Tools to read sites and sondes output

The EMEP model currently provides detailed outputs for selected locations. The 'sites' outputs provide surface concentrations (at ca. 3m), and typically many (or all) chemical compounds are provided for each site and hour. The 'sondes' type of outputs provide vertical profiles, typically for a selection of compounds (to prevent huge files) and possibly with time-resolution of e.g. 3 or 6 hours. The model has historically provided ascii outputs, but recently a parallel system with netcdf outputs has been introduced. In future the ascii outputs will be removed.

We provide four programmes

- Rd_ncsites.py - python script to read and plot netcdf site files

- Rd_ncsondes.py - python script to read and plot netcdf sonde files

- Rd_csvsites.f90 - fortran code to read and plot ascii site files

- Rd_csvsondes.f90 - fortran code to read and plot ascii sonde files

The codes have a number of things in common:

- they can be called either directly with site names and pollutant, or

- they can be used in a simple menu-like approach in which case the user is presented with a list of stations, pollutants and other choices as appopriate.

- they produce ascii files for the desired sites and pollutants.

The python scripts also produce plots, e.g. of daily or monthly mean concenrations - as time-series for sites data (see Fig. 1), and as 2-D plots for sonde data (see Fig.2).

Rd_ncsites.py, Rd_ncsondes.py

These python (2.7) tools make use of the matplotlib and netCDF4 modules - these are usually readily available, e.g. in standard Ubuntu repositories.

Examples

```
Rd_ncsondes.py -h
  - produces help with usage information
```
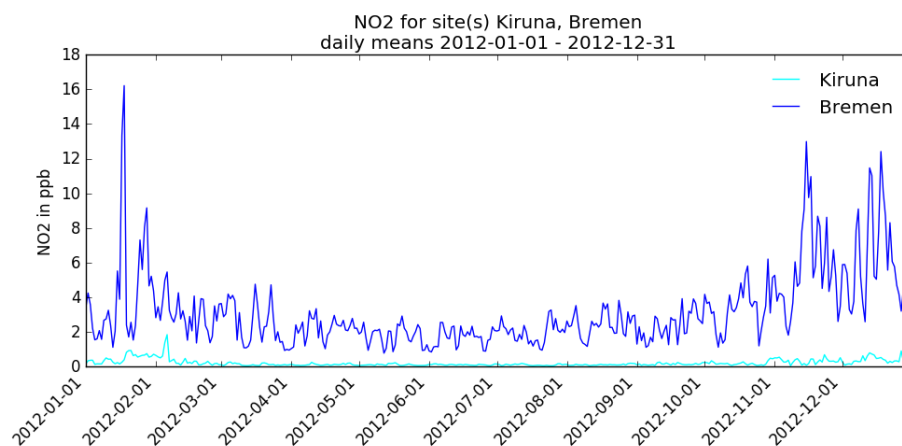
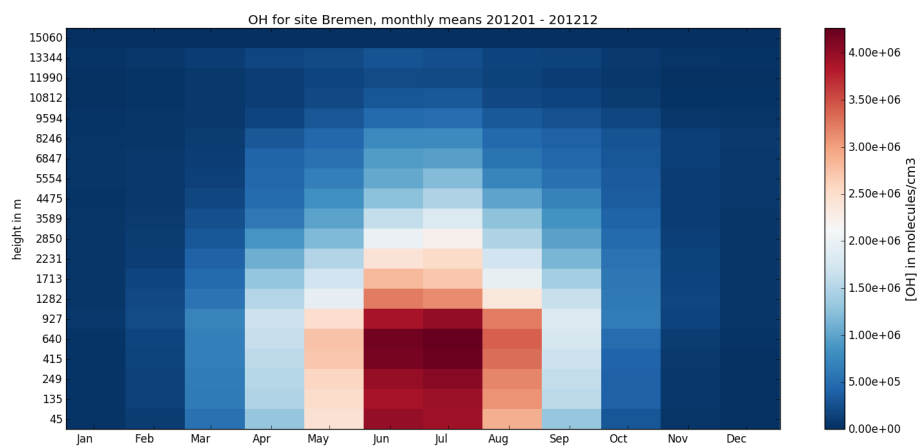Figure 1: Example of Rd_ncsites.py output: daily NO2 values for 2 sites

Figure 2: Example of Rd_ncsondes.py output: monthly mean OH values

```
Rd_ncsondes.py -i sondes_2012.nc
- will suggest list of sites and then pollutants
- then will generate outputs

Rd_ncsondes.py -i sondes_2012.nc -s Bremen -v O3 -pt monmeans -pr entire
    - will produce ascii outputs and plot

Rd_ncsites.py -i sondes_2012.nc -s Bremen -v O3 -pt monmeans -pr entire
    - will produce ascii outputs and plot
```

Usage of Rd_ncsites.py is very similar, but if wanted more than one site can be plotted (as in Fig.1):

```
Rd_ncsites.py -i sondes_2012.nc -s Bremen,Kiruna -v NO2 -pt daymeans -pr entire
```

The ascii output files are prefixed with SITES or SONDES, for example:

- SITES_Birkenes_O3.vals - Hourly values as 24 column matrix

- SITES_Birkenes_O3.1hrly - Hourly values

- SITES_Birkenes_O3.dmean - Daily means

- SITES_Birkenes_O3.dmax - Daily max

- SITES_Birkenes_O3.mmean - Monthly mean

Rd_csvsites.f90, Rd_csvsondes.f90 (DEPRECATED)

Reads the comma separated sites or sondes files produced by the EMEP model, and extracts data for one pollutant and site to ascii files.

Examples

```
Rd_csvsites
    - produces help with usage information

Rd_csvsites /xxx/../sites_2009.csv
    - will suggest list of sites and then pollutants
    - then will generate outputs

Rd_csvsites /xxx/../sites_2009.csv Birkenes  O3
    - will generate outputs
```

Other comments: Formatting of output may need to be modified for different polls.

meteoPreProc.f90

If desired, emissions in the EMEP model can be related to so-called heating degree-days (HDD), which quantify the "coldness" of each day with respect to some assumed standard temperature, e.g. 18 or 20 degrees C. The HDD values are first calculated for each day of the year, then normalised, to produce an EMEP netcdf input file which can be used to control the emissions of domestic/residential sources (SNAP-2). The method is explained further in Simpson et al. (Atmos.Chem.Phys.,2012: www.atmos-chem-phys.net/12/7825/2012/), Sect.6.1.2.

The code meteoPreProc.f90 is used for this pre-processing and this needs to be compiled with Fortran-netcdf support. The compilation and library-flags vary from machine to machine, but are anyway required before the EMEP model can be installed. We assume here that the compiled program is called meteoProc.

In order to produce a HDD file with base-temperature 18 deg C, for 2012 and on the EECCA grid, one would need to specify the location of the EMEP meteorological files, and then run something like::

```
meteoPreProc 18 2012 /some/input/directory/meteo/2012 EECCA-2012.nc
```

Then move EECCA-2012.nc to the input directory as needed by the EMEP modrun.sh script.