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The effect of observation geometry on single-channel aerosol retrievals from geostationary satellites in the Mediterranean

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Satellite remote sensing is nowadays used for aerosol monitoring on an operational basis via specially designed algorithms which are based on multidimensional data. The development of sensors suitable for aerosol monitoring, has given way to the implementation of algorithms for multispectral (e.g. MODIS, MERIS and SEVIRI sensors), hyper-spectral (e.g. CHRIS sensor), multi-angle (e.g. MISR and CHRIS sensors) and multi-polarization observations (e.g. POLDER sensor) both over ocean and land. These sensors have been providing data on a continuous basis for less than two decades (e.g. MODIS archived aerosol data are available since 2001), a period which cannot be considered adequate for studies related to global climate change.
On the other hand, archived data from the first generation meteorological sensors such as AVHRR and MVIRI (aboard the NOAA and METEOSAT series satellites respectively) span a period of almost thirty years a fact that is challenging as regards re-processing of such data. In the past, single channel algorithms developed for operational AOD retrievals over oceans have been successfully applied with METEOSAT data (Moulin et al. 1997) and are still used on an operational basis in several cases for AVHRR (Ignatov et al. 2004), SEVIRI (Bridley & Ignatov 2006) and MODIS (Ignatov et al. 2006).One of the main limitations of such algorithms affecting the accuracy of the AOD retrievals is the need for a universal aerosol model. Such an approach although have led to accurate results in open oceanic areas it can be problematic in more complex environments such as the Mediterranean where multiple types of aerosol particles (i.e. desert dust, pollution aerosol and oceanic particles) are encountered (Myhre et al. 2005).
In the present paper the expected accuracy of a single channel algorithm developed for the visible MVIRI band is assessed as a function of the aerosol model and the geometry of observation of the geostationary METEOSAT satellite. Two different aerosol models are used as candidate models corresponding to desert dust and water soluble particles encountered in the Mediterranean region. The theoretical simulations were based on radiative transfer computations performed with the 6S code. Results showed that that optimum geometries can be defined where the AOD error is minimized. The results are confirmed using Meteosat-6 data along with concurrent AERONET measurements from the Mediterranean.

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