A semi-parametric quantile mapping technique for bias correcting precipitation and temperature simulations

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Bias correction methods are used to adjust simulations from global climate models to further utilize them in practical applications. In this work, a semi-parametric quantile mapping (SPQM) method is introduced to bias-correct precipitation and temperature at the daily scale. Simulations are quantile mapped to the marginal distribution of observations, maintaining the trend line of observed time series in the future. That is, the detrended time series of observations and projections have the same marginal distribution. The results are compared with the two most popularly used quantile mapping techniques, Quantile Delta Mapping (QDM) and statistical transformation of the CDF using splines (SSPLINE). The proposed method performed well in reproducing the observed statistics while preserving the observed marginal distribution, wet and dry spells. Further, the hypothesis that the observed and modeled samples of extreme events, as characterized by the climate indices, are drawn from the same distribution could not be rejected at a 1% significance interval. Comparatively, the SPQM performed equally well or better than QDM and SSPLINE, specifically in reproducing observed wet spells and extreme quantiles. Overall, the SPQM method developed is easy to apply, yet robust in quantile mapping daily precipitation and temperature simulations.