Geophysical Research Abstracts
Vol. 17, EGU2015-1441, 2015
EGU General Assembly 2015

On the predictability of convective mode in high resolution WRF ensembles

William Gallus and John Lawson

Iowa State University, Geological and Atmospheric Science, Ames, IA, United States (wgallus@iastate.edu, +1 515 294-2619)

Convective mode has been shown to be associated with different distributions of severe weather reports. For instance, bow echoes are often associated with severe straight-line winds, while isolated supercell thunderstorms are perhaps more likely to produce tornadoes. Recent research has suggested that the WRF model when run with 3 km horizontal grid spacing has particular problems with some types of convective mode. It does not produce nearly enough bow echoes, and also fails to produce squall lines with trailing stratiform rain regions as often as are observed. It also is more likely to show broken lines of cells instead of squall lines lacking stratiform rain.

Our current research is examining two bow echo events through the use of three different types of ensemble design. WRF ensembles are being created using (i) 12 mixed microphysical schemes, (ii) 11 members with perturbed initial and lateral boundary conditions via the GEFS reforecast version 2 dataset, and (iii) 10 members using the stochastic kinetic energy backscatter scheme (SKEB). In addition, one ensemble of 12 members has also been constructed using both SKEB and mixed microphysics.

For one of the events, all three ensembles seem to do a reasonable job simulating a strong bow echo. However, for the other case, few of the ensemble members reproduce a bow echo, with state-sized positional errors. It is found that changing the microphysics can alter the forecasts in the case where bow echoes are generally simulated. Research will be discussed about the variations in spread seen in these different ensembles, along with the synoptic backgrounds as a method to determine why some cases apparently have very low predictability while others are much more predictable. Preliminary results suggest that the spread of the system position is reduced in the mixed microphysics and SKEB ensembles, but the structure of the thunderstorm systems still varies. Mode and structure are very sensitive to small changes, while system position, timing, and some other larger-scale parameters are comparatively less sensitive. It should also be noted that underdispersion and model clustering are common features of the ensembles.