

MMM SEMINAR SERIES



Improving Tropical Weather Prediction and Understanding Tropical Cyclone Intensification using Global Convection-Permitting Models

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Accurately simulating the complex dynamics of the tropical atmosphere remains a significant challenge for global weather and climate models. These models often struggle to capture the extreme winds of tropical cyclones, represent equatorial waves accurately, and account for variations in tropical rainfall. In this seminar, I will demonstrate how these limitations can be overcome by employing a global convection-permitting model. Using an MPAS "resolution ensemble", I will showcase how a convection-permitting MPAS simulation successfully captures the intensity of tropical cyclones, realistically reproduces equatorial waves, and mirrors the observed rainfall variability. Lower resolution simulations with parameterized convection fail to achieve similar results.

Additionally, the convection-permitting MPAS simulation provides valuable insights into the mechanisms governing tropical cyclone intensification. By examining seven cases of rapid intensification that occur in the simulation, two distinct modes of intensification can be identified: the "marathon mode," characterized by gradual and sustained intensification, and the "sprint mode," marked by explosive and short-lived bursts of intensification. The two modes exhibit differences in initial vortex structure, intensification patterns, and environmental conditions, signifying separate intensification mechanisms.

Overall, the use of global convection-permitting models presents an opportunity to improve simulations of tropical weather phenomena and deepen our understanding of their underlying mechanisms. However, it is essential to acknowledge the limitations of these models, including their substantial computational costs and the disparities that exist among different global convection-permitting models. Further investigation is necessary to fully realize their potential and address any biases.

Thursday, 01 June 2023, 2:00pm

Refreshments 1:45pm

Please also join colleagues for refreshments and informal discussion after the seminar until 3:30pm

NCAR-Foothills Laboratory, 3450 Mitchell Lane
FL2-1022, Large Auditorium

Seminar will also be live webcast

<https://operations.ucar.edu/live-mmm>

Participants may ask questions during the seminar via Slido.