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Satellite retrieval of aerosol properties over bright reflecting desert regions

T. Dinter (1), W. von Hoyningen-Huene (1), A. Kokhanovsky (1), J. P. Burrows (1), M. Diouri (2)

(1) Inst. of Environmental Physics, University of Bremen, (2) University Mohammed I, Oujda Morocco

The effect of aerosols on climate can only be estimated with confidence if the high spatial and temporal heterogeneity of the aerosol properties is monitored. In particular retrieving aerosol properties from satellite remote sensing over a bright surface is a challenging problem in the research of atmospheric and land applications. An approach to retrieve aerosol properties over brighter surfaces such as arid and semi-arid areas over the Sahara Desert is proposed and investigated. The consideration of increased surface reflectance in lookup tables and the retrieval scheme enables a modification of the BEAR-approach (Bremen AErosol Retrieval) [c.f. von Hoyningen-Huene et al., 2003] to extend its application to brighter regions. Examples of aerosol optical thickness derived using the BEAR-algorithm over the Sahara Desert reveal various dust sources, which are important contributors to airborne dust transported over long distances. The aerosol optical thickness and surface reflectance are determined simultaneously in the algorithm using lookup tables to match the satellite observed spectral top of atmosphere radiances. Reduced Resolution Level 1 data of the Medium Resolution Imaging Spectrometer (MERIS), which is an radiometer on the ENVISAT Satellite are used, giving top of atmosphere radiances at 15 channels in the wavelength range of 412 to 900 nm. The spatial resolution of the radiometer is 1 km reduced up to 300 m full resolved. The SAharan Mineral Dust Experiment (SAMUM) is a joint project of several research institutes in Germany, in cooperation with the Mohammed I. University (Oujda, Morocco), funded by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG). It is focussed on the measurement and analysis of the effect of mineral dust from the Saharan desert on the atmospheric radiation budget.