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Mineral Dust Single Scattering Albedo and Radiative Effects Based on DREAM Model

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Mineral dust is the most abundant aerosol, with the largest contribution to global aerosol mass load and significant aerosol optical depth [1]. Dust affects the Earth's radiative balance directly, through interaction with solar and terrestrial radiation, and indirectly, altering the optical properties and lifetime of clouds. 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 [2]. Single scattering albedo is one of key properties 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 [3,4]. 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 Aerosol Robotic Network (AERONET) [5] inversion products. Furthermore, the resulting direct radiative effects of dust are discussed.

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Primary author: KUZMANOSKI, Maja (Institute of Physics Belgrade, University of Belgrade)

Co-authors: Mr ILIĆ, Luka (Institute of Physics Belgrade, University of Belgrade); NIČKOVIĆ, Slobodan (Institute of Physics Belgrade, University of Belgrade)

Presenter: KUZMANOSKI, Maja (Institute of Physics Belgrade, University of Belgrade)

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