','a',
195 'EVERYWHERE', 'ALL'      , 'PMFINE_CA'  , 'ACA'     , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_MG'  , 'AMG'     , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_K'   , 'AK'      , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_FE'  , 'AFE'     , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_AL'  , 'AAL'     , 'FINE',1.    , 'UNIT','a',
200 'EVERYWHERE', 'ALL'      , 'PMFINE_SI'  , 'ASI'     , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_TI'  , 'ATI'     , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_MN'  , 'AMN'     , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_H2O' , 'AH2O'    , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_OTHR', 'AOTHR'   , 'FINE',1.    , 'UNIT','a',
205

```

```

! :Scaling of Fine-Mode POA from Wind-Blown Dust or Sea Spray. Either the
! :Nonvolatile POA should be propagated to the transport model, or the Low
! :Volatility POA should be propagated, not both.

```

```

! : --> Nonvolatile POA

```

```

210 ! 'EVERYWHERE', 'ALL'      , 'PMFINE_POC' , 'APOC'    , 'FINE',1.    , 'UNIT','a',
      ! 'EVERYWHERE', 'ALL'      , 'PMFINE_PNCOM', 'APNCOM'  , 'FINE',1.    , 'UNIT','a',

```

```

! : --> Semivolatile POA

```

```

      'EVERYWHERE', 'ALL'      , 'PMFINE_LVPO1', 'ALVPO1'  , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_LV001', 'ALV001'  , 'FINE',1.    , 'UNIT','a',
215

```

```

! Wind-Blown Dust and Sea Spray Scaling

```

```

! Coarse Components
'EVERYWHERE', 'ALL'      , 'PMCOARSE_S04', 'ASO4'      , 'COARSE', 1.      , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMCOARSE_NO3', 'ANO3'      , 'COARSE', 1.      , 'UNIT', 'a',
220 'EVERYWHERE', 'ALL'      , 'PMCOARSE_CL'  , 'ACL'       , 'COARSE', 1.      , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMCOARSE_H2O', 'AH20'      , 'COARSE', 1.      , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMCOARSE_SOIL', 'ASOIL'     , 'COARSE', 1.      , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMCOARSE_SEACAT', 'ASEACAT'   , 'COARSE', 1.      , 'UNIT', 'a',
/
225 !-----!
! Size Distribution Specification Section !
! Each size distribution rule either modifies the parameters associated with !
! the aerosol modes of a particular stream, or adds new modes to a particular!
230 ! stream if they do not already exist. !
!-----!

&SizeDistributions
SD_NML =
235 ! | Stream Label | Surr. Mode | Ref. Mode
!<Default> 'ALL'      , 'FINE'     , 'FINE_REF',
!<Default> 'ALL'      , 'COARSE'   , 'COARSE_REF',
          'WBDUST' , 'FINE'     , 'FINE_WBDUST',
          'WBDUST' , 'COARSE'   , 'COARSE_WBDUST',
240 'SEASPRAY' , 'FINE'     , 'FINE_SEASPRAY',
          'SEASPRAY' , 'COARSE'   , 'COARSE_SEASPRAY',
!<Example> 'AIRCRAFT' , 'FINE'     , 'AIR_FINE', !To use these examples, you
!<Example> 'AIRCRAFT' , 'COARSE'   , 'AIR_COARSE', ! must add entries for AIR_FINE
                                     ! and AIR_COARSE to the data
245 structure                                     ! em_aero_ref in AERO_DATA.
/

250 !-----!
! Region-Based Scaling Specification Section !
! It is possible in CMAQ to scale emissions for a subset of the model domain !
! using gridded masks to indicate where the scaling should occur. These masks!
! should be of type real and provided as variables on a file with format !
255 ! consistent with IO-API. Any number of files and variables may be used to !
! specify 1 or more "regions" to be used in CMAQ. This section of the name- !
! list provides users with an interface to name these regions and identify !
! the stream data for each. !
!-----!
260

&RegionsRegistry
RGN_NML =
! | Region Label | File_Label | Variable on File
!<Default> 'EVERYWHERE' , 'N/A'     , 'N/A',
265 !<Example> 'WATER'     , 'CMAQ_MASKS' , 'OPEN',

```

```
!<Example> 'ALL'          , 'CMAQ_MASKS' , 'ALL',
!<Example> 'ALL'          , 'ISAM_REGIONS', 'ALL',
```

```
/
```

```
270 !-----!
! Emissions Scaling Family Definitions !
! This section includes definitions for families of CMAQ chemical species, !
! emission streams and region combinations. Please see the Emissions !
! Scaling Specification Section for a definitions of CMAQ species, Regions, !
275 ! and Streams. For each type of family, please indicate the number of !
! families you are prescribing (e.g. NChemFamilies=1). Then for each Family !
! indicate the Name, the number of components, and the name of each !
! component. All entries are case-insensitive. See the Emissions tutorial !
! in the CMAQ Repository for detailed directions for how to work with !
280 ! Families. !
!-----!
```

```
!&ChemicalFamilies
```

```
! NChemFamilies      = 1
285 ! ChemFamilyName(1) = 'NOX'
! ChemFamilyNum(1)   = 2
! ChemFamilyMembers(1,:)= 'NO','NO2'
!/
```

```
290 !&StreamFamilies
```

```
! NStreamFamilies    = 1
! StreamFamilyName(1) = 'PT_SOURCES'
! StreamFamilyNum(1)  = 3
! StreamFamilyMembers(1,:)= 'PT_NONEGU','PT_EGU','PT_OTHER'
295 !/
```

```
!&RegionFamilies
```

```
! NRegionFamilies    = 1
! RegionFamilyName(1) = 'Water'
300 ! RegionFamilyNum(1) = 2
! RegionFamilyMembers(1,:)= 'SURF','OPEN'
!/
```

S2: Emission Control Interface for implementation of Example 13 in Table 5.

```

305 !-----!
! EMISSION CONTROL INPUT FILE !
! FOR THE !
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310 ! DEVELOPED AND MAINTAINED BY THE !
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! !
! THIS VERSION CONSISTENT WITH THE RELEASE OF CMAQv5.3.2 (FALL 2020) !
315 !-----!

!-----!
! Emissions Scaling Specification Section !
!-----!

320 &EmissionScalingRules
EM_NML=
! Region | Stream Label | Emission | CMAQ- | Phase/ | Scale | Basis | Op
! Label | | Variable | Species | Mode | Factor | |
325 !> DEFAULT MAPPING <!
! Note: Without default mapping for a species,
! there is no emission of that species.

! Default Gases
330 'EVERYWHERE', 'ALL' , 'NO2' , 'NO2' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'NO' , 'NO' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'HONO' , 'HONO' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'SO2' , 'SO2' , 'GAS' ,1. , 'UNIT', 'a',
335 'EVERYWHERE', 'ALL' , 'NH3' , 'NH3' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'AACD' , 'AACD' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'ALD2' , 'ALD2' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'FORM' , 'FORM' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'MEOH' , 'MEOH' , 'GAS' ,1. , 'UNIT', 'a',
340 'EVERYWHERE', 'ALL' , 'FACD' , 'FACD' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'CO' , 'CO' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'ALDX' , 'ALDX' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'ETHA' , 'ETHA' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'ETOH' , 'ETOH' , 'GAS' ,1. , 'UNIT', 'a',
345 'EVERYWHERE', 'ALL' , 'KET' , 'KET' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'PAR' , 'PAR' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'ACET' , 'ACET' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'PRPA' , 'PRPA' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'ETHY' , 'ETHY' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'ETH' , 'ETH' , 'GAS' ,1. , 'UNIT', 'a',
350 'EVERYWHERE', 'ALL' , 'OLE' , 'OLE' , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL' , 'IOLE' , 'IOLE' , 'GAS' ,1. , 'UNIT', 'a',

```



```

'EVERYWHERE', 'ALL'      , 'ISOP'   , 'ISOP'   , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'APIN'   , 'APIN'   , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'TERP'   , 'TERP'   , 'GAS' ,1. , 'UNIT', 'a',
355 'EVERYWHERE', 'ALL'      , 'CH4'    , 'ECH4'   , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'CL2'    , 'CL2'    , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'HCL'    , 'HCL'    , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'SESQ'   , 'SESQ'   , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'SOAALK' , 'SOAALK' , 'GAS' ,1. , 'UNIT', 'a',
360 'EVERYWHERE', 'ALL'      , 'ACROLEIN', 'ACROLEIN', 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ALD2_PRIMARY', 'ALD2_PRIMARY', 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'FORM_PRIMARY', 'FORM_PRIMARY', 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ACROLEIN', 'ACRO_PRIMARY', 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'BUTADIENE13', 'BUTADIENE13', 'GAS' ,1. , 'UNIT', 'a',
365 'EVERYWHERE', 'ALL'      , 'SULF'   , 'SULF'   , 'GAS' ,0. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'TOL'    , 'TOL'    , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'XYLMN'  , 'XYLMN'  , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'NAPH'   , 'NAPH'   , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'BENZ'   , 'BENZENE', 'GAS' ,1. , 'UNIT', 'a',
370
! Scaling Modification from Table 5 (Example 13)
'IL',      'ALL'      , 'NO2', 'NO2'      , 'GAS' ,1.1 , 'UNIT', 'o',

! Default Aerosols
375 'EVERYWHERE', 'ALL'      , 'SULF'   , 'ASO4'   , 'FINE' ,1. , 'MASS', 'a',
'EVERYWHERE', 'ALL'      , 'PSO4'   , 'ASO4'   , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PNH4'   , 'ANH4'   , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PNO3'   , 'ANO3'   , 'FINE' ,1. , 'UNIT', 'a',
380 'EVERYWHERE', 'ALL'      , 'PCL'    , 'ACL'    , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PNA'    , 'ANA'    , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PEC'    , 'AEC'    , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMOTHR' , 'AOTHR'  , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PFE'    , 'AFE'    , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PAL'    , 'AAL'    , 'FINE' ,1. , 'UNIT', 'a',
385 'EVERYWHERE', 'ALL'      , 'PSI'    , 'ASI'    , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PTI'    , 'ATI'    , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PCA'    , 'ACA'    , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMG'    , 'AMG'    , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PK'     , 'AK'     , 'FINE' ,1. , 'UNIT', 'a',
390 'EVERYWHERE', 'ALL'      , 'PMN'    , 'AMN'    , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PH20'   , 'AH20'   , 'FINE' ,1. , 'UNIT', 'a',

! Coarse-Mode Inorganic Ions Scaling
395 'EVERYWHERE', 'ALL'      , 'PMC'    , 'ACORS'  , 'COARSE',0.99675, 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMC'    , 'ASO4'   , 'COARSE',0.001 , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMC'    , 'ANO3'   , 'COARSE',0.00048, 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMC'    , 'ACL'    , 'COARSE',0.00145, 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMC'    , 'AH20'   , 'COARSE',0.00032, 'UNIT', 'a',

400 ! Fine-Mode Primary Organic Aerosol Scaling

```

```

!   There are a series of species available for propagating emissions of primary
!   organic particles and vapor. APOC and APNCOM are nonvolatile species that
!   age chemically in the particle phase. Traditionally, all POC (primary organic
!   carbon) and PNCOM (primary non-carbon organic matter) have been represented
405 !   by these species.
!   It is more correct to use semivolatile species to account for the gas-particle
!   partitioning of this POA mass. Several particle and gas-phase species are
!   provided for this task, and these species vary in their volatility, which is
!   quantified with the metric C*. See Donahue et al. (ES&T, 2006).
410 !   Gas Species :      VLVP01  VSVPO1  VSVPO2  VSVPO3  VIVP01
!   Particle Species :  ALVP01  ASVPO1  ASVPO2  ASVPO3  AIVP01
!   C* (ug m-3) :      0.1     1       10      100     1000
!
!               (Mostly Particle)                (Mostly Vapor)
!   To enable semivolatile partitioning, you may direct a fraction of mass from the
415 !   nonvolatile emission variables (POC and PNCOM) to each of these semivolatile
!   CMAQ species. To conserve mass, the total of the scale factors should sum to 1.
!   Note: Each of the semivolatile species accounts for both OC and NCOM mass, so
!   rules should come in pairs (one for POC and one for PNCOM) in order to
!   conserve the total. For Example,
420 !   'EVERYWHERE', 'ALL' , 'POC'   , 'VSVPO2'   , 'GAS' , 0.14 , 'MASS', 'a',
!   'EVERYWHERE', 'ALL' , 'PNCOM', 'VSVPO2'   , 'GAS' , 0.14 , 'MASS', 'a',
!   Note: To avoid large swings in repartitioning after emission, it's a good idea
!   to split mass between gas and particle phases, with all mass going to
!   the particle in the C* = 0.1-1 range and all gas for C* = 100-1000.
425 !   Species with C*=10 can generally have mass split between gas and particle
!   or be put in all gas if conditions are very clean. If too much mass
!   evaporates or condenses upon emission, the aerosol size distribution
!   will be affected.
!   Note: It is common to specify different volatility distributions for different
430 !   emission sources. Please use this interface to specify your model
!   parameters.
!
! --> Nonvolatile POA
! 'EVERYWHERE', 'ALL'           , 'POC'   , 'APOC'   , 'FINE', 0.   , 'MASS', 'a',
435 ! 'EVERYWHERE', 'ALL'           , 'PNCOM' , 'APNCOM' , 'FINE', 0.   , 'MASS', 'a',
! --> Semivolatile POA
! 'EVERYWHERE', 'ALL'           , 'POC'   , 'VLVP01' , 'GAS' , 0.   , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'PNCOM' , 'VLVP01' , 'GAS' , 0.   , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'POC'   , 'VSVPO1' , 'GAS' , 0.045, 'MASS', 'a',
440 ! 'EVERYWHERE', 'ALL'           , 'PNCOM' , 'VSVPO1' , 'GAS' , 0.045, 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'POC'   , 'VSVPO2' , 'GAS' , 0.14  , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'PNCOM' , 'VSVPO2' , 'GAS' , 0.14  , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'POC'   , 'VSVPO3' , 'GAS' , 0.18  , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'PNCOM' , 'VSVPO3' , 'GAS' , 0.18  , 'MASS', 'a',
445 ! 'EVERYWHERE', 'ALL'           , 'POC'   , 'VIVP01' , 'GAS' , 0.50  , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'PNCOM' , 'VIVP01' , 'GAS' , 0.50  , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'POC'   , 'ALVP01' , 'FINE' , 0.09  , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'PNCOM' , 'ALVP01' , 'FINE' , 0.09  , 'MASS', 'a',
! 'EVERYWHERE', 'ALL'           , 'POC'   , 'ASVPO1' , 'FINE' , 0.045, 'MASS', 'a',

```

```

450 'EVERYWHERE', 'ALL'      , 'PNCOM'  , 'ASVP01'  , 'FINE', 0.045, 'MASS', 'a',
    'EVERYWHERE', 'ALL'      , 'POC'    , 'ASVP02'  , 'FINE', 0.    , 'MASS', 'a',
    'EVERYWHERE', 'ALL'      , 'PNCOM'  , 'ASVP02'  , 'FINE', 0.    , 'MASS', 'a',
    'EVERYWHERE', 'ALL'      , 'POC'    , 'ASVP03'  , 'FINE', 0.    , 'MASS', 'a',
    'EVERYWHERE', 'ALL'      , 'PNCOM'  , 'ASVP03'  , 'FINE', 0.    , 'MASS', 'a',
455 'EVERYWHERE', 'ALL'      , 'POC'    , 'AIVP01'  , 'FINE', 0.    , 'MASS', 'a',
    'EVERYWHERE', 'ALL'      , 'PNCOM'  , 'AIVP01'  , 'FINE', 0.    , 'MASS', 'a',

```

```

! pcSOA is a CMAQ species introduced to account for missing pathways for SOA
! formation from combustion sources. It includes IVOC oxidation as well as other
460 ! phenomena (Murphy et al., ACP, 2017). It was parameterized primarily in LA,
! where vehicle exhaust continues to dominate.

```

```

'EVERYWHERE', 'ALL'      , 'POC'    , 'PCVOC'   , 'GAS' , 6.579, 'MASS', 'a',
'EVERYWHERE', 'ALL'      , 'PNCOM'  , 'PCVOC'   , 'GAS' , 6.579, 'MASS', 'a',

```

```

465 ! However, the added pcSOA is probably inappropriate for Fire sources, especially
! in its current configuration. This pathway should be zeroed out for all fire
! and wood-burning related sources.

```

```

'EVERYWHERE', 'PT_FIRES'  , 'ALL'    , 'PCVOC'   , 'GAS' , 0.0   , 'MASS', 'o',
'EVERYWHERE', 'PT_RXFIRES', 'ALL'    , 'PCVOC'   , 'GAS' , 0.0   , 'MASS', 'o',
'EVERYWHERE', 'PT_AGFIRES', 'ALL'    , 'PCVOC'   , 'GAS' , 0.0   , 'MASS', 'o',
470 'EVERYWHERE', 'PT_OTHFIRES', 'ALL'    , 'PCVOC'   , 'GAS' , 0.0   , 'MASS', 'o',
'EVERYWHERE', 'PT_FIRES_MXCA', 'ALL'    , 'PCVOC'   , 'GAS' , 0.0   , 'MASS', 'o',
'EVERYWHERE', 'GR_RES_FIRES', 'ALL'    , 'PCVOC'   , 'GAS' , 0.0   , 'MASS', 'o',

```

```

! Wind-Blown Dust and Sea Spray Scaling

```

```

475 ! Fine Components

```

```

'EVERYWHERE', 'ALL'      , 'PMFINE_S04' , 'ASO4'    , 'FINE', 1.    , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMFINE_NO3' , 'ANO3'    , 'FINE', 1.    , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMFINE_CL'  , 'ACL'     , 'FINE', 1.    , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMFINE_NH4' , 'ANH4'    , 'FINE', 1.    , 'UNIT', 'a',
480 'EVERYWHERE', 'ALL'      , 'PMFINE_NA'  , 'ANA'     , 'FINE', 1.    , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMFINE_CA'  , 'ACA'     , 'FINE', 1.    , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMFINE_MG'  , 'AMG'     , 'FINE', 1.    , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMFINE_K'   , 'AK'      , 'FINE', 1.    , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMFINE_FE'  , 'AFE'     , 'FINE', 1.    , 'UNIT', 'a',
485 'EVERYWHERE', 'ALL'      , 'PMFINE_AL'  , 'AAL'     , 'FINE', 1.    , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMFINE_SI'  , 'ASI'     , 'FINE', 1.    , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMFINE_TI'  , 'ATI'     , 'FINE', 1.    , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMFINE_MN'  , 'AMN'     , 'FINE', 1.    , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMFINE_H2O' , 'AH2O'    , 'FINE', 1.    , 'UNIT', 'a',
490 'EVERYWHERE', 'ALL'      , 'PMFINE_OTHR', 'AOTHR'   , 'FINE', 1.    , 'UNIT', 'a',

```

```

! :Scaling of Fine-Mode POA from Wind-Blown Dust or Sea Spray. Either the
! :Nonvolatile POA should be propagated to the transport model, or the Low
! :Volatility POA should be propagated, not both.

```

```

495 ! : --> Nonvolatile POA

```

```

! 'EVERYWHERE', 'ALL'      , 'PMFINE_POC' , 'APOC'    , 'FINE', 1.    , 'UNIT', 'a',
! 'EVERYWHERE', 'ALL'      , 'PMFINE_PNCOM', 'APNCOM'  , 'FINE', 1.    , 'UNIT', 'a',

```

```

! : --> Semivolatile POA

```

```

500      'EVERYWHERE', 'ALL'      , 'PMFINE_LVPO1', 'ALVPO1'      , 'FINE', 1.      , 'UNIT', 'a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_LVOO1', 'ALVOO1'      , 'FINE', 1.      , 'UNIT', 'a',

```

```

! Wind-Blown Dust and Sea Spray Scaling

```

```

! Coarse Components

```

```

505  'EVERYWHERE', 'ALL'      , 'PMCOARSE_S04', 'AS04'      , 'COARSE', 1.      , 'UNIT', 'a',
      'EVERYWHERE', 'ALL'      , 'PMCOARSE_NO3', 'ANO3'      , 'COARSE', 1.      , 'UNIT', 'a',
      'EVERYWHERE', 'ALL'      , 'PMCOARSE_CL' , 'ACL'      , 'COARSE', 1.      , 'UNIT', 'a',
      'EVERYWHERE', 'ALL'      , 'PMCOARSE_H2O', 'AH20'      , 'COARSE', 1.      , 'UNIT', 'a',
      'EVERYWHERE', 'ALL'      , 'PMCOARSE_SOIL', 'ASOIL'      , 'COARSE', 1.      , 'UNIT', 'a',
510  'EVERYWHERE', 'ALL' , 'PMCOARSE_SEACAT', 'ASEACAT'      , 'COARSE', 1.      , 'UNIT', 'a',
/

```

```

!-----!
! Size Distribution Specification Section                                     !
! Each size distribution rule either modifies the parameters associated with !
515 ! the aerosol modes of a particular stream, or adds new modes to a particular!
! stream if they do not already exist.                                     !
!-----!

```

```

&SizeDistributions

```

```

520  SD_NML      =
      !          | Stream Label      | Surr. Mode      | Ref. Mode
!<Default>    'ALL'                , 'FINE'          , 'FINE_REF',
!<Default>    'ALL'                , 'COARSE'        , 'COARSE_REF',
525           'WBDUST'            , 'FINE'          , 'FINE_WBDUST',
           'WBDUST'            , 'COARSE'        , 'COARSE_WBDUST',
           'SEASPRAY'          , 'FINE'          , 'FINE_SEASPRAY',
           'SEASPRAY'          , 'COARSE'        , 'COARSE_SEASPRAY',
!<Example>    'AIRCRAFT'          , 'FINE'          , 'AIR_FINE',    !To use these examples, you
!<Example>    'AIRCRAFT'          , 'COARSE'        , 'AIR_COARSE', ! must add entries for AIR_FINE
530                                           ! and AIR_COARSE to the data
structure
                                           ! em_aero_ref in AERO_DATA.
/

```

```

535
!-----!
! Region-Based Scaling Specification Section                               !
! It is possible in CMAQ to scale emissions for a subset of the model domain !
540 ! using gridded masks to indicate where the scaling should occur. These masks!
! should be of type real and provided as variables on a file with format      !
! consistent with IO-API. Any number of files and variables may be used to    !
! specify 1 or more "regions" to be used in CMAQ. This section of the name-   !
! list provides users with an interface to name these regions and identify    !
545 ! the stream data for each.
!-----!

```

```

&RegionsRegistry
  RGN_NML =
550  !           | Region Label   | File_Label   | Variable on File
           'ALL'           , 'US_STATES' , 'ALL',
/

555  !-----!
! Emissions Scaling Family Definitions !
! This section includes definitions for families of CMAQ chemical species, !
! emission streams and region combinations. Please see the Emissions !
! Scaling Specification Section for a definitions of CMAQ species, Regions, !
560  ! and Streams. For each type of family, please indicate the number of !
! families you are prescribing (e.g. NChemFamilies=1). Then for each Family !
! indicate the Name, the number of components, and the name of each !
! component. All entries are case-insensitive. See the Emissions tutorial !
! in the CMAQ Repository for detailed directions for how to work with !
565  ! Families. !
!-----!

!&ChemicalFamilies
! NChemFamilies      = 1
570  ! ChemFamilyName(1) = 'NOX'
! ChemFamilyNum(1)   = 2
! ChemFamilyMembers(1,:)= 'NO','NO2'
! /

575  !&StreamFamilies
! NStreamFamilies    = 1
! StreamFamilyName(1) = 'PT_SOURCES'
! StreamFamilyNum(1)  = 3
! StreamFamilyMembers(1,:)= 'PT_NONEGU','PT_EGU','PT_OTHER'
580  ! /

!&RegionFamilies
! NRegionFamilies    = 1
! RegionFamilyName(1) = 'Water'
585  ! RegionFamilyNum(1) = 2
! RegionFamilyMembers(1,:)= 'SURF','OPEN'
! /

```

590 **S3: Emission Control Interface for implementation of all Examples in Table 7.**

```

!-----!
! EMISSION CONTROL INPUT FILE                                     !
! FOR THE                                                         !
! COMMUNITY MULTISCALE AIR QUALITY (CMAQ) MODEL                 !
595 ! DEVELOPED AND MAINTAINED BY THE                             !
! NATIONAL EXPOSURE RESEARCH LABORATORY, OFFICE OF RESEARCH AND DEVELOPMENT !
! UNITED STATES ENVIRONMENTAL PROTECTION AGENCY                 !
!                                                               !
! THIS VERSION CONSISTENT WITH THE RELEASE OF CMAQv5.3.2 (FALL 2020) !
600 !-----!

!-----!
! Emissions Scaling Specification Section                         !
!-----!
605 &EmissionScalingRules
EM_NML=
! Region      | Stream Label | Emission | CMAQ-      | Phase/|Scale |Basis |Op
! Label       |              | Variable | Species    | Mode  |Factor|      |
!
! Note: Without default mapping for a species,
!       there is no emission of that species.

! Default Gases
615 'EVERYWHERE', 'ALL'      , 'NO2'      , 'NO2'      , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'NO'       , 'NO'       , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'HONO'     , 'HONO'     , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'SO2'     , 'SO2'     , 'GAS' ,1. , 'UNIT', 'a',
620 'EVERYWHERE', 'ALL'      , 'NH3'     , 'NH3'     , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'AACD'    , 'AACD'    , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ALD2'    , 'ALD2'    , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'FORM'    , 'FORM'    , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'MEOH'    , 'MEOH'    , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'FACD'    , 'FACD'    , 'GAS' ,1. , 'UNIT', 'a',
625 'EVERYWHERE', 'ALL'      , 'CO'      , 'CO'      , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ALDX'    , 'ALDX'    , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ETHA'    , 'ETHA'    , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ETOH'    , 'ETOH'    , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'KET'     , 'KET'     , 'GAS' ,1. , 'UNIT', 'a',
630 'EVERYWHERE', 'ALL'      , 'PAR'     , 'PAR'     , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ACET'    , 'ACET'    , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PRPA'    , 'PRPA'    , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ETHY'    , 'ETHY'    , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ETH'     , 'ETH'     , 'GAS' ,1. , 'UNIT', 'a',
635 'EVERYWHERE', 'ALL'      , 'OLE'     , 'OLE'     , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'IOLE'    , 'IOLE'    , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ISOP'    , 'ISOP'    , 'GAS' ,1. , 'UNIT', 'a',

```

```

'EVERYWHERE', 'ALL'      , 'APIN'   , 'APIN'   , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'TERP'   , 'TERP'   , 'GAS' ,1. , 'UNIT', 'a',
640 'EVERYWHERE', 'ALL'      , 'CH4'   , 'ECH4'   , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'CL2'   , 'CL2'   , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'HCL'   , 'HCL'   , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'SESQ'   , 'SESQ'   , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'SOAALK' , 'SOAALK' , 'GAS' ,1. , 'UNIT', 'a',
645 'EVERYWHERE', 'ALL'      , 'ACROLEIN', 'ACROLEIN', 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ALD2_PRIMARY', 'ALD2_PRIMARY', 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'FORM_PRIMARY', 'FORM_PRIMARY', 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'ACROLEIN', 'ACRO_PRIMARY', 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'BUTADIENE13', 'BUTADIENE13', 'GAS' ,1. , 'UNIT', 'a',
650 'EVERYWHERE', 'ALL'      , 'SULF'   , 'SULF'   , 'GAS' ,0. , 'UNIT', 'a',

```

! Mapping Rules from Table 7 (Examples 15-18)

```

'EVERYWHERE', 'ALL'      , 'TOL'    , 'TOL'    , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'XYLMN'  , 'XYLMN'  , 'GAS' ,1. , 'UNIT', 'a',
655 'EVERYWHERE', 'ALL'      , 'NAPH'   , 'NAPH'   , 'GAS' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'BENZ'   , 'BENZENE', 'GAS' ,1. , 'UNIT', 'a',

```

! Scaling Modifications from Table 7 (Examples 19-21)

```

'EVERYWHERE', 'ALL'      , 'ALL'    , 'AROMATICS' , 'GAS' ,0.6 , 'UNIT', 'm',
660 'SOUTHWEST', 'ALL'      , 'NO'     , 'NO'        , 'GAS' ,0.9 , 'UNIT', 'o',
'EVERYWHERE', 'INDUS'    , 'ALL'    , 'AROMATICS' , 'GAS' ,0.3 , 'UNIT', 'o',

```

! Default Aerosols

```

'EVERYWHERE', 'ALL'      , 'SULF'   , 'ASO4'   , 'FINE' ,1. , 'MASS', 'a',
665 'EVERYWHERE', 'ALL'      , 'PSO4'   , 'ASO4'   , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PNH4'   , 'ANH4'   , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PNO3'   , 'ANO3'   , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PCL'    , 'ACL'    , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PNA'    , 'ANA'    , 'FINE' ,1. , 'UNIT', 'a',
670 'EVERYWHERE', 'ALL'      , 'PEC'    , 'AEC'    , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMOTHR' , 'AOTHR'  , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PFE'    , 'AFE'    , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PAL'    , 'AAL'    , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PSI'    , 'ASI'    , 'FINE' ,1. , 'UNIT', 'a',
675 'EVERYWHERE', 'ALL'      , 'PTI'    , 'ATI'    , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PCA'    , 'ACA'    , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMG'    , 'AMG'    , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PK'     , 'AK'     , 'FINE' ,1. , 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMN'    , 'AMN'    , 'FINE' ,1. , 'UNIT', 'a',
680 'EVERYWHERE', 'ALL'      , 'PH20'   , 'AH20'   , 'FINE' ,1. , 'UNIT', 'a',

```

! Coarse-Mode Inorganic Ions Scaling

```

'EVERYWHERE', 'ALL'      , 'PMC'    , 'ACORS'   , 'COARSE',0.99675, 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMC'    , 'ASO4'    , 'COARSE',0.001 , 'UNIT', 'a',
685 'EVERYWHERE', 'ALL'      , 'PMC'    , 'ANO3'    , 'COARSE',0.00048, 'UNIT', 'a',
'EVERYWHERE', 'ALL'      , 'PMC'    , 'ACL'     , 'COARSE',0.00145, 'UNIT', 'a',

```

```
'EVERYWHERE', 'ALL' , 'PMC' , 'AH20' , 'COARSE',0.00032,'UNIT','a',
```

```
! Fine-Mode Primary Organic Aerosol Scaling
```

```
690 ! There are a series of species available for propagating emissions of primary
! organic particles and vapor. APOC and APNCOM are nonvolatile species that
! age chemically in the particle phase. Traditionally, all POC (primary organic
! carbon) and PNCOM (primary non-carbon organic matter) have been represented
! by these species.
```

```
695 ! It is more correct to use semivolatile species to account for the gas-particle
! partitioning of this POA mass. Several particle and gas-phase species are
! provided for this task, and these species vary in their volatility, which is
! quantified with the metric C*. See Donahue et al. (ES&T, 2006).
```

```
! Gas Species : VLVPO1 VSVPO1 VSVPO2 VSVPO3 VIVPO1
```

```
700 ! Particle Species : ALVPO1 ASVPO1 ASVPO2 ASVPO3 AIVPO1
```

```
! C* (ug m-3) : 0.1 1 10 100 1000
```

```
! (Mostly Particle) (Mostly Vapor)
```

```
! To enable semivolatile partitioning, you may direct a fraction of mass from the
! nonvolatile emission variables (POC and PNCOM) to each of these semivolatile
705 ! CMAQ species. To conserve mass, the total of the scale factors should sum to 1.
```

```
! Note: Each of the semivolatile species accounts for both OC and NCOM mass, so
! rules should come in pairs (one for POC and one for PNCOM) in order to
! conserve the total. For Example,
```

```
! 'EVERYWHERE', 'ALL' , 'POC' , 'VSVPO2' , 'GAS' ,0.14 , 'MASS','a',
```

```
710 ! 'EVERYWHERE', 'ALL' , 'PNCOM', 'VSVPO2' , 'GAS' ,0.14 , 'MASS','a',
```

```
! Note: To avoid large swings in repartitioning after emission, it's a good idea
! to split mass between gas and particle phases, with all mass going to
! the particle in the C* = 0.1-1 range and all gas for C* = 100-1000.
```

```
715 ! Species with C*=10 can generally have mass split between gas and particle
! or be put in all gas if conditions are very clean. If too much mass
! evaporates or condenses upon emission, the aerosol size distribution
! will be affected.
```

```
! Note: It is common to specify different volatility distributions for different
! emission sources. Please use this interface to specify your model
720 ! parameters.
```

```
! --> Nonvolatile POA
```

```
'EVERYWHERE', 'ALL' , 'POC' , 'APOC' , 'FINE',0. , 'MASS','a',
```

```
725 'EVERYWHERE', 'ALL' , 'PNCOM' , 'APNCOM' , 'FINE',0. , 'MASS','a',
```

```
! --> Semivolatile POA
```

```
'EVERYWHERE', 'ALL' , 'POC' , 'VLVPO1' , 'GAS' ,0. , 'MASS','a',
```

```
'EVERYWHERE', 'ALL' , 'PNCOM' , 'VLVPO1' , 'GAS' ,0. , 'MASS','a',
```

```
'EVERYWHERE', 'ALL' , 'POC' , 'VSVPO1' , 'GAS' ,0.045, 'MASS','a',
```

```
730 'EVERYWHERE', 'ALL' , 'PNCOM' , 'VSVPO1' , 'GAS' ,0.045, 'MASS','a',
```

```
'EVERYWHERE', 'ALL' , 'POC' , 'VSVPO2' , 'GAS' ,0.14 , 'MASS','a',
```

```
'EVERYWHERE', 'ALL' , 'PNCOM' , 'VSVPO2' , 'GAS' ,0.14 , 'MASS','a',
```

```
'EVERYWHERE', 'ALL' , 'POC' , 'VSVPO3' , 'GAS' ,0.18 , 'MASS','a',
```

```
'EVERYWHERE', 'ALL' , 'PNCOM' , 'VSVPO3' , 'GAS' ,0.18 , 'MASS','a',
```

```
'EVERYWHERE', 'ALL' , 'POC' , 'VIVPO1' , 'GAS' ,0.50 , 'MASS','a',
```

```
735 'EVERYWHERE', 'ALL' , 'PNCOM' , 'VIVPO1' , 'GAS' ,0.50 , 'MASS','a',
```



```

740 'EVERYWHERE', 'ALL'      , 'POC'      , 'ALVP01'    , 'FINE',0.09 , 'MASS','a',
      'EVERYWHERE', 'ALL'      , 'PNCOM'    , 'ALVP01'    , 'FINE',0.09 , 'MASS','a',
      'EVERYWHERE', 'ALL'      , 'POC'      , 'ASVP01'    , 'FINE',0.045, 'MASS','a',
      'EVERYWHERE', 'ALL'      , 'PNCOM'    , 'ASVP01'    , 'FINE',0.045, 'MASS','a',
      'EVERYWHERE', 'ALL'      , 'POC'      , 'ASVP02'    , 'FINE',0.    , 'MASS','a',
      'EVERYWHERE', 'ALL'      , 'PNCOM'    , 'ASVP02'    , 'FINE',0.    , 'MASS','a',
      'EVERYWHERE', 'ALL'      , 'POC'      , 'ASVP03'    , 'FINE',0.    , 'MASS','a',
      'EVERYWHERE', 'ALL'      , 'PNCOM'    , 'ASVP03'    , 'FINE',0.    , 'MASS','a',
745 'EVERYWHERE', 'ALL'      , 'POC'      , 'AIVP01'    , 'FINE',0.    , 'MASS','a',
      'EVERYWHERE', 'ALL'      , 'PNCOM'    , 'AIVP01'    , 'FINE',0.    , 'MASS','a',

```

```

! pcSOA is a CMAQ species introduced to account for missing pathways for SOA
! formation from combustion sources. It includes IVOC oxidation as well as other
! phenomena (Murphy et al., ACP, 2017). It was parameterized primarily in LA,
750 ! where vehicle exhaust continues to dominate.

```

```

'EVERYWHERE', 'ALL'      , 'POC'      , 'PCVOC'     , 'GAS' ,6.579, 'MASS','a',
'EVERYWHERE', 'ALL'      , 'PNCOM'    , 'PCVOC'     , 'GAS' ,6.579, 'MASS','a',

```

```

! However, the added pcSOA is probably inappropriate for Fire sources, especially
! in its current configuration. This pathway should be zeroed out for all fire
755 ! and wood-burning related sources.

```

```

'EVERYWHERE', 'PT_FIRES'  , 'ALL'      , 'PCVOC'     , 'GAS' ,0.0  , 'MASS','o',
'EVERYWHERE', 'PT_RXFIRES', 'ALL'      , 'PCVOC'     , 'GAS' ,0.0  , 'MASS','o',
'EVERYWHERE', 'PT_AGFIRES', 'ALL'      , 'PCVOC'     , 'GAS' ,0.0  , 'MASS','o',
'EVERYWHERE', 'PT_OTHFIRES', 'ALL'      , 'PCVOC'     , 'GAS' ,0.0  , 'MASS','o',
760 'EVERYWHERE', 'PT_FIRES_MXCA', 'ALL'      , 'PCVOC'     , 'GAS' ,0.0  , 'MASS','o',
'EVERYWHERE', 'GR_RES_FIRES', 'ALL'      , 'PCVOC'     , 'GAS' ,0.0  , 'MASS','o',

```

```

! Wind-Blown Dust and Sea Spray Scaling

```

```

! Fine Components

```

```

765 'EVERYWHERE', 'ALL'      , 'PMFINE_S04' , 'ASO4'     , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_NO3' , 'ANO3'     , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_CL'  , 'ACL'      , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_NH4' , 'ANH4'     , 'FINE',1.    , 'UNIT','a',
770 'EVERYWHERE', 'ALL'      , 'PMFINE_NA'  , 'ANA'      , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_CA'  , 'ACA'      , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_MG'  , 'AMG'      , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_K'   , 'AK'       , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_FE'  , 'AFE'      , 'FINE',1.    , 'UNIT','a',
775 'EVERYWHERE', 'ALL'      , 'PMFINE_AL'  , 'AAL'      , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_SI'  , 'ASI'      , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_TI'  , 'ATI'      , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_MN'  , 'AMN'      , 'FINE',1.    , 'UNIT','a',
      'EVERYWHERE', 'ALL'      , 'PMFINE_H2O' , 'AH2O'     , 'FINE',1.    , 'UNIT','a',
780 'EVERYWHERE', 'ALL'      , 'PMFINE_OTHR', 'AOTHR'    , 'FINE',1.    , 'UNIT','a',

```

```

! :Scaling of Fine-Mode POA from Wind-Blown Dust or Sea Spray. Either the
! :Nonvolatile POA should be propagated to the transport model, or the Low
! :Volatility POA should be propagated, not both.
! : --> Nonvolatile POA

```

```

785     !'EVERYWHERE', 'ALL'      , 'PMFINE_POC' , 'APOC'          , 'FINE',1.    , 'UNIT','a',
     !'EVERYWHERE', 'ALL'      , 'PMFINE_PNCOM', 'APNCOM'       , 'FINE',1.    , 'UNIT','a',
! : --> Semivolatile POA
     'EVERYWHERE', 'ALL'      , 'PMFINE_LVPO1', 'ALVPO1'       , 'FINE',1.    , 'UNIT','a',
     'EVERYWHERE', 'ALL'      , 'PMFINE_LVOO1', 'ALVOO1'       , 'FINE',1.    , 'UNIT','a',
790
! Wind-Blown Dust and Sea Spray Scaling
! Coarse Components
'EVERYWHERE', 'ALL'      , 'PMCOARSE_S04', 'AS04'        , 'COARSE',1.  , 'UNIT','a',
'EVERYWHERE', 'ALL'      , 'PMCOARSE_NO3', 'ANO3'        , 'COARSE',1.  , 'UNIT','a',
795 'EVERYWHERE', 'ALL'      , 'PMCOARSE_CL' , 'ACL'         , 'COARSE',1.  , 'UNIT','a',
'EVERYWHERE', 'ALL'      , 'PMCOARSE_H2O', 'AH2O'        , 'COARSE',1.  , 'UNIT','a',
'EVERYWHERE', 'ALL'      , 'PMCOARSE_SOIL', 'ASOIL'       , 'COARSE',1.  , 'UNIT','a',
'EVERYWHERE', 'ALL'      , 'PMCOARSE_SEACAT', 'ASEACAT'     , 'COARSE',1.  , 'UNIT','a',
/
800
!-----!
! Size Distribution Specification Section                                     !
! Each size distribution rule either modifies the parameters associated with !
! the aerosol modes of a particular stream, or adds new modes to a particular!
805 ! stream if they do not already exist.                                     !
!-----!

&SizeDistributions
SD_NML =
810 ! | Stream Label | Surr. Mode | Ref. Mode
!<Default> 'ALL'      , 'FINE'     , 'FINE_REF',
!<Default> 'ALL'      , 'COARSE'   , 'COARSE_REF',
      'WBDUST' , 'FINE'     , 'FINE_WBDUST',
      'WBDUST' , 'COARSE'   , 'COARSE_WBDUST',
815 'SEASPRAY'  , 'FINE'     , 'FINE_SEASPRAY',
      'SEASPRAY' , 'COARSE'   , 'COARSE_SEASPRAY',
!<Example> 'AIRCRAFT' , 'FINE'     , 'AIR_FINE', !To use these examples, you
!<Example> 'AIRCRAFT' , 'COARSE'   , 'AIR_COARSE', ! must add entries for AIR_FINE
                                           ! and AIR_COARSE to the data
820 structure                                           ! em_aero_ref in AERO_DATA.
/

!-----!
825 ! Region-Based Scaling Specification Section                                     !
! It is possible in CMAQ to scale emissions for a subset of the model domain !
! using gridded masks to indicate where the scaling should occur. These masks!
! should be of type real and provided as variables on a file with format      !
! consistent with IO-API. Any number of files and variables may be used to   !
830 ! specify 1 or more "regions" to be used in CMAQ. This section of the name- !
! list provides users with an interface to name these regions and identify   !
! the stream data for each.                                                  !
!-----!

```

```

835 &RegionsRegistry
      RGN_NML =
      !           | Region Label   | File_Label | Variable on File
      !
      !           'ALL'           , 'US_STATES' , 'ALL',
840 /

!-----!
! Emissions Scaling Family Definitions                                     !
!   This section includes definitions for families of CMAQ chemical species, !
845 !   emission streams and region combinations. Please see the Emissions   !
!   Scaling Specification Section for a definitions of CMAQ species, Regions, !
!   and Streams. For each type of family, please indicate the number of    !
!   families you are prescribing (e.g. NChemFamilies=1). Then for each Family !
!   indicate the Name, the number of components, and the name of each      !
850 !   component. All entries are case-insensitive. See the Emissions tutorial !
!   in the CMAQ Repository for detailed directions for how to work with    !
!   Families.                                                                !
!-----!

855 &ChemicalFamilies
      NChemFamilies      = 1
      ChemFamilyName(1)  = 'AROMATICIS'
      ChemFamilyNum(1)   = 4
      ChemFamilyMembers(1,:)= 'TOL', 'XYLMN', 'BENZENE', 'NAPH'
860 /

&StreamFamilies
      NStreamFamilies    = 1
      StreamFamilyName(1) = 'INDUS'
865 StreamFamilyNum(1)    = 3
      StreamFamilyMembers(1,:)= 'POINT_NONEGU', 'POINT_EGU', 'POINT_OTHER'
/

&RegionFamilies
870 NRegionFamilies      = 1
      RegionFamilyName(1) = 'SOUTHWEST'
      RegionFamilyNum(1)  = 5
      RegionFamilyMembers(1,:)= 'CA', 'NM', 'AZ', 'NV', 'UT'
/
875

```

880

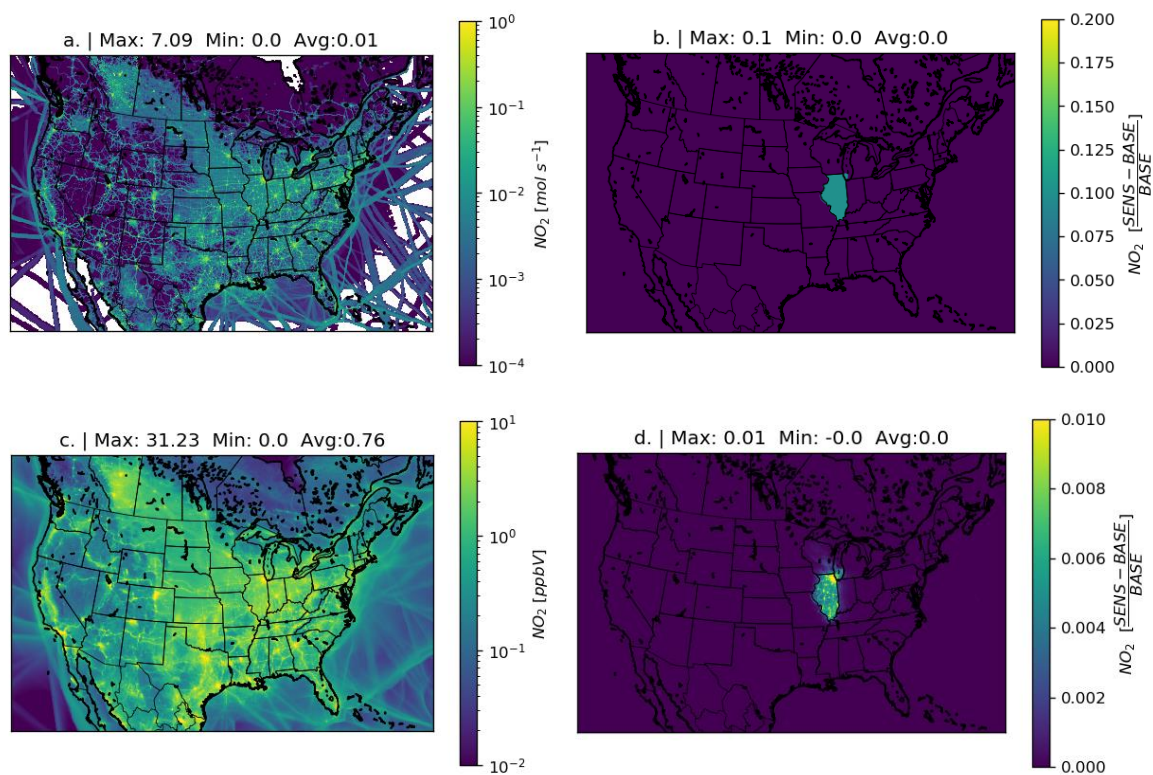
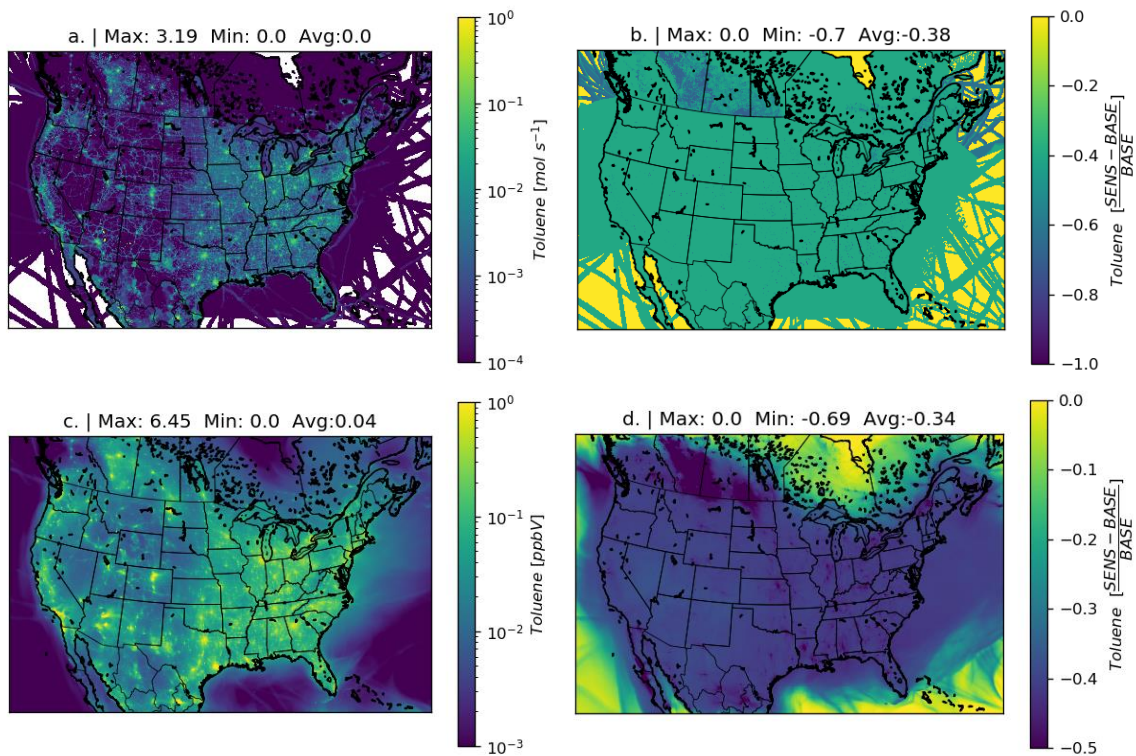


Figure S1. a) Average 1-hr NO_2 emissions input for June 3-10, 2016. b) Change in 1-hr NO_2 emissions for CMAQ run with ECI shown in section S2. c) Average NO_2 surface concentrations predicted by CMAQ for June 3-10, 2016. d) Change in average NO_2 concentration for ECI shown in section S2.

885



895 Figure S2. a) Average 1-hr TOL emissions input for June 3-10, 2016. b) Change in 1-hr TOL emissions for CMAQ run with ECI shown in section S3. c) Average TOL surface concentrations predicted by CMAQ for June 3-10, 2016. d) Change in average TOL concentration for ECI shown in section S3.

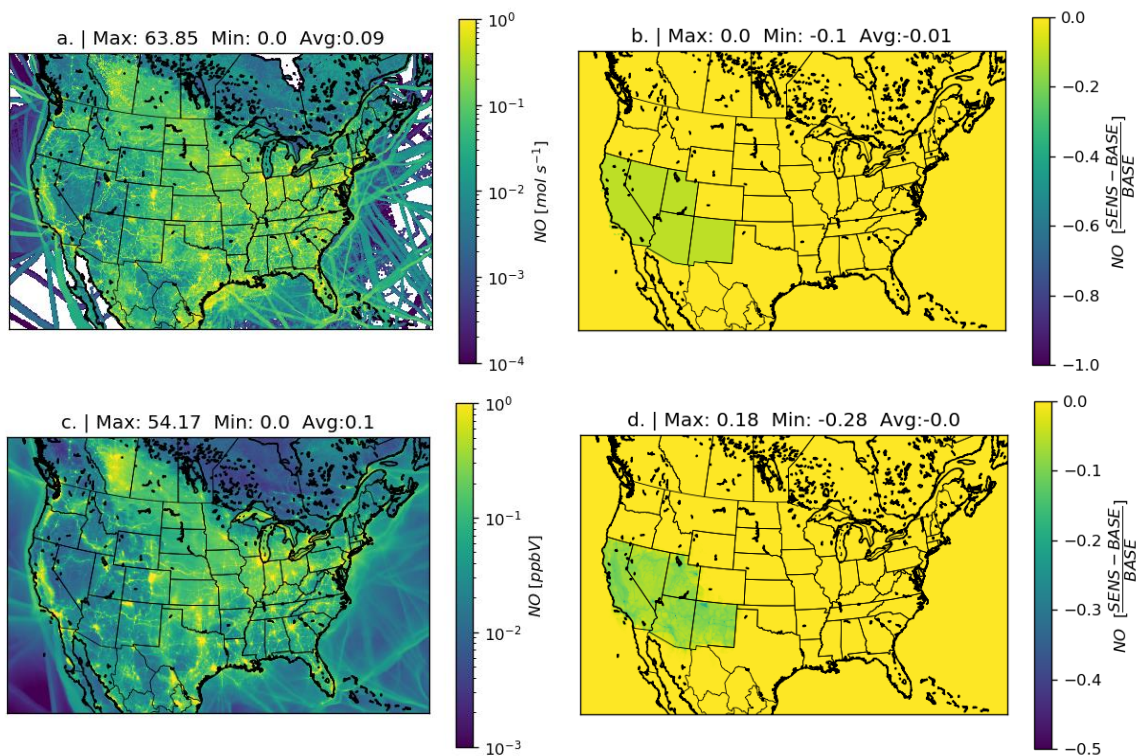


Figure S3. a) Average 1-hr NO emissions input for June 3-10, 2016. b) Change in 1-hr NO emissions for CMAQ run with ECI shown in section S3. c) Average NO surface concentrations predicted by CMAQ for June 3-10, 2016. d) Change in average NO concentration for ECI shown in section S3.