Geophysical Research Abstracts
Vol. 16, EGU2014-2388, 2014
EGU General Assembly 2014

Energetics, structure and life-cycle of GCM simulated tropical cyclones and their response to global warming

Ming Zhao (1) and Yanluan Lin (2)
(1) GFDL/NOAA, (2) Tsinghua University

The genesis and evolution of tropical cyclones (TC) involve a wide range of spatial and temporal scales (cumulus to planetary), making it particularly challenging for modeling, observation and theory. At present, it is still not entirely clear at what resolution it is adequate to resolve the evolution of an individual storm's structure and intensity. Despite this, the imperativeness in understanding the connections between TCs and climate has motivated the use of global climate models (GCMs) in studying the response of TC statistics to changing climate conditions. These GCM integrations were typically operated at much larger spatial (global) and longer time (decadal) scales with a sacrifice of model resolution. Nevertheless, with only a modest increase of spatial resolution (e.g., 50km), these models have demonstrated skills in capturing many observed variability of TC statistics. Given this success and the fact that in the next few years, most current generation (100-200km) GCMs will evolve into higher resolution (e.g., 50km) models, it is important to further investigate and document the extent of these models' ability in simulating the energetics, structure and life-cycle of individual TCs which are not expected to be perfect. This process level assessment of the fidelity of GCM simulated TCs is especially important if the models are coupled with an ocean model for studies of the TC and climate connections. On the other hand, the energetics and structure of individual TCs have been a focus of the TC research community for many years since the first aircraft measurements of TCs. Conceptual models and compelling theories have been proposed to explain the observed features. Many of these aspects have been analyzed and documented in literature. In this work, we analyze and document the GCM simulated TCs beyond their frequency and tracks. Six-hourly three-dimensional data of thousands of storms are extracted from the GCM simulations. The structure, size, and energetics of individual storms and their statistics are analyzed in a way that facilitates the comparison with existing theories, satellite observations, and high resolution simulations of individual storms. Through this effort, we hope to be able to bring closer the traditional TC and GCM research communities for future studies of the TC-climate problem. To this end, it would be valuable to make the GCM simulated TC data publicly available for the broad TC research community to foster collaborative research. We will discuss GCM simulated responses in TC destructive power (winds, size, and precipitation) owing to global warming.