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Satellite based Observations of Saharan Dust Source Areas – Comparison and Variability

K. Schepanski (1), I. Tegen (2), and A. Macke (2)

(1) University of Leeds, School of Earth & Environment, Institute for Climate and Atmospheric Science, Leeds, United Kingdom (k.schepanski@leeds.ac.uk), (2) Leibniz Institute for Tropospheric Research, Leipzig, Germany

Satellite remote sensing products such as Meteosat Second Generation (MSG) Infra Red (IR) dust index and Ozone Monitoring Instrument (OMI) Aerosol Index (AI) are commonly used to infer dust source areas. We compare two different methods for dust source identification, (1) a "back-tacking" method applied to 4 years of 15-minute MSG IR dust index, and (2) a "frequency" method applied to daily OMI AI and daily MODIS DeepBlue Aerosol Optical Thickness (AOT) data for the same time period.
Using the "back-tracking" method, dust source areas are inferred by tracking individual dust plumes back to their place of origin, allowed by the high temporal resolution of the MSG images. OMI AI and MODIS Deep Blue AOT products are available on daily resolution only, which disables for back-tracking of individual dust plumes. Thus, dust source areas are retrieved by relating the frequencies of occurrence of high dust loadings to source areas.
The spatial distribution of inferred dust source areas from the two methods shows significant differences. The MSG back-tracking method highlights frequent dust emission from sources within complex terrain, while frequencies of high OMI AI values emphasise topographic basins as important dust source areas. Dust source areas retrieved from DeepBlue AOTs are generally placed further south towards the Sahel region.
This study shows that the temporal resolution of satellite dust products is a key issue in retrieving dust source areas. Both, the spatial distribution of dust sources and their annual cycle strongly depend on the acquisition time related to the start of dust emission.