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Assessment and Improvement of Noah-MP over the Tibetan grasslands in growing season

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The Tibetan grasslands has very strong land-air interactions and plays an important role in the regional climate system of the Tibetan Plateau and understanding of land-air interactions in the Tibetan grasslands is significantly important for the sustainable development of it under the climate change. In this paper, we assessed the Noah-MP by conducting ensemble experiments for analyzing the sensitive physical processes, and selected the optimal combinations of parameterization options at four alpine meadow sites in the Tibetan grassland ecosystems. Measurements collected from four study sites over the Tibetan grassland ecosystems in the Heihe Watershed Allied Telemetry Experimental Research (HiWATER) are used. The results showed that the dynamic vegetation (Dveg), the canopy stomatal resistance (Crs), the runoff and the groundwater (Run) and the surface exchange coefficient (Sfc) physical processes are the most sensitive control physical processes for energy and water fluxes in the Tibetan grassland ecosystems. Importantly, the optimal combination of parameterization options in Noah-MP overestimates the sensible heat flux (H) and underestimates soil moisture (θ) obviously. After finding the problems in the simulations outputed by the optimal combination of parameterization options, two groups of improved experiments were conducted to find out the reason. We found that the improved calculation of the surface exchange coefficient can alleviate the overestimation H , and the improved method of soil parameters considering the soil organic carbon (SOC) and an exponential form of root vertical distribution for each soil layers can effectively solve the underestimation of θ at all four sites.

