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Estimation of land surface key parameters for the study of energy and water cycle over the Tibetan Plateau based on geostationary and polar orbiting satellites

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Estimation of land surface characteristic parameters and turbulent heat fluxes is important for energy and water cycle studies, especially on the Tibetan Plateau (TP), where the topography is unique and the land-atmosphere interactions are strong. The land surface heating conditions also directly influence the movement of atmospheric circulation. However, high temporal resolution information on the plateau-scale land surface parameters has lacked for a long time, which significantly limits the understanding of diurnal variations in land-atmosphere interactions. On the other hand, how to remove cloud effects for optical satellite images is another important research issue. Based on Chinese FY geostationary satellite data and other polar orbiting satellite data, the hourly land surface characteristic parameters and turbulent heat fluxes were estimated. A new cloud□free time series of vegetation index data sets was reconstructed, and the vegetation density showed a general increasing trend along with a warming trend in the TP. The regions showing significant increases accounted for 7.63% of the total Tibetan territory. Downwelling shortwave and longwave radiation parameterization schemes were improved to derive all-sky radiation over the TP. The diurnal and seasonal cycles of the land surface parameters were clearly identified, and their spatial distribution was found to be consistent with the heterogeneous land surface conditions and the general hydrometeorological conditions of the TP.