Analysis and Reflectivity Inversion from Hyperion Hyperspectral Image

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This study presents an operational scheme to estimate downward surface shortwave radiation (DSSR) over China based on TOA radiance/reflectance information from GMS 5 visible imagery. Sensitivity studies showed the DSSR retrieval is sensitive to the selection of aerosol types, particularly for rural and urban aerosol, but less to that of cloud types. Uncertainty of surface reflectance with very high value leads to considerable uncertainties of the GMS 5 retrieved DSSR value [±(6%~9%)]. The satellite-derived daily DSSR were evaluated by comparison with ground-based observations over 96 stations of the global radiation monitoring network of China Meteorological Administration, and 14 first-class international exchange stations, respectively. The comparison showed that GMS 5 estimated daily DSSR are in good agreement with the ground-observed values, with linear correlation coefficient of 0.91 and almost zero mean bias. Root mean square (RMS) differences are 16.2% and 13% for all-sky and clear-sky condition, respectively. The comparison of individual first-class station demonstrated cloud and water vapor concentration have stronger absorption impacts on incident shortwave flux at the surface. An overall positive bias over large cities was addressed due to absorptive aerosol. This paper demonstrates the application of GMS 5 satellite to detect and estimate diurnal variation of shortwave flux reaching the surface and daily DSSR. With the long-term available record of GMS satellites, GMS-retrieved DSSR will play an important role in solar radiation budget evaluation.

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