A Novel Method for Bias-Correction of Convection Permitting Climate Simulation

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Correcting biases in convection-permitting (CP) climate model output is an important step to ensure that the simulations are more representative of the real-world climate conditions. Bias correction methods are used to adjust model output to match observational or reanalysis datasets. In this study, the Multivariate Quantile Mapping (MBCn) method is chosen for bias correction of current climate simulations, with the goal of maintaining correlation between meteorological variables as in the observation. However, limitations of observation data, such as high-spatial and temporal resolution data being hard to find and potential biases near large mountains, need to be carefully considered. A machine-learning approach is used to link the simulations to other variables, such as thermal dynamical variables, cloud physics, synthetic radar reflectivity, and condensation rate to further improve the bias-correction. Furthermore, the consistency from WRF physics used in current CP climate simulations (CTL) and future CP climate simulations (PGW) is critical to avoid distorting the climate change signal in the bias-corrected precipitation.