

WESTERN REGION TECHNICAL ATTACHMENT
NO. 86-29
October 14, 1986

TEMPERATURE BIAS OF THE NGM

The attached description of the NGM temperature bias serves as a reminder of the cold bias that the current version of this model has. We do not know yet how this cold bias might become modified as we get into the cold season. However, as discussed in this tech attachment, the bias was similar in September to what it was in August.



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL WEATHER SERVICE

National Meteorological Center
Washington, DC 20233

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W/NMC2x2:NAP

MEMORANDUM FOR: Addressees

FROM: Norman A. Phillips
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SUBJECT: Temperature Bias in Forecasts from the Nested Grid Model

REF: Letter from R. McPherson, dated June 12, 1986, titled "Update on Test and Evaluation of RAFS Physics Package"

As mentioned in McPherson's letter, the radiation code in the NGM seems to produce a cold bias in the troposphere. In June this had a maximum of -2 deg/48 hours at 850 mbs, and a similar value at 300 mbs. Figures 1a and 1b show this bias during September as a function of forecast hour for each of the two daily cycles. (Note that the units are tenths of degrees.) Results for August were almost identical.

The excess cooling at 850 mbs reported by McPherson was associated with excessive evaporation of convective rainfall that was programmed in the test system being used up to the time of McPherson's letter. About that time we implemented a major change in the convective parameterization, including a reduction of the evaporation of falling convective rain. This has eliminated the maximum in cold bias at 850 mbs, as shown by Figures 1a and 1b.

The second maximum of cold bias reported by McPherson in June was at 300 mbs. It still exists in the September averages. We know now that part of this is caused by a too sudden drop-off in relative humidity at 300 mbs in the RAFS analysis. A partial correction of this will be implemented in several weeks.

However, we have been unable to find a reason for the cooling between 300 and 850 mbs that is shown on Figures 1a and 1b. McPherson suggested in his letter that we might introduce an empirical correction if everybody wished it. The replies he received were mixed, with greater weight on not introducing an empirical correction.

But there are additional reasons for not introducing a simple correction. Figures 2a and 2b show the average 48-hour forecast error by the LFM and by the NGM during September for the 250-850mb thickness (meters). (1 degree in mean virtual temperature between these levels corresponds to about 36 meters in thickness.)

Both models produce the same pattern, but that from the NGM is colder by about 30 meters (about 0.8 deg) in the United States.

The common pattern has maximum cooling near both coasts, especially the West Coast. A similar pattern existed in August for both models. It therefore appears likely that part of the systematic cold error is not due alone to the

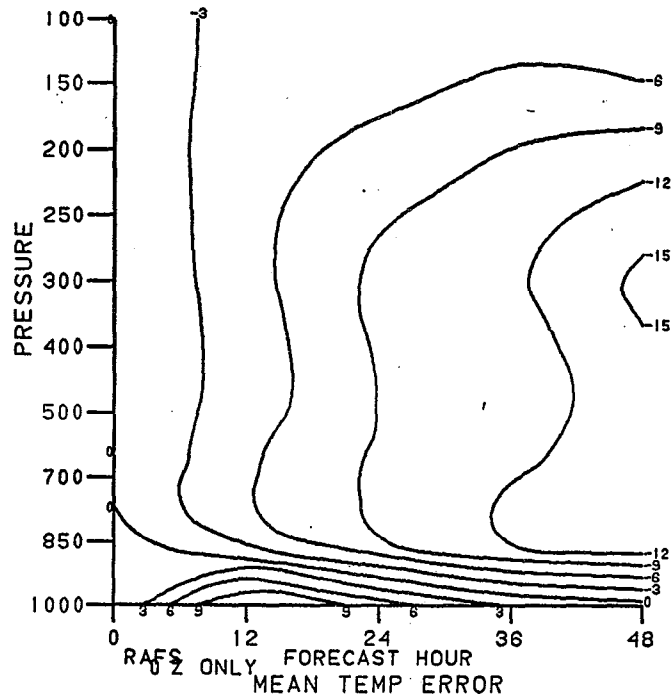


radiation code used in the NGM, but is also present in the LFM. Keeping this error in the forecasts without ad-hoc correction will help us keep aware of it, and hopefully lead to detection of the reason it exists and development of a meteorologically sound correction.

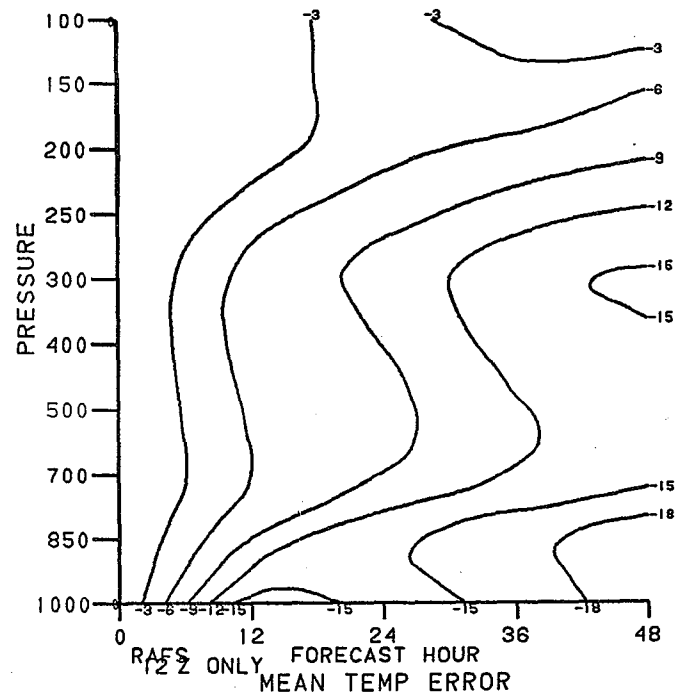
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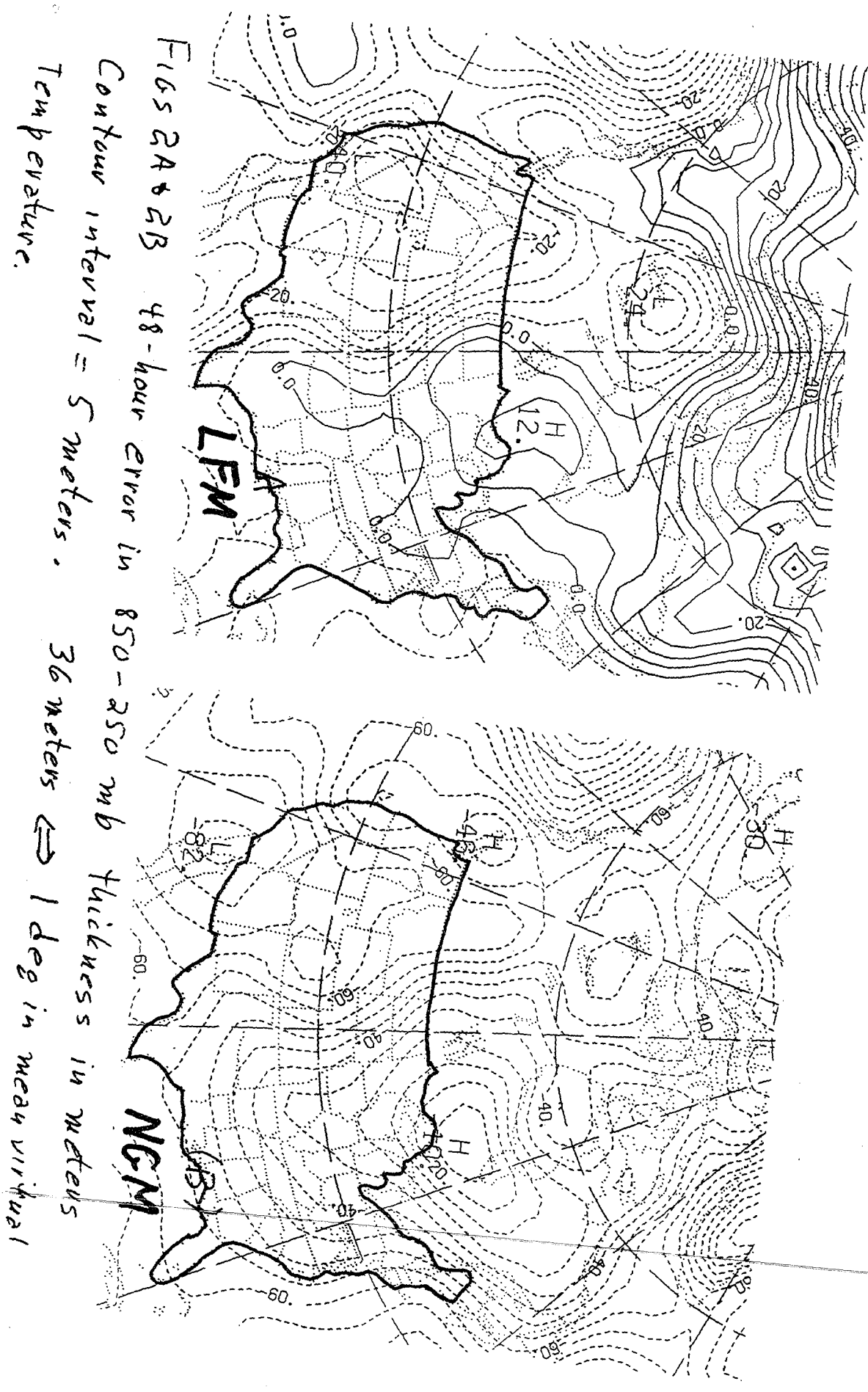


A 00Z runs



B 12Z runs

FIGS. 1A AND B. September average temperature forecast error by the RAFS, averaged over North America. Values below 850 mbs are meaningless Units = 0.1 deg C.



FIGS 2A & 2B

48-hour error in 850-250 mb thickness in meters
 Contour interval = 5 meters.
 Temperature. 36 meters \leftrightarrow 1 deg in mean virtual