Spatial variability of mineral dust single scattering albedo based on DREAM model

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Atmospheric aerosols have an impact on the Earth's radiation budget. They interact with solar and terrestrial radiation (direct effect) and play role in formation of clouds, thus modifying cloud properties and lifetime (indirect effect). Mineral dust is one of the most abundant aerosol types, with the largest contribution to global aerosol mass and significant optical depth (Kinne et al, 2006). There are still uncertainties in model estimates of dust radiative effects, partly due to variability in its mineral composition and shape of its particles, which are not accounted for in models (Boucher et al. 2013, Di Biagio et al. 2020). Single scattering albedo is an important parameter determining dust direct radiative effects, therefore its accurate representation in models is important. Dust single scattering albedo depends on its mineral composition, particularly on the content of iron oxide minerals (hematite and goethite).

In this study we present dust single scattering albedo values based on Dust Regional Atmospheric Model (DREAM) with incorporated particle mineral composition (Ničković et al. 2001, 2012). The domain of the model covers Northern Africa, Middle East and the European continent, with horizontal resolution of 1/5°. It uses eight particle size bins, in the radius range of 0.1-10 μm. DREAM model simulations of a dust episode that affected Mediterranean and part of Eastern Europe in June 2010 are performed to obtain total dust and hematite mass concentrations. Single scattering albedo is calculated using total dust and hematite concentration in each size bin from the model output. We analyze the spatial variability of the resulting dust single scattering albedo over the model domain. The results are evaluated using single scattering albedo values from Aerosol Robotic Network (AERONET) sunphotometer measurements (Holben et al., 1998).

References

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