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TITLE: Global Projections of Intense Tropical Cyclone Activity for the Late Twenty-First Century from Dynamical Downscaling of CMIP5/RCP4.5 Scenarios

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ABSTRACT:

Abstract Global projections of intense tropical cyclone activity are derived from the Geophysical Fluid Dynamics Laboratory (GFDL) High Resolution Atmospheric Model (HiRAM; 50-km grid) and the GFDL hurricane model using a two-stage downscaling procedure. First, tropical cyclone genesis is simulated globally using HiRAM. Each storm is then downscaled into the GFDL hurricane model, with horizontal grid spacing near the storm of 6 km, including ocean coupling (e.g., ?cold wake? generation). Simulations are performed using observed sea surface temperatures (SSTs) (1980?2008) for a ?control run? with 20 repeating seasonal cycles and for a late-twenty-first-century projection using an altered SST seasonal cycle obtained from a phase 5 of CMIP (CMIP5)/representative concentration pathway 4.5 (RCP4.5) multimodel ensemble. In general agreement with most previous studies, projections with this framework indicate fewer tropical cyclones globally in a warmer late-twenty-first-century climate, but also an increase in average cyclone intensity, precipitation rates, and the number and occurrence days of very intense category 4 and 5 storms. While these changes are apparent in the globally averaged tropical cyclone statistics, they are not necessarily present in each individual basin. The interbasin variation of changes in most of the tropical cyclone metrics examined is directly correlated to the variation in magnitude of SST increases between the basins. Finally, the framework is shown to be capable of reproducing both the observed global distribution of outer storm size?albeit with a slight high bias?and its interbasin variability. Projected median size is found to remain nearly constant globally, with increases in most basins offset by decreases in the northwest Pacific.

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