

Title: Precipitation extremes in the western United states: its spatiotemporal changes under natural climate variability and human-induced climate change

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Changes in the frequency or intensity of extreme precipitation events would have profound impacts on both human society and the natural environment. Previous studies suggested that both the human-induced global warming and natural climate variability are important contributors to the recent high extreme precipitation values. In this study, we strive to offer a comprehensive analysis of spatiotemporal changes in precipitation extremes in the western United States. We seek to: (1) identify spatial and multi-scale temporal variability in precipitation extremes (1948-2009) using wavelet analysis; and (2) determine the spatial characterization of the ENSO-extreme precipitation response pattern by calculating the correlation coefficient between Jun-Nov average Southern Oscillation Index (SOI) and five selected indices for precipitation extremes during the winter period (Oct-Mar). Preliminary results indicated that ENSO-extreme precipitation relationship displays a bipolar pattern between Northwest and Southwest, although the boundaries of the dipole center are not the same for ENSO and different extreme indices. The western United States are undergoing rapidly changing social dynamics and pressure including increasing population and a greater risk of water shortage. Better Understanding of spatial correlation between large scale climate pattern and precipitation extremes and the multi-scale temporal variability of different extreme precipitation indices due to the natural climate variability and human-induced climate change will benefit water resource management and climate forecasting in this area.