SYNTHETIC RETRIEVAL OF AEROSOL OPTICAL DEPTH AND SURFACE REFLECTANCE USING TERRA AND AQUA PLATFORMS IN SEMI-ARID REGIONS

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Abstract:

Quantitative remote sensing becomes one of the main research directions in remote sensing research, which requests that the information gains from sensors are able to reflect the Earth surface characteristics accurately. In order to obtain the real surface reflectance, atmosphere correction is absolutely a necessary processing step to deal with the space or aircraft-borne remote sensing data. However, precised atmosphere correction not only needs to know the directional reflectance (or radiation) characteristics of the land surface, but also needs to know the coinstantaneous parameters of atmosphere when the sensors pass by. The most essential parameter in atmosphere correction is the aerosol optical thickness. A key problem in aerosol retrieval from remotely sensed data is to distinguish between surface and atmospheric contributions to the variability in satellite signals. A major contribution in the surface-related variability is caused by the non-Lambertian nature of the Earth surface reflectance and the fact that the illumination/observation geometry varies considerably between successive observations of the same area [1]. Often the aerosol contribution is small compared to the surface scattering, particularly over bright desert surfaces, arid area, and semi-arid regions [2]. Therefore, aerosol retrieval over bright land is still a challenging task.

A new aerosol optical depth (AOD) and surface reflectance remote sensing retrieval model was developed by exploiting kernel-driven BRDF model and the SYNTAM (Synergy of TERRA and AQUA MODIS) model [3]-[4], which considered the surface BRDF effect while retrieving aerosol

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optical depth. Therefore, this new model can simultaneously retrieve aerosol optical depth and kernel parameters. The new model was applied to Terra and Aqua MODIS data in the Heihe River Basin. AOD values from measurements of sun Photometer CE318 and surface reflectance measured by ASD Field Spec spectral radiometer were used for the validation. Results show that the correlation coefficient (R2) between retrieved AOD from MODIS and CE318 measurements are greater than 0.86. Using ASD measurements to validate retrieved surface reflectance from MODIS, the RMSE is lower than 0.055.

Key Words: Aerosol Optical Depth; BRDF; Surface reflectance; Semi-arid; MODIS

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