Deliverable D13.2: Demonstration of online evaluation capabilities

Julie Letertre-Danczak, Luke Jones, Cihan Sahin, Angela Benedetti (ECMWF)
Enric Terradellas (AEMET/BSC), Sara Basart, Enza Di Tomaso, Oriol Jorba (BSC)
Augustin Mortier, Jan Griesfeller, Michael Schulz (Met Norway)

Work package no	**WP*13***
Deliverable no.	**D*13.2***
Lead beneficiary	
Deliverable type	☑ R (Document, report) ☐ DEC (Websites, patent fillings, videos, etc.) ☐ OTHER: please specify **.....**
Dissemination level	☑ PU (public) ☐ CO (confidential, only for members of the Consortium, incl Commission)
Estimated delivery date	**Month *21***
Actual delivery date	***16/11/2017***
Version	**2**
Comments	***Revised on 07/11/2017***

ACTRIS (www.actris.eu) is supported by the European Commission under the Horizon 2020 – Research and Innovation Framework Programme, H2020-INFRAIA-2014-2015, Grant Agreement number: 654109

D13.2: DEMONSTRATION OF ONLINE EVALUATION CAPABILITIES

13.2.1 INTRODUCTION

Various model evaluation and verification activities fall under the umbrella of the Joint Research Activity 3 (JRA) under WP13. In report D13.1, a detailed scientific overview of the verification activities has been reported. Here we summarize the report and provide links to websites that have been set-up to provide a demonstration of what the near-real-time (NRT) verification capabilities may look like in an operational context. We emphasize that this is still a research activity and there are no operational requirements in JRA3. Hence some of the webpages displayed are not actually updated in NRT at the moment.

13.2.2 EVALUATION OF MODEL-DERIVED DUST VERTICAL PROFILES

A problem for the evaluation of dust models is the scarcity of routine observations intended for dust monitoring. At the moment, sun-photometric measurements and satellite retrievals are used for the WMO Sand and Dust Storm Warning Advisory and Assessment System Regional Center (SDS-WAS RC) for Northern Africa, the Middle East and Europe joint model evaluation exercise (https://sds-was.aemet.es/forecast-products/forecast-evaluation/). This model evaluation is also officially part of the Copernicus Atmosphere Monitoring Service (CAMS) verification for dust. However, to date, the only parameter that is routinely evaluated is the dust optical depth provided by ground-based and satellites (i.e. ACTRIS-AERONET sun photometers and MODIS), which provides the integrated contribution of the entire vertical column.

Ground- and satellite-borne lidar and last generation of ceilometers are the only tools capable of providing information about the vertical profiles of aerosol variables, including dust. Some work has already been done to develop an evaluation in this direction, as in Binietoglou et al. (2015), where dust concentration forecast by different numerical models is compared with lidar retrievals of dust mass vertical profiles obtained through the use of the Lidar/Radiometer Inversion Code (LIRIC) algorithm. However, retrieval of mass vertical profiles has limitations and now it has been opted to establish a routine comparison of extinction vertical profiles.

The SDS-WAS RC started working in the establishment of a near-real-time (NRT) model monitoring/evaluation dust profile system in the framework of ACTRIS-2 (https://sds-was.aemet.es/projects-research/evaluation-of-model-derived-dust-vertical-profiles). Currently, the SDS-WAS RC is receiving in NRT aerosol extinction profiles (at 12UTC) of a lidar located in Dakar (Senegal, U. Lille) and ceilometers (NRT) in Santa Cruz de Tenerife (Canary Islands, Spain, CIAI-AEMET), Granada (Spain, UGR) and Montsec (Barcelona, Spain, CSIC-IDAEA). These ceilometers are part of the Iberian Ceilometer Network (ICENET, Cazorla et al., 2017). Up to now, University of Lille, State Meteorological Agency of Spain, University of Granada and Barcelona Supercomputing Center contribute to the initiative, which is expected to be extended soon to other institutions participating in the activities of the WMO SDS-WAS RC.

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13.2.3 EVALUATION OF AEROSOL LIGHT SCATTERING COEFFICIENT

In the framework of ACTRIS-2 verification activities, ECMWF has started to compare ACTRIS-2 observations of aerosol light scattering from nephelometers with the output from the Integrated Forecast System run under the Copernicus Atmospheric Monitoring Service (CAMS) for atmospheric composition. Data of aerosol light scattering coefficient are acquired from the ACTRIS2 Data Centre at NILU via ftp since December 2016.
The IFS model was modified to output the aerosol light scattering, absorption and extinction coefficients for 50, 40, 30, 20, 10 and 0% relative humidity. The measurements are reported at 40% relative humidity, hence this is the value used for the comparison with the ACTRIS2 observations.

A prototype of website has been developed by Luke Jones. Stations at different locations measuring aerosol light scattering at various wavelengths can be visualized on the website, following this link:
http://atmosphere.copernicus.eu/charts/cams_actris_deliverable/
The page shows verification at all ACTRIS sites and a map with several model evaluation statistical parameters.

This is compatible with the CAMS verification interface, which provides the operational evaluation in the context of the air quality and atmospheric composition monitoring service (http://atmosphere.copernicus.eu/services/air-quality-atmospheric-composition). An extension of this evaluation to the operational phase is currently under discussion between CAMS management and ACTRIS2 Coordination Office.

13.2.3 TREND WEB INTERFACE

ACTRIS2 data are used by MetNo for different evaluation activities. The Copernicus Atmospheric Monitoring Service (CAMS) with its global and regional chemical weather forecast model results are quality checked every three months. In a more broad setting, AeroCom model results delivered for different AeroCom experiments, are evaluated against a consistent dataset from the ACTRIS2 Data Centre held at NILU (EBAS). A metadata database was produced by NILU, which was then used via a data query function by MetNo to select the data of interest. AERONET and EARLINET data on the other hand have a different format and required extra reading routines to be developed.

Visualization of MetNo's evaluation work using ACTRIS2 data has been put in place by firstly maintaining and improving the traditional AeroCom web interface and secondly developing a trend web interface. The AeroCom web interface (http://aerocom.met.no/data.html) shows now a large variety of model evaluation. It has also been used with great success for regular CAMS model version evaluations and for CCI-aerosol satellite retrieval optimization. One offspring web interface was made for connecting ACTRIS and CAMS Copernicus data in an interface where model data comparisons can be accessed with an interactive map feature (http://aerocom.met.no/cams-aerocom-evaluation/).

The trend web interface developed specifically for ACTRIS-2 shows those observable parameters, which are core to ACTRIS2 (see http://aerocom.met.no/trends/). It combines a simplified access to station data

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from ACTRIS observation networks and models via a map, with statistical evaluations showing long term trends since 1980 and the underlying data. While work is under way to include more model data, some important models such as the CAMS and EMEP models and all satellite datasets from aerosol-cci (ESA) are already included. Seasonal trends for different periods can also be inspected. Documentation of methods and resources can be found along with the web visualization.

13.2.4 REFERENCES

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