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Regionalization of surface heat fluxes and evapotranspiration over heterogeneous landscape of the Third Pole region

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Like Antarctica and the Arctic, the Third Pole region is drawing increased attention among the international academic community. It is centered on the Tibetan Plateau, stretching from the Pamir Plateau and Hindu-Kush on the west to the Hengduan Mountains on the east, and from the Kunlun and Qilian Mts on the north to the Himalayas on the south. Covering over 5,000,000 km2 in total and with an average elevation surpassing 4000 m. The exchange of energy and evapotranspiration (ET) between land surface and atmosphere over the Third Pole region play an important role in the Asian monsoon system, which in turn is a major component of both the energy and water cycles of the global climate system.

The parameterization methods based on satellite data and Atmospheric Boundary Layer (ABL) observations have been proposed and tested for deriving regional distribution of surface reflectance, surface temperature, net radiation flux, soil heat flux, sensible heat flux, latent heat flux and ET over heterogeneous landscape. As cases study, the methods were applied to the whole Tibetan Plateau area and Nepal area. To validate the proposed methods, the ground-measured surface reflectance, surface temperature, net radiation flux, soil heat flux, sensible heat flux and latent heat flux in the Third Pole Environment Programme (TPE) Research Platform (TPEP) TPEP are compared to the derived values. The results show that the derived surface variables, land surface heat fluxes and ET over the study area are in good accordance with the land surface status. These parameters show a wide range due to the strong contrast of surface features. And the estimated land surface variables and land surface heat fluxes are in good agreement with ground measurements, and all the absolute percent difference is less than 10% in the validation sites. It is therefore concluded that the proposed methods are successful for the retrieval of land surface variables and land surface heat fluxes over heterogeneous landscape of the Tibetan Plateau area and Nepal area. Further improvement of the methods and its applying field were also discussed.