Estimating surface fluxes over the north Tibetan Plateau area with ASTER imagery

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Surface fluxes are important boundary conditions for climatological modeling and Asian monsoon system. The recent availability of high-resolution, multi-band imagery from the ASTER (Advanced Space-borne Thermal Emission and Reflection radiometer) sensor has enabled us to estimate surface fluxes. ASTER covers a wide spectral region with 14 bands from the visible to the thermal infrared with high spatial, spectral and radiometric resolution. The spatial resolution varies with wavelength: 15 m in the visible and near-infrared (VNIR), 30 m in the short wave infrared (SWIR), and 90 m in the thermal infrared (TIR). A parameterization method based on ASTER data and field observations has been proposed and tested for deriving surface albedo, surface temperature, Normalized Difference Vegetation Index (NDVI), Modified Soil Adjusted Vegetation Index (MSAVI), vegetation coverage, Leaf Area Index (LAI), net radiation flux, soil heat flux, sensible heat flux and latent heat flux over heterogeneous land surface. As a case study, the methodology was applied to the experimental area of the Coordinated Enhanced Observing Period (CEOP) Asia-Australia Monsoon Project (CAMP) on the Tibetan Plateau (CAMP/Tibet), which located at the north Tibetan Plateau. The ASTER data of 24 July 2001, 29 November 2001 and 12 March 2002 was used in this paper. To validate the proposed methodology, the ground-measured surface variables (surface albedo and surface temperature) and land surface heat fluxes (net radiation flux, soil heat flux, sensible heat flux and latent heat flux) were compared to ASTER derived values. The results show that the derived surface variables and land surface heat fluxes in three different months over the study area are in good accordance with the land surface status. Also, the estimated land surface variables and land surface heat fluxes are in good accordance with ground measurements, and all their absolute percent difference (APD) is less than 9.8% in the validation sites. It is therefore concluded that the proposed methodology is successful for the retrieval of land surface variables and land surface heat fluxes using the ASTER data and filed observation over the study area.

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