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Adding Species to model and output

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25 April 2013

Adding Species

Species are listed in **CM_ChemSpecs_ml.f90**

Advected (IAXDV) , Sholt lived (IXSHL) and total.

Ex: SO2

```
, IXADV_SO2      = 52  &        in advected
, SO2        = 68  &            in total
```

Listed in species array (type Chemical)

```
species(SO2) =
Chemical("SO2",  64.00,  0,  0,  0,  1,  0.0,  0.000,  0.0)
```

Name molw nmhc carbons nitrogens sulphurs ExtC CiStar DeltaH

Ex: SeaSaltf (fine sea salt)

```
 ,  IXADV_SEASALT_F   = 116   & in advected
 ,  SEASALT_F   = 132   &          in total
species(SEASALT_F)=
```

ExtC

Chemical("SEASALT_F", 58.00, 0, 0, 0, 0, 3.0, 0.00, 0.0)

The species can also be members of goups in **CM_ChemGroups_ml.f90**

```
integer, public, parameter ::  INDEX_DDEP_SS_GROUP = 1
integer, public, target, save, dimension(2) :: &
            DDEP_SS_GROUP     = (/ SEASALT_F,SEASALT_C /)


 gtype( "DDEP_SS", 2, (/
   SEASALT_F,SEASALT_C,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
                                  0,0,0,0,0,0,0,0,0,0,0,0,0,0 /) ) &
```

Reactions

Handled in **Solver_ml.f90**

CM_Reactions1.inc

The chemistry is iterated several times, more iterations closer to the ground than in the higher layers, example SO2

```
!-SO2
    P =   &
        rcemis(SO2,k)
    L =  &
        2e-12*AQRCK(ICLOHSO2,K)* xnew(OH )  &
      + AQRCK(ICLRC1,K)* xnew(H2O2 )  &
      + AQRCK(ICLRC2,K)* xnew(O3 )  &
      + AQRCK(ICLRC3,K)
    xnew(SO2)=  ( xold(SO2) + dt2 * P) /(1.0 + dt2*L )
```

Reactions

Handled in **Solver_ml.f90**

CM_Reactions2.inc

Simpler reactions, or species with no chemical reactions that only need one iteration per chemical time step, example SeaSalt_f (emissions are handled in the module **SeaSalt_ml.f90)**

```
!-> SEASALT_F
      P =   &
          rcemis(SEASALT_F,k)
      ! L = 0.0
      xnew(SEASALT_F)=  xold(SEASALT_F) + dt2 * P
```

Wet deposition

CM_WetDep.inc

, depmap(IXADV_SO2, CWDEP_SO2, -1) &

, depmap(IXADV_SeaSalt_f, CWDEP_SSf, -1) &

Can assume specie to fall with an alredy established CWDEP, ex. CWDEP_PMf, or define your own in **Aqueous_n_WetDep_ml.f90,**

	w_sca	w_sub
WetDep(CWDEP_SO2) = WScav(	0.3,	0.15)
WetDep(CWDEP_SSf) = WScav(	1.6,	EFF25)

Dry Deposition

CM_DryDep.inc

, depmap(IXADV_SO2, CDDEP_SO2, -1) &

, depmap(IXADV_SeaSalt_f, CDDEP_PMfS, -1) &

Can assume specie to fall with an already established CDDEP, ex. CDDEP_PMf

If you want to define you own CDDEP, this can be done in **Wesely_ml.f90** and **My_Aerosol_ml.f90**

Add Output

- _fullrun.nc The result of the whole run
- _month.nc Monthly results for the months in the run
- _day.nc Daily results for the days in the run

Output for these files are handled by the modules **My_Derived_ml** and **Derived_ml**

- _hour.nc Hourly output
- sites/sondes_2010.csv Output from site and sondes

Output for these files are handled by the modules **My_Outputs_ml** and **Output_hourly**

Both **My_Derived_ml** and **My_Output_ml** defines the output you want, and **Derived_ml** and **Output_hourly** sets up the species and groups for the output requested.

My_Derived_ml.f90

For **surface concentrations** in OutputConcs array

Ex: SURF_ug_PM10

Unit of output

,typ_s5i("PM10 ", "ug ", D2,"AIR_CONCS", GROUP, D)&

D2: Surface concentations

D3: All vertical layers and surface .

D: Output in _day.nc, _month.nc and fullrun.nc

M: Output in _month.nc and fullrun.nc

Column output are set with the two arrays: COLUMN_MOLEC_CM2 and COLUMN_LEVELS. The units are molec/m^2, but can be changed in **Derived_ml.f90**

Ex: NO2 column over all 20 layers

COLUMN_COMPONENT_NLAYERS → COLUMN_NO2_k20

Dry and **wet deposition** are set by the arrays DDEP_WANTED and WDEP_WANTED. (Remember also the landtype for dry deposition)

```
typ_s3("SOX       ",GROUP, "mgS"), &
```

name GROUP/SPEC unit

Se more in the UserGuide!

For other output ex meteorological variables, see the array D2_extra in **My_Derived_ml** and other examples in **Derived_ml** by using AddNewDeriv.

Hourly Output

My_Outputs_ml.f90

Output for **sites** and **sondes** are set in SITE_ADV, SITE_XTRA_MISC,SITE_XTRA_D2D. By default everything is set as output!

Hourly output in _hourly.nc is set by setting **nhourly_out** to the numer of fields you want and **hr_out** to the field. See examples for other species.

There are preset a lot of output for different modes of the model. The mode for opensource is default. Look at examples.