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:

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

2). Spread:

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

3). Ensemble mode:

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

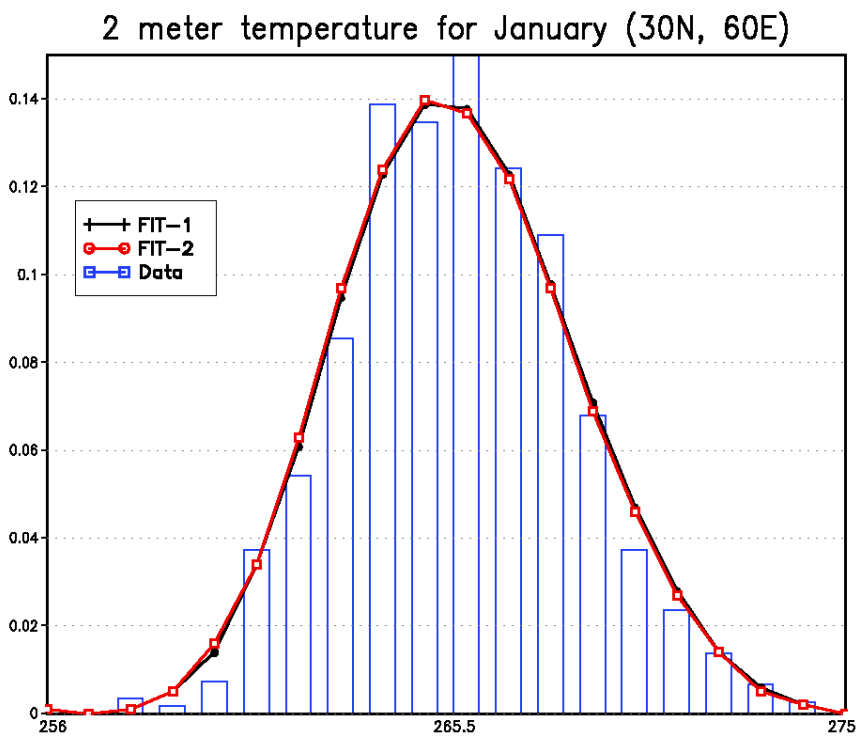
4). 10%, 50%(median) and 90% probability forecasts:

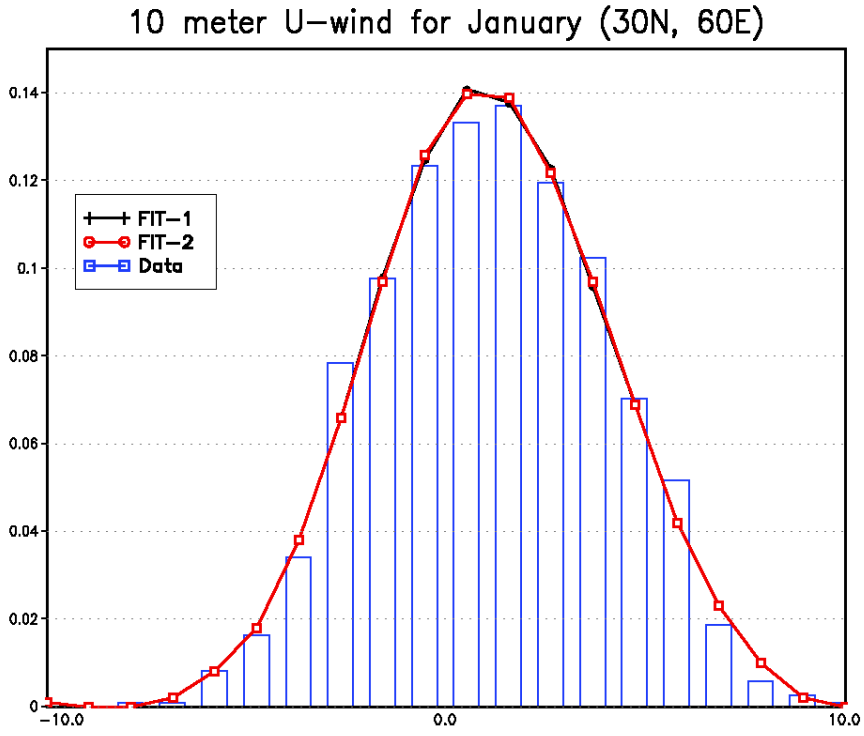
The l-moment method has been introduced to generate probability forecast. In particular, GEV (Generalized Extreme-Value Distribution) has been assumed to assimilate ensemble forecast distribution. In general, GEV has the similar properties of common Gamma-3 distribution, Pearson Type 3 distribution and 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

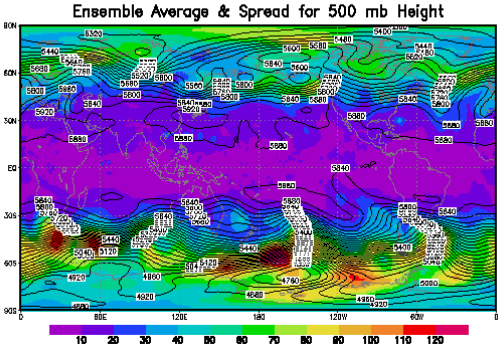
***Top four maps (page after)*:** There are mean, 10%, 90% and 50% (median) from bias corrected NAEFS forecasts (120 hours from August 20 2008) for all 40 members.

***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.

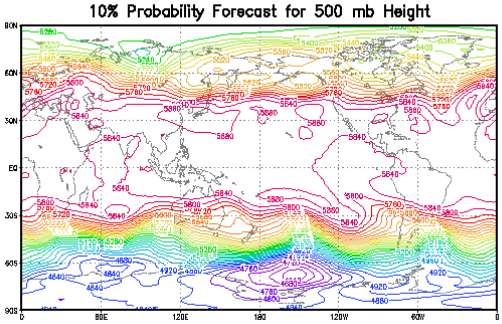

2 meter temperature for January (30N, 60E)
FIT−1
FIT−2
Data
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
256
265.5
275


10 meter U−wind for January (30N, 60E)
FIT−1
FIT−2
Data
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
−10.0
0.0
10.0

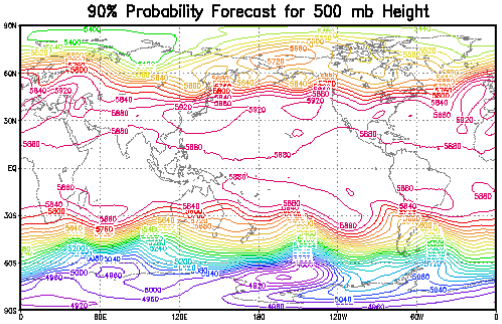
Ensemble Average & Spread for 500 mb Height



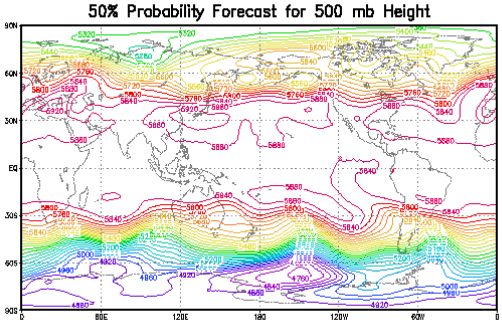
10% Probability Forecast for 500 mb Height



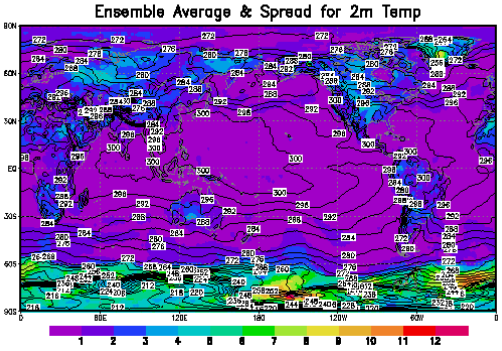
90% Probability Forecast for 500 mb Height



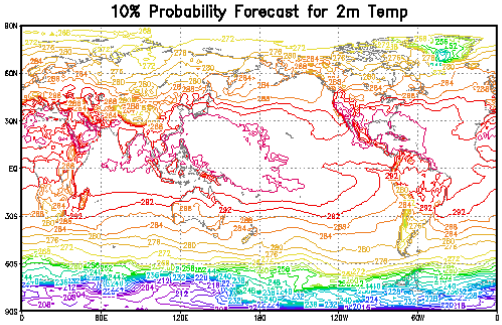
50% Probability Forecast for 500 mb Height



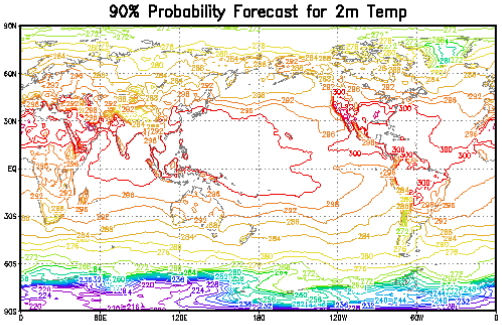
Ensemble Average & Spread for 2m Temp



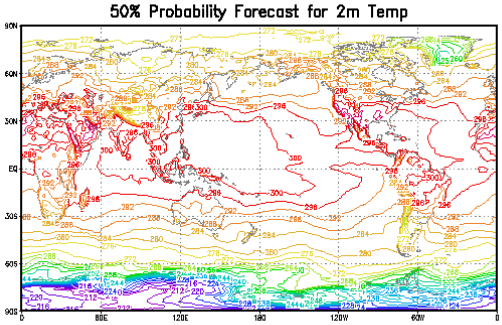
10% Probability Forecast for 2m Temp



90% Probability Forecast for 2m Temp



50% Probability Forecast for 2m Temp



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).

$$f_{an} = f_{em} - c_m + \sum_{j}^{decaying} (c_m^j - a^j)$$

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