

Interannual variability of the hydroclimate of the western United States
Based on Observations and Regional Climate Simulations.

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The role of orography in establishing mesoscale ENSO anomalies in the western U.S. is examined based on on observed precipitation and temperature data at 1/8 degree spatial resolution and regional climate simulations at 40km spatial resolution. We concentrated on winter anomalies. A spatial feature we investigated further is the positive-negative-positive precipitation anomaly found during El Niño years on (particularly) the east slope of the Olympic mountains, and on the west and east side of the Cascades in both observation and regional simulation. Observed streamflows of river basins located in those areas are found to be consistent with the precipitation anomalies. The spatial direction of the precipitation anomalies is investigated by relating flow direction and moisture advection to the orientation of mountains and the orographic precipitation signature.

On the west side of the north-south oriented Cascades Range, the increase in atmospheric moisture during El Niño is not able to compensate the loss of orographic precipitation associated with a more southwesterly flow. In California, however, the trends of the topography are more southeast-northwest, allowing both moisture advection and orographic effects to reenforce each other. An interesting puzzle that our analysis could not address, however, is understanding why the regional teleconnections in the Northwest are more nearly universally negative between 1958 and 1977 in the cool phase of the PDO, in contrast to the above-described situation in the last two decades of the 20th Century, even though the southern and central California signal remained largely the same.