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PUBLIC INFORMATION STATEMENT...TECHNICAL IMPLEMENTATION NOTICE 00-06
NATIONAL WEATHER SERVICE HEADQUARTERS WASHINGTON DC
130 PM EST FRI MAR 17 2000

TO: FAMILY OF SERVICES /FOS/ SUBSCRIBERS
NOAA WEATHER WIRE SERVICES /NWS/ AND EMWIN SUBSCRIBERS
NOAAPORT SUBSCRIBERS
OTHER NWS CUSTOMERS...PARTNERS AND EMPLOYEES

FROM: THERESE Z. PIERCE
CHIEF...HYDROMETEOROLOGICAL SERVICES

SUBJECT: CHANGES TO THE NCEP NESTED GRID MODEL...EFFECTIVE MARCH 15 2000

I. RATIONALE FOR CHANGES

AT 1200 COORDINATED UNIVERSAL TIME /UTC/ MARCH 15 2000 /TENTATIVE/...A SERIES OF CHANGES TO THE INITIALIZATION PROCEDURE FOR THE NATIONAL CENTERS FOR ENVIRONMENTAL PREDICTION /NCEP/ NESTED GRID MODEL /NGM/ WERE MADE. SINCE THE DISABLING OF THE NCEP CRAY C-90 COMPUTER ON SEPTEMBER 27 1999...THE NGM HAS BEEN RUN ON A CRAY J-90 WHICH IS THREE TO FOUR TIMES SLOWER THAN THE C-90. THUS...NGM PRODUCTS ARE NOW AVAILABLE ABOUT ONE HOUR LATER THAN BEFORE.

SINCE NWS FIELD FORECASTERS AND OUTSIDE CUSTOMERS ARE STILL HEAVILY DEPENDENT ON TIMELY NGM AND NGM MODEL OUTPUT STATISTICS /MOS/ PRODUCTS...AND BECAUSE THERE ARE NO FUNDS TO MAINTAIN THE CRAY J-90 IN OPERATIONS BEYOND MARCH 2000...THERE WAS A NEED FOR NCEP/S ENVIRONMENTAL MODELING CENTER /EMC/ TO CONVERT THE NGM TO RUN ON THE NEW IBM-SP COMPUTER. CONVERSION OF THE ENTIRE SUITE OF CODES WHICH RAN ON THE C-90 /INCLUDING THE REGIONAL OPTIMUM INTERPOLATION /ROI/ ANALYSIS/ USING IBM/S MESSAGE PASSING INTERFACE /MPI/ WAS ESTIMATED TO TAKE TWO PERSON YEARS OF WORK. SUCH AN EFFORT WAS NEITHER FEASIBLE NOR COST EFFECTIVE.

TO SATISFY BOTH USER REQUIREMENTS FOR A TIMELY NGM FORECAST AND NCEP/S REQUIREMENTS FOR A MAINTAINABLE NGM SYSTEM...THE FOLLOWING CHANGES WERE MADE:

- NGM INITIAL CONDITIONS WILL BE OBTAINED FROM THE MESO ETA ANALYSIS OVER NORTH AMERICA...AND FROM A 6-HOUR AVIATION /AVN/ MODEL FORECAST OVER THE REST OF THE NORTHERN HEMISPHERE...INSTEAD OF FROM THE HEMISPHERIC ROI ANALYSIS.

- SINCE THE ETA ANALYSIS DOES NOT EXTEND BEYOND THE NORTH POLE INTO EUROPE AND ASIA...THE HIGH RESOLUTION NGM C-GRID WAS MODIFIED TO BE SIMILAR IN SIZE TO THE ETA COMPUTATIONAL GRID.

- USE OF THE ETA ANALYSIS/AVN FORECAST TO INITIALIZE THE NGM WILL HAVE ADVANTAGES AND DISADVANTAGES... WHICH WILL CAUSE IMPROVEMENT OR DEGRADATION OVER THE CRAY NGM SYSTEM:

CURRENT AND FUTURE ADVANTAGES:

1. SINCE THE NGM IS INITIALIZED FROM THE ETA ANALYSIS...IT CAN START ONE HOUR EARLIER ON THE IBM THAN IT DID ON CRAY J-90. ALTHOUGH THE NGM RUNS SLOWER ON THE IBM THEN IT DID ON THE CRAY C-90...THE EARLIER START TIME ON THE IBM WILL COMPENSATE FOR THIS...AND NGM PRODUCTS FROM THE IBM WILL BE AVAILABLE AT ABOUT THE SAME TIME AS BEFORE THE DISABLING OF THE C-90 /ABOUT 50 MINUTES SOONER THAN TODAY/.
2. ETA ANALYSIS USES MORE DATA TYPES THAN REGIONAL OPTIMUM INTERPOLATION ANALYSIS...SUCH AS AIRCRAFT TEMPERATURES...WEATHER SURVEILLANCE RADAR-1988 DOPPLER /WSR-88D/ VELOCITY AZIMUTH DISPLAY /VAD/ WINDS...SPECIAL SENSOR MICROWAVE/IMAGER /SSM/I/ OCEANIC WIND SPEEDS...SURFACE WIND OBSERVATIONS OVER LAND AND PRECIPITABLE WATER FROM THE GEOSTATIONARY ORBITING ENVIRONMENTAL SATELLITE /GOES/ AND SSM/I SOUNDER.
3. THE ETA ANALYSIS WILL CONTINUE TO BE IMPROVED BY ALGORITHM CHANGES AND BY NEW DATA SOURCES /SATELLITE RADIANCES...ASSIMILATION OF OBSERVED PRECIPITATION AND CLOUD...WSR-88D RADIAL WINDS/.
4. CONTINUED IMPROVEMENTS IN THE AVN FORECAST SUITE.
5. THE IBM VERSION OF THE NGM COULD BE RUN WELL INTO THE FUTURE TO PROVIDE EARLY MOS GUIDANCE AND TO PROVIDE EMC WITH A BASELINE FOR THE MEASUREMENT OF MESO ETA SKILL.

DISADVANTAGES:

1. SMALLER INNERMOST GRID WHICH STOPS AT THE NORTH POLE.
2. OCCASIONAL PROBLEMS WITH ETA ANALYSIS IN PACIFIC WHICH ADVERSELY IMPACT THE NGM FORECAST ON THE IBM. THIS COULD BE THE RESULT OF FEWER OBSERVATIONS BEING AVAILABLE TO THE ETA ANALYSIS DUE TO THE EARLY /T+70 MINUTES/ DATA CUTOFF TIME.
3. USE OF A 6-HOUR AVN FORECAST INSTEAD OF AN ROI ANALYSIS TO INITIALIZE ANY PART OF THE NGM GRIDS OUTSIDE OF THE ETA COMPUTATIONAL GRID. AT THE EARLY DATA CUTOFF TIME OF THE ETA...THERE WOULD BE LITTLE IF ANY OBSERVATIONS AVAILABLE FOR AN ANALYSIS IN THE EASTERN HEMISPHERE.

II. RESULTS

EMC HAS PERFORMED TWO PARALLEL TESTS OF THE IBM VERSION OF THE NGM: A REAL-TIME TEST WHICH STARTED AT 1200 UTC DECEMBER 16 1999...AND A WARM-SEASON RETROSPECTIVE TEST FOR JULY 1999. EMC/S QUANTITATIVE SKILL SCORES /FIT TO RAWINSONDE DATA AND 24-HOUR QUANTITATIVE PRECIPITATION FORECASTS /QPF/ SCORES/ FOR THESE TESTS CAN BE FOUND AT /USE LOWER CASE/:

[HTTP://SGI62.WWB.NOAA.GOV:8080/NGMSTATS/](http://SGI62.WWB.NOAA.GOV:8080/NGMSTATS/)

THE TECHNIQUES DEVELOPMENT LABORATORY (TDL) RAN THE NGM MOS PACKAGE FROM THE PARALLEL NGM FORECASTS. THESE RESULTS CAN BE FOUND AT /USE LOWER CASE/:

[HTTP://WWW.NWS.NOAA.GOV/TDL/SYNOP/NGMCAFTI.HTM](http://WWW.NWS.NOAA.GOV/TDL/SYNOP/NGMCAFTI.HTM).

DURING THE JULY 1999 TEST...THE EMC SCORES AND THE TDL MOS VERIFICATIONS SHOW SMALL DIFFERENCES IN THE QUALITY OF THE PARALLEL NGM WHEN COMPARED TO THE OPERATIONAL NGM. QPF SKILL FROM THE PARALLEL NGM WAS SLIGHTLY BETTER IN THE EASTERN U.S. AND SLIGHTLY WORSE IN THE WESTERN U.S...WHILE THE FIT TO RAWINSONDE DATA WAS GENERALLY BETTER FOR ALL VARIABLES.

FOR THE CURRENT COOL-SEASON TEST...THERE ARE LARGER DIFFERENCES IN QUALITY BETWEEN THE OPERATIONAL AND PARALLEL NGM...WITH DEGRADATION MORE COMMON AT UPPER LEVELS THAN IN THE WARM-SEASON TEST. THE GREATEST DIFFERENCES WERE SEEN IN WINDS /WORSE ABOVE 700 MB/...TEMPERATURE AND HEIGHTS /COMPARABLE OR BETTER BELOW 400 MB BUT WORSE ABOVE DUE TO A GROWING WARM BIAS/ AND SURFACE TEMPERATURE /BETTER AT THE 12-HOUR AND 24-HOUR RANGE BUT SLIGHTLY WORSE AT 48 HOURS/. QPF SKILL IS COMPARABLE OR SLIGHTLY BETTER IN THE EASTERN U.S. BUT WORSE IN THE WESTERN U.S.

TDL PRODUCED AVERAGE VERIFICATION STATISTICS FROM 700+ SITES IN THE CONTIGUOUS U.S. /CONUS/ AND ALASKA FOR BOTH THE OPERATIONAL AND PARALLEL NGM. FOR THE TWO NGM RUNS...THE ERRORS ARE COMPARABLE THROUGH THE 12- TO 36-HOUR PERIOD...WITH SLIGHT DEGRADATION /FOUR PERCENT FOR THE COOL-SEASON TEMPERATURE/ FOR THE PARALLEL NGM/S 60-HOUR MOS TEMPERATURE FORECAST.

FURTHER DETAILS CAN BE FOUND IN THE NWS TECHNICAL PROCEDURES BULLETIN NUMBER 464..."CHANGES TO THE NCEP REGIONAL ANALYSIS AND FORECAST SYSTEM /RAFS/: INITIAL CONDITIONS FOR THE NESTED GRID MODEL" AT /USE LOWER CASE/: [HTTP://SGI62.WWB.NOAA.GOV:8080/NGMTPB/](http://SGI62.WWB.NOAA.GOV:8080/NGMTPB/)

THE MARCH 1 2000 PRESENTATION TO THE NWS COMMITTEE ON ANALYSIS AND FORECAST TECHNIQUES IMPLEMENTATION /CAFTI/ ON THE NGM CHANGES IS ALSO AVAILABLE ONLINE AT /USE LOWER CASE/: [FTP://FTP.NCEP.NOAA.GOV/PUB/EMC/WD20ER/NGMCAFTI6/INDEX.HTM](ftp://FTP.NCEP.NOAA.GOV/PUB/EMC/WD20ER/NGMCAFTI6/INDEX.HTM)

NOTE TO FORECASTERS: USERS SHOULD NOT EXPECT TO SEE AN EXACT MATCH BETWEEN THE ETA ANALYSIS AND THE NGM 00-HOUR FIELDS DERIVED FROM THE ETA ANALYSIS IN ALL SITUATIONS FOR THE FOLLOWING REASONS:

1. THE NGM IMPLICIT NORMAL MODE INITIALIZATION IS PERFORMED ON THE INTERPOLATED ETA ANALYSIS BEFORE THE NGM MODEL INTEGRATION.
2. VERTICAL RESOLUTION DIFFERENCE: THE OPERATIONAL MESO ETA MODEL HAS 45 VERTICAL LEVELS...WHILE THE NGM HAS 16 LEVELS. CERTAIN FEATURES /SUCH AS NARROW JET STREAKS OR SHARP VERTICAL MOISTURE GRADIENTS/ WHICH ARE RESOLVED IN THE ETA ANALYSIS MAY NOT BE CAPTURED WITH THE SAME DETAIL WHEN INTERPOLATED TO THE THICKER NGM VERTICAL LAYERS.
3. MODEL TERRAIN HEIGHT DIFFERENCES: THE 32-KM ETA MODEL TERRAIN HEIGHT IS DERIVED FROM HIGH RESOLUTION 30 SECOND DATA OVER THE CONUS...WHILE THE NGM USES MUCH SMOOTHER TERRAIN BASED ON R40 SPECTRAL RESOLUTION. THUS...THERE ARE MANY REGIONS WITH SIGNIFICANT DIFFERENCES IN MODEL TERRAIN HEIGHT. DURING THE ETA-TO-NGM INTERPOLATION...THE FIRST STEP IS TO RECOMPUTE THE ETA ANALYSIS SURFACE PRESSURE BASED ON THE NGM TERRAIN HEIGHT. IF THE NGM TERRAIN HEIGHT IS LESS THAN THE ETA TERRAIN HEIGHT...ONE MUST EXTRAPOLATE THE WIND...TEMPERATURE AND MOISTURE FROM THE FIRST ATMOSPHERIC ETA LAYER TO GET VALUES AT NGM LEVELS BELOW THE ETA MODEL TERRAIN.

4. FORECASTERS WHO USE THE MESO ETA AND NGM FORECAST HOURLY STATION PROFILES PACKED IN BUFR FORMAT SHOULD BE AWARE THAT THE STATION DATA IN THE ETA MODEL IS TAKEN FROM THE MODEL GRIDPOINT CLOSEST TO THE STATION LOCATION...WHILE THE NGM PERFORMS A BILINEAR INTERPOLATION FROM THE FOUR GRIDPOINTS CLOSEST TO THE STATION. THEREFORE...THE 00-HOUR ETA AND NGM PROFILES MAY NOT ALWAYS AGREE EVEN FOR STATIONS CLOSE TO SEA LEVEL...ESPECIALLY IN REGIONS WITH STRONG GRADIENTS.

NATIONAL TECHNICAL IMPLEMENTATION NOTICES ARE ONLINE AT /USE LOWER CASE/:

[HTTPS://WWW.WEATHER.GOV/NOTIFICATION/ARCHIVE](https://www.weather.gov/notification/archive)

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