Effect of CAM5 dynamical core on Tropical Cyclones

• *Objective*

This work explores the impact of the CAM5 dynamical core on tropical cyclone (TC) frequency, distribution and intensity. The dynamical core is the central fluid flow component of any GCM, but is often overlooked in the analysis of a model's ability to simulate TCs, relative to the attention awarded to physical parameterizations. This analysis contrasts high resolution CAM5 simulations built with two different dynamical cores to examine the effect of the dynamical core on TC frequency, intensity and distribution. This analysis demonstrates that the dynamical core has a significant impact on storm intensity and frequency, even within similar large-scale environments.

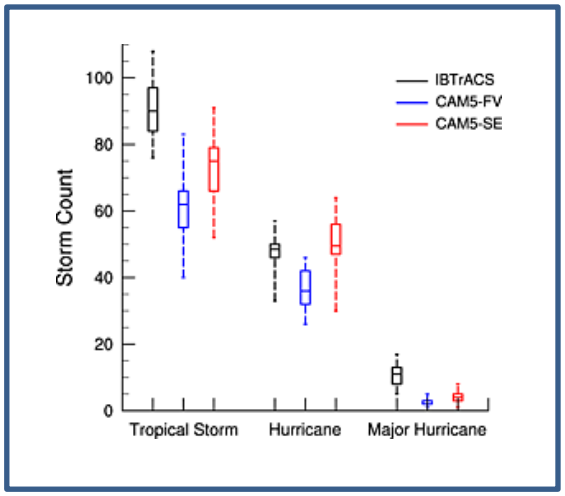

Figure: Distribution of the global number of TCs that reach tropical storm (categories 0-5), hurricane (categories 1-5), and major hurricane (categories 4-5) strength per year for the CAM5-FV and CAM5-SE simulations (1980-2005). IBTrACS observations are included for reference.

• *Approach*

This analysis compared simulations that used two different dynamical cores: CAM5-SE (spectral element) and CAM5-FV (finite volume). Both simulations were run AMIP style using similar variants of the CAM5 physics parameterizations. Model resolution was ~1/4, and the simulations were forced by observed AMIP protocols from 1980-2005.

• *Impact*

This analysis demonstrates that the choice of CAM5's dynamical core has a significant impact on the simulation of tropical cyclone intensity and frequency, even with similar climatology and large-scale environment. CAM5-SE is demonstrated to produce stronger TCs, and therefore more hurricanes and major hurricanes per year than CAM5-FV. This study is not meant to suggest that one dynamical core is better than the other, but rather to show that varying the dynamical core can have a significant impact on the TC climatology.

Reed, K. A., J. T. Bacmeister, N. A. Rosenbloom, M. F. Wehner, S. C. Bates, P. H. Lauritzen, J. E. Truesdale, and C. Hannay (2015), Impact of the dynamical core on the direct simulation of tropical cyclones in a high-resolution global model. Geophys. Res. Lett., 42, 3603–3608. doi: 10.1002/2015GL063974.