Dynamical Downscaling of Tropical Cyclone Activity: An Update on the Use of the GFDL Hurricane Model in Multiple Basins

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Recent efforts at GFDL to use high-resolution dynamical downscaling models to examine tropical cyclone activity from a climate change perspective have been focused in two areas. The first is an extension of the Atlantic Basin downscaling study of Bender et al. (Science 2010) to include CMIP5 climate models as well as a large (n=10) sample of individual CMIP3 model projections of twenty-first century climate. This work has relied on the GFDL Zetac regional model (18-km grid) to simulate Atlantic storm cases for input to the GFDL hurricane model. The second approach is to again use the GFDL hurricane model to downscale tropical cyclone activity, but in this case for each of the world's TC basins, and using a 50-km grid global atmospheric model (GFDL HiRAM C180; Zhao et al., J. Climate, 2009) to generate storm cases to downscale. This second method has the advantage of being global in scope and the global model simulations use SST as input, as opposed to atmospheric reanalyses, as used for the Zetac regional model. This avoids potential inhomogeneity issues associated with the reanalysis.

For the global downscaling study, we have been conducting present-climate tests for the modeling framework. Tests thus far have examined several versions of the GFDL hurricane model, including a new enhanced resolution version of the operational model (~6km inner nest), now being tested with and without use of a synthetic vortex replacement (i.e., bogusing) of the global model storms. Preliminary results from these experiments will be discussed at the meeting.