HIGH RESOLUTION WIND VECTOR RETRIEVALS IN TROPICAL CYCLONES USING WINDSAT

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For the past three decades, the primary technology for sensing ocean surface vector winds has been the scatterometer. These reliable instruments are able to measure near-surface winds in a wide range of atmospheric conditions and have aided hurricane forecasters in determining eye locations and track forecasts. Scatterometers generally measure only a single quantity–wind vectors–and the sensitivity of these measurements decreases at high winds. Also, the large amounts of precipitation present in tropical cyclones, usually correlated with the highest of winds, interfere with surface measurements.

Polarimetric radiometers, such as WindSat, introduce the ability to passively measure both surface wind speed and wind direction, and are particularly well suited for measuring high wind conditions due to increased brightness temperature sensitivity to both magnitude and direction at high wind speeds. Additionally, the multi-frequency design allows for the coincident retrieval of other environmental parameters, such as precipitation, As with scatterometers, rain contamination results in erroneous surface measurements; however, the ability to perform coincident precipitation retrievals and to measure surface and atmospheric conditions over a range of frequencies offers the potential to mitigate unwanted environmental contamination.

This paper will present an analysis of high resolution wind vector retrievals in tropical cyclone conditions using data from the WindSat polarimetric radiometer. Brightess temperatures for the 10.7-, 18.7-, 23.8-, and 37-GHz channels are averaged to a common footprint of 25 km by 35 km, which is approximately equivalent to the 23.8 GHz spatial resolution. Environmental data product retrievals are performed using these resolution-matched brightness temperatures in conjunction with a new emissivity model designed to improve wind speed retrievals at high wind speeds. Retrievals are compared with SFMR measurements from 2003 through 2006 and with H*Winds analyses from 2003 and 2005.