Section 1: Summary of GFS bias correction

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EMC has experimentally summary for GFS bias correction since 2006, which is using the same algorithm as global ensemble forecast system (GEFS) bias correction. The description of the method is as following:

1). Bias Estimation: The bias (b) for each lead-time (t) (6-hour interval up to 180 hours), each grid point (i,j) is defined as the different of analysis (a) and forecast (f) at the same valid time (t0) which is up on latest available analysis.

$$b_{i,j}(t) = f_{i,j}(t) - a_{i,j}(t_0) \qquad (1)$$

2). Decaying Average: Average bias will be updated by considering prior period bias and current bias by using decaying average with weight coefficient (w).

$$B_{i,j}(t) = (1-w)B_{i,j}(t-1) + wb_{i,j}(t) \qquad (2)$$

3). Weight: By previous experiments for different weights (0.01, 0.02, 0.05, 0.1 and etc…), w equals to 0.02 has been used for GEFS bias correction which is mainly using past 50-60 days information (see figure).
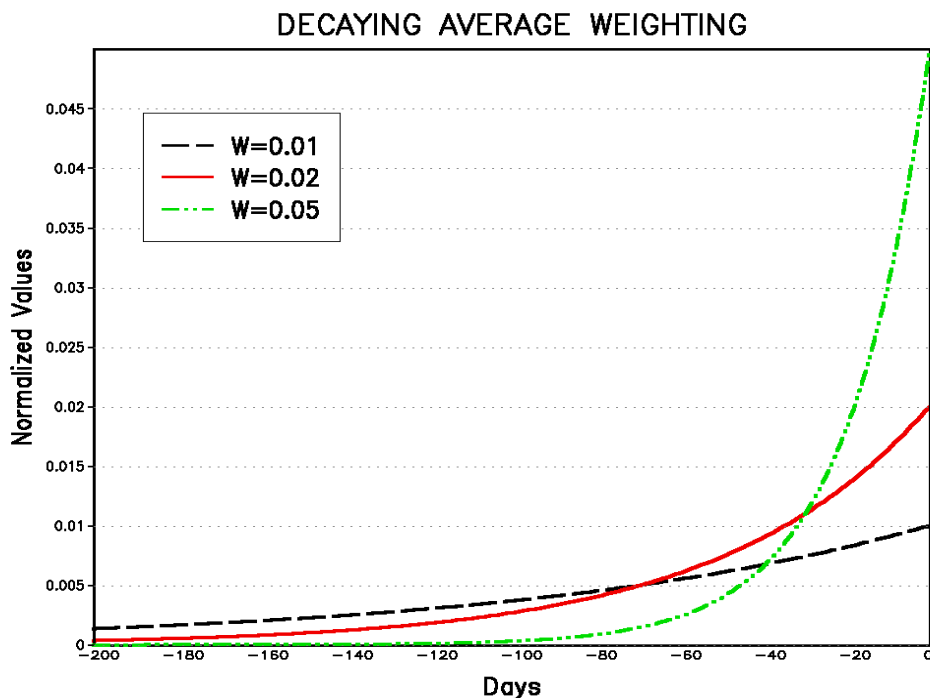
4). Bias corrected forecast: The new forecast (bias corrected) will be generated by applying decaying average bias (B) to current forecasts at each lead-time and each grid point.

$$F_{i,j}(t) = f_{i,j}(t) - B_{i,j}(t) \qquad (3)$$

5). Performance: The performance is estimated by applying bias correction method. The bias is calculated at each grid point through equation (1) for raw forecast (f) and bias corrected forecast (F), then using decaying average method (w=0.02) to get current average bias, taking absolute bias for each grid point, each lead-time to generate domain average absolute error (bias) which smaller value is better (see figure: example for Northern Hemisphere 2 meter temperature, decaying average (w=0.2) about 2 months period ended by April 27, 2007).

NH 2m Temperature
Valid Time : 2007042700 (for t00z forecast)