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REVIEW OF THE NMC NUMERICAL GUIDANCE SUITE IN 1987 AND A PREVIEW OF CHANGES IN 1988 PART VI

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7. A Preview of RAFS Changes for 1988: James Hoke

Development changes to the RAFS in 1988 will involve all components of the system--first guess, analysis, initialization, and prediction. Discussions of expected changes in each component follow.

- First guess - Currently, the GDAS supplies the first guess to the RAFS analysis (ROI). Although improvements in the GDAS over the past two years have greatly enhanced the quality of the guess, it still is of coarser resolution than, say, the 12hr forecast from the RAFS' previous cycle. We plan to implement in 1988 a Regional Data Assimilation System (RDAS) which will allow the RAFS to provide its own first guess.

- Analysis - We have already mentioned the unification effort, to produce a single, highly efficient, analysis computer program for both global and regional applications. This effort will continue, and will permit an increase in horizontal resolution of the ROI analysis grid from 1.5 degrees latitude by 2 degrees longitude to 1 degree by 1 degree. Also, a major effort is under way at NMC to improve data quality control, and this will also have an impact on the ROI. We expect to incorporate some additional data, such as the experimental wind profiles in Colorado, and more automated aircraft reports. We also expect to introduce a new statistical basis for the ROI, a project which has been ongoing for two years.

- Initialization - Presently the initialization is done with the normal modes of a T80 hemispheric version of the global spectral model, rather than the normal modes of the NGM itself, because the normal modes of a spectral model are better defined mathematically. In 1988, we expect to introduce a grid point version of the initialization, based on the NGM's finite difference equations. This change will also permit more convenient changes in the model's vertical structure.

o Prediction - We expect to refine the orography used in the RAFS, and to introduce a gravity-wave drag parameterization in the NGM. We will also experiment with, and possibly implement, stability-dependent heat and moisture surface fluxes over water, such that cold air moving over warm water will experience more warming and moistening then currently occurs in the LFM.
To accompany this improvement in the parameterization of surface processes, we will study the possibility of increasing the resolution of the sea surface temperature (SST) analysis used in the NGM. Regional SST analyses at 50km resolution are generated by NMC, but have not as yet been used in the atmospheric prediction models. Increased resolution is also planned for the snow cover analysis. An increase in the number of vertical levels in the RAFS in the boundary layer and near jet levels is also contemplated. The present resolution in the latter regions is about 70mb, which is not enough to represent strong vertical shears. Some improvements in the numerical procedures used in the NGM are under consideration. One of these involves the smoothing of fields along the vertical coordinate of the model. Near mountains these coordinates slope steeply. Currently, the nature of smoothing applied to the temperature and moisture fields is such that mountain tops are cooled and moistened, and valleys warmed and dried. This is a systematic and artificial effect that should be avoided. To combat this, we will experiment with smoothing only the changes in the forecast fields, rather than the full fields themselves.

Finally, we are very concerned about the tendency of the RAFS to exhibit large, negative, systematic errors over large portions of the western U.S. (See Figure F-1.) It is not unique to the NGM as is shown in Figure F-2. We are studying this phenomenon intently, and expect progress during 1988.

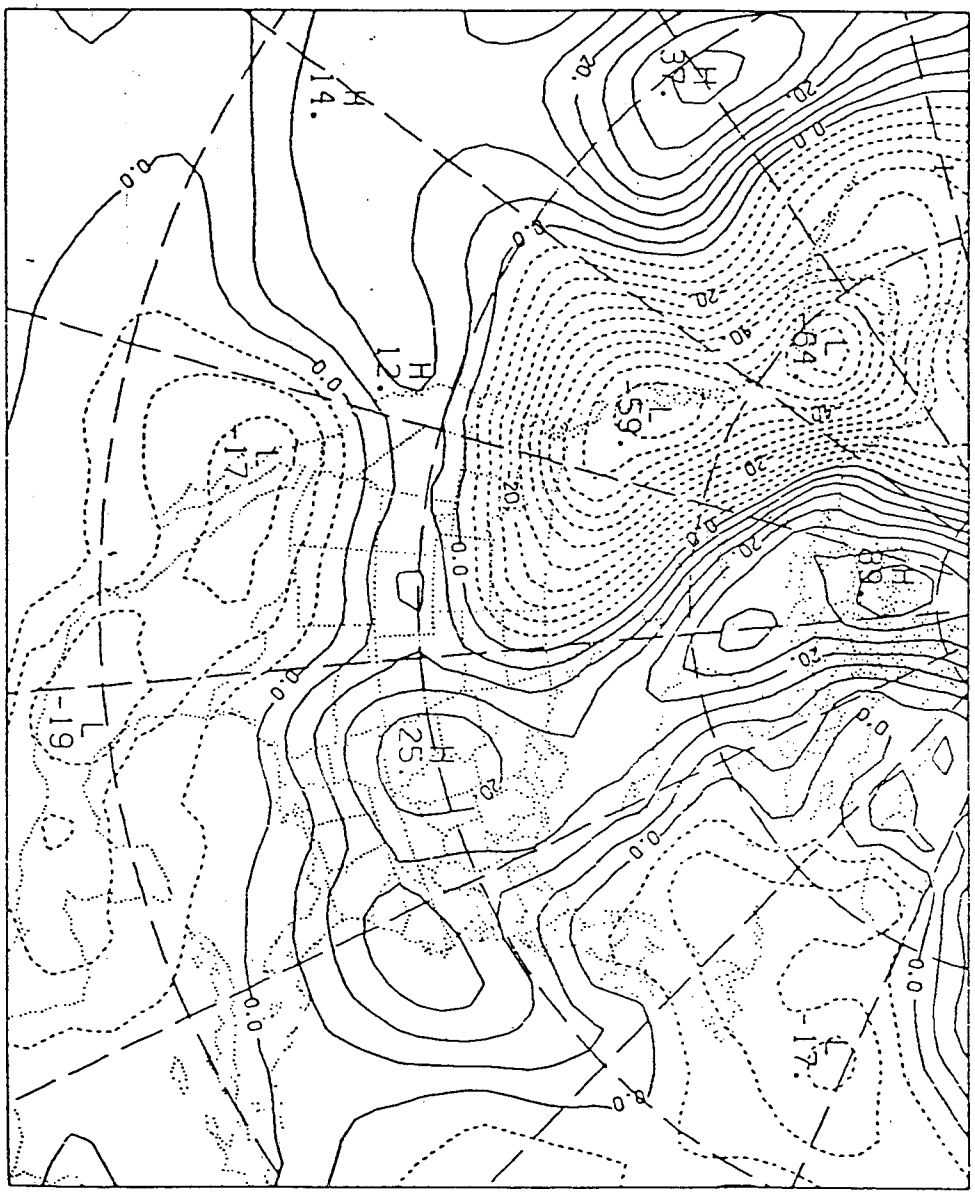

Figure F - 1

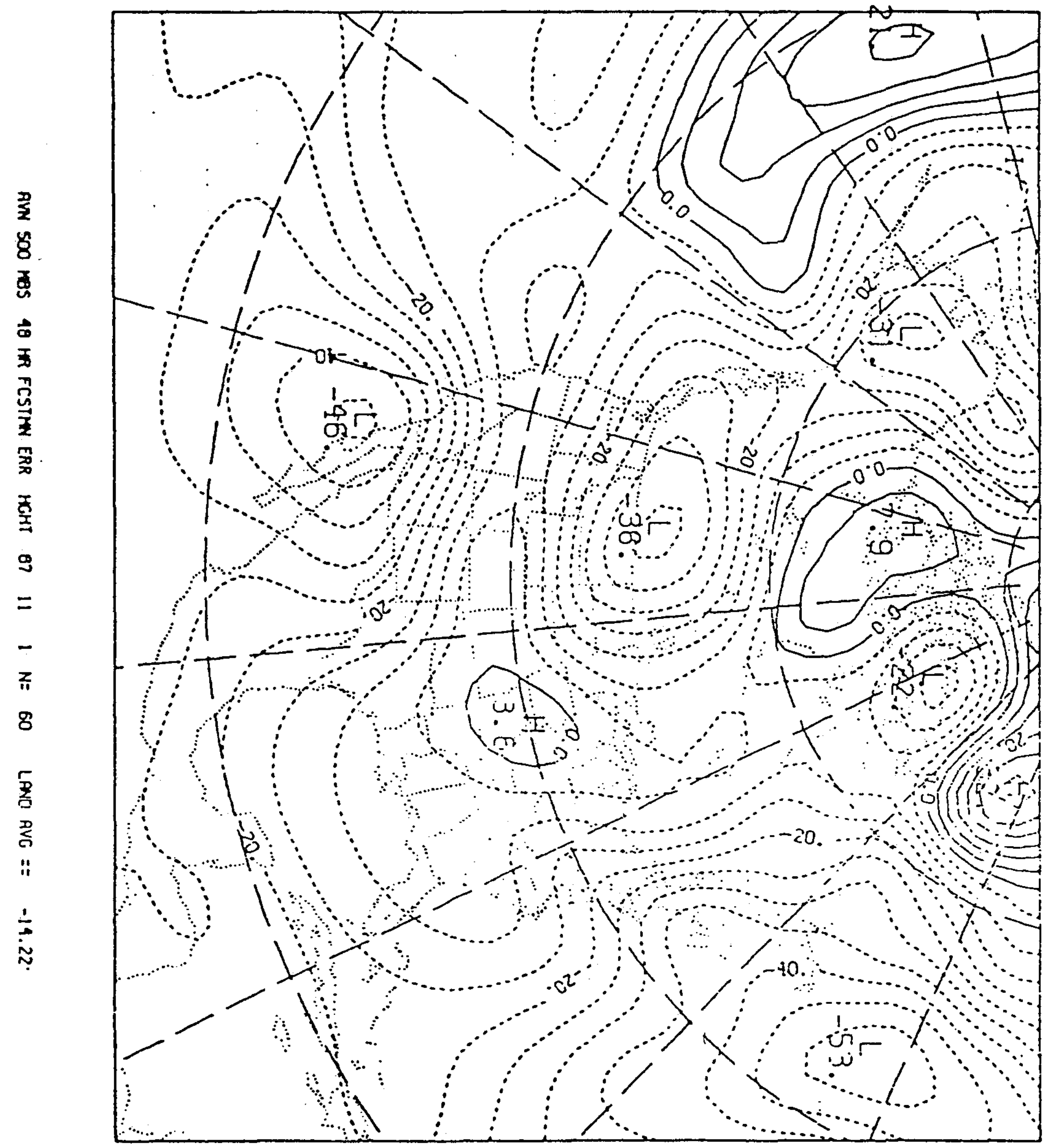

Figure F - 2