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## Impact assessment of climate change on spatial patterns of precipitation in the Western United States

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The spatial distribution of precipitation is very important for water management and planning in regions with complex terrains. Over the world, especially in developing countries, the mismatch between where precipitation falls and where water is consumed is a major issue affecting many aspects of life. Therefore, massive manmade infrastructures have been built to resolve this mismatch. It is a big challenge to properly plan infrastructures for adapting climate change, which largely relies on our understanding of how the changing climate will affect the spatial distribution of precipitation. Recently, EOF analysis on the U.S. daily precipitation product of Climate Prediction Center (CPC) revealed that there exists dominant spatial patterns in the precipitation field over the western United States. The spatial patterns are consistent at different spatial resolutions and persistent over decades. In this study, we investigate how well climate models can capture the spatial patterns of observed precipitation and how the spatial patterns will change with the projected climate change. EOF analysis is applied to precipitation outputs from NARRCAP, and the derived spatial patterns are compared with those of observation for the same time period. Moreover, based on model simulations, the spatial patterns of current (1971-2000) and future (2041-2070) with the SRES A2 emissions scenario are compared. Results show that climate models can capture the spatial patterns and the spatial patterns do not change even with the SRES A2 emissions scenario. This research proves the validity of investigating spatial precipitation patterns based on model simulation in regions where observation is sparse. The methods developed in this study will be applied to developing countries with high water pressures to help in evaluating the impacts of climate change on water systems.