Section 3: NAEFS mean, spread and probability forecasts

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The mean and spread of NAEFS are straight from multi-center ensembles after bias correction. Current NAEFS represents NCEP global ensemble system and CMC global ensemble system.

1). Mean:

$$\bar{f}(t) = \frac{1}{m} \sum_{n=1}^{m} f_n(t)$$

2). Spread:

$$spr(t) = \sqrt{\frac{1}{m-1} \sum_{n=1}^{m} (f_n(t) - \bar{f}(t))^2}$$

3). Ensemble mode:

$$mode = 3*median - 2*mean$$

4). 10%, 50% (median) and 90% probability forecasts:

The l-moment method has been introduced to generate probability forecast. In particular, GEV (Generalized Extreme-Value Distribution) has been assumed to assimilate ensemble forecast distribution. In general, GEV has the similar properties of common Gamma-3 distribution, Pearson Type 3 distribution and so on. There are two examples of GEV data fitting for 2-meter temperature and 10-m U-wind from 40-year NCEP/NCAR reanalysis monthly mean data (next pages).

5). Example of probability forecast maps

**Top four maps (page after):** There are mean, 10%, 90% and 50% (median) from bias corrected NAEFS forecasts (120 hours from August 20 2008) for all 40 members.

**Bottom four maps (page after):** There are mean, 10%, 90% and 50% (median) from bias corrected NAEFS forecasts (120 hours from August 20 2008) for all 40 members.
6). Forecast anomaly

The forecast anomaly for ensemble mean has been generated for all 19 bias corrected ensemble variables at 1°1 degree resolution grid. The anomalistic values are the difference between climatological mean (NCEP/NCAR 40-year reanalysis) and bias corrected ensemble mean by considering the systematic difference between reanalysis and current analysis (GFS/GDAS).

\[ f_{an} = f_{em} - c_m + \sum_j (c_m^j - a_j) \]

There is an example (shown below) for 5-d forecast.