

**Regional Climate Model Simulations over the United States Pacific Northwest:
Verifications and Future Climate Change**

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ABSTRACT

The Pacific Northwest is characterized by mountainous terrain and intricate land-sea contrasts resulting in a host of fine-scale weather systems such as sea and land breezes, rain shadows, and downslope windstorms that define the local weather and climate. In a warming climate, such fine-scale weather systems can significantly alter the local temperature and precipitation trends and are essential to consider in climate simulations and climate change assessment at regional and local scales. Therefore, use of regional climate models with horizontal resolutions on the order of tens of kilometers is crucial over the Pacific Northwest to better represent local terrain and fine-scale weather features. This work presents the application of WRF (Weather Research and Forecasting) and HadRM (Hadley Centre Regional Model) over the Pacific Northwest in model validation, climate change studies and climate diagnostics. Firstly, the two models were driven by the reanalysis data and the simulated Tmax, Tmin and precipitation were compared with station observations from the Historical Climate Network (HCN). Secondly, WRF simulations driven by free-running global climate models (ECHAM5 and CCSM3) were validated using gridded observations for the current decades (1970-1999) and were examined in terms of regional climate change for the future decades (2030-2059). Lastly, WRF simulations in representing the spatially coherent warm-dry and cool-wet teleconnection patterns over the Pacific Northwest and the Southwest United States in association with ENSO were investigated for the current and future decades.