



How snowmelt changed due to climate change in an ungauged catchment on the Tibetan Plateau?

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Snow variability is an integrated indicator of climate change, and it has important impacts on runoff regimes and water availability in high altitude catchments. Remote sensing techniques can make it possible to quantitatively detect the snow cover changes and associated hydrological effects in those poorly gauged regions. In this study, the spatial-temporal variations of snow cover and snow melting time in the Tuotuo River basin, which is the headwater of the Yangtze River, were evaluated based on satellite information from MODIS snow cover product, and the snow melting equivalent and its contribution to the total runoff and baseflow were estimated by using degree-day model. The results showed that the snow cover percentage and the tendency of snow cover variability increased with rising altitude. From 2000 to 2012, warmer and wetter climate change resulted in an increase of the snow cover area. Since the 1960s, the start time for snow melt has become earlier by 0.9~3 d/10a and the end time of snow melt has become later by 0.6~2.3 d/10a. Under the control of snow cover and snow melting time, the equivalent of snow melting runoff in the Tuotuo River basin has been fluctuating. The average contributions of snowmelt to baseflow and total runoff were 19.6 % and 6.8 %, respectively. Findings from this study will serve as a reference for future research in areas where observational data are deficient and for planning of future water management strategies for the source region of the Yangtze River.