An advanced initiative for tracking operationally aerosol events over the last decade based on MSG/SEVIRI satellite observations

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The major difficulty to detect properly the aerosol signal by using remote sensing observations in the visible range relies on a clear separation of the scattering components between the atmospheric layer and the ground surface. This turns to be quite challenging over bright targets like deserts. We propose a method that combines the directional and temporal dimensions of the satellite signal through out the use of a semi-empirical BRDF kernel-driven model of the surface/atmosphere coupled system. As a result, a simultaneous retrieval of surface albedo and aerosol properties (optical thickness) is performed. The method proves to be meaningful to track anthropogenic aerosol emissions in the troposphere, to monitor volcanic ash release and above all to estimate dust events over bright targets.

The proposed method is applied to MSG/SEVIRI slots in the three spectral bands (VIS, NIR, SWIR) at the frequency of 15min and for a geographic coverage that encompasses Europe, Africa, and South America regions. The SEVIRI-derived optical aerosol depth (AOD) estimates compare favourably with measurements carried on over well distributed AERONET stations. The comparison with state of art MODIS-derived (Moderate Resolution Imaging Spectro-radiometer), and MISR-derived (Multi-angle Imaging Spectro-Radiometer) AOD products falls within 20% of accuracy while it reveals the capability of AERUS-GEO to depict more aerosol events still quantitatively. Owing to that, more AOD products offers new insights to better estimate the aerosol radiative forcing (ARF) from GEO compared to low-orbit elevation orbit (LEO) satellite data. The AERUS-GEO algorithm was implemented in the ICARE/AERIS Data Center based in Lille (France) (http://www.icare.univ-lille1.fr). It disseminates operationally from 2014 a daily AOD product (AERUS-GEO) at 670 nm over the MSG disk. In addition to the NRT AOD product, a long term reprocessing is also available over the last decade.