

## Example mozbc.inp for mapping CAM-Chem and WACMM output to WRF-Chem MOZART gas phase species:

```
&control
do_bc      = .true.
do_ic      = .true.
domain     = 1
dir_wrf    = '/glade/scratch/pfister/WRFreal_WACCM/'
dir_moz    = './'
fn_moz     = 'output_WACMM_0001.nc'
moz_var_suffix = ''
def_missing_var = .true.
spc_map    = 'o3 -> O3', 'n2o -> N2O', 'no -> NO',
             'no2 -> NO2', 'nh3 -> NH3', 'hno3 -> HNO3', 'hno4 -> HO2NO2',
             'n2o5 -> N2O5', 'h2o2 -> H2O2',
             'ch4 -> CH4', 'co -> CO', 'ch3ooh -> CH3OOH',
             'hcho -> CH2O', 'ch3oh -> CH3OH', 'c2h4 -> C2H4',
             'ald -> CH3CHO', 'acet -> CH3COCH3', 'mgly -> CH3COCHO',
             'pan -> PAN', 'mpan -> MPAN', 'macr -> MACR',
             'mvk -> MVK', 'c2h6 -> C2H6', 'c3h6 -> C3H6', 'c3h8 -> C3H8',
             'c2h5oh -> C2H5OH', 'c10h16 -> MTERP',
             'isopr -> ISOP', 'acetol -> HYAC', 'mek -> MEK',
             'bigene -> BIGENE', 'bigalk -> BIGALK',
             'tol -> TOLUENE', 'benzene -> BENZENE', 'xylenes ->XYLENES',
             'cres -> CRESOL', 'dms -> DMS', 'so2 -> SO2'
```

### For MOZCART gas species replace:

```
'tol -> TOLUENE', 'benzene -> BENZENE', 'xylenes ->XYLENES',
```

with

```
'tol -> TOLUENE+BENZENE+XYLENES',
```

## Matching the Modal Aerosol Model (MAM) in CESM (CAM-chem and WACCM) to WRF-Chem aerosol models

### CESM with MAM4 -> MOSAIC 8-bin in WRF-Chem

```
'oc_a01->0.0093*pom_a1+0.7510*soa1_a2+0.0093*soa1_a1+0.7510*soa2_a2+
0.0093*soa2_a1+0.7510*soa3_a2+0.0093*soa3_a1+0.7510*soa4_a2+0.0093*soa4_a1+
0.7510*soa5_a2+0.0093*soa5_a1;1.e9',
'oc_a02->0.1123*pom_a1+0.2376*soa1_a2+0.1123*soa1_a1+0.2376*soa2_a2+
0.1123*soa2_a1+0.2376*soa3_a2+0.1123*soa3_a1+0.2376*soa4_a2+0.1123*soa4_a1+
0.2376*soa5_a2+ 0.1123*soa5_a1;1.e9',
'oc_a03->0.3835*pom_a1+0.0113*soa1_a2+0.3835*soa1_a1+0.0133*soa2_a2+
0.3835*soa2_a1+0.0113*soa3_a2+0.3838*soa3_a1+0.0113*soa4_a2+0.3838*soa4_a1+
0.0113*soa5_a2+ 0.3838*soa5_a1;1.e9',
'oc_a04->0.3783*pom_a1+0.0001*soa1_a2+0.3783*soa1_a1+0.0001*soa2_a2+
0.3783*soa2_a1+0.0001*soa3_a2+0.3783*soa3_a1+0.0001*soa4_a2+0.3783*soa4_a1+
0.0001*soa5_a2+ 0.3783*soa5_a1;1.e9',
'oc_a05->0.1077*pom_a1+0.0000*soa1_a2+0.1077*soa1_a1+0.0000*soa2_a2+
0.1077*soa2_a1+0.0000*soa3_a2+0.1077*soa3_a1+0.0000*soa4_a2+0.1077*soa4_a1+
0.0000*soa5_a2+ 0.1077*soa5_a1;1.e9',
'oc_a06->0.0087*pom_a1+0.0000*soa1_a2+0.0087*soa1_a1+0.0000*soa2_a2+
0.0087*soa2_a1+0.0000*soa3_a2+0.0087*soa3_a1+0.0000*soa4_a2+0.0087*soa4_a1+
0.0000*soa5_a2+ 0.0087*soa5_a1;1.e9',
'oc_a07->0.0002*pom_a1+0.0000*soa1_a2+0.0002*soa1_a1+0.0000*soa2_a2+
0.0002*soa2_a1+0.0000*soa3_a2+0.0002*soa3_a1+0.0000*soa4_a2+0.0002*soa4_a1+
0.0000*soa5_a2+ 0.0002*soa5_a1;1.e9',
```

'oc\_a08->0.0000\*pom\_a1+0.0000\*soa1\_a2+0.0000\*soa1\_a1+0.0000\*soa2\_a2+  
0.0000\*soa2\_a1+0.0000\*soa3\_a2+0.0000\*soa3\_a1+0.0000\*soa4\_a2+0.0000\*soa4\_a1+  
0.0000\*soa5\_a2+ 0.0000\*soa5\_a1;1.e9',  
'bc\_a01->0.0093\*bc\_a1+0.0093\*bc\_a4;1.e9',  
'bc\_a02->0.1123\*bc\_a1+0.1123\*bc\_a4;1.e9',  
'bc\_a03->0.3835\*bc\_a1+0.3835\*bc\_a4;1.e9',  
'bc\_a04->0.3783\*bc\_a1+0.3783\*bc\_a4;1.e9',  
'bc\_a05->0.1077\*bc\_a1+0.1077\*bc\_a4;1.e9',  
'bc\_a06->0.0087\*bc\_a1+0.0087\*bc\_a4;1.e9',  
'bc\_a07->0.0002\*bc\_a1+0.0002\*bc\_a4;1.e9',  
'bc\_a08->0.0000\*bc\_a1+0.0000\*bc\_a4;1.e9',  
'so4\_a01->0.7510\*so4\_a2+0.0093\*so4\_a1+0.0000\*so4\_a3;1.e9',  
'so4\_a02->0.2376\*so4\_a2+0.1123\*so4\_a1+0.0000\*so4\_a3;1.e9',  
'so4\_a03->0.0113\*so4\_a2+0.3835\*so4\_a1+0.0000\*so4\_a3;1.e9',  
'so4\_a04->0.0001\*so4\_a2+0.3783\*so4\_a1+0.0002\*so4\_a3;1.e9',  
'so4\_a05->0.0000\*so4\_a2+0.1077\*so4\_a1+0.0061\*so4\_a3;1.e9',  
'so4\_a06->0.0000\*so4\_a2+0.0087\*so4\_a1+0.0934\*so4\_a3;1.e9',  
'so4\_a07->0.0000\*so4\_a2+0.0002\*so4\_a1+0.4020\*so4\_a3;1.e9',  
'so4\_a08->0.0000\*so4\_a2+0.0000\*so4\_a1+0.4983\*so4\_a3;1.e9',  
'nh4\_a01->0.1410\*so4\_a2+0.0033\*so4\_a1+0.0000\*so4\_a3;1.e9',  
'nh4\_a02->0.0446\*so4\_a2+0.0017\*so4\_a1+0.0000\*so4\_a3;1.e9',  
'nh4\_a03->0.0021\*so4\_a2+0.0210\*so4\_a1+0.0000\*so4\_a3;1.e9',  
'nh4\_a04->0.0000\*so4\_a2+0.0720\*so4\_a1+0.0000\*so4\_a3;1.e9',  
'nh4\_a05->0.0000\*so4\_a2+0.0202\*so4\_a1+0.0011\*so4\_a3;1.e9',  
'nh4\_a06->0.0000\*so4\_a2+0.0001\*so4\_a1+0.0175\*so4\_a3;1.e9',  
'nh4\_a07->0.0000\*so4\_a2+0.0000\*so4\_a1+0.0755\*so4\_a3;1.e9',  
'nh4\_a08->0.0000\*so4\_a2+0.0000\*so4\_a1+0.0935\*so4\_a3;1.e9',  
'no3\_a01->0.0000\*so4\_a2+0.0000\*so4\_a1+0.0000\*so4\_a3;1.e9',  
'no3\_a02->0.0000\*so4\_a2+0.0000\*so4\_a1+0.0000\*so4\_a3;1.e9',  
'no3\_a03->0.0000\*so4\_a2+0.0000\*so4\_a1+0.0000\*so4\_a3;1.e9',  
'no3\_a04->0.0000\*so4\_a2+0.0000\*so4\_a1+0.0000\*so4\_a3;1.e9',  
'no3\_a05->0.0000\*so4\_a2+0.0000\*so4\_a1+0.0000\*so4\_a3;1.e9',  
'no3\_a06->0.0000\*so4\_a2+0.0000\*so4\_a1+0.0000\*so4\_a3;1.e9',  
'no3\_a07->0.0000\*so4\_a2+0.0000\*so4\_a1+0.0000\*so4\_a3;1.e9',  
'no3\_a08->0.0000\*so4\_a2+0.0000\*so4\_a1+0.0000\*so4\_a3;1.e9',  
'na\_a01->0.2954\*ncl\_a2+0.0037\*ncl\_a1+0.0000\*ncl\_a3;1.e9',  
'na\_a02->0.0935\*ncl\_a2+0.0442\*ncl\_a1+0.0000\*ncl\_a3;1.e9',  
'na\_a03->0.0045\*ncl\_a2+0.1509\*ncl\_a1+0.0000\*ncl\_a3;1.e9',  
'na\_a04->0.0000\*ncl\_a2+0.1488\*ncl\_a1+0.0000\*ncl\_a3;1.e9',  
'na\_a05->0.0000\*ncl\_a2+0.0424\*ncl\_a1+0.0024\*ncl\_a3;1.e9',  
'na\_a06->0.0000\*ncl\_a2+0.0034\*ncl\_a1+0.0367\*ncl\_a3;1.e9',  
'na\_a07->0.0000\*ncl\_a2+0.0000\*ncl\_a1+0.1582\*ncl\_a3;1.e9',  
'na\_a08->0.0000\*ncl\_a2+0.0000\*ncl\_a1+0.1960\*ncl\_a3;1.e9',  
'cl\_a01->0.4555\*ncl\_a2+0.0056\*ncl\_a1+0.0000\*ncl\_a3;1.e9',  
'cl\_a02->0.1441\*ncl\_a2+0.0681\*ncl\_a1+0.0000\*ncl\_a3;1.e9',  
'cl\_a03->0.0068\*ncl\_a2+0.2326\*ncl\_a1+0.0000\*ncl\_a3;1.e9',  
'cl\_a04->0.0000\*ncl\_a2+0.2295\*ncl\_a1+0.0000\*ncl\_a3;1.e9',  
'cl\_a05->0.0000\*ncl\_a2+0.0654\*ncl\_a1+0.0037\*ncl\_a3;1.e9',  
'cl\_a06->0.0000\*ncl\_a2+0.0055\*ncl\_a1+0.0567\*ncl\_a3;1.e9',  
'cl\_a07->0.0000\*ncl\_a2+0.0001\*ncl\_a1+0.2439\*ncl\_a3;1.e9',  
'cl\_a08->0.0000\*ncl\_a2+0.0000\*ncl\_a1+0.3023\*ncl\_a3;1.e9',  
'oin\_a01->0.7510\*dst\_a2+0.0093\*dst\_a1+0.0000\*dst\_a3;1.e9',  
'oin\_a02->0.2376\*dst\_a2+0.1123\*dst\_a1+0.0000\*dst\_a3;1.e9',  
'oin\_a03->0.0113\*dst\_a2+0.3835\*dst\_a1+0.0000\*dst\_a3;1.e9',  
'oin\_a04->0.0001\*dst\_a2+0.3783\*dst\_a1+0.0002\*dst\_a3;1.e9',  
'oin\_a05->0.0000\*dst\_a2+0.1077\*dst\_a1+0.0061\*dst\_a3;1.e9',  
'oin\_a06->0.0000\*dst\_a2+0.0087\*dst\_a1+0.0934\*dst\_a3;1.e9',  
'oin\_a07->0.0000\*dst\_a2+0.0002\*dst\_a1+0.4020\*dst\_a3;1.e9',  
'oin\_a08->0.0000\*dst\_a2+0.0000\*dst\_a1+0.4983\*dst\_a3;1.e9',  
'num\_a01->0.9502\*num\_a2+0.2509\*num\_a1+0.0000\*num\_a3;1.0',  
'num\_a02->0.0494\*num\_a2+0.4626\*num\_a1+0.0000\*num\_a3;1.0',  
'num\_a03->0.0004\*num\_a2+0.2470\*num\_a1+0.0007\*num\_a3;1.0',  
'num\_a04->0.0000\*num\_a2+0.0377\*num\_a1+0.0232\*num\_a3;1.0',  
'num\_a05->0.0000\*num\_a2+0.0016\*num\_a1+0.1886\*num\_a3;1.0',  
'num\_a06->0.0000\*num\_a2+0.0000\*num\_a1+0.4372\*num\_a3;1.0',

'num\_a07->0.0000\*num\_a2+0.0000\*num\_a1+0.2935\*num\_a3;1.0',  
 'num\_a08->0.0000\*num\_a2+0.0000\*num\_a1+0.0566\*num\_a3;1.0'

### WACCM -> MOSAIC 4 bin

Sum the 8-bin MOSAIC bins

4bin\_a01 = 8bin\_a01 + 8bin\_a02

4bin\_a02 = 8bin\_a03 + 8bin\_a04

4bin\_a03 = 8bin\_a05 + 8bin\_a06

4bin\_a04 = 8bin\_a07 + 8bin\_a08

### CESM/MAM4 -> GOCART in WRF-Chem

'BC1 -> 1.0\*bc\_a4;1.e9',

'BC2 -> 1.0\*bc\_a1;1.e9',

'OC1 -> 1.0\*pom\_a4+1.0\*soa\_a4;1.e9',

'OC2 -> 1.0\*pom\_a1+1.0\*soa\_a1;1.e9',

'SEAS\_1 -> 1.0\*ncl\_a1+1.0\*ncl\_a2;1.e9',

'SEAS\_2 -> 0.5\*ncl\_a3;1.e9',

'SEAS\_3 -> 0.5\*ncl\_a3;1.e9',

'SEAS\_4 -> 0.0\*ncl\_a3;1.e9'

'DUST\_1 -> 0.02\*dst\_a3;1.e9',

'DUST\_2 -> 0.93\*dst\_a3;1.e9',

'DUST\_3 -> 0.05\*dst\_a3;1.e9',

'DUST\_4 -> 0.0\*dst\_a3;1.e9',

'DUST\_5 -> 0.0\*dst\_a3;1.e9',

### MAM4 Aerosols [X. Liu, GMD, doi:10.5194/gmd-9-505-2016, 2016]

| Aerosol Mode   | CESM label | type                              | $\sigma_g$ | Size range ( $\mu\text{m}$ ) |
|----------------|------------|-----------------------------------|------------|------------------------------|
| Aitken         | _a2        | dst, ncl, so4, num                | 1.6        | 0.015 – 0.053                |
| Accumulation   | _a1        | bc, pom, dst, ncl, so4, soa*, num | 1.8        | 0.058 – 0.27                 |
| Coarse         | _a3        | dst, ncl, so4, num                | 1.8        | 0.8 – 3.65                   |
| Primary carbon | _a4        | bc, pom, soa*, num                | 1.8        | 0.058 – 0.27                 |

soa\* = soa1, soa2, soa3, soa4, soa5 in mechanisms with VBS-SOA; =soa in MAM-SOA

num = total number (all aerosol types) for each mode