Use of the ensemble covariance matrix to propagate forecast uncertainty across climate model components

Malaquías Peña
IMSG at EMC/NCEP/NWS/NOAA

- Background: A method to propagate uncertainties across atmospheric variables based on a Bayesian filtering of the ensemble covariance matrix has been developed (Peña and Toth, 2016)

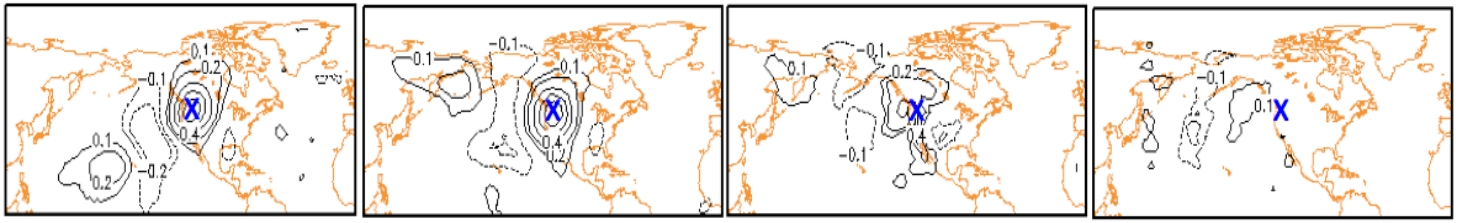

Fig. 1. Ensemble rank correlations for modifying a forecast at a selected point (blue cross) across space (5-day lead 500 hPa height for Dec. 2007 & Jan. 2008, left 2 panels), across variables (5-day lead 2m temp, 2nd from right), & across lead time (3-day lead 2m temp, right).

- Last year: The Ensemble Group at EMC generated three sets of experimental extended (35-days) integrations of the GEFS to analyze the effect of SST on the skill of weather prediction over the U.S.
  - Set 1: forecast integrations use persisted (90-days e-folding damping towards climate) initial SST. This is common in AGCMs.
  - Set 2: Same configuration as Set 1 except that the analysis SST is prescribed daily (AMIP-type).
  - Set 3. Instead of analysis, a corresponding forecast SST from the fully coupled CFSv2 is prescribed.
- Figure on the right: Shows the difference between the AMIP-type and the SST-persisted runs. Forecast lead times considered are weeks 3 to 4. Twenty-member average. Daily initial conditions.
- Currently: The Climate Group at EMC is working on a wide range of development activities for a multi-component unified global coupled model as next generation of the CFS. Propagation of forecast uncertainty across climate components will be addressed.