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A multivariate bias correction approach to remove biases in GCM simulations

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Many hydro-climatological applications require information provided by the General Circulation Models (GCMs). However, the raw information as available from GCMs often contains significant systematic biases when compared with observations. It necessitates some kind of statistical correction to be carried out on the GCM fields before their use in any application. It is common to correct the individual time series of GCM derived variables by removing the systematic biases at daily, monthly or seasonal time scales. In this paper, we present a modified bias correction approach that corrects for the low as well higher order moments biases in the several GCM derived variables across multiple time scales. The proposed methodology forms an extension of our recently published papers on Nested Bias Correction (NBC) technique, which progressively corrects GCM simulations from lower to higher time scales to impart the observed distributional and persistence properties across the selected multiple time scales. The proposed Multivariate Recursive Nested Bias Correction (MRNBC) approach offers an improved basis for applying bias correction simultaneously on many variables at multiple time scales over the original NBC procedure. The method ensures that the bias corrected series exhibits improvements that are consistently spread across all variables and over all the time scales considered. The use of the approach in downscaling applications related to hydrology and water resources is expected to deliver better results.