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Formulation and results from ensemble forecasting using Multimodels for Hurricanes, Global Weather and Seasonal Climate

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This paper carries a short review of a multimodel/multianalysis superensemble for weather and seasonal climate forecasts. This model was first developed by the authors in 1999 at Florida State University. This entails a large number of forecasts using these multimodels from past data sets, that is called a training phase of the superensemble. During this training phase statistical relation among the model forecasts and the observed fields is obtained using multiple regression methods. This training phase requires roughly 4 months of past daily forecasts for numerical weather prediction (NWP), approximately 6 years of past seasonal forecast and about 60 past hurricane/typhoon/tropical cyclone forecasts from each of the participating member models. The training phase is followed by a forecast phase where the member model forecasts (into the future) use the aforementioned statistics to construct multimodel superensemble forecasts. Our focus on NWP has been to examine the performance of the multimodel superensemble forecast against those of the member models, their ensemble mean and the bias removed ensemble means. We have noted an invariable much superior performance of the multimodel superensemble. We have noted that roughly a minimal number of 7 to 8 models are needed to carry out this exercise. We were also able to improve the database and the statistics of the training phase by rejecting poorer forecast days and optimizing the number of training days. The common metrics for forecast evaluation include root mean square error, anomaly correlation and equitable threat scores. Great impact on real time and experimental forecasts from the superensemble were noted for precipitation, sea level pressure, temperature and 500 hPa geopotential height fields. The improvements in forecasting heavy rains by the multimodel/multianalysis superensemble are found to provide useful guidance in flood events. In hurricane forecasts improvements in track position forecasts of the order of 100 to 250 km were noted in one to three day forecasts. Intensity forecast for hurricanes shows only a marginal improvement. The seasonal climate forecasts show a lower performance from the member models compared to climatology, the multimodel superensemble appears to have skill somewhat above that of climatology.