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Quantifying the intra-annual uncertainties in climate change assessment over 10 sub-basins across the Pacific Northwest US

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Uncertainty is an inevitable feature of climate change impact assessments. Understanding and quantifying different sources of uncertainty is of high importance, which can help modeling agencies improve the current models and scenarios. In this study, we have assessed the future changes in three climate variables (i.e. precipitation, maximum temperature, and minimum temperature) over 10 sub-basins across the Pacific Northwest US. To conduct the study, 10 statistically downscaled CMIP5 GCMs from two downscaling methods (i.e. BCSD and MACA) were utilized at 1/16 degree spatial resolution for the historical period of 1970-2000 and future period of 2010-2099. For the future projections, two future scenarios of RCP4.5 and RCP8.5 were used. Furthermore, Bayesian Model Averaging (BMA) was employed to develop a probabilistic future projection for each climate variable. Results indicate superiority of BMA simulations compared to individual models. Increasing temperature and precipitation are projected at annual timescale. However, the changes are not uniform among different seasons. Model uncertainty shows to be the major source of uncertainty, while downscaling uncertainty significantly contributes to the total uncertainty, especially in summer.