1.9 WORKSTATION ETA VERIFICATION EFFORTS
AT THE LOWER MISSISSIPPI RIVER FORECAST CENTER

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1. INTRODUCTION

The National Centers for Environmental Prediction (NCEP) Workstation Eta (WSETA) is a modified version of NCEP's operational Eta model (Black, 1994) designed to run at the workstation level. The WSETA is currently running in operational mode at the Lower Mississippi River Forecast Center (LMRFC). Verification of this model is important to determining how well the model performs across the LMRFC area. Quantatative Precipitation Forecasts (QPF) from the WSETA are verified and compared to the operational Eta.

2. MODEL DESCRIPTION

The WSETA has been running at the LMRFC since April, 2001, and is currently running with a grid resolution of 55x91x45 gridpoints (20 km horizontal) across the LMRFC forecast area. Figure 1 shows the computational domain used in the model. Initialization of the model is taken from operational Eta output provided by NCEP. The model runs at 0000 UTC and 1200 UTC, with output every 6 hours out to 60 hours. The choice of grid and temporal resolution allows the model to be used in a near-operational time frame. The WSETA currently uses the Betts-Miller-Janjic (Betts and Miller, 1986, Janjic, 1994) convective parameterization scheme, similar to the operational Eta model.

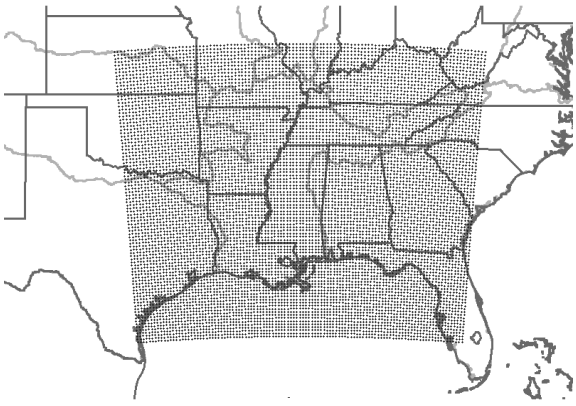

Fig. 1. Domain used in the WSETA.

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3. QPF VERIFICATION

3.1 Mean Areal Precipitation

Mean Areal Precipitation (MAP) amounts are important to RFC operations, as observed and forecasted MAP amounts are used in the hydrologic model at the LMRFC. MAP amounts from the WSETA are computed for each of the LMRFC's basins by averaging the QPF at each grid point across the basin for each six hour time step. These MAP values are then compared to the observed MAP values, computed from the gage reports for each basin. Tables 1 and 2 summarize the Mean Errror (ME), Mean Absolute Error (MAE), and Root Mean Square Error (RMSE) for all forecast hours from the WSETA and operational Eta, respectively.

Month	ME (in.)	MAE (in.)	RMSE(in.)
Apr-2001	0.009	0.025	0.114
May-2001	0.010	0.044	0.125
Jun-2001	0.023	0.075	0.202
Jul-2001	0.026	0.070	0.164
Aug-2001	0.035	0.078	0.164

Table 1. MAP-based statistics computed from 6-hour QPF amounts from the Workstation Eta model.

Month	ME (in.)	MAE (in.)	RMSE(in.)
Apr-2001	0.000	0.028	0.110
May-2001	-0.002	0.036	0.115
Jun-2001	0.004	0.064	0.183
Jul-2001	0.011	0.065	0.158
Aug-2001	0.007	0.050	0.127

Table 2. MAP-based statistics computed from 6-hour QPF amounts from the operational Eta model.

Statistics between the two models were very similar, as ME and MAE were usually within a few hundredths of an inch of each other. The WSETA did consistently produce higher MAE values, with larger RMSEs. When broken down into six-hourly forecast periods, the WSETA always produced a positive ME, indicating a high bias. The tendency of the WSETA to produce higher QPF amounts could also be seen when visually comparing output from the two models. The increased grid resolution of the WSETA compared to the Eta (20 km vs. 32 km) could explain the higher WSETA bias and over-forecasting of rainfall. However, due to the averaging produced by the MAP process, this comparison may or may not be an indicatior of how well the WSETA performs.

3.2 Grid Point

In order to get a better idea of the WSETA performance, verification statistics were also computed using QPF on a grid point scale. The model data were verified against quality-controlled, multisensor Stage III (Fulton, et al., 1998) data from the surrounding National Weather Service (NWS) Weather Surveillance Radar-88d (WSR-88D) radar network. This radar network included 27 radars within the vicinity of the LMRFC forecast domain. Stage III data are computed on the Hydrologic Rainfall Analysis Project (HRAP) grid (4 km x 4 km), which required converting the WSETA QPF to HRAP coordinates. Once the data were converted, QPF could be verified at each grid point.

Tables 3 summarizes the ME, MAE, and RMSE computed from the WSETA QPF output verified using Stage III data. Table 4 summarizes the corresponding statistics from the Eta, as computed by the NCEP Hydrometeorological Prediction Center (HPC) - National Precipitation Verification Unit (NPVU) (McDonald, 2001). Both sets of statisitcs are calculated using the first 24 hours of QPF. April statistics were not computed due to lack of Stage III data for that month.

Month	ME (in.)	MAE (in.)	MAE(in.)
Mar-2001	0.006	0.026	0.117
May-2001	0.003	0.068	0.197
Jun-2001	0.009	0.082	0.254
Jul-2001	0.026	0.078	0.213
Aug-2001	0.027	0.075	0.203

Table 3. Grid-based statistics computed from 6-hour QPF amounts from the Workstation Eta model.

Month	ME (in.)	MAE (in.)	MAE(in.)
Mar-2001	0.013	0.049	0.147
May-2001	-0.004	0.045	0.147
Jun-2001	-0.012	0.070	0.206
Jul-2001	-0.003	0.060	0.175
Aug-2001	0.027	0.075	0.203

Table 4. Grid-based statistics computed from 6-hour QPF amounts from the Eta model (from the NPVU).

As seen in the MAP-based statistics, both models produced very similar results, with the WSETA again showing a consistent high bias. The WSETA, in all but one month, over-forecasted rainfall compared to the Eta. These results could also be seen when visually comparing QPF from the two models. In many cases, for the same precipitation event, the WSETA produced a higher peak in the rainfall forecast, which could also be attributed to the increased grid resolution. For convective precipitation, the WSETA also had a tendency to over-predict the amount of rainfall right along the Gulf coast. In these cases, the precipitation many times did not verify, indicating possible enhancement of the rainfall along the coast due to land-sea interaction effects.

4. CONCLUSIONS/RECOMMENDATIONS

The availability of the WSETA allows individuals the opportunity to view another model output source, in addition to providing another way to study numerical weather prediction models. The WSETA has been running operationally at the LMRFC since March 2001, and efforts have been made to verify QPF from the model using two different methodologies. Results have shown that the WSETA overforecasts rainfall compared to the operational Eta model. The WSETA, in addition to, in general, producing higher QPF, will produce too much rainfall along the coast.

Unfortunately, six months of data is not sufficient to truly determine the model's performance; therefore, more data need to be collected. Though the results have only been compared with the operational Eta, the model must also be verified against other current numerical models. Since the WSETA offers configurability, the WSETA could also be run at an even finer grid resolution (10 km or less), and using a different convective parameterization scheme.

4. REFERENCES

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