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VERIFICATION OF IHOP MODEL RUNS OF MM5 AND WRF WITH DIABATIC INITIALIZATION

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1. INTRODUCTION

At the previous NWP conference we presented the LAPS "hot start" method for diabatic initialization of mesoscale models (McGinley and Smart 2001; Schultz and Albers 2001; Shaw et al 2001). QPF threat and bias scores computed from 40 wintertime cases using MM5 configured with a 10-km grid showed a distinct advantage for hot-started model runs compared to parallel model runs initialized conventionally (by interpolating from a larger-scale model) or via dry 4DDA (by cycling state variables and modifying vapor according to remotely-sensed cloudiness).

Thunderstorm forecasting is a problem much different from winter snow events, and the IHOP field project was a unique opportunity to examine and critique the modeling system by forecasters engaged in mission-critical applications.

Despite our best efforts we were unable to deliver real-time model outputs from the new WRF model to IHOP participants, although the model ran routinely and reliably for the most of the IHOP operations period. Verification statistics were unavailable at the time this report was prepared (early June), but visual comparisons of similar forecasts from WRF and MM5 (*Figs 1 and 2)* suggest that the WRF model numerics seem to handle detail ways that will be interesting to investigate.

2. MODIFICATIONS TO THE ORIGINAL METHOD

For the first week of the IHOP operations period, the hot-start method was as described in the first papers. This includes saturating any grid box indicated by the LAPS cloud analysis to have nonzero cloud liquid, which avoids nonphysical downdrafts caused by instantaneous evaporation of cloud liquid, as treated in most explicit cloud physics parameterizations. This practice caused only minor problems in the winter storm cases, but in warm, low-elevation cases such as those encountered in the IHOP domain, this may cause an artificial injection of 3 g/kg of vapor or more. The result was copious precipitation in the first several forecast hours, so simple ad hoc adjustments to reduce the vapor addition were applied on Friday, May 24. Bias values computed over a few dozen cases since then are very near unity, suggesting that the precipitation overforecast problem is less severe.

At the conference we will show traditional skill scores as well as the results from additional approaches to verification, including pattern-matching techniques.

3. REFERENCES

McGinley, J.A., and J.R. Smart, 2001: On providing a cloud-balanced initial condition for diabatic initialization. Preprints, *14th Conf. On Numerical Weather Prediction,* Ft. Lauderdale, Amer. Meteor. Soc.

Schultz, P. and S. Albers, 2001: The use of three-dimensional analysis of cloud attributes for diabatic initialization of mesoscale models. Preprints, *14th Conf. On Numerical Weather Prediction,* Ft. Lauderdale, Amer. Meteor. Soc., J122-J124.

Shaw, B.L., J.A. McGinley, and P. Schultz, 2001a: Explicit initialization of clouds and precipitation in mesoscale forecast models. Preprints, *14th Conf. On Numerical Weather Prediction,* Ft. Lauderdale, Amer. Meteor. Soc., J87-J91.

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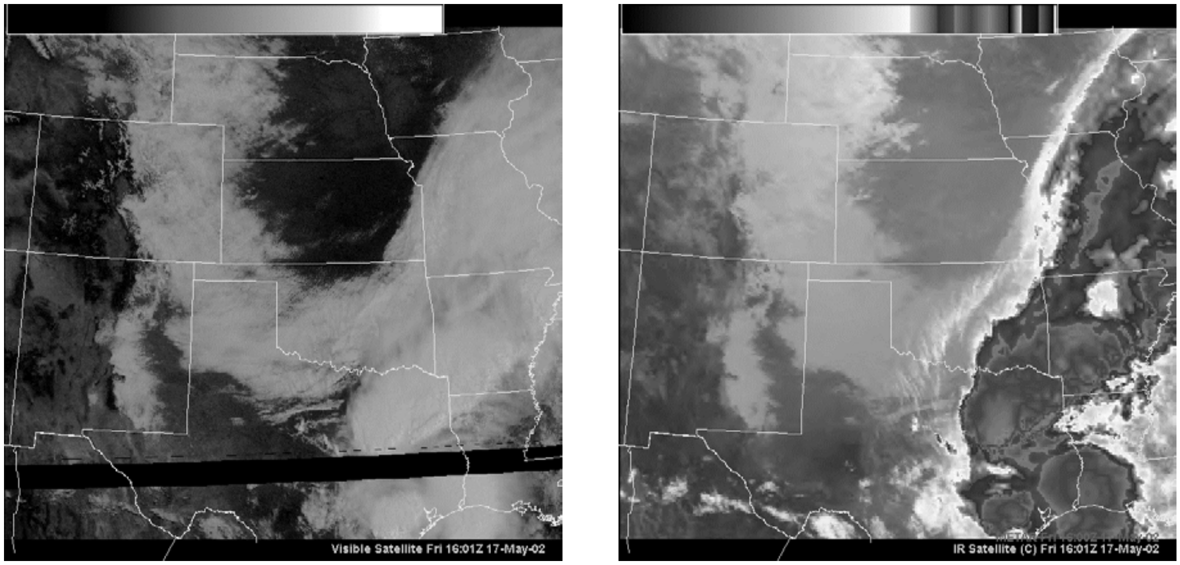

Figure 1. Visible (left) and infrared satellite imagery from 1601 UTC on 17 May 2002.

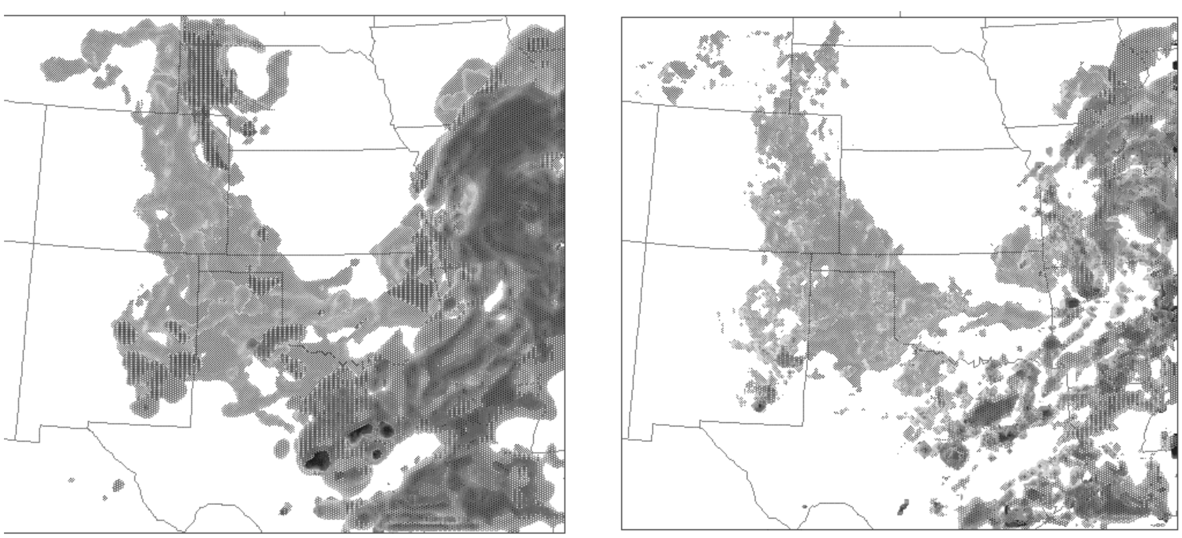

Figure 2. 1-h forecasts of liquid condensate by MM5 (left) and WRF models initialized with data from 1500 UTC, valid at 1600 UTC on 17 May 2002.