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# A model for prediction of mineral dust from meso to global scales: Regional experiments for North Africa

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As one of the most important sources of atmospheric aerosol mass, mineral dust emitted from arid and semi-arid areas is significantly impacting the Earth's climate system. Dust models are being capable of reproducing the fully dust cycle allowing for prediction of the global and regional dust loading or the quantification of its radiative effects. These models depend on the accuracy of prescribed surface wind speeds which are provided by meteorological centres. Unfortunately, they tend to be underestimated over large arid and semi-arid areas not reflecting the mesoscale character of the meteorological disturbancies. With the new NMMB-BSC/DUST model, we focus on the behavior of the model under these circumstances evaluating its performance in a qualitative way by comparing with observations. It will later be complemented by a long-term study focussing quantitative performance of the model.

Apart from uncertainties introduced from the atmospheric data, also the modeling of the dust emissions lacks complete certainty due to the misrepresentation of subgrid-scale spatial heterogeneity in soil and vegetation boundary conditions. A new source function has been applied in the NMMB-BSC/DUST model being based on the preferential source approach. Its performance is quantitatively and qualitatively compared and evaluated with observations from two field campaigns (SAMUM-I, BoDEx) and satellite data such as MSG, MISR and MODIS. It is complemented by an extraordinary African dust outbreak in March 2004 with direct comparison of the new SEVIRI aerosol product provided from EUMETSAT with the simulated model AOD. Measurements of optical thicknesses, extinction coeffcients, and particle size distributions at the ground and in the troposhere are used, accompanied by wind profile data, sun photometers and surface meteorology as well as AERONET sun photometer and EARLINET lidar data.

All simulations were performed at the regional scale for the Northern African domain, including the Arabian peninsula and southern/central Europe (0 to 65ºN and 25ºW to 55ºE) at 1/4ºx1/4º spatial resolution with 40 vertical layers. Dust columnal load, dust concentration at the surface, AOD, extinction coefficient, wind speed and surface temperature are extracted for the referred periods of time (March 2004, March 2005, May 2006). The dust vertical flux calculation after Marticorena and Bergametti was applied, including GFDL LW and SW radiation, and LISA aerodynamic roughness length for the Saharan desert surface. Particular attention was turned to the capability of the model to reproduce the low level jet in the Bodélé, being analyzed for the two respective field campaign periods.