

Surface Wind Vector and Rain Rate Observation Capability of the Future Airborne Hurricane Imaging Radiometer (HIRAD)

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The Hurricane Imaging Radiometer (HIRAD) is the next-generation Stepped Frequency Microwave Radiometer (SFMR) that will be used for NOAA operational hurricane surveillance. HIRAD will offer the capability of simultaneous wide-swath observations of both extreme ocean surface wind vector and strong precipitation from either aircraft (including UAS) or for future satellite platforms.

This paper describes the airborne instrument under development at the NASA MSFC in Huntsville, AL. HIRAD is a compact, lightweight, low-power instrument with no moving parts that will produce wide-swath wind and rain rate observations under hurricane conditions. The SFMR is a proven aircraft remote sensing system for simultaneously observing extreme ocean surface wind speeds and rain rates, including those of major hurricane intensity. The HIRAD instrument advances beyond the current nadir viewing SFMR to an equivalent wide-swath SFMR imager using passive microwave synthetic thinned aperture radiometer technology, which operates over 4-7 GHz (C-band frequencies). HIRAD incorporates a unique, technologically advanced array antenna and several other technologies successfully demonstrated by NASA's Instrument Incubator Program. A brassboard (laboratory) version of the instrument has been completed and successfully tested in a test chamber. Development of the aircraft instrument is underway, with flight testing planned for the fall of 2009. Preliminary Observing System Simulation Experiments (OSSE's) show that HIRAD will have a significant positive impact on surface wind analyses as either a new aircraft or satellite sensor. New off-nadir data collected in 2008 by SFMR that affirms the ability of this measurement technique to obtain wind speed data at non-zero incidence angle will be presented.