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Changes in snowmelt runoff for mountain regions of eastern Turkey

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Mountain snowpack and spring runoff are critical for surface water resources as they serve an important and regionally integrated indicators of climate variability and change. This study investigates whether mountain snowmelt in eastern Turkey has shown a consistent hydrologic response to global climatic changes over the past several decades. The decreasing snow cover depth, especially in the spring, is of critical importance because of the effect of the timing and magnitude of spring snowmelt runoff to regional hydrologic systems. Eastern Turkey is characterized by mountainous terrain and a dry climate, where winter snow storage provides snowmelt runoff during the spring and early summer which usually constitutes 50–80% of the total annual runoff in the region. Analysis is made using the hydrometeorological stations distributed in the mountainous area to identify spatial and temporal patterns of trends in the seasonality of streamflow, snowmelt runoff, temperature and precipitation. Findings suggest that temperature increases to date have affected mountain snowmelt runoff simultaneously on the regional scale with there is no significant increase in precipitation. However, the nature of the effect is strongly dependent on geographic location and elevation. The streamflow timings in the mountainous basins are found to be shifting to earlier days in the year and this suggesting earlier spring melting of snowpack due to increased temperatures in the last decade. A striking increase in the discharges takes place during the first half of March. With continued warming, regional climate simulations suggest that annual surface runoff is projected to decline around 25-30 % in mountainous basins particularly with an increase in winter runoff and decrease in spring runoff by the end of the century. This indicates further shift in the snowmelt-derived streamflow timing to earlier days.