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The Tropical Cyclone Outflow Layer: New Observations and Possible Relationship to

Pre-landfall Structure and Intensity Change

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ABSTRACT

Dropsonde profiles through Tropical Cyclone (TC) outflow layers were recently obtained during the Hurricane and Severe Storms Sentinel (HS3) experiment (2012-2014) and plans are underway to utilize the Tropical Cyclone Intensity (TCI) experiment to augment these measurements in 2014 and 2015. Using mini-dropsondes deployed with the Airborne Vertical Atmospheric Profiling System (AVAPS) from a NASA Global Hawk and eXpendable Digital Dropsondes (XDDs) deployed with the High Definition Sounding System (HDSS) from a NASA WB-57F, new insights into the vertical structure of the TC outflow layer have been obtained within the context of rapid outflow jet evolution documented by CIMSS Atmospheric Motion Vectors (AMVs) provided by the Cooperative Institute for Meteorological Satellite Studies (CIMSS). Detailed fine structure within the outflow layer has been obtained that distinguishes this region from lower layers in Tropical Cyclones (TCs). Development of dual outflow jets directed equatorward and poleward may be related to rapid intensification and structure transformation. Outflow jet observations such as these may lead to insights regarding storm structure and size changes that distinguish between predominant surge events at landfall such as occurred with Katrina (2005) and Sandy (2012) in the U.S. and Morokot (2009) and Haiyan (2013) in the western Pacific (WPAC) from predominantly wind events such as Charlie (2004) in the U.S. and Haiqui (2012) in China. It is suggested that environmentally forced outflow jets vs convectively-driven outflow jets may play differing roles in these changes, which are especially important near TC landfall. Investigation of the uncertainty associated with these outflow-level features will assist in assessing overall forecast uncertainty for landfalling TCs.