Hurricane Simulations in a Regional Atmospheric Model

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Simulations of hurricane activity have been carried out using a regional atmospheric model (WRF) at 27-km horizontal resolution, as part of the experiments coordinated by the US CLIVAR Hurricane Working Group. The spatial extent of the model was chosen to span the entire Atlantic basin and adjoining continental areas, allowing for the entire lifecycle of a hurricane to be contained within the model domain. Three different experiments, each 21 years in length, were carried out: (i) Using climatological annual cycle of sea surface temperature (SST); (ii) Using observed SST for the period 1980-2000; and (iii) Using doubled-CO2 and climatological SST with uniform 2K warming added over the entire basin. The first two experiments used lateral boundary conditions derived from observational reanalyses, while the third experiment used lateral boundary conditions from a global integration using CAM5, also using doubled-CO2 and SST with uniform 2K warming.

The observed SST experiment produces a fairly good simulation of the interannual variability in hurricane numbers and Atlantic accumulated cyclone energy (ACE). The experiment with climatological SST also exhibits random interannual variations in storm activity, but somewhat weaker than in the observed SST experiment. The experiment with uniform 2K warming exhibits an increase in the number of more intense storms, as expected, but also exhibits a large increase in the total number of storms and the ACE. Preliminary results suggest that the overall increase in storm activity is primarily a result of increased storm activity at the start and end of the traditional Atlantic hurricane season.