Data User Guide

Hurricane and Severe Storm Sentinel (HS3) High-altitude Imaging Wind & Rain Airborne Profiler (HIWRAP)

Introduction

The High-altitude Imaging Wind & Rain Airborne Profiler (HIWRAP) is a dual-frequency (Ku- and Ka-band, or ~14 and 35 GHz), dual-beam (30° and 40° incidence angle), conically scanning radar that has been designed for the Global Hawk aircraft. HIWRAP data was collected during the HS3 field experiment. Its dual-wavelength operation enables it to map full tropospheric winds from cloud and precipitation volume backscatter measurements, derive information about precipitation drop-size distributions, and estimate the ocean surface winds using scatterometry techniques.

Citation

Keywords:

Campaign

The Hurricane and Severe Storm Sentinel (HS3) was a five-year NASA mission specifically targeted to investigate the processes that underlie hurricane formation and intensity change in the Atlantic Ocean basin. Goals for HS3 included: assessing the relative roles of large-scale environment and storm-scale internal processes; and addressing the controversial role of the Saharan Air Layer (SAL) in tropical storm formation and intensification as well as the role of deep convection in the inner-core region of storms. To achieve these goals, sustained measurements over several years was needed to get a large enough sample of storms. Therefore, field measurements took place from 2012 through 2014 for one month during each hurricane season. The HS3 campaign utilized two Global Hawks, one with instruments geared toward measurement of the environment and the other with instruments suited to inner-core structure and processes. The environmental payload included the scanning High-resolution Interferometer Sounder (S-HIS) and the AVAPS dropsonde system; the over-storm payload included the HIWRAP conically scanning Doppler radar, the HIRAD multi-frequency interferometric radiometer, and the HAMSR microwave sounder. More information about the HS3 campaign can be found at
https://hs3.nsstc.nasa.gov/.

Instrument Description

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HIWRAP Ku-Band System Specifications During HS3

Parameters	Specifications	
	Inner Beam	Outer Beam
RF Frequency (GHz)	Chirp mode: 13.915 Pulse mode: 13.896	Chirp mode: 13.464 Pulse mode: 13.483
Transmitter Peak Power (dBm) (at Transceiver Tx/Rx port)	40.27	40.00
Antenna Gain (dB)	35.40	35.20
Antenna 3 dB Beamwidth AZ (º)	3.07	2.90
Antenna 3 dB Beamwidth EL (º)	2.90	3.00
PRF (Hz)	4516/3859	
RF Pulse Width (μs)	Chirp mode: 20.0 Pulse mode: 2.0	Chirp mode: 20.0 Pulse mode: 2.0
Receiver Bandwidth (MHz)	2	2
Doppler Range (m/s)	+/- 97.4	+/-100.6
Minimum Detectable Reflectivity (dBZ) (@10 km, ave 128 samples)	Chirp mode: 3.6 Pulse mode: 11.2	Chirp mode: 2.5 Pulse mode: 9.5

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File Naming Convention

The HIWRAP dataset files are named with the following convention:

IPHEX_HIWRAP_L1B_yymmdd_hhmmss_hhmmss_subc_dist_v02.nc

Where,

      IPHEX_HIWRAP = project and instrument
      L1B = product level
      yymmdd_hhmmss_hhmmss = indicate the GPS (note that GPS time is ahead of UTC by 15 sec) start and end time of the data (year, month, day and hours, minutes, seconds)
      subc = indicate radar frequency (Ku or Ka).
      v02 = version
      .nc = netCDF data format

Data Format Description

The Hurricane and Severe Storm Sentinel (HS3) High-altitude Imaging Wind & Rain Airborne Profiler (HIWRAP) data is available in NetCDF format with a data processing level of 1B. More information about NASA Data Processing Levels can be found at http://science.nasa.gov/earth-science/earth-science-data/data-processing-levels-for-eosdis-data-products/.

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Contact Information

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