Real-Time Weather Forecasts in WRF 3DVar Data Assimilation Model using Prepbufr Observational Data

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Abstract

WRF and WRF-var 3D data assimilation model have been used repsectively to perform simulation and to update the boundary lateral condition. weather has been forescasted for the period 1^{st} to 3^{nd} August 2010 initialized at 12:00 UTC over Cameroon and surroundings. The results show that WRFDA enhance the accuracy of the forecasts compared to WRF alone without data assimilation. Relative humidity is high over the coastal region of Cameroon and then tends to produce convective clouds.

Introduction

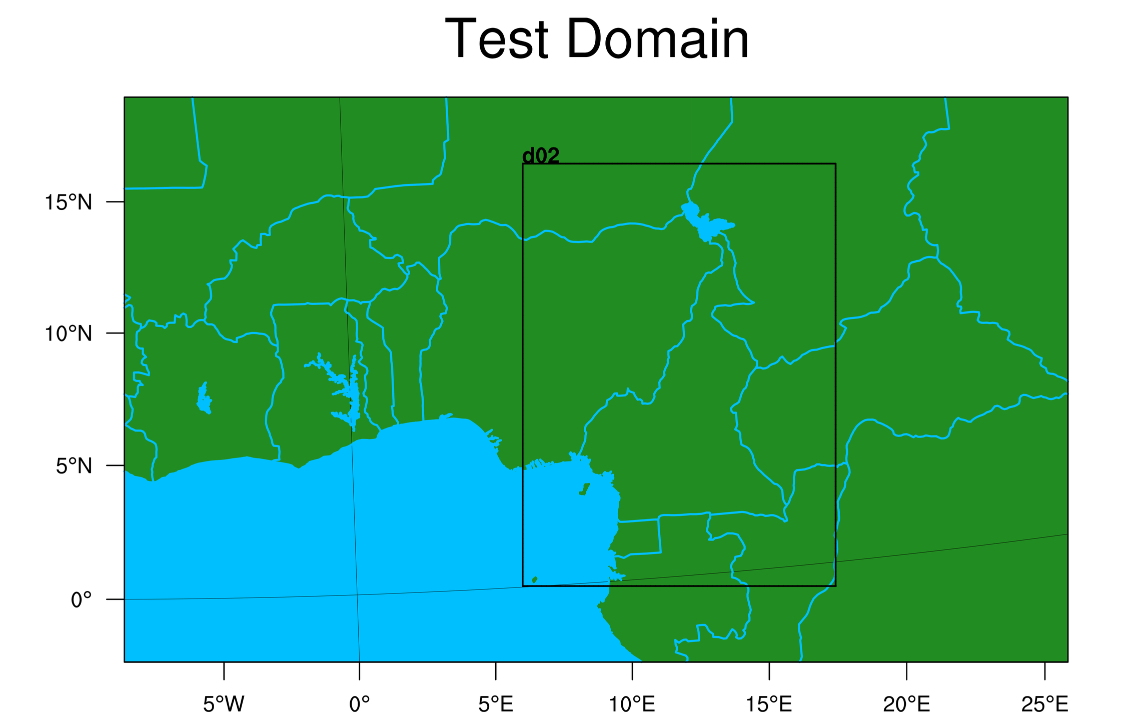
Climate change, including changes in climate variability, poses significant threats to people and natural systems. Higher temperature and changes in precipitation patters is reducing yields of many of the most important crops currently being used to feed the african's population. Weather and climate forecasting help to find strategies for adaptation. It is our duty to play a central role in analyzing and understanding the impacts of climate changes on our ecosystem. We can identify the risks to society and the environment via forecasting and inform policy makers with the results of assessments so that policies can be enacted. Mesoscale numerical prediction by using mesoscale models has played an important role in operational as well as severe weather forecasting by high-performance computing. High-resolution models can contribute to localized weather forecasting, particularly in areas where the topography and land-use heterogeneity modulate synoptic scale weather.

Model and Method

The model used to conduct forecasts in this study is the Advanced Weather Research Forecasts (ARW) Data Assimilation (DA) system, based on WRF version 3.2.1. It was established as successor to the long-standing Penn State/NCAR Fifth-Generation Mesoscale Model (MM5). The model provides several simulation options. In the present study, the options used are:

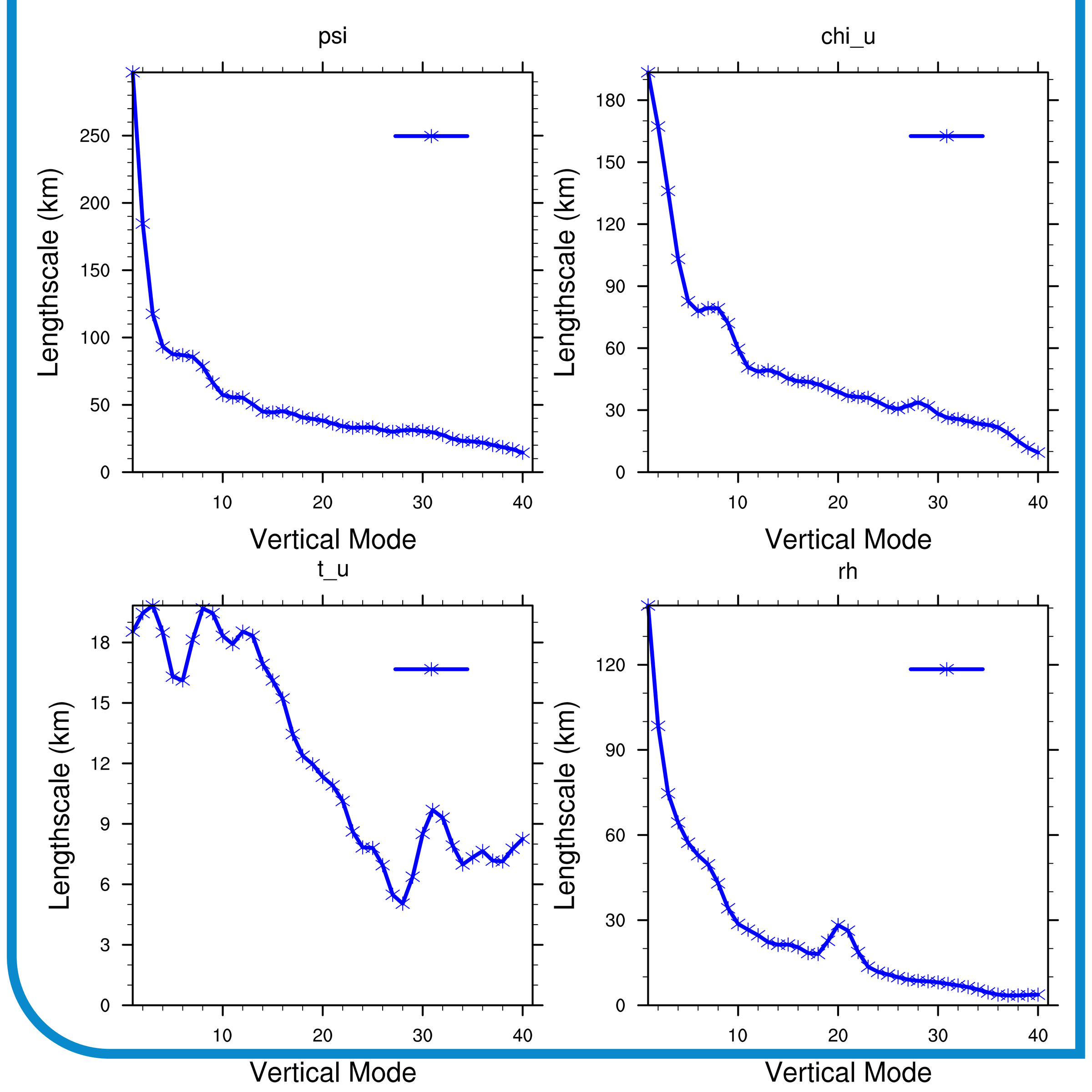
1. Microphysics options: *Lin et al. scheme*
2. Cumulus paremeterization: *Kain-Fritsh*
3. Boundary Layer: *YSU scheme*
4. Surface physics: *Thermal diffusion scheme*
5. Cloud effect: *With cloud effect*

Study Area

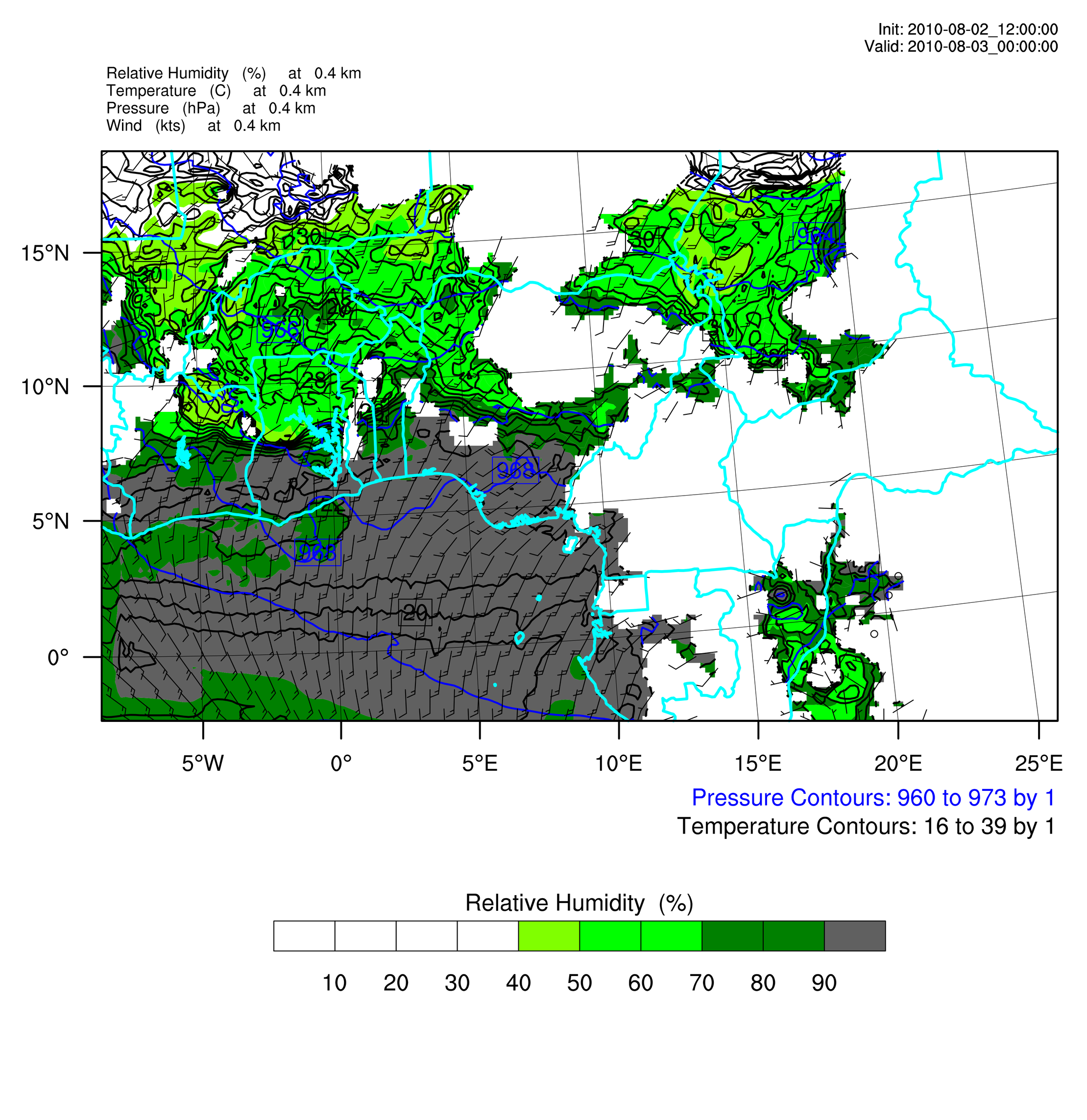


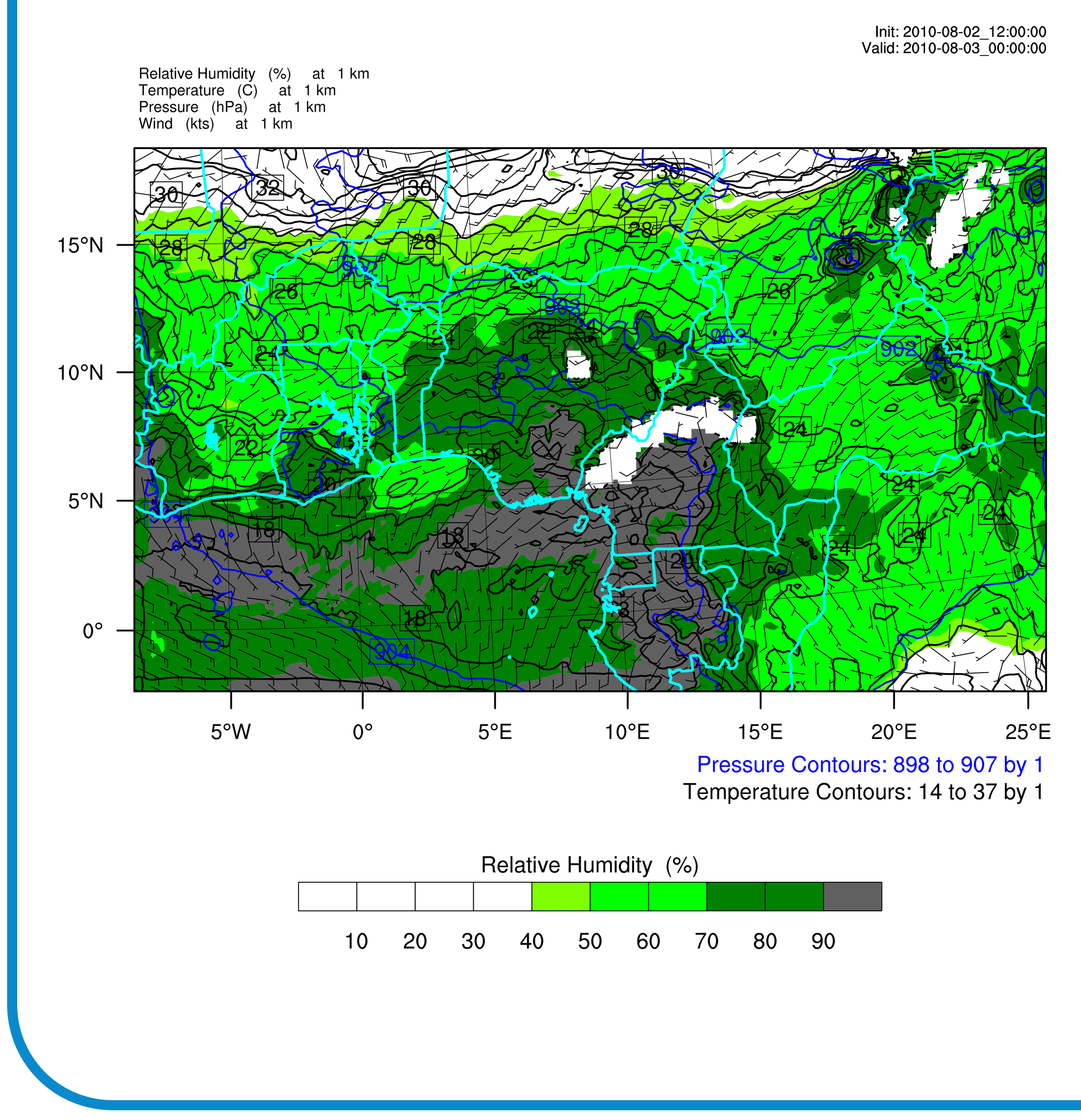
Global Forecastings System (GFS) data were used for the initial and boundary conditions. WRF-Var was used to update the lateral boundary conditions. Observational data are in the Burf format.

Results

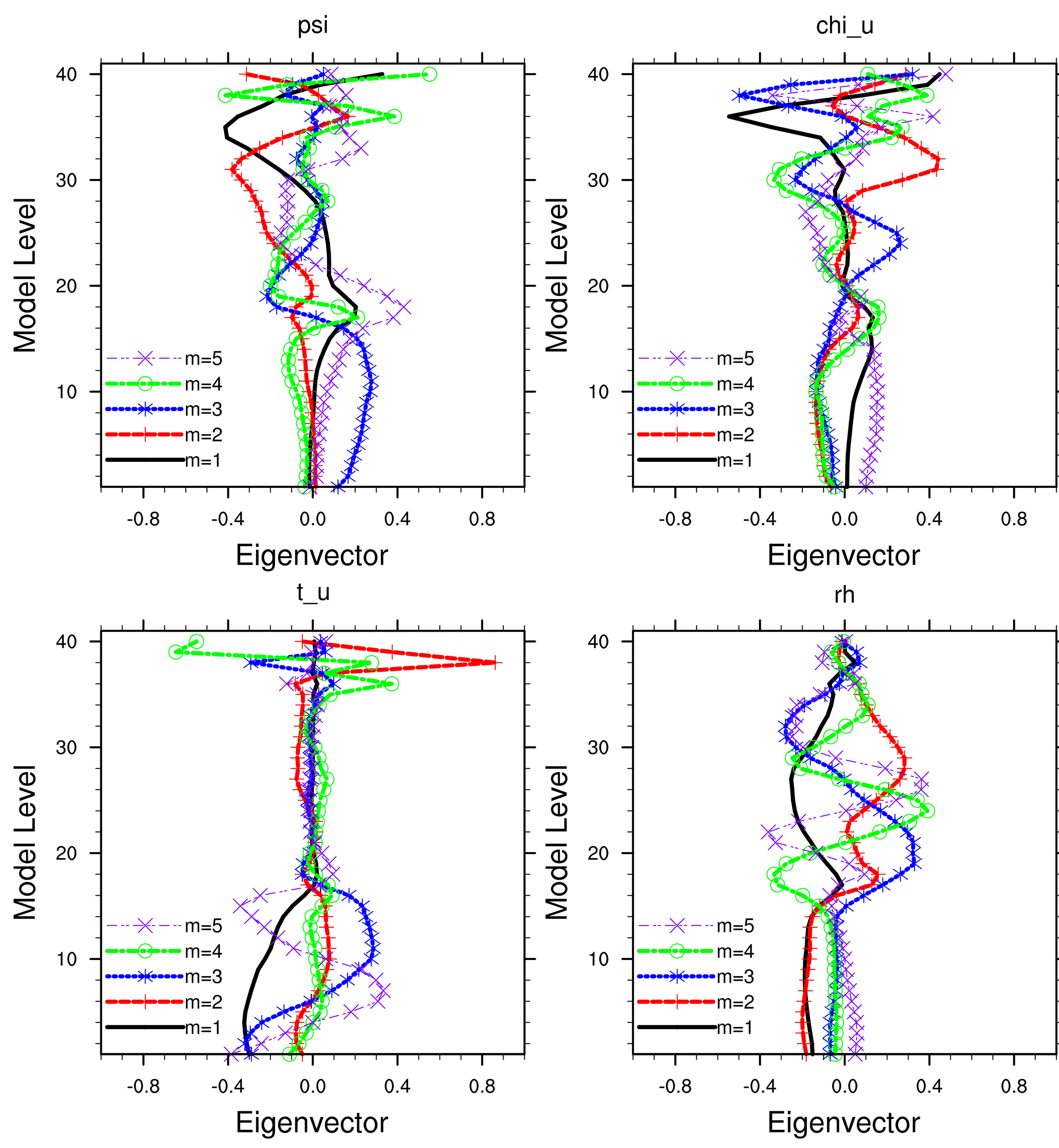


Results





Results



The domain extends from (10°W-3°S) to (25°E-20°N) and has a dimension of 200*120 points with a grid spacing of 20km and 41 vertical levels.

1. Relative humidity is high over the Atlantic Ocean and coastal regions
2. Winds are strong and are toward the Intertropical Convergence Zone
3. The background error variance tuning factor for stream function (PSI), potential velocity (CHI), unbalanced pressure (Pu)... are represented with their respective lenght scale (used in the recursive filter). We see that they are correlated.

Conclusion/Suggestions

We have forecasted some atmospheric variables with WRF-Var model. We intend to use observational data (TRMM, NCEP...) to compare outputs and calcule biases and correlation coefficients.

References

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