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the observation, simulation and evaluation of lake-air interaction process over a high altitude small lake on the Tibetan Plateau

Binbin Wang (1,2), Yaoming Ma (1), Weiqiang Ma (1), and Bob Su (2)

(1) Key Laboratory of Tibetan Environment Changes and Land Surface Processes, Institute of Tibetan Plateau Research, Chinese Academy of Sciences China, (2) Faculty of Geo-Information Science and Earth Observation, University of Twente, Enschede, Netherlands

Lakes are an important part of the landscape on the Tibetan Plateau. The area that contains most of the plateau lakes has been expanding in recent years, but the impact of lakes on lake-atmosphere energy and water interactions is poorly understood because of a lack of observational data and adequate modeling systems. Furthermore, Precise measurements of evaporation and understanding of the physical controls on turbulent heat flux over lakes at different time scales have fundamental significance for catchment-scale water balance analysis and local-scale climate modeling. To test the performance of lake-air turbulent exchange models over high-altitude lakes and to understanding the driving forces for turbulent heat flux and obtain the actual evaporation over the small high-altitude lakes, an eddy covariance observational system was built above the water surface of the small Nam Co Lake (with an altitude of 4715 m and an area of approximately 1 km2) in April 2012. Firstly, we proposed the proper Charnock coefficient (0.031) and the roughness Reynolds number (0.54) for simulation using turbulent data in 2012, and validated the results using data in 2013 independently; secondly, wind speed shows significance at half-hourly time scales, whereas water vapor and temperature gradients have higher correlations over daily and monthly time scales in lake-air turbulent heat exchange; thirdly, the total evaporation in this small lake (812 mm) is approximately 200 mm larger than that from adjacent Nam Co (approximately 627 mm) during their ice-free seasons. Moreover, the energy stored during April to June is mainly released during September to November, suggesting an energy balance closure value of 0.97 over the entire ice-free season; lastly, 10 evaporation estimation methods are evaluated with the prepared datasets.