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# Performance of DREAM dust model during the SAMUM 2006 Field Campaign

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The Dust Regional Atmospheric Modeling System (DREAM) delivers operational forecasts for the Mediterranean, North African and Asian regions. It has been widely tested and compared with available data, and it undergoes daily evaluation by direct comparison with sun photometer data from the Aerosol Robotic Network (AERONET). The model qualitative and quantitative verification studies performed so far, using data from observation networks such as the European Aerosol Research Lidar Network (EARLINET) and AERONET/PHOTONS (sun photometers), satellite and ground level PM data have outlined the good skills of the model concerning both, the horizontal and vertical extent of the dust plume after long range transport. However, traditionally there has been a lack of intensive measurements directly over dust sources for validating and improving dust model capabilities.

In this context, a German consortium carried out the Saharan Mineral Dust Experiment

(SAMUM), providing a valuable and unprecedented dust dataset for North Africa: ground-based (Raman and backscatter) and onboard High-Spectral-Resolution Lidar (HSRL) profiles, dust size distributions, mass concentration, chemical composition and optical properties, and vertical (radiosounding) and in-situ meteorological parameters. These data were derived mainly from three sites in Morocco but also from several Falcon and Partenavia overflights. In addition, the operational AERONET data as well as Lidar data from EARLINET during the SAMUM-I period are available for model comparison.

In this contribution, several model versions and scenarios are run. The simulation period covers the whole measurement period of the campaign from May 10th to June 04th 2006. For this, 6-hourly updated NCEP analysis data have been used to initialize and drive the model with a 'dust' spin up period of 72 hours in advance. In a first run, the operational model version including four particle size bins (effective size radii of 0.73, 6.1, 18, and 38 $\mu$m) is applied keeping also the operational horizontal (1/3°) and vertical (24 z-levels) resolution. Furthermore, higher spatial and temporal resolution scenarios for this version are tested in order to quantify its impact on dust emission over source regions.

The first results of comparison reveal that the modeled dust field agrees reasonably well with Lidar and sun photometer data from a qualitative point of view. The simulations show the limitations of the four-particle size bin approach of the model to reproduce quantitatively the dust optical properties over sources and after long range transport simultaneously. Indeed, this is due to poor particle bin resolution, but also due to the fact that in the model optical depths are coarsely estimated from dust mass using a constant extinction cross-section which is not adequate over the sources. In a second stage, an improved model version with higher size bin resolution (8 bins from 0.15 to 7.1 $\mu$m effective radius) and dust radiative feedback is used. Since dust long range transport is mainly driven by smaller dust particles, the results with increased number of dust size bins is expected to be considerably better, since the small particle size range ($< 10\mu$m effective radius) is well defined. In this contribution, we test the upgrades in comparison with the operational version and we explore new refinements on the soil size distribution and the optical look-up tables of the model.