WP6- NA6: WP "Integration, outreach, and sustainability"
Deliverable D6.5: Web interface to Higher Level products for the climate &
air-pollution modelling community
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1. Goal

Within WP6 - ACTRIS it is planned to conceptually design and construct easily accessible new higher-level data products in response to established end user needs by integrating different measurement data from the ACTRIS network. In addition to the NRT data streams to GEMS and WMP the major users of the advanced ACTRIS data are in the atmospheric science community in general. General model evaluation studies, satellite retrieval development, and scientific assessments for climate and air pollution policy advice make use of integrated information and coarsely gridded data products, eventually on much lower time resolution than actually measured in ACTRIS. Measurements taken in ACTRIS thus require further integration and preparation as higher-level products to make the network efficient. Error documentation and sampling statistics need to be explained and documented in a form usable for model evaluation and assessments. Higher-level products require on the other hand scientific judgment and need to be designed with expertise coming from the data providers. The higher-level products shall be integrated with the overall ACTRIS data dissemination in collaboration with the data centre (SA1). The following higher-level products are envisaged in a first stage:

- Standard benchmark data sets for model evaluation (climatologies for concentrations of Essential Climate Variables, optical properties, size distributions, composition and deposition fields)
- Regional long-term trends of key aerosol species and associated error
- 3D spatial distributions of key species and their radiative forcing efficiency"

An interface has been constructed here, linked to the AeroCom platform with the support of the ACTRIS project, which gives access to higher-level products mainly aimed at aerosol model evaluation. This interface is meant to be expanded and shall hold more products built in the course of the ACTRIS project.

2. Description of Interface

Several datasets for aerosol model evaluation are now available as higher-level products. Higher-level products are here defined as products originating from ACTRIS-type observational data, which have been post-processed, combined or transformed in such a way that they serve a more abstract purpose then the original observational data. The ACTRIS/EBAS database provides an up-to-date access to calibrated, well characterized and over time corrected original observational data, often referred to as "data of known quality". However, not all potential users of such data can cope with the nature and structure of these data, especially in the exact form provided by accessing the EBAS database. A thorough database search is relatively slow, often over-complete and demanding considerable insight into the database and data origins. Selecting data, weighing quality of different parameters, deriving statistical characterization such as regional or seasonal means and judging fit-for-purpose is an important step to produce a higher level product. It requires sophisticated scientific post-processing of the original data, even if the latter are of highest quality. After the selection procedure it might be also useful to adapt the data format itself to facilitate usage. This can involve - depending on needs - gridding of station data, establishing new netcdf or ascii files and even the production of images. Finally - error characterization is at best clarified with additional documentation or per data point. Eventually also associated data are identified which must or should be used in conjunction with the original data, such as meteorological observations or quality flags.

Supplementary information, coming with publications, could serve the function of giving access to higher-level products, but often misses to fulfill what one would expect from a higher-level product. This happens mainly because access and documentation of the underlying data was not the goal of the original publication. Also - not all journals allow for extensive documentation. The procedures and pathways to add supplementary information are often too rigid and limited in structure, support and extent. However, a classical scientific publication can very usefully underpin knowledge and usage of higher-level products and should be the primary pathway to finalise and advertise higher-level products.

A very well known user requirement with respect to ACTRIS is the preparation of data for model evaluation. The AeroCom model intercomparison initiative has attempted since 2003 to jointly improve aerosol modelling, ultimately with the goal to reduce uncertainty in aerosol radiative forcing. Complex numerical models are used on high-performance computers to simulate on rather coarse grids global aerosol fields. Inter-regional differences and seasonal averages of selected aerosol parameters can be helpful to constrain the aerosol budget and derived aerosol optical parameters. Aggregated higher-level products have several advantages here: Model evaluation becomes reproducible and easier for modellers, model development becomes more efficient, modelling progress over time can be documented, inter-model differences can be analysed across institutional boundaries, model diversity and error can be judged against consolidated data errors and finally model parameters which are not observable can be constrained, especially if multiple products are integrated in the evaluation process.

To assemble and provide access to higher-level products for aerosol model evaluation a section of the AeroCom model intercomparison web platform is prepared here as interface to these:

http://aerocom.met.no/databenchmarks.html

This compiles a consistent catalogue of such products and associated data, documentation and links. Where possible, data are directly available in a download area of this website for easy access. Note that the terms of usage vary from dataset to dataset and should be understood from reading the associated readme file. Some data are prepared and physically hold at other places and are merely listed. Since this interface aims to inform aerosol and AeroCom modellers, it was deemed useful to list both original high-level products and other places holding such products. Note also that a similar listing is prepared at NILU/Actris, having a broader scope, but being closer linked to the data hold by the ACTRIS/EBAS database.

Each higher-level product consists of at least an essential readme file (ascii format) and a more detailed document describing data origin, methods, purpose, preparation (pdf-format). Eventually an exemplary application of the data is documented as well. Finally the product has the associated real data files (any format, preferably ascii, netCDF, NASA-Ames, images as png, jpg). The essential ascii readme file shall contain a short description, contact details, usage terms, references to publications or websites and advice how to use the product.

3. Higher-level products listed via the AeroCom/ACTRIS interface

3.2. AEROCE/SEAREX deposition data

The dataset refers to the long-term monitoring at oceanic sites, mainly observation towers on islands, operated by J. Prospero and colleagues. Beginning in the early 1980s and into the late 1990s, the University of Miami Aerosol Group established and operated a global network of aerosol sampling stations. During these two decades, the UM group occupied over 50 stations for varying periods of time. During most of this period, 20 to 25 stations were constantly in concurrent operation. A few stations were in operation for much or all of the two decades. A documentary note refers to all references (Prospero, 2009). Link to data and documentation:

http://aerocom.met.no/download/AEROCE-SEAREX/

3.3. Initial Black Carbon AeroCom evaluation data

The data in this directory have been used for the AeroCom Black Carbon evaluation paper by Koch, D. et al. Atmos. Chem. Phys., 9, 9001-9026, 2009. Link to data and documentation:

http://aerocom.met.no/download/BC_BENCHMARK_KOCH2009/

3.4. Caliop Aerosol Extinction Profile data

The data in this directory have been used for the AeroCom paper by Koffi, B., et al., J. Geophys. Res., 117, D10201, doi:10.1029/2011JD016858, 2012. Link to data and documentation:

http://aerocom.met.no/download/CALIOP_BENCHMARK_KOFFI2012/

3.5. Dust Aerocom evaluation data

The data in this directory have been used for the AeroCom paper by Huneeus N., et al. , Atmos. Chem. Phys., 11, 7781-7816, 2011. Link to data and documentation:

http://aerocom.met.no/download/DUST_BENCHMARK_HUNEEUS2011/

3.6. Number size distribution climatology for Europe

The data refer to a summarizing climatology paper by Asmi et al., Atmos. Chem. Phys., 11, 5505-5538, 2011, of measurements made in the EUSAAR project (ACTRIS predecessor). Link to data and documentation: http://www.atm.helsinki.fi/eusaar/

4. Acknowledgment

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5. References

Web address for the interface:
http://aerocom.met.no/databenchmarks.html

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