Western Region Technical Attachment
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WHAT'S THE LATEST AT NMC?

As usual, the status of the NMC model runs has continued to change in the last year. This attachment summarizes the latest state of the NMC models.

Presently, NMC runs three different models to service the five standard production runs. There is a fourth model under development, and there is a new analysis scheme also under development.

Early Look (ERL) Run

The purpose of this run is to provide a 48-hour forecast for North America as quickly as possible. This run continues to be served by the Limited Area Fine Mesh (LFM) model. There have been no changes to this model, and none are planned for the future. The LFM still provides the model data for the MOS (FPC).

Regional (RGL) Run

The purpose of this run is to produce the best possible 48-hour forecast for North America. Since its operational implementation in March 1985, the hemispheric Nested Grid Model (NGM) has served as the model for this run. The NGM, along with its associated analysis, is collectively referred to as the Regional Analysis and Forecast System (RAFS). The RAFS has undergone numerous changes since 1985, and a number of improvements were made in late 1990. These latest changes include:

- new higher resolution topography
- improved radiative heating rates in the upper levels
- improved subsoil temperature specification
- correction of soil moisture specification along the coastlines
- new stability dependent surface fluxes over water
- switch from second- to forth-order finite differencing to take advantage of the CRAY
- an additional analysis level at 10 mb
- improved quality control of satellite temperature and wind data

However, as of December 1990,the RAFS has been frozen with two exceptions. The NGM currently uses the global spectral model "final" run as a first guess. This will be changed so that the NGM can provide its own first guess in order to improve "spinup" time for the model to produce precipitation, and also to increase the horizontal resolution in order to

better capture frontal intensity. This change will also allow the RAFS to use off-time data (such as profilers) in the future. The second change still in the offing for the RAFS is an expansion of the high-resolution "C" grid which will primarily benefit the Western, Pacific, and Alaskan Regions.

The NGM is responsible for the model data used for the MOS (FWC).

Aviation (AVN) Run

The purpose of this run is to provide guidance material in support of NMC's international aviation requirements. It also provides important guidance to field forecast operations. In 1990, the AVN had the best overall verification skill scores among the ERL, RAFS, and AVN. Since November 1986, this run has been served by the Medium Range Forecast (MRF) model and is executed twice daily through 72 hours. A more complete discussion of this model follows in the next section, including recent changes to model resolution.

Medium Range Forecast (MRF) Run

This model is a global spectral model. It is run at 12Z out to 72 hours as the AVN run, and at 00Z out to 240 hours. It is also run out 6 hours as the Final (FNL) at 18Z and 06Z to produce first guess fields for the other 00Z and 12Z model runs. Essentially, the FNL is run four times a day, using the latest possible data available.

In early March 1991, the horizontal resolution of the MRF was increased from Triangular Truncation-80 modes (T80) to T126. This effectively increases the horizontal resolution from 160 km to 105 km. This compares with 90 km on the "C" grid of the NGM and 190.5 km of the LFM. This increase in horizontal resolution was possible because of the faster speed of the CRAY. A marine stratus cloud parmeterization and a new sea surface temperature analysis scheme were also implemented. There was also a change to mean orography rather than enhanced silhouette orography.

Future plans for the MRF include an increase in vertical resolution from 18 to 28 levels, the use of liquid water as a prognostic variable, and more frequent execution of the radiation parameterization. A new 3-D variational analysis, referred to as spectral optimum interpolation (OI), will likely be implemented in 1991. It differs significantly from the current OI in that analysis is done in the spectral space rather than in the local physical space. Tests of this new analysis scheme have shown that it will likely have a noticeable positive impact on the MRF.

New Model and New Analysis

A new "ETA" coordinate model is now in development and testing at NMC. The ETA model will likely become the new RGL run, and the RAFS will be moved to the ERL slot. The ETA model was tested at 80 km, 50 km, and 30 km with up to 30 vertical levels during 1990. It continues to show great promise in its precipitation forecasts as well as the treatment of airflow around mountains. The 80 km version is often available for comparison to NMC forecasters. Plans are for the ETA model to be made available during the next few years to field offices in the MARD.

A new rapid update analysis based on PROFS' Mesoscale Analysis and Prediction System (MAPS) is being tested at NMC to produce hourly upper-air analyses based on off-time

data such as wind profilers and ACARS (automatic aireps) in concert with a frequently updated first guess field from a predictive model. These hourly upper-air analyses will be distributed to field sites in the MARD. The analysis is currently being tested with 80 km horizontal resolution.

Backup Systems

All of the above models have been converted to run on the CRAY YMP/832 computer that became operational early in 1990. This computer replaced one of the CYBER 205 computers. Presently, when the models must be run in backup mode on the CYBER, older, lower resolution versions of the model are used, e.g., T80 MRF, second order finite difference NGM. Later this year, the remaining CYBER will likely be removed in order to prepare for the installation of a new CRAY that will be three to four times faster than the current CRAY. This new computer is scheduled for early in FY 1992. During the period when there is only one supercomputer at NMC, backup will be provided by models run by the Navy.

RUN	PREDICTION MODEL	DOMAIN	ANALYSIS	DATA CUT-OFF	RESOLUTION HORIZ	RESOLUTION VERT	FORECAST PROJECTION	500 MB HEIGHT AND VORTICITY PRODUCTS AVAILABLE ON AFOS
EARLY LOOK (ERL)	LIMITED-AREA FINE MESH (LFM)	REGIONAL (N.A.)	GRIDPOINT CRESSMAN SUCCESSIVE CORRECTION 2-DIMENSIONAL	1+30	GRIDPOINT 190 KM @60°N	7 LAYERS	48 HRS	50(6,7) 52(6,7) 54(6,7) 56(6,7) 58(6,7)
REGIONAL (RGL)	NESTED GRID MODEL (NGM)	HEMISPHERIC	GRIDPOINT 3-DIMENSIONAL OPTIMUM INTERPOLATION (OI)	2:00	GRIDPOINT GRID A 360 KM GRID B 180 KM GRID C 90 KM @60°N	16 LAYERS	48 HRS	50(H,V) 52(H,V) 54(H,V) 56(H,V) 58(H,V)
AVIATION (AVN)	MEDIUM RANGE FORECAST MODEL (MRF)	GLOBAL	GRIDPOINT 3-DIMENSIONAL (OI)	2+45	SPECTRAL 126 WAVES (105KM)	18 LAYERS	72 HRS	5A(H,V) 5C(H,V) 5E(H,V) 5G(H,V) 5I(H,V) 5J(H,V) 5KH
HURRICANE (HCN)	MOVABLE FINE MESH (MFM)	REGIONAL (51X51 GRID)	GRIDPOINT (51X51 GRID) (OI)	3+45	GRIDPOINT 60 KM	10 LAYERS	72 HRS	NONE
MEDIUM RANGE (MRF)	MEDIUM RANGE FORECAST MODEL (MRF)	GLOBAL	GRIDPOINT 3-DIMENSIONAL (OI)	6+00	SPECTRAL 126 WAVES (105KM)	18 LAYERS	240 HRS	5TH 5UH 5ZH 5VH 5ZC 5WH (00Z ONLY) 5XH 5YH
FINAL (FNL)	MEDIUM RANGE FORECAST MODEL (MRF) (GDAS)	GLOBAL	GRIDPOINT 3-DIMENSIONAL (OI) RUN 4 TIMES A DAY	00Z 6+00 06Z 9+30 12Z 8+30 18Z 9+30	SPECTRAL 126 WAVES (105KM)	18 LAYERS	FOUR 6 HR SEGMENTS	NONE