*Supplement of*

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

Benjamin N. Murphy[1] et al.

*Correspondence to*: Benjamin N. Murphy (murphy.ben@epa.gov)

Supplemental Material

**Contents:**

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

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

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

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.

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.

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

```
!------------------------------------------------------------------------------!
! EMISSION CONTROL INPUT FILE                                                  !
!  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                                !
!                                                                              !
! THIS VERSION CONSISTENT WITH THE RELEASE OF CMAQv5.3.2 (FALL 2020)           !
!------------------------------------------------------------------------------!

!------------------------------------------------------------------------------!
! Emissions Scaling Specification Section                                      !
!------------------------------------------------------------------------------!
&EmissionScalingRules
 EM_NML=
 ! Region      | Stream Label  |Emission | CMAQ-         |Phase/|Scale |Basis |Op
 !  Label      |               |Variable | Species       |Mode  |Factor|      |

                            !> DEFAULT MAPPING <!
   ! Note: Without default mapping for a species,
   !       there is no emission of that species.

   ! 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',
   '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',
   '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',
   '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',
   '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',
```

```
'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',
'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',
'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',
'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',
'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',
'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',
'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',
'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',
'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
!   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.
!   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
!     Particle Species : ALVPO1  ASVPO1  ASVPO2  ASVPO3  AIVPO1
!     C* (ug m-3) :       0.1      1       10     100     1000
!                 (Mostly Particle)                    (Mostly Vapor)
!   To enable semivolaitle partitioning, you may direct a fraction of mass from the
!   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,
!            'EVERYWHERE', 'ALL' ,'POC'  ,'VSVPO2'   ,'GAS' ,0.14 ,'MASS','a',
!            'EVERYWHERE', 'ALL' ,'PNCOM','VSVPO2'   ,'GAS' ,0.14 ,'MASS','a',
!     Note: To avoid large swigns 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
!           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
!           parameters.
!
! --> Nonvolatile POA
 'EVERYWHERE', 'ALL'         ,'POC'    ,'APOC'       ,'FINE',0.   ,'MASS','a',
 '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',
 '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',
 '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',
 'EVERYWHERE', 'ALL'         ,'POC'    ,'ASVPO2'     ,'FINE',0.   ,'MASS','a',
 'EVERYWHERE', 'ALL'         ,'PNCOM'  ,'ASVPO2'     ,'FINE',0.   ,'MASS','a',
 'EVERYWHERE', 'ALL'         ,'POC'    ,'ASVPO3'     ,'FINE',0.   ,'MASS','a',
```

```
 '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,
! 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
! 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',
 '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
'EVERYWHERE', 'ALL'    ,'PMFINE_SO4'  ,'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',
'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',
'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',

! :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
   !'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',

! Wind-Blown Dust and Sea Spray Scaling
```

```
   ! Coarse Components
   'EVERYWHERE', 'ALL'    ,'PMCOARSE_SO4','ASO4'      ,'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','AH2O'      ,'COARSE',1.   ,'UNIT','a',
   'EVERYWHERE', 'ALL'   ,'PMCOARSE_SOIL','ASOIL'     ,'COARSE',1.   ,'UNIT','a',
   'EVERYWHERE', 'ALL' ,'PMCOARSE_SEACAT','ASEACAT'   ,'COARSE',1.   ,'UNIT','a',
/

!------------------------------------------------------------------------------!
! 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!
!   stream if they do not already exist.                                       !
!------------------------------------------------------------------------------!

&SizeDistributions
 SD_NML    =
 !          | Stream Label   | Surr. Mode   | Ref. Mode
 !<Default>  'ALL'          ,'FINE'        ,'FINE_REF',
 !<Default>  'ALL'          ,'COARSE'      ,'COARSE_REF',
             '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
                                                          !  and  AIR_COARSE  to  the  data
structure
                                                          ! em_aero_ref in AERO_DATA.

/

!------------------------------------------------------------------------------!
! 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   !
!   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.
!------------------------------------------------------------------------------!

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

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

!------------------------------------------------------------------------------!
! 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, !
!    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       !
!    Families.                                                                 !
!------------------------------------------------------------------------------!

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

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

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

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

```
!------------------------------------------------------------------------------!
! EMISSION CONTROL INPUT FILE                                                  !
!  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                                !
!                                                                              !
! THIS VERSION CONSISTENT WITH THE RELEASE OF CMAQv5.3.2 (FALL 2020)           !
!------------------------------------------------------------------------------!

!------------------------------------------------------------------------------!
! Emissions Scaling Specification Section                                      !
!------------------------------------------------------------------------------!
&EmissionScalingRules
 EM_NML=
 ! Region      | Stream Label  |Emission | CMAQ-        |Phase/|Scale |Basis |Op
 !  Label      |               |Variable | Species      |Mode  |Factor|      |

                            !> DEFAULT MAPPING <!
   ! Note: Without default mapping for a species,
   !       there is no emission of that species.

   ! 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',
   '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',
   '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',
   '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',
   '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',
'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',
'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',
'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',
'EVERYWHERE', 'ALL'         ,'NAPH'   ,'NAPH'        ,'GAS'  ,1.  ,'UNIT','a',
'EVERYWHERE', 'ALL'         ,'BENZ'   ,'BENZENE'     ,'GAS'  ,1.  ,'UNIT','a',

! Scaling Modification from Table 5 (Example 13)
'IL',         'ALL'             ,'NO2','NO2'         ,'GAS'  ,1.1 ,'UNIT','o',

! Default Aerosols
'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',
'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',
'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',
'EVERYWHERE', 'ALL'         ,'PMN'    ,'AMN'         ,'FINE' ,1.  ,'UNIT','a',
'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',
'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
```

```
!   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.
!   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
!     Particle Species : ALVPO1  ASVPO1  ASVPO2  ASVPO3  AIVPO1
!     C* (ug m-3) :       0.1      1       10     100     1000
!                   (Mostly Particle)                   (Mostly Vapor)
!   To enable semivolaitle partitioning, you may direct a fraction of mass from the
!   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,
!            'EVERYWHERE', 'ALL' ,'POC'  ,'VSVPO2'   ,'GAS' ,0.14 ,'MASS','a',
!            'EVERYWHERE', 'ALL' ,'PNCOM','VSVPO2'   ,'GAS' ,0.14 ,'MASS','a',
!     Note: To avoid large swigns 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
!           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
!           parameters.
!
! --> Nonvolatile POA
 'EVERYWHERE', 'ALL'         ,'POC'    ,'APOC'       ,'FINE',0.   ,'MASS','a',
 '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',
 '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',
 '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',
 'EVERYWHERE', 'ALL'         ,'POC'    ,'ASVPO2'     ,'FINE',0.   ,'MASS','a',
 'EVERYWHERE', 'ALL'         ,'PNCOM'  ,'ASVPO2'     ,'FINE',0.   ,'MASS','a',
 'EVERYWHERE', 'ALL'         ,'POC'    ,'ASVPO3'     ,'FINE',0.   ,'MASS','a',
 '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,
! 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
! 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',
 '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
'EVERYWHERE', 'ALL'    ,'PMFINE_SO4'  ,'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',
'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',
'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',

! :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
   !'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',

   ! Wind-Blown Dust and Sea Spray Scaling
   ! Coarse Components
   'EVERYWHERE', 'ALL'    ,'PMCOARSE_SO4','ASO4'      ,'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','AH2O'      ,'COARSE',1.   ,'UNIT','a',
   'EVERYWHERE', 'ALL'   ,'PMCOARSE_SOIL','ASOIL'     ,'COARSE',1.   ,'UNIT','a',
   'EVERYWHERE', 'ALL' ,'PMCOARSE_SEACAT','ASEACAT'   ,'COARSE',1.   ,'UNIT','a',
/

!------------------------------------------------------------------------------!
! 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!
!   stream if they do not already exist.                                       !
!------------------------------------------------------------------------------!

&SizeDistributions
 SD_NML    =
 !          | Stream Label   | Surr. Mode   | Ref. Mode
 !<Default>  'ALL'          ,'FINE'        ,'FINE_REF',
 !<Default>  'ALL'          ,'COARSE'      ,'COARSE_REF',
             '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
                                                          ! and AIR_COARSE to the data
structure
                                                          ! em_aero_ref in AERO_DATA.
/


!------------------------------------------------------------------------------!
! 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   !
!   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.                                                  !
!------------------------------------------------------------------------------!
```

```
&RegionsRegistry
 RGN_NML  =
 !          | Region Label   | File_Label  | Variable on File

               'ALL'         ,'US_STATES'  ,'ALL',
/

!------------------------------------------------------------------------------!
! 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, !
!    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       !
!    Families.                                                                 !
!------------------------------------------------------------------------------!

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

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

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

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

```
!------------------------------------------------------------------------------!
! EMISSION CONTROL INPUT FILE                                                  !
!  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                                !
!                                                                              !
! THIS VERSION CONSISTENT WITH THE RELEASE OF CMAQv5.3.2 (FALL 2020)           !
!------------------------------------------------------------------------------!

!------------------------------------------------------------------------------!
! Emissions Scaling Specification Section                                      !
!------------------------------------------------------------------------------!
&EmissionScalingRules
 EM_NML=
 ! Region      | Stream Label  |Emission | CMAQ-        |Phase/|Scale |Basis |Op
 !  Label      |               |Variable | Species      |Mode  |Factor|      |

                            !> DEFAULT MAPPING <!
   ! Note: Without default mapping for a species,
   !       there is no emission of that species.

   ! 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',
   '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',
   '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',
   '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',
   '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',
```

```
'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',
'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',
'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',

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

! Scaling Modifications from Table 7 (Examples 19-21)
'EVERYWHERE', 'ALL'          ,'ALL'    ,'AROMATICS'   ,'GAS'  ,0.6  ,'UNIT','m',
'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',
'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',
'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',
'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',
'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',
'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
!   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.
!   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
!     Particle Species : ALVPO1  ASVPO1  ASVPO2  ASVPO3  AIVPO1
!     C* (ug m-3) :       0.1      1       10     100     1000
!                 (Mostly Particle)                    (Mostly Vapor)
!   To enable semivolaitle partitioning, you may direct a fraction of mass from the
!   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,
!            'EVERYWHERE', 'ALL' ,'POC'  ,'VSVPO2'   ,'GAS' ,0.14 ,'MASS','a',
!            'EVERYWHERE', 'ALL' ,'PNCOM','VSVPO2'   ,'GAS' ,0.14 ,'MASS','a',
!     Note: To avoid large swigns 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
!           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
!           parameters.
!
! --> Nonvolatile POA
 'EVERYWHERE', 'ALL'         ,'POC'    ,'APOC'       ,'FINE',0.   ,'MASS','a',
 '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',
 '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',
 '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',
 'EVERYWHERE', 'ALL'         ,'POC'    ,'ASVPO2'     ,'FINE',0.   ,'MASS','a',
 'EVERYWHERE', 'ALL'         ,'PNCOM'  ,'ASVPO2'     ,'FINE',0.   ,'MASS','a',
 'EVERYWHERE', 'ALL'         ,'POC'    ,'ASVPO3'     ,'FINE',0.   ,'MASS','a',
 '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,
! 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
! 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',
 '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
'EVERYWHERE', 'ALL'    ,'PMFINE_SO4'  ,'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',
'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',
'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',

! :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
```

```
      !'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',

   ! Wind-Blown Dust and Sea Spray Scaling
   ! Coarse Components
   'EVERYWHERE', 'ALL'    ,'PMCOARSE_SO4','ASO4'      ,'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','AH2O'      ,'COARSE',1.   ,'UNIT','a',
   'EVERYWHERE', 'ALL'   ,'PMCOARSE_SOIL','ASOIL'     ,'COARSE',1.   ,'UNIT','a',
   'EVERYWHERE', 'ALL' ,'PMCOARSE_SEACAT','ASEACAT'   ,'COARSE',1.   ,'UNIT','a',
/

!------------------------------------------------------------------------------!
! 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!
!   stream if they do not already exist.                                       !
!------------------------------------------------------------------------------!

&SizeDistributions
 SD_NML    =
 !         | Stream Label   | Surr. Mode   | Ref. Mode
 !<Default>  'ALL'          ,'FINE'        ,'FINE_REF',
 !<Default>  'ALL'          ,'COARSE'      ,'COARSE_REF',
             '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
                                                          !  and  AIR_COARSE  to  the  data
structure
                                                          ! em_aero_ref in AERO_DATA.
/

!------------------------------------------------------------------------------!
! 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   !
!   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.                                                  !
!------------------------------------------------------------------------------!
```

```
&RegionsRegistry
 RGN_NML  =
 !          | Region Label   | File_Label  | Variable on File

               'ALL'         ,'US_STATES'  ,'ALL',
/

!------------------------------------------------------------------------------!
! 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, !
!    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       !
!    Families.                                                                 !
!------------------------------------------------------------------------------!

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

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

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

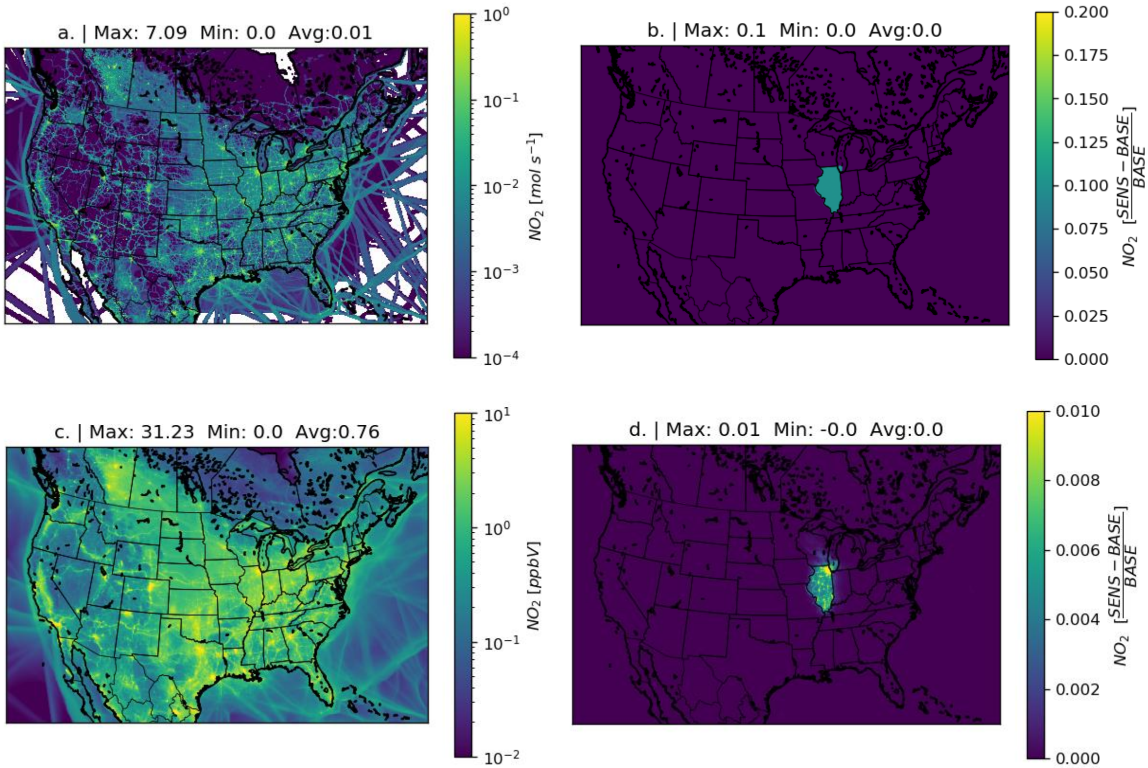


Figure S1. a) Average 1-hr $NO_2$ emissions input for June 3-10, 2016. b) Change in 1-hr $NO_2$ emissions for CMAQ run with ECI shown in section S2. c) Average $NO_2$ surface concentrations predicted by CMAQ for June 3-10, 2016. d) Change in average $NO_2$ concentration for ECI shown in section S2.

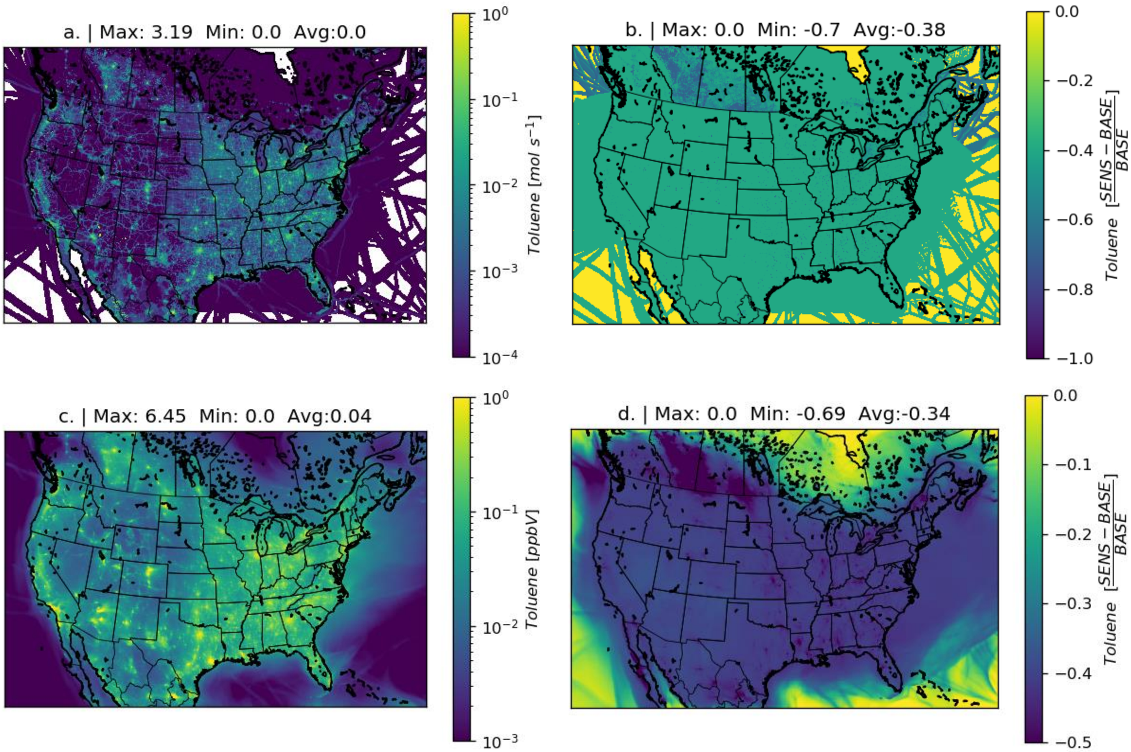


Figure S2. a) Average 1-hr TOL emissions input for June 3-10, 2016. b) Change in 1-hr TOL emissions for CMAQ run with ECI shown in section S3. c) Average TOL surface concentrations predicted by CMAQ for June 3-10, 2016. d) Change in average TOL concentration for ECI shown in section S3.

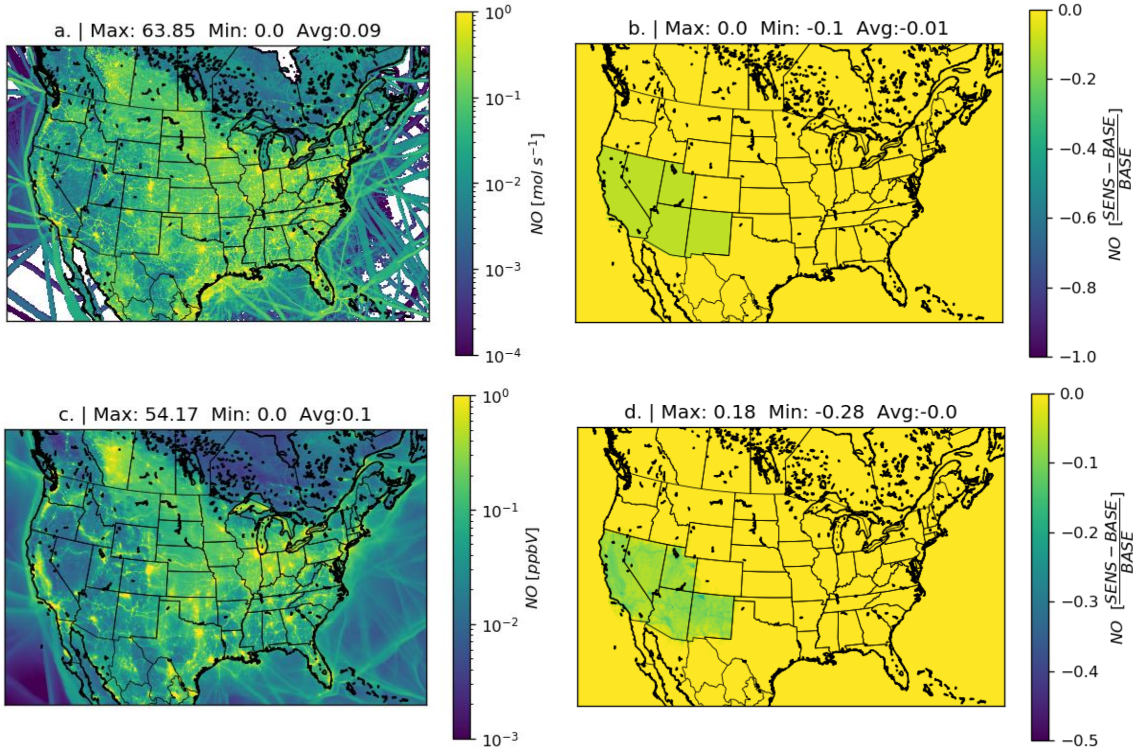


Figure S3. a) Average 1-hr NO emissions input for June 3-10, 2016. b) Change in 1-hr NO emissions for CMAQ run with ECI shown in section S3. c) Average NO surface concentrations predicted by CMAQ for June 3-10, 2016. d) Change in average NO concentration for ECI shown in section S3.