Geophysical Research Abstracts
Vol. 15, EGU2013-13410, 2013
EGU General Assembly 2013

Using the JPL Tropical Cyclone Information System to study the climatology of hurricane precipitation structure from 10 years of passive microwave satellite observations in the Atlantic

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In spite of recent improvements in hurricane track forecast accuracy, currently there are still many unanswered questions about the physical processes that determine hurricane genesis, and evolution. Furthermore, a significant amount of work remains to be done in validating and improving hurricane forecast models.

None of this can be accomplished without a comprehensive set of multi-parameter observations that are relevant to both the large-scale and the storm-scale processes in the atmosphere and in the ocean. Despite the significant amount of satellite observations today, they are still underutilized in hurricane research and operations, due to complexity and volume.

To facilitate hurricane research, we developed the JPL Tropical Cyclone Information System (TCIS) of multi-instrument satellite observations pertaining to: i) the thermodynamic and microphysical structure of the storms; ii) the air-sea interaction processes; iii) the larger-scale environment as depicted by the SST and the Total Precipitable Water of the environment (Hristova-Veleva et al., 2008, 2011). Our goal was to create a one-stop place to provide the researchers with an extensive set of observed hurricane data, and their graphical representation, organized in an easy way to determine when coincident observations from multiple instruments are available.

In this study we use the 10+ years of passive microwave observations of Atlantic hurricanes to create composite structures that are segregated by hurricane category and by intensification rate. The use of composite structures provides a statistically robust framework (e.g. Rogers et al., 2012). We analyze the storm asymmetry as depicted by several factors - brightness temperatures and their derivatives such as a newly-develop Rain Indicator and a new convective/stratiform separation that is based on the value and the spatial variability of this Rain Indicator. The goal is to determine whether the storm morphology (in particular, the storm asymmetry or lack thereof) carries predictive skills regarding the potential for intensification.

The presentation will describe the JPL TCIS and the results of our analysis of the passive microwave satellite observations of the Atlantic hurricanes.

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