Geophysical Research Abstracts,
Vol. 11, EGU2009-6628, 2009
EGU General Assembly 2009

Large Scale Skill in Regional Climate Modeling and the Lateral Boundary Condition Scheme

K. Veljović (1), B. Rajković (1), and F. Mesinger (2)

(1) Institute of Meteorology, Faculty of Physics, University of Belgrade, Serbia, (2) ESSIC, Un. Maryland, College Park, USA, and Serbian Academy of Sciences and Arts, Belgrade, Serbia (fedor.mesinger@noaa.gov)

Several points are made concerning the somewhat controversial issue of regional climate modeling: should a regional climate model (RCM) be expected to maintain the large scale skill of the driver global model that is supplying its lateral boundary condition (LBC)? Given that this is normally desired, is it able to do so without help via the fairly popular large scale nudging? Specifically, without such nudging, will the RCM kinetic energy necessarily decrease with time compared to that of the driver model or analysis data as suggested by a study using the Regional Atmospheric Modeling System (RAMS)? Finally, can the lateral boundary condition scheme make a difference: is the almost universally used but somewhat costly relaxation scheme necessary for a desirable RCM performance?

Experiments are made to explore these questions running the Eta model in two versions differing in the lateral boundary scheme used. One of these schemes is the traditional relaxation scheme, and the other the Eta model scheme in which information is used at the outermost boundary only, and not all variables are prescribed at the outflow boundary. Forecast lateral boundary conditions are used, and results are verified against the analyses. Thus, skill of the two RCM forecasts can be and is compared not only against each other but also against that of the driver global forecast. A novel verification method is used in the manner of customary precipitation verification in that forecast spatial wind speed distribution is verified against analyses by calculating bias adjusted equitable threat scores and bias scores for wind speeds greater than chosen wind speed thresholds. In this way, focusing on a high wind speed value in the upper troposphere, verification of large scale features we suggest can be done in a manner that may be more physically meaningful than verifications via spectral decomposition that are a standard RCM verification method.

The results we have at this point are somewhat limited in view of the integrations having being done only for 10-day forecasts. Even so, one should note that they are among very few done using forecast as opposed to reanalysis or analysis global driving data. Our results suggest that (1) running the Eta as an RCM no significant loss of large-scale kinetic energy with time seems to be taking place; (2) no disadvantage from using the Eta LBC scheme compared to the relaxation scheme is seen, while enjoying the advantage of the scheme being significantly less demanding than the relaxation given that it needs driver model fields at the outermost domain boundary only; and (3) the Eta RCM skill in forecasting large scales, with no large scale nudging, seems to be just about the same as that of the driver model, or, in the terminology of Castro et al., the Eta RCM does not lose "value of the large scale" which exists in the larger global analyses used for the initial condition and for verification.