

Hurricane Imaging Radiometer (HIRAD) Wind Speed Retrievals and Assessment Using Dropsondes

Daniel J. Cecil, NASA Marshall Space Flight Center
Sayak K. Biswas, Universities Space Research Association

Abstract

The Hurricane Imaging Radiometer (HIRAD) is an experimental C-band passive microwave radiometer designed to map the horizontal structure of surface wind speed fields in hurricanes. New data processing and customized retrieval approaches were developed after the 2015 Tropical Cyclone Intensity (TCI) experiment, which featured flights over Hurricanes Patricia, Joaquin, Marty, and the remnants of Tropical Storm Erika. These new approaches produced maps of surface wind speed that looked more realistic than those from previous campaigns. Dropsondes from the High Definition Sounding System (HDSS) that was flown with HIRAD on a WB-57 high altitude aircraft in TCI were used to assess the quality of the HIRAD wind speed retrievals. The root mean square difference between HIRAD-retrieved surface wind speeds and dropsonde-estimated surface wind speeds was 6.0 m s^{-1} . The largest differences between HIRAD and dropsonde winds were from data points where storm motion during dropsonde descent compromised the validity of the comparisons. Accounting for this and for uncertainty in the dropsonde measurements themselves, we estimate the root mean square error for the HIRAD retrievals as around 4.7 m s^{-1} .

Prior to the 2015 TCI experiment, HIRAD had previously flown on the WB-57 for missions across Hurricanes Gonzalo (2014), Earl (2010), and Karl (2010). Configuration of the instrument was not identical to the 2015 flights, but the methods devised after the 2015 flights may be applied to that previous data in an attempt to improve retrievals from those cases.