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Asuka Suzuki-Parker

Uncertainties and Limitations in Simulating Tropical Cyclones

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Uncertainties and Limitations in Simulating Tropical Cyclones

Doctoral Thesis accepted by
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This theses is currently being revised for additional journal publications.

Supervisor's Foreword

The thesis work was in two major parts, each of which develops a methodology that will be widely utilized in future modeling assessments of the impacts of climate on tropical cyclones. They are: development and testing of a new approach to detecting and tracking tropical cyclones in climate models; and application of an extreme value statistical approach to enable assessment of changes in weather extremes from climate models.

The tracking algorithm applied a creative phase-space approach to differentiate between modeled tropical cyclones and their mid-latitude cousins. A feature here was the careful attention to sensitivity to choice of selection parameters, which is considerable. The major finding was that the changes over time were relatively insensitive to these details. This new approach will improve the accuracy of assessing tropical cyclone activity from models and is already adding confidence to assessments of future climate impacts.

The extremes approach utilized the Generalized Pareto Distribution (one of the standard approaches to statistics of extremes) applied to present and future hurricane distributions as modeled by a regional climate model, then applied the changes to current observations to extract the changes in the extremes. Since climate models cannot resolve these extremes directly, this provides an excellent method of determining weather extremes in general. This is of considerable societal importance as we are most vulnerable to such extremes and knowledge of their changes enables improved planning and adaptation strategies.

USA, September 2011 Dr. Greg Holland

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