Geophysical Research Abstracts
Vol. 18, EGU2016-4425, 2016
EGU General Assembly 2016

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

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Mineral dust comprises a significant part of global aerosol burden. There is a large uncertainty in estimating role of dust in Earth's climate system, partly due to poor characterization of its optical properties. Single scattering albedo is one of key optical properties determining radiative effects of dust particles. While it depends on dust particle sizes, it is also strongly influenced by dust mineral composition, particularly the content of light-absorbing iron oxides and the mixing state (external or internal). However, an assumption of uniform dust composition is typically used in models. To better represent single scattering albedo in dust atmospheric models, required to increase accuracy of dust radiative effect estimates, it is necessary to include information on particle mineral content.

In this study, we present the spatial distribution of dust single scattering albedo based on the Dust Regional Atmospheric Model (DREAM) with incorporated particle mineral composition. The domain of the model covers Northern Africa, Middle East and the European continent, with horizontal resolution set to 1/5°. It uses eight particle size bins within the 0.1-10 μm radius range. Focusing on dust episode of June 2010, we analyze dust single scattering albedo spatial distribution over the model domain, based on particle sizes and mineral composition from model output; we discuss changes in this optical property after long-range transport. Furthermore, we examine how the AERONET-derived aerosol properties respond to dust mineralogy. Finally we use AERONET data to evaluate model-based single scattering albedo.

Acknowledgement

We would like to thank the AERONET network and the principal investigators, as well as their staff, for establishing and maintaining the AERONET sites used in this work.