

WESTERN REGION TECHNICAL ATTACHMENT
NO. 86-27
September 2, 1986

CORRECTION TO VERTICAL MIXING IN THE NGM FORECAST CODE

[Editor's Note: The attached memorandum is being distributed as a technical attachment for two reasons: 1) it is the quickest way to get widespread distribution of information on a change that has already been implemented; 2) this TA and Technical Procedures Bulletin No. 363 should enhance forecasters' understanding of how the new NGM physics works. As mentioned in the memorandum, the vertical mixing problem only occurred occasionally.]



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

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W/NMC2x2:NAP

MEMORANDUM FOR: Addressees

FROM: Norman A. Phillips
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NAP

SUBJECT: Correction to vertical mixing in the NGM forecast code.

The NGM forecast code contains a subroutine called "SFCMIX". This has the function of mixing the potential temperature and specific humidity in the bottom layers of the model, in response to upward turbulent fluxes of heat and moisture from the ground and in response to mechanical stirring from strong winds in the bottom layer of the model. A change to this subroutine will be made on September 3 to correct a forecast error that occurs only occasionally (e.g. several times per month), but is serious when it happens.

SFCMIX contains a special treatment of the case when the uppermost of the mixed layers is saturated. (The number of the mixed layers varies with time and location during each forecast. See Figure 2 in Technical Procedures Bulletin 363.) The special treatment is designed to increase the "entrainment" between the mixed layers and the overlying stable layer when the uppermost mixed layer is saturated. This procedure seems to work satisfactorily in the usual case of dry air above a stratocumulus-topped mixed layer. But it has occasionally produced catastrophic results when the overlying air is itself saturated with a moist-adiabatic lapse rate. An example is shown in Fig. 1. The dry-adiabatic lapse rate in the bottom 4 layers produced by the subroutine SFCMIX is meteorologically incompatible with the saturation that is also predicted.

When this happens in the forecast, too much precipitation is forecast at the grid point in question. A more serious error however is that the forecast of the lifted index is much too unstable. Figures 2-4 illustrate the erroneous forecast near Dulles in this case. Figure 5 shows the improvement obtained when the special treatment of saturation in SFCMIX is removed; in this example it has removed the only major error in the forecast value of the index. The change did not degrade any other aspects of the forecast (e.g. sea-level pressure).

A revised version of the saturation treatment in SFCMIX should eventually be possible. In the meantime, the offending part of SFCMIX will be cancelled on September 3.

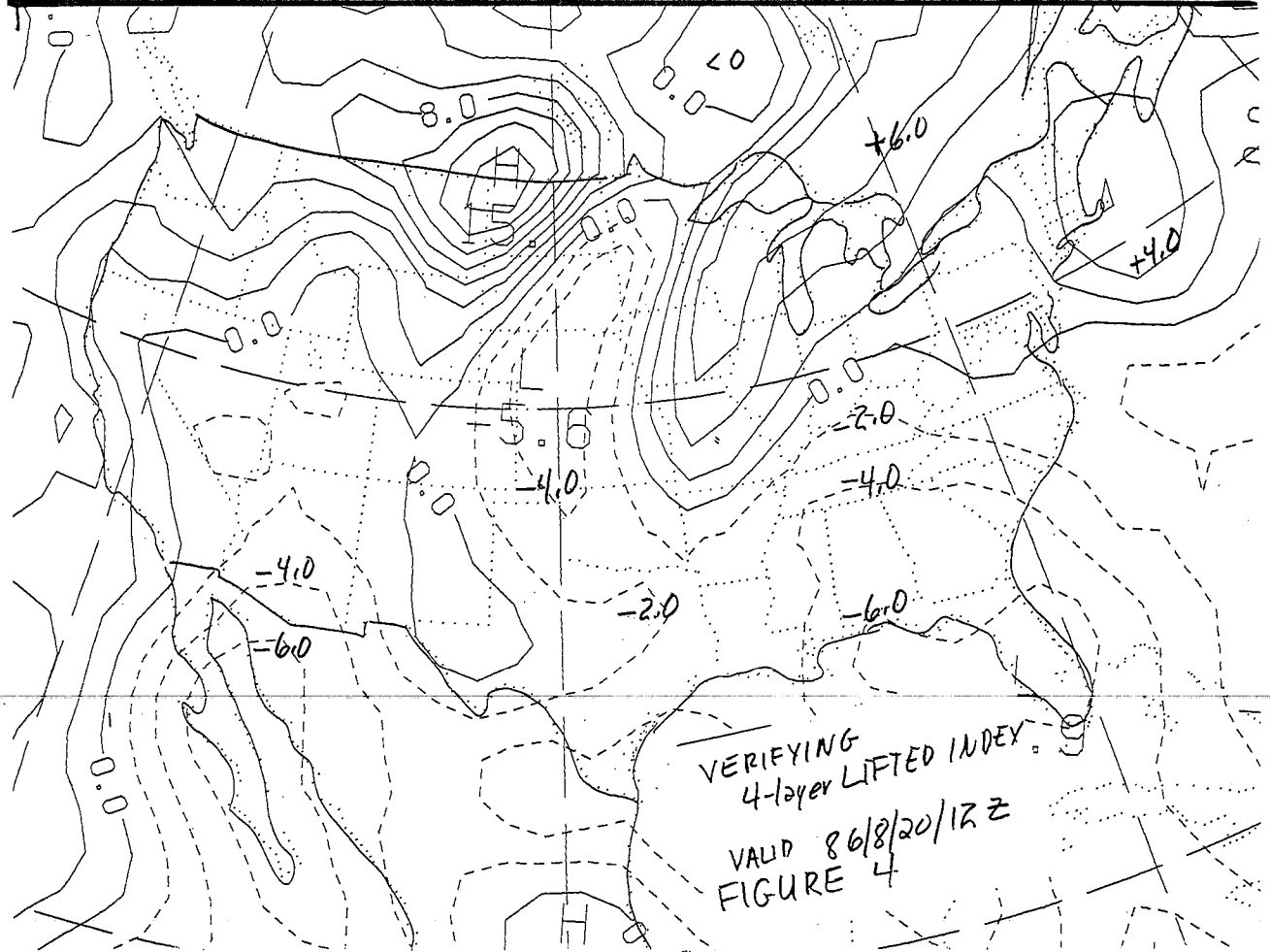
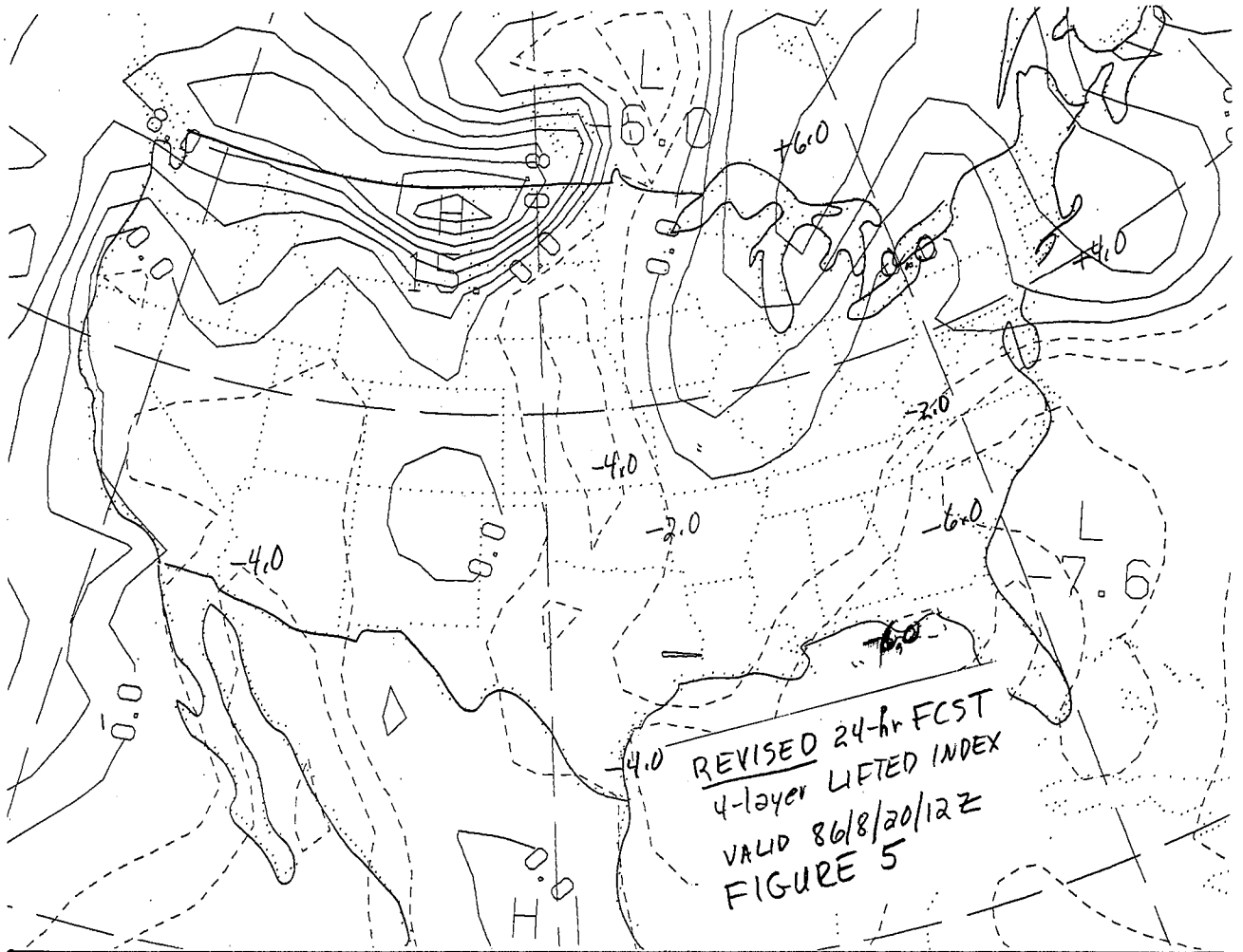
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Regional SSDs.





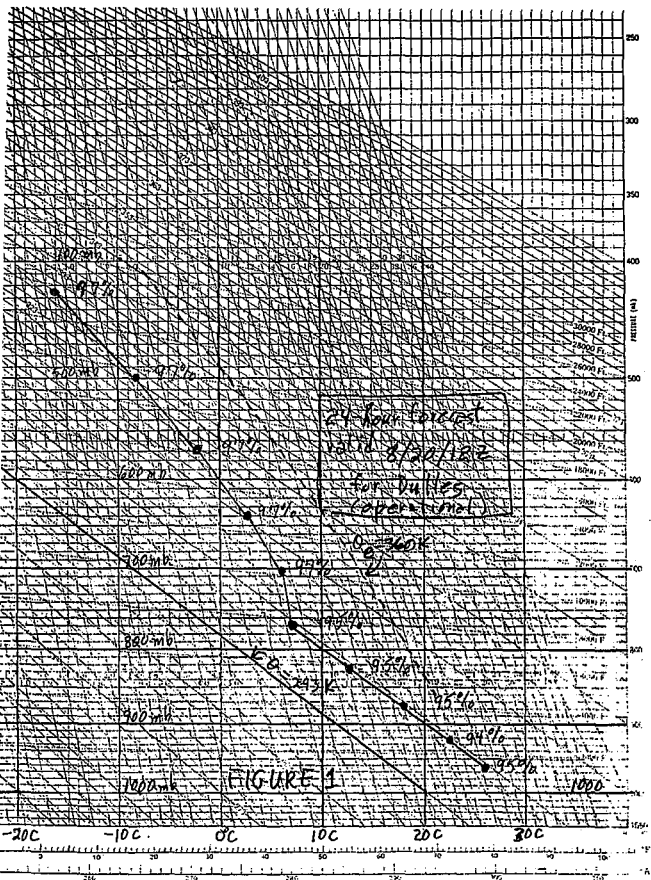


FIGURE 1

