Interannual variability of the hydroclimate of the western United States 
Based on Observations and Regional Climate Simulations. 
L. Ruby Leung, Allen Hunt, Xindi Bian, Yun Qian

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.