COMPUTER AND MODEL CHANGES AT NMC

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As my colleague, Colin Flood, has noted in his report, Bracknell has had the availability of the Cyber-205 for about two years. Although the Cyber-205 has been in use at NASA and a few other agencies in the U. S. meteorological community, the meteorological authority of the U. S. did not have a Cyber-205 available to it until last year when the National Weather Service (NWS) began installation of it (Figure 1). The Cyber-205 has now been installed and we are currently in the process of transferring guidance over to the new computer. Prior to the installation of the Cyber-205, the IBM 360/195 was in use and the limited fine mesh (LFM) running time was 20 minutes. The LFM on the Cyber-205 runs out to 48 hours and takes 75 seconds to run. The Cyber-205 is a great "number cruncher," but we have to off-load from the Cyber-205 onto other computers for output so there is a slowdown as the larger numbers are transferred back to the postprocessing computer. Figure 2 shows the current operational cycle starting with an early run, a regional run (which is the LFM model at the present time), and the global run (which is the global spectral model currently running). At 09:30 hours after data time, the Global Data Assimilation System (GDAS) produces the "first guess" for the next run. NWS is currently trying to improve its efficiency in order to get fast, accurate data to pilots and others in need of the information.

NWS is currently examining the possibilities of inputting a physics package to the global spectral model; but it takes a longer running time on the computer to produce with the physics input, and the aviation users cannot afford to wait any longer for the output products to be made available. The improved physics has shown in evaluations that there are improvements noted at three days and beyond; but the improved physics has very little impact on the 0–48-hour range, and that is the range in which aviation is most interested. The global model currently serves aviation interests, as well as all other users. We have not been as successful as Bracknell in breaking out an "aviation only" package versus extended range.

The nested grid model came on-line in the Summer of 1985 and we then had improved resolution. It is expected that it will improve our precipitation guidance. Our target was to implement that early in 1985.

Figure 3 shows the current model structure, and on the extreme left it shows the current global spectral model, which is a 12-layer model. The middle column shows the 7-layer LFM, and the column on the extreme right shows the 16-layer nested grid model, which we are hoping to implement early in 1985. Some other possible

- CYBER-205 INSTALLED 1984
  - TRANSFERRING GUIDANCE TO NEW COMPUTER
  - LFM RUNNING TIME ON IBM 360/195 WAS 20 MINUTES
    - LRM OUT TO 48 HOURS
  - TAKES 75 SECONDS TO RUN LFM ON CYBER-205
- STRUCTURE OF CURRENT NMC OPERATIONAL PREDICTION MODELS
- IMPROVED PHYSICS PACKAGE BEING ADDED TO GLOBAL SPECTRAL MODEL
  - WILL INCREASE RUNNING TIME BY ABOUT AN HOUR
    - AVIATION USERS CANNOT WAIT
  - IMPROVEMENTS NOTED AT 3 DAYS AND BEYOND
  - LITTLE/NO IMPROVEMENT THROUGH 48-72 HOURS OF FORECAST
- GLOBAL MODEL CURRENTLY SERVES AVIATION AND ALL USERS INCLUDING EXTENDED RANGE
- GLOBAL DATA ASSIMILATION SYSTEM (GDAS) PROVIDES "FIRST GUESS" FOR NEXT RUN
- NESTED GRID MODEL (NGM)
  - WILL IMPROVE PRECIPITATION GUIDANCE
  - TARGETED TO BE IMPLEMENTED BY LATE MARCH/EARLY APRIL IS HEMISPHERIC
- VERTICAL STRUCTURE OF THE NMC OPERATIONAL PREDICTION MODELS
- OTHER POSSIBLE CHANGES:
  - EXPAND LFM TO HEMISPHERIC
  - AVIATION MODEL
- HEMISPHERIC LFM
  - WOULD REMAIN 7-LAYER
  - AVIATION GUIDANCE WOULD BE AVAILABLE AT APPROXIMATELY 2 + 30
- AVIATION MODEL
  - WOULD BE PRESENT SPECTRAL WITH THESE CHANGES:
    - IMPROVED TOPOGRAPHY (MOUNTAINS)
    - INCREASE VERTICAL RESOLUTION
    - 18 LAYERS CONCENTRATED AROUND 300-100 MB LAYER
  - WILL RUN JUST ABOUT THE SAME TIME
  - COULD BE IMPLEMENTED BY SUMMER 1985
- MODEL OUTPUTS TO BE EVALUATED FOR QUALITY OF FORECASTS AND TIMELINESS

Figure 1. NOAA/NWS National Meteorological Center Computer/Model Changes.

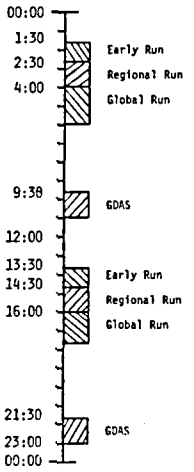

Figure 2. Structure of Current NMC Operational Prediction Models.

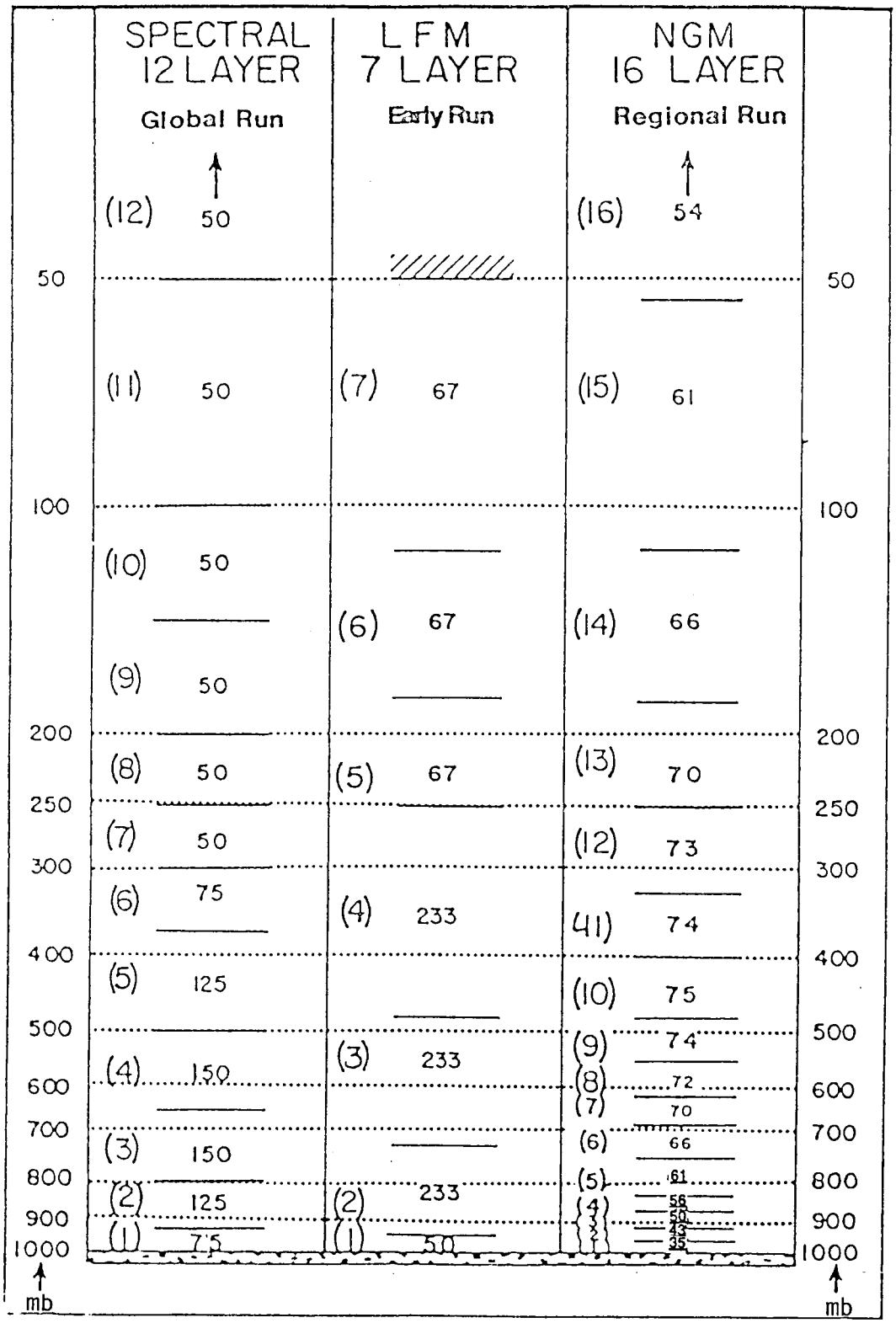

Figure 3. Vertical Structure of the NMC Operational Prediction Models.

changes are to expand the LFM to a hemispheric model in order to output earlier winds and temperatures aloft. We also intend to develop a separate aviation model which would be generally for aviation only. The hemispheric LFM would remain a 7-layer model and the aviation guidance which would be produced from it would be available at approximately 2 + 30 from the data time. Therefore, some indications would be available for winds and temperatures aloft much earlier; however, a much earlier data cutoff time would give us the eastern section of the Pacific, and a good part of the North Atlantic covered, but very little data could be produced for the western section of the Pacific Ocean and it would be based generally on the "guess" generated by the previous run.

The aviation model would be as the current spectral model is now with a few changes. We would input improved topography and increase the vertical resolution. We are planning to increase the "aviation model" to an 18-layer model concentrated in the layer between 100-300 mb. This is the area which would be concentrated around the jets, and we would hope to have a much better resolution definition of the jet stream. The computer running time would be about the same, and the "aviation only" model could be implemented as early as the Summer of 1985. The model outputs would have to be evaluated according to the tests being run at NMC to make sure there is an improvement in the various models.

Figure 4 is an example of the proposed model. The early run would be an LFM around 1 + 30. We have trouble eliminating the LFM run because all of the multiple output statistics (MOS) are based upon the LFM. Therefore, we will have to use the LFM until a data base is gathered to make it possible to run MOS from the nested grid model. The regional run displayed in Figure 4 would be the nested grid model; then the new 18-layer aviation run is depicted with a cutoff time of about 3 + 45. We would hope to improve the time by about one hour for availability of winds and temperatures aloft. At approximately H + 8 hours comes the GDAS. This would be the new global model with the improved physics, and would be the model showing the concentration on days 3–10. The current winds and temperatures aloft are being produced from the LFM model (currently referred to as the FD winds which FSS's see displayed and most pilots use), and the global spectral model which produces what is currently referred to as the ADF winds. They are global in nature (northern and southern hemisphere) and are generated for computer-to-computer use with airlines, as well as the 17 processors of the digital data.

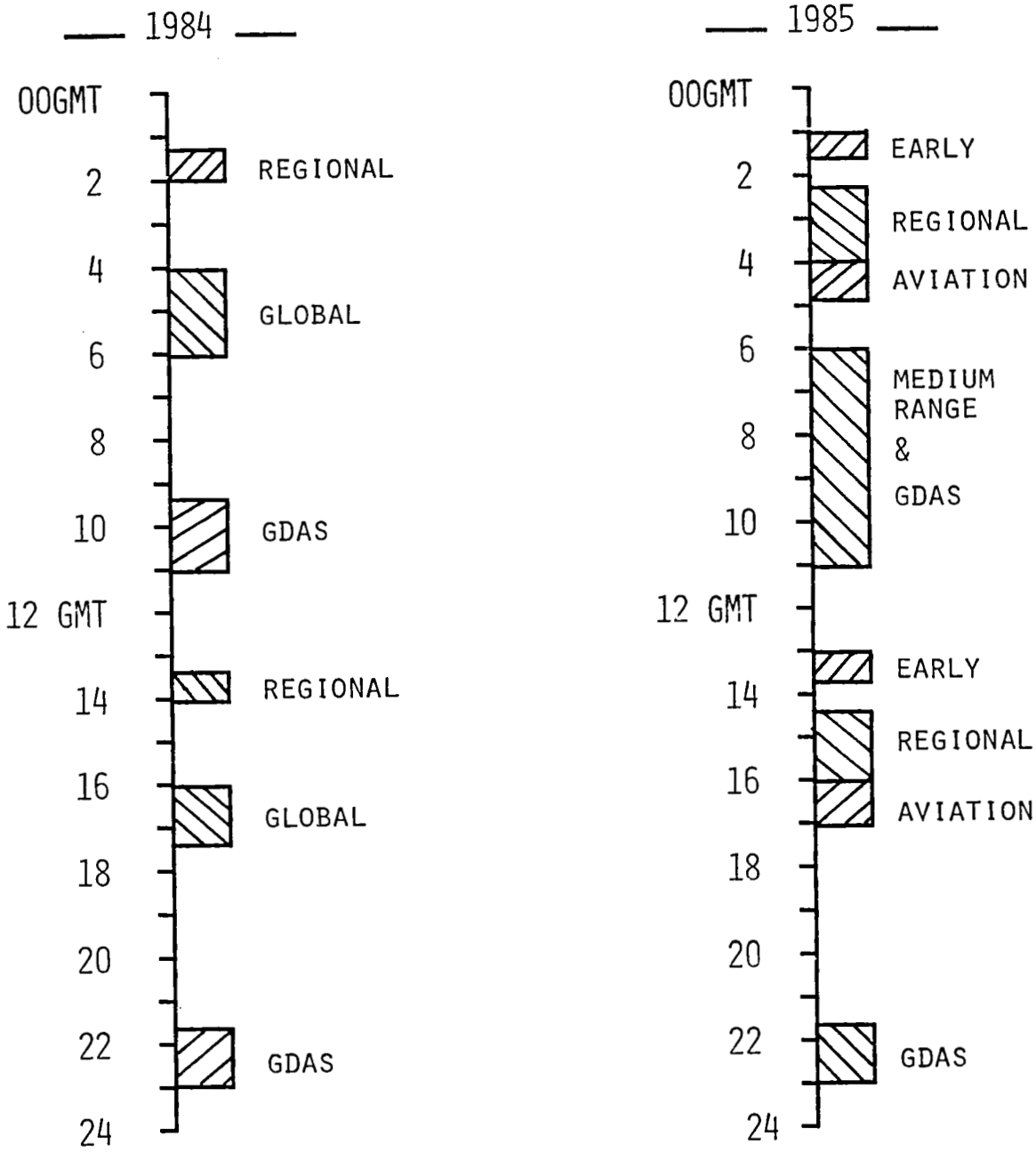

Figure 4. Class VI Computer Numerical Guidance Schedule.