Diagnosis and Anticipation of Tropical Cyclone Behavior from New and Enhanced GOES-R Capabilities

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Abstract

This proposal builds on previous tropical cyclone (TC) research, makes use of unique datasets, and leverages the NOAA Hurricane Forecast Improvement Program (HFIP) resources. Here we propose to learn how to better diagnose and anticipate TC behavior with the new and enhanced capabilities of the next generation of GOES satellites. Our proposed work addresses three important aspects of TC behavior. The first topic addresses how to interpret the occasional variations of cloud-top microphysics associated with TCs. GOES-R products include cloud effective particle size (EPS) estimates and the precision of the Advanced Baseline Imager (ABI) will enable many qualitative products (e.g., RGB combinations) that provide users with information about EPS. GOES-R will greatly enhance our ability to see where and when small ice particles are being generated atop the TC. In this work we describe efforts to interpret such observations. The second topic proposes work to better statistically infer the TC structure from IR imagery. In the past, such work relied heavily on composited aircraft reconnaissance data to provide the necessary inferences. HWRF model output from NOAA's HFIP program provides both simulated IR imagery and instantaneous ground truth at multiple levels (done at CIRA?). If successful, these relationships will allow the inference TC wind structure from a combination of observed IR imagery and routinely available information (intensity and translation). The final area of proposed work will investigate methods to anticipate TC eye formation. Eye formation has long been known to indicate that a TC has reached hurricane intensity and is a primary pattern used to infer tropical cyclone intensity. In fact, the appearance of a clear eye can result in Dvorak-based intensity estimates of more than 40 knots in 24 hours. These proposed topics have potential to enhance our understanding and improve our ability to forecast tropical cyclones using GOES-R data. This proposal describes the details of each proposed topic, their potential importance to forecasters and the different paths to operations.