

Retrieved Thermodynamic Structure of Hurricane Rita (2005) using RAINEX Observations

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The radial location and timing of convective bursts in the tropical cyclone eyewall are critical for intensification efficiency, and thus directly impact tropical cyclone intensity change. However, the forcing mechanisms which determine the location and timing of these convective bursts are not fully understood. Ordinary tropical convection is generally forced by positive buoyancy, but rotational forces and a strengthening warm core and perturbation pressure gradients play a progressively important role in organizing convection as a tropical cyclone intensifies. Further clarification is needed to determine the role of thermodynamic forcing in tropical cyclone intensity change throughout its life-cycle.

Direct high-resolution measurements of thermodynamic fields in a tropical cyclone usually can only be collected along an aircraft track or a dropsonde profile, limiting the spatial coverage of the observations. A new indirect retrieval approach will be presented, which allows estimation of three-dimensional temperature and pressure perturbations in the entire eyewall region using airborne radar observations. A detailed analysis of the structure of the eyewall convection in Hurricane Rita (2005) on 23 September using observations from the Hurricane Rainband and Intensity Change Experiment (RAINEX) field campaign will be presented. The performance of the thermodynamic retrieval approach will be assessed using a high-resolution observing system simulation. The results of the RAINEX data analysis suggest that vertical wind shear results in a wavenumber one asymmetry in both temperature and pressure that is consistent with the theoretical response of a tilted vortex by shear. These new insights into the observed structure of a sheared hurricane and the impact on intensity change will be discussed.