Seasonal Cycle Shifts in Hydroclimatology over the Western US

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Abstract

Analyses of streamflow, snowfall temperature, and precipitation in snow-melt dominated river basins in the western US indicates an advance in the timing of peak spring flows over the past fifty years. Warm temperature spells in spring have occurred much earlier in recent years, which partly explains the trend in the timing of the spring peak flow. In addition, a decrease in snow water equivalent and a general increase in winter precipitation is evident for many weather stations in the western U.S. It appears that in recent decades more of the precipitation is coming as rain rather than snow. The trends are strongest at lower elevations and in the Pacific Northwest region, where winter temperatures are closer to the freezing-point; it appears that in this region in particular, modest shifts in temperature are capable of forcing large shifts in basin hydrologic response. We speculate that these trends could be potentially a manifestation of the general global warming trend in recent decades and also due to enhanced ENSO activity. The observed trends in hydroclimatology over the western US can have significant impacts on water resources planning and management.