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Role of Intense Convection in Sheared Tropical Cyclones

The proposal has three parts. First, we propose a composite study of the azimuthal helicity distribution in tropical cyclones with respect to ambient vertical wind shear. In our previous study of Hurricane Bonnie we found an enormous azimuthal asymmetry in helicity, with large helicity and intense supercell-like storms in the downshear direction. Our goal is to examine the robustness of these results over a wide range of storms. Second, we will carry out a detailed study of the evolution of Hurricane Bonnie using an extensive set of flights and dropsondes during the period of interest. The goal is to understand how the storm maintained its intensity in the presence of strong ambient shear. Finally, we will examine the role of the helicity distribution on the formation and downshear re-formation of tropical storms. We will identify near-coastal examples in range of continuous land-based radar. The downshear reformation of Tropical Storm Gabrielle (2001) will be one such study. The goal is to examine the structure and evolution of individual cells in the presence of large helicity and how such cells influence the vortex as a whole.

Broader impacts include the training of graduate students, support for graduate students to attend conferences and present their work, and dissemination of results in the refereed literature and at conferences. We also hope that the research results will contribute to a greater understanding and better prediction of hurricanes. The PI also gives talks on hurricanes to lay groups as part of outreach efforts.