Geophysical Research Abstracts, Vol. 9, 02618, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-02618

Enhancing the Prediction Skill of tropospheric Aerosols by using near real-time Satellite Data in a 3–dimensional variational Assimilation Scheme

L. Nieradzik, H. Elbern

Rhenish Institute for Environmental Research at the University of Cologne, Germany
(ln@eurad.uni-koeln.de, +49 221 400 2320)

A challenging aspect in tropospheric aerosol forecast is to quickly react on changing emission conditions by episodic or exceptional events like wild-fires, desert dust outbreaks and volcanic eruptions. A method to automatically adapt the forecast to the changed conditions by ingesting near real-time aerosol retrievals from space borne sensors is given by the technique of variational data assimilation

In this study the combined AATSR and SCIAMACHY aerosol retrievals SYNAER (SYNergetic AERosol Retrieval) from DLR-DFD for PM10, PM2.5 and PM0.5 are taken for assimilation.

The University of Cologne Chemistry-Transport-Model EURAD-CTM (EURopean Air Dispersion and pollution CTM) including the aerosol model MADE (Modal Aerosol Dynamics model for Europe) and the Secondary Organic Aerosol Module (SORGAM) is applied to produce background PM_x fields, to assimilate both SYNAER retrievals and in situ observations, and to produce assimilation based forecasts.

The assimilation method is a three dimensional variational assimilation system, including full 3D covariance modelling with anisotropic and inhomogeneous radii of influence, resting on the diffusion approach.

The efficiency of this replacement of an explicit implementation of a high dimensional background error covariance matrix (BECM) by an operator will be demonstrated.

The presentation includes a description of the assimilation system as well as the gen-

eration of the BECM by use of the NMC-method. Furthermore a validation against in situ data for a set of chosen scenarios is presented to illustrate the benefits of PM_x assimilation. The time span investigated includes a 5 month period from July to November 2003, comprising extensive wild fires on the Iberian peninsula during the summer period. Validation of the results are made by in situ observations of particulate matter, which were retained from assimilation unter the footprints of SCIAMACHY, and only used for evaluation of the analysis results.

In contrast to photo-oxidant gas phase chemistry assimilation, it can be demonstrated that the persistence time of aerosol assimilation results prevail over several days after assimilation, showing the beneficial impact of sophisticated data assimilation for forecasts.