**Flow-dependent Predictability of Tropical Cyclones**

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Through cloud-resolving idealized simulations of tropical cyclones (TC) idealized with different initial vortices under different background environments, as well as through cloud-resolving ensemble analysis and forecast of several dozens of Atlantic hurricanes with the assimilation of the inner-core airborne Doppler radar observations, this study seeks to understand the limit of TC intensity predictability under different flow regions and at different stages of the TC development. Our preliminary results show that the weaker storms, especially those before genesis, are more unpredictable and more sensitive to small initial condition errors than stronger tropical cyclones after the primary inner-core circulation has firmly established. Ongoing work also examines the predictability of the TC intensity under different environmental parameters such as the vertical wind shear and moisture inhomogeneity. The current study complements our recent studies of Sippel and Zhang (2008, 2010 JAS) and Zhang and Sippel (2009 JAS) about the impact of moist convection on the predictability of tropical cyclones, as well as our recent studies of Fang and Zhang (2010, 2011 JAS) on the dynamics and impact of multi-scale processes in the formation of tropical cyclone formation. This study also attempts to integrate the predictability lessons that we learned from the recent field experiments of NOAA’s IFEX (2008-2010) and the NSF’s field experiment PREDICT (2010) as well as the realtime hurricane forecast testbed during 2008-2010 under NOAA’s Hurricane Forecast Improvement Project (HFIP).