Patil, S., P.J. Wigington Jr., S.G. Leibowitz, and R.L. Comeleo (2013), Use of Hydrologic Landscape Classification to Diagnose Streamflow Predictability in Oregon.
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We implement a spatially lumped rainfall-runoff model to predict daily streamflow at 88 catchments within Oregon, USA and analyze its performance within the context of Oregon Hydrologic Landscapes (OHL) classification. OHL classification is used to characterize the physio-climatic conditions that potentially favor high (or low) streamflow predictability. Results show that high prediction catchments (Nash-Sutcliffe efficiency of $\sqrt{Q}$ (NS) > 0.75) are predominantly classified as rain dominated with very wet climate, low aquifer permeability, and low to medium soil permeability. Most of these catchments are located in western Oregon, west of the Cascades Mountain Range. Conversely, most low prediction catchments (NS < 0.6) are classified as snow dominated with high aquifer permeability and medium to high soil permeability. They are mainly located in the volcano-influenced regions near the High Cascades. Using a subset of 36 catchments, we further test whether class-specific model parameters can be developed for prediction at ungauged catchments. In most catchments, OHL class-specific parameters provide predictions that are on par with individually calibrated parameters (performance decline < 10%). However, large performance declines are observed in OHL classes where hydrologic predictability is not high enough to begin with. Results suggest that higher uncertainty in the rain-to-snow transition of precipitation phase and the difficulty in estimating external gains/losses of deep groundwater are major concerns for modeling at lower prediction catchments of Oregon. Moreover, regionalized estimation of model parameters appears to be more useful in regions where physio-climatic conditions favor good hydrologic predictability.

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