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

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Abstract. 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 to bridge the gap between local scale flux measurements using micrometeorological instruments and regional scale land-atmosphere exchanges of water and heat fluxes that are fundamental for the understanding of the water cycle in the Asian monsoon system. 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 in this paper. 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), 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 for the case of summer, winter and spring. 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 the 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 percentage difference (APD) is less than 10% 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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