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AERUS-GEO: A new aerosol product based on MSG geostationary satellite observations

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The major difficulty in detecting the aerosol signal from visible and near-infrared remote sensing observations is to reach the proper separation of the components related to the atmosphere and the surface. This issue becomes especially challenging over bright targets such as deserts. A method is proposed to circumvent this issue by exploiting the directional and temporal dimensions of the satellite signal through the use of a semi-empirical kernel-driven model for the surface/atmosphere coupled system. As a result, simultaneous retrieval of surface albedo and aerosol properties is made possible. The proposed method proves to be capable of detecting and tracking the presence of anthropogenic aerosols, volcanic ash emissions and dust events over deserts.

The proposed method referred to as AERUS-GEO (Aerosol and surface albEdo Retrieval Using a directional Splitting method - application to GEO data) is applied to three spectral bands (0.6 mm, 0.8 mm, and 1.6 mm) of MSG (Meteosat Second Generation) observations, which scan Europe, Africa, and the Eastern part of South America every 15 minutes. The AERUS-GEO AOD estimates compare favorably with measurements of several AERONET stations, MODIS-derived (Moderate Resolution Imaging Spectro-radiometer), and MISR-derived (Multi-angle Imaging Spectro-Radiometer) products within a 20% of accuracy. Also, results reveal the capability of AERUS-GEO to detect more aerosol events within a given time period compared to products derived from low Earth orbit satellites. This higher availability of AOD products thanks to AERUS-GEO may benefit the accurate monitoring of the aerosol radiative forcing. The AERUS-GEO algorithm was recently implemented by the ICARE Data Center (http://www.icare.univ-lille1.fr), which operationally disseminates a daily AOD product at 670 nm over the MSG disk since 2014. Also, application of this method could be carried out with Himawari-8 data in the next years.