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Towards chemistry resolved variational assimilation of satellite retrieved aerosol data

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One of the biggest challenges in atmospheric chemistry modelling still is the forecast of tropospheric aerosols, especially in the case of events like wildfires or desert dust outbreaks. A proper and widely known method to enhance forecast skills of CTMs (Chemistry-Transport-Models) by ingesting measurements is the method of variational data assimilation. With this method and the advent of near real time space borne aerosol measurements it has become feasible to quickly react on changes in the atmospheric composition.

In this study, in preparation for a four dimensional variational data assimilation (4Dvar) system for aerosols to be applied in the earth observation systems PROMOTE and GEMS, as part of the AERO-SAM project, combined AATSR and SCIAMACHY aerosol retrievals SYNAER (SYNergetic AErosol Retrieval) from DLR-DFD have been taken for 3Dvar assimilation. The EURAD-CTM (EURopean Air Dispersion and pollution CTM) with its aerosol model MADE, including the Secondary Organic Aerosol Module SORGAM, and the EURAD-FIRE-MODEL (EFM) was taken to simulate aerosol transport and chemistry and to assimilate SYNAER data for two periods: July and August of 2003, a period with high wildfire activity, and July 2006, a period covering a saharan desert dust outbreak. The forecast skill was observed for three different configurations: in-situ data only, in-situ with PM10 or AOT, respectively. Furthermore a quick and efficient way to obtain the background error covariance matrix (BECM), crucial for variational assimilation, by the NMC - method is shortly described. It can clearly be stated, that making use of space borne near real

time aerosol measurements leads to an enhancement in aerosol forecast quality.