Comparison of multivariate post-processing approaches

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Over the past decade, statistical post-processing of ensemble forecasts has become routine in numerical weather prediction. However, critically important spatial, temporal and inter-variable dependencies are lost when univariate post-processing techniques are applied separately to multiple locations, forecast horizons or variables. Therefore, several approaches for restoring multivariate dependencies have been proposed in the literature. These techniques rely on parametric and empirical copulas to incorporate multivariate dependence structures estimated from past forecasts or observations. Examples include ensemble copula coupling, the Gaussian copula approach and the Schaake shuffle. We compare these state of the art approaches in a simulation setting that mimics how post-processing is done in practice and that allows for investigating the effect of various types of misspecification of the ensemble prediction system on the forecast performance of the multivariate post-processing methods.