Precipitation extremes and their relation to climatic indices in the Pacific Northwest, USA

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Recently research has focused on the influence of climate indices on precipitation extremes. In the current study, we present the analysis of the precipitation-based extremes in Columbia River Basin (CRB) in the Pacific North-West USA. We first analyzed the precipitation-based extreme indices using statistically downscaled past and future climate projections from ten GCMs. Seven different precipitation-based indices that help inform about the flood duration/intensity are used in the study. These indices would give firsthand information on spatial and temporal scales for different service sectors including energy, agriculture, forestry etc. in the area. Temporally, historical and future projections are analyzed over the whole CRB using ten CMIP5 models. For each scenario, we have mapped out these indices over the area to see the spatial variation of past and future extremes. The analysis shows that high values of extreme indices are clustered in either western or southern parts of the basin while northern part of the basin is experiencing high increase in the indices in future scenarios. Here we focus our attention on evaluating the relation of these extreme and climate indices in historical period to understand which climate indices have more impact on extremes over CRB. Various climate indices are evaluated for their relationship using Principal Component Analysis (PCA) and Singular Value Decomposition (SVD). Results indicated that, out of fifteen climate indices used in the study, CRB is being most affected negatively by East Pacific (EP), Western Pacific Index (WP), Eastern Asia (EA) and North Atlantic Oscillation (NAO).