AEROSOL OPTICAL DEPTH RETRIEVAL OVER LAND USING MODIS DATA AND ITS APPLICATION IN MONITORING AIR QUALITY

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ABSTRACT

Atmospheric remote sensing offers us a view to estimate air quality in describing the aerosol distribution either for a local or global coverage. Physically speaking, atmospheric turbidity is an significant indicator of air quality, which have a good relationship with atmospheric aerosol content (Liu, 2002).Aerosol Optical Depth (AOD) is a vitally important physical parameter of aerosol which can be retrieved from satellite remote sensing data.

Many algorithms or methods have already been applied by previous researchers to improve the accuracy of retrieving AOD. However, Retrieving AOD over land still remains a difficult task because the measured signal is a composite of reflectance of sunlight by the variable surface covers and back scattering by the semitransparent aerosol layer. The key problems addressed here is how to retrieve the aerosol information from remotely sensed data over high reflective land surface, make the operational aerosol remote sensing possible over various land surface. In this paper, an approach using Moderate Resolution Imageing Spectroradiometer (MODIS) data was presented, which is based on the approach from Xue and Cracknel (1995) and Tang, Xue et al. (2005). Uncertainties of our method are mainly introduced by factors such as aerosol and water vapour spectral absorption, registration of two angles images and all the assumptions, which should be taken in to account in future research.

Furthermore, due to the relationship between aerosol optical depth and turbidity coefficient (Kumar, 2007), satellite images can be employed for monitoring air quality. In our new algorithm, as an example, the date and time we have chose to validate our model were from MODIS data of TERRA and AQUA overpassing China on June 12th, 2007. The image size is 6600×3600 pixels with spatial resolution 1km. MODIS L1B reflectance values are corrected for water vapor, ozone and carbon dioxide before used for further AOT calculation. Preliminary validation result comparing with AERONET measured data shows good accuracy and promising potential with relative errors reduced from around 10% to below 10% (around 5%).

The result shows that the aerosol products in line with the actual situation better on June 12, 2007, we can see the smoke creating by incinerated straw affect the entire North China, as well as over parts of eastern China. According to the reports given by State Environmental Protection Administration of the Preparatory Office of Environmental Satellite Center and National Weather Service Satellite Center, high temperature intensive areas north moved, mainly in Henan, Anhui, Jiangsu, and other areas along Huaihe River, Shandong, Shanxi and the Weihe River in central and southern Plains in mid-May to early June,which demonstrates that burning of straw is serious at the wheat harvest time. Due to the heat wave and sultry weather is not conducive to the spread of pollutants, combined with the burning of incinerated material, leading to air quality decline in Tianjin, Beijing, Hubei and other area.

Key Words: Aerosol Optical Depth (AOD), MODIS, Air Quality

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