Regional Quantitative Retrieval of Aerosol Optical Depth by exploiting the synergy of VISSR and MODIS Data

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Atmospheric aerosol particles influence the Earth's radiation balance directly by scattering of infrared energy and indirectly by modifying the properties of clouds through microphysical processes[1,2,3]. For the sake of effectively monitoring it, many atmospheric aerosol observation networks are set up and provide associated informational services in the wide world[4,5,6,7]. However, the aerosol optical depth show large spatial and temporal variations because of the variety of production (e.g., car exhaust, power plants, forest fires, evaporation from petroleum products, agriculture, natural living plants, dust storms, breaking ocean waves, volcanoes), transport and removal processes and the prevailing meteorological conditions. Only satellite remote sensing can provide the spatial and temporal resolution to measure the inhomogeneous aerosol fields. Aerosol optical depth was Great concerned, due to it's capability of estimate the aerosol mass loading. In spite of many methods have been proposed to retrieval aerosol optical depth, none of them can be used to gain a real time or near real time monitoring of aerosol. The launch of FY-2C (Fengyun 2C) and FY-2D (Fengyun 2D), China's first generation of geostationary meteorological satellites, made it is possible to provide frequent observations of the Earth's surface, with a high temporal resolution: 15 minutes. In this paper, the authors introduce a new context synergic retrieving model/mode (CSRM) to retrieve aerosol optical depth, using multi-source satellite data that were obtained by the VISSR aboard FY-2C and FY-2D, and MODIS aboard Terra and Aqua.

The aerosol optical depth research over China is of great significance on the study of the source, generation and transportation of aerosol. Due to the effect of aerosol on the earth's radiation balance and its physical and chemical properties, aerosol researching is very useful for climate monitoring, and environment monitoring. Nowadays, most of the aerosol products are with daily or more lower temporal resolution. To get more information for the aerosol monitoring, it is urgently to produce the aerosol products with high temporal resolution.

In order to validate what were mentioned above, a case study over China was provided. A set of VISSR and MODIS images over China, obtained on June 6, 2007, were used in this study. A series of the aerosol optical depth distribution maps with high time resolution, 15 minutes, based on a time series of changes, were obtained, which clearly and dynamically represented the distributed status of the optical depth of and transport process and trend of atmospheric aerosol on the investigated day over China. Preliminary validations have been carried out by comparing with AERONET measured data, which shows good accuracy and promising potential.

This research is helpful for understanding the forming mechanism, influence and controlling approach of atmospheric aerosol and necessary for establishing corresponding operational predicting system of haze weather, which will provide the stable scientific support for predicting haze weather and setting up the controlling standard and synthesis prevention countermeasure.

Key words: Aerosol Optical Depth, VISSR, MODIS, High time resolution

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