

ATS/CIRA Colloquium

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Dynamic and Thermodynamic Controls on Tropical Cyclone Intensity Change

December 6, 2007

ATS room 101; Discussion will begin at 3:30pm

Refreshments will be served at 3:00pm in the coffee lounge

A simplified dynamical system is developed that can predict many aspects of tropical cyclone intensity change. The system is based on a logistic growth equation for the time evolution of the maximum sustained surface wind, which is a first-order differential equation that constrains the solution to lie between zero and the maximum potential intensity (MPI). The MPI is estimated from thermodynamic soundings along the track of the storm. Once the MPI is specified the primary free parameter of the model is the growth rate, which is estimated from the vertical wind shear and a parameter that measures the convective instability. The convective instability parameter is determined from an entraining parcel model, which utilizes the thermodynamic formulation of Ooyama (1990). The convective instability and vertical shear provide a two-parameter phase space which can be used to classify the behavior of tropical cyclone intensity changes. This simple dynamical system can also be used for real time intensity forecasting and to evaluate the impact of thermodynamic soundings from satellite-based retrievals.