Geophysical Research Abstracts
Vol. 13, EGU2011-278, 2011
EGU General Assembly 2011

The retrieval of aerosol optical depth over land based on time series technique using MSG/SERIVI data

Linlu Mei (1,4), Yong Xue (1,2), Jie Guang (1), Yingjie Li (1,4), Ying Wang (1,4), Hui Xu (1,4), Chaolin Wu (1), Leiku Yang (1,4), Ziqiang Chen (3,4), Xinwei He (1,4)

(1) Institute of Remote Sensing Applications, Chinese Academy of Sciences,Beijing,China, (4) Graduate University of the Chinese Academy of Sciences, Beijing , China, (2) Facultyof Computing, London Metropolitan University, 166-220 Holloway Road, London N7 8DB, UK, (3) Center for Earth Observation and Digital Earth of the Chinese Academy of Sciences, Beijing , China

In spite of different Aerosol optical depth (AOD) retrieval algorithms have been established over land for different sensors, most retrievals are limited to twice per day, as by the morning and afternoon passes of the orbiting polar satellites (Knapp, 2005). However, aerosol optical properties vary widely and quickly depend on the source and nature of the aerosol as well as the atmospheric environment, high-frequency aerosol products are eagerly needed ranged from research to people's everyday life. For example, AOD is a significant indicator of dust events, biomass burning, and many other disasters, which have extreme and time-varying effect on local, or even global, atmospheric environment. It is important to monitor the temporal aspects of aerosols.

The Geostationary satellites series has the potential to provide aerosol observations over land and ocean with multiple observations per day. However, algorithms for polar orbiting satellites are more mature than geostationary satellites because the spectral channels of the first generation METEOSAT were rather limited for accurate retrievals of aerosol parameters. Contrary to traditional geostationary satellite, MSG has three narrow spectral bands in the solar spectrum (at 0.63, 0.81 and 1.64 μm), in addition to the wide HRV band, and combines thus somewhat the advantages of a multi-spectral sensor, such as MODIS and POLODER, with the frequency of METEOSAT measurements (Thieuleux, 2005), which implies that MSG has potential to become a wildly used data source in meteorology monitoring due to high-temporary and multi-spectral character. Recently there are some developments on the daily averaged AOD from MSG data. Carrer et al. (2010) put forwarded daily estimates of aerosol optical thickness over land surface based on a directional and temporal analysis of SEVIRI MSG visible observations. Govaerts et al. (2010) developed joint retrieval method of surface reflectance and aerosol optical depth from MSG/SEVIRI observations with an optimal estimation approach.

In this paper, we make use of the two solar bands at 0.63 and 0.81 μm of three series time to retrieve the AOD over land, especially high reflectance area. Follow the analysis of Chandrasekhar (1960) and Kontratyev (1969); we confined our consideration only to one approximate method of reducing the problem to solving a set of differential equations in the application to the case of shortwave radiation transfer. After approximating the exact integrodifferential equation of radioactive transfer equations for radiant intensity by common differential equations for the upward and incident radiation fluxes, a MSG/SEVIRI multi-spectral for three series time algorithm to retrieve AOD and surface reflectance was proposed following the results from Xue and Cracknell (1995). No other parameters need to be assumed in our method, which allows the retrieval to be more objective and possibly more accurate.

The derived AOD is compared to Aerosol Robotic Network (AERONET) observations in European and African area and a retrieval absolute error was around 0.1 and relative error was 15% are found.The satellite-derived SEVIRI AOD also compares favourably with similar MODIS products, which demonstrates a good agreement of the two results. Although preliminary validation is encouraging, the difference in wavelength and time differences makes comparison difficult, and further validation is needed.