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Simulating Atlantic Tropical Cyclone Variability with a range of climate model formulations

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In this presentation we discuss the ability of the GEM (Global Environmental Model) model, run in a number of different configurations, to simulate the observed variability in Atlantic Tropical Cyclones over the recent past. Specifically we have run GEM in a number of configurations, using observed Sea Surface Temperatures (SSTs) for the period 1978-2006. The different configurations include (i) A 2° Global, regular resolution version of GEM, (ii) A Global Variable resolution version of GEM, where the area of high resolution (0.3°) covers the tropical Atlantic and all of North Africa and the remaining part of the Globe is covered at 2° resolution. (iii) 2 Limited-Area (LAM) domains of GEM, one covering only the tropical Atlantic and the other both the tropical Atlantic and the entire North Africa. These two LAM domains are both run at 0.3° resolution and are forced by results from integration (i), namely output from the Global 2° regular resolution integration. (iv) 2 LAM versions of GEM, employing the exact same resolution and domain coverage as the LAMs in (iii), but employing ECMWF Reanalysis data as lateral boundary forcing, rather than output from the 2° GEM-Global run.

By intercomparing the ability of each of these configurations to simulate the observed number, geographical distribution, intensity distribution and seasonal and interannual variability of Atlantic Tropical Cyclones we can begin to understand the importance for simulating Atlantic Tropical Cyclones of factors such as : (i) Model resolution local to the Atlantic Basin, (ii) Treatment of LAM lateral boundary conditions compared to the open-boundary, Variable Global Model approach, (iii) Importance of the inclusion of a high-resolution representation of the upstream African Easterly Wave (AEW) track in LAM configurations, versus the AEWs being represented on the LAM boundaries as derived from the 2° GCM run (iv) the importance of employing ERA40 versus GEM lateral boundary conditions.

In this presentation we will present an overview of the perfomance of the Global Variable Resolution version of GEM in simulating the climatology and variability of Atlantic Tropical Cyclones. The range of other model configurations will then be compared and constrated to address the list of factors outlined above.