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Evaluations of the Eta, RUC, WRF, and MM5 Meteorological Models During NEAQS

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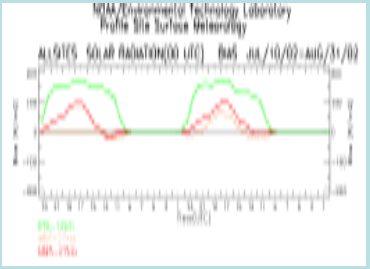
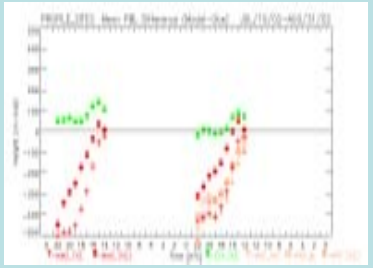
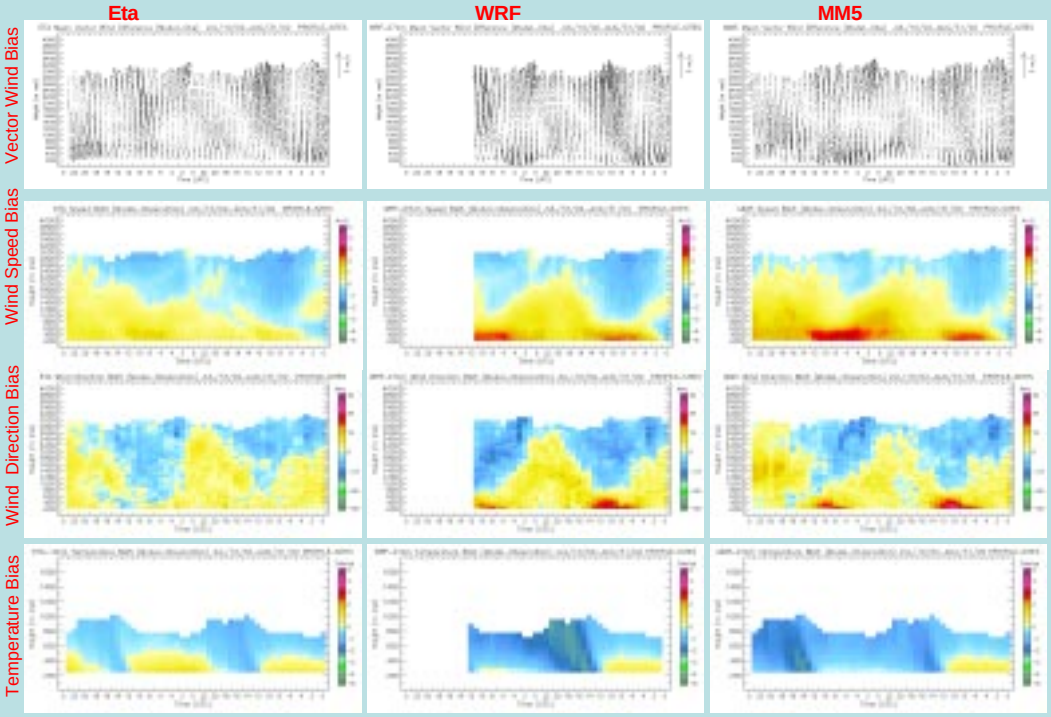
During the NEAQS summer 2002 field program, 4 meteorological models were evaluated using an array of 915 MHz wind profilers and surface meteorological measurements. The evaluation focused on boundary layer structure, which most directly affects pollutant transport and mixing. Here we present results focusing on the Eta, WRF and MM5 models.

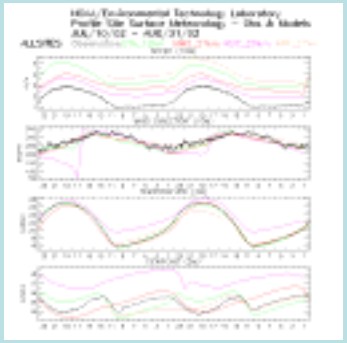


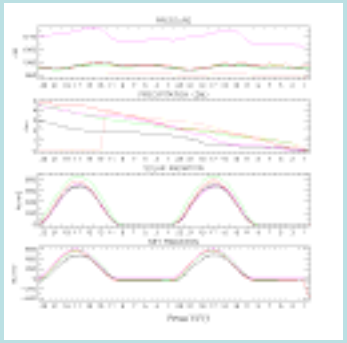


Bias of solar radiation for 3 models (left) and PBL depth (right). All 3 models overestimate solar radiation due to cloud effects, with the largest bias in the Eta model. Eta accurately predicts PBL depths. MM5 and WRF both under-predict PBL depth.



Time-height cross-sections of mean bias for each model of 1) vector wind, 2) scalar wind speed, wind direction, and virtual temperature, averaged at 6 wind profiler sites. For the 3 wind statistics, the models are almost identical except at low-levels, especially at night, with larger errors in MM5 and WR. WRF and MM5 also show a cooling trend with time.





Time series of surface meteorological parameters (speed, direction, temperature, dewpoint, pressure, precipitation, solar and net radiation). Observations are shown in black, different models in colors.

CONCLUSION

Forecasts of boundary layer structure (winds, temperature and depth) are better in the Eta model than in MM5 or WRF. The most significant bias error in the Eta model is an over-estimation of solar radiation, which can effect photolysis rates and ozone production.