Accepted Manuscript

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PII: S0169-8095(18)30533-7
DOI: doi:10.1016/j.atmosres.2018.08.008
Reference: ATMOS 4338

To appear in: *Atmospheric Research*

Received date: 26 April 2018
Revised date: 18 July 2018
Accepted date: 16 August 2018

Please cite this article as: Ruida Zhong, Yanhu He, Xiaohong Chen , Responses of the hydrological regime to variations in meteorological factors under climate change of the Tibetan plateau. Atmos (2018), doi:10.1016/j.atmosres.2018.08.008

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Responses of the hydrological regime to variations in meteorological factors under climate change of the Tibetan plateau

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Abstract

Meteorological factors and the hydrologic cycle of the Tibetan plateau (TP) significantly influence the water resource supply, ecology, and social economy of wide downstream areas in Asia. This study evaluates changes in meteorological factors (e.g., precipitation, air temperature, and snowfall) and corresponding responses in the hydrological regime under future climate change scenarios in both the TP and the downstream areas. The Lancang River basin (LRB), located in the southeast TP and known as the upper Mekong River basin, is selected as the case study area. Future climate change projections are derived from five independent GCMs of CMIP5 and their multi-model ensemble. The variable infiltration capacity (VIC) distributed hydrological model is used to generate streamflow projections in future scenarios. Results show that precipitation and air temperature in both the lower LRB (representing the downstream area of TP) and upper LRB (representing the area in TP) are expected to increase substantially in the future, with higher increments in air temperature found in the upper LRB under high-emission scenarios. Snowfall, snow water equivalent (SWE), and snowmelt are commonly found to decrease with increasing air temperature, and the snow melt time tends to be earlier. Significantly increasing mean and extreme

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