



## **A Robust and Effective Multivariate Post-processing approach: Application on North American Multi-Model Ensemble Climate Forecast over the CONUS**

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The North American Multi-model Ensemble (NMME) forecasting system has been providing valuable information using a large number of contributing models each consisting of several ensemble members. Despite all the potential benefits that the NMME offers, the forecasts are prone to bias in many regions. In this study, monthly precipitation from 11 contributing models totaling 128 ensemble members in the NMME are assessed and bias corrected. All the models are regridded to 0.5 degree spatial resolution for a more detailed assessment. The goals of this study are as follows:

1. Evaluating the performance of the NMME models over the Contiguous United States using the probabilistic and deterministic measures.
2. Introducing the Copula based ensemble post-processing (COP-EPP) method rooted in Bayesian methods for conditioning the forecast on the observations to improve the performance of NMME predictions.
3. Comparing the forecast skill of the NMME at four different lead-times (lead-0 to lead-3) across the western US, and assessing the effectiveness of COP-EPP in post-processing of precipitation forecasts.

Results revealed that NMME models are highly biased in central and western US, while they provide acceptable performance in the eastern regions. The new approach demonstrates substantial improvement over the raw NMME forecasts. However, regional assessment indicates that the COP-EPP is superior to the commonly used Quantile Matching (QM) approach. Also, this method is showing considerable improvements on the seasonal NMME forecasts at all lead times.