



## Data User Guide

# ***Hurricane and Severe Storm Sentinel (HS3) Naval Research Laboratory (NRL) Tropics Satellite Data***

### **Introduction**

The Hurricane and Severe Storm Sentinel (HS3) Naval Research Laboratory (NRL) Tropics Satellite Data contains browse only data files, including brightness temperature, rain rate, and Red, Green, Blue (RGB) composite imagery, for the Hurricane and Severe Storm Sentinel (HS3) field campaign. Goals for the HS3 field campaign included assessing the relative roles of large-scale environmental and storm-scale internal processes, addressing the controversial role of the Saharan Air Layer (SAL) in tropical storm formation and intensification, and the role of deep convection in the inner-core region of storms. These browse only data files are available for dates between April 22, 2013 and September 30, 2014 in JPG format.

### **Citation**

Doyle, James. 2019. Hurricane and Severe Storm Sentinel (HS3) Naval Research Laboratory (NRL) Tropics Satellite Data [indicate subset used]. Dataset available online from the NASA EOSDIS Global Hydrology Resource Center Distributed Active Archive Center, Huntsville, Alabama, U.S.A. doi: <http://dx.doi.org/10.5067/HS3/SATELLITE/DATA101>

### **Keywords:**

*NASA, HS3, NRL, brightness temperature, rain rate, RGB composite image*

### **Campaign**

The Hurricane and Severe Storm Sentinel (HS3) was a five-year NASA field campaign mission targeted to investigate the processes that underlie hurricane formation and intensity change, including assessing the relative roles of the large-scale environment and the storm-scale internal processes. To achieve these goals, three 5-week campaigns were carried out during 2012 - 2014 which consisted of 21 flight missions over nine storms, two

undeveloped systems, and several Saharan air layer outbreaks. 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. Information about instrument flights made during each campaign year are summarized in Table 2 of the [HS3 2016 BAMS](#) paper. More information about the HS3 campaign can be found at <https://ghrc.nsstc.nasa.gov/home/projects/hs3>.

## Product Description

Browse imagery of brightness temperatures, rain rates, and Red, Green, Blue (RGB) composites illustrate the structures and developments of tropical systems during the HS3 field campaign. These imagery were produced by using various data from the Global Precipitation Measurement (GPM) Microwave Imager (GMI), Tropical Rainfall Measuring Mission (TRMM) Microwave Imager (TMI), TRMM Precipitation Radar (PR), Defense Meteorological Satellite Program (DMSP) F15 Special Sensor Microwave Imager (SSM/I), DMSP F16, F17, and F18 Special Sensor Microwave Imager/Sounder (SSMIS), National Oceanic and Atmospheric Administration (NOAA) Advanced Microwave Sounding Unit-A (AMSU-A) and Advanced Very High Resolution Radiometer (AVHRR), Meteorological Operational satellite programme-A (MetOp-A) AMSU-A, and WindSat on the Coriolis satellite.

## Investigators

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## Data Characteristics

The Hurricane and Severe Storm Sentinel (HS3) Naval Research Laboratory (NRL) Tropics Satellite Data consists of browse only imagery (brightness temperature, rain rate, and RGB composite) highlighting tropical storms and hurricanes as satellite pass over for the HS3 field campaign. These data are available in PNG format at a Level 2 processing level. More information about the NASA data processing levels are available on the [EOSDIS Data Processing Levels](#) webpage. Table 1 shows the characteristics of these browse files.

Table 1: Data Characteristics

Characteristic	Description
Platform	DMSP F15-18, GPM, MetOp-A, NOAA-18, NOAA-19, TRMM, Coriolis
Instrument	SSM/I (DMSP F15), SSMIS (DMSP F16, 17, 18), GMI (GPM), AMSU-A (MetOp-A), AMSU-A and AVHRR (NOAA-18 and NOAA-19), TMI (TRMM), PR (TRMM), WindSat (Coriolis)
Spatial Coverage	N: 53.9 , S: 2.2, E: -9.0, W: -113.5 (Atlantic Ocean)
Temporal Coverage	July 23, 2013 - September 30, 2014
Temporal Resolution	Hourly -> Daily
Parameter	Brightness temperature, rain rate, RGB composite
Version	1
Processing Level	2

## File Naming Convention

The Hurricane and Severe Storm Sentinel (HS3) Naval Research Laboratory (NRL) Tropics Satellite Data product has the following file naming convention:

### Browse files:

hs3\_YYYYMMDD\_hhmm\_<sat>\_x\_<type>\_<storm>\_<wind>\_<pressure>\_<lat>\_<lon>.jpg

Table 2: File naming convention variables

Variable	Description
YYYY	Four-digit year
MM	Two-digit month
DD	Two-digit day
hh	Two-digit hour in UTC
mm	Two-digit minute in UTC
sat	Satellite platforms including gpm, metopa, f15, f16, f17, f18, trmm, noaa18, noaa19, coriolis
type	Four types are included: brightness temperature (i.e., '89_1deg', 'tmi_85h_1deg'.) rain rate ('rain', 'surfaceRain', 'surfaceRain2') RGB composite (i.e., 'color_89_150', 'color37'.) and a 'composite' type composed of four images showing satellite overpass, brightness temperature and RGB composite
storm	Name of the storm (i.e., '97LINVEST', '13LLORENZO', '11LJERRY', '09L HUMBERTO', '10LINGRID', '04LDORIAN')
wind	Maximum wind speed of the storm (i.e., '25kts')
pressure	Maximum pressure of the storm (i.e., '988mb')
lat	Latitude of the storm center (i.e., '351N')
lon	Longitude of the storm center (i.e., '490W')
.jpg	Joint Photographic Experts Group format

## Data Format and Parameters

These browse imagery are in JPG format and include brightness temperature, rain rate, and RGB composites. Tropical storms and hurricanes are highlighted as satellites (DMSP, GPM, METOP-A, NOAA, TRMM, and Coriolis) passed over the HS3 field campaign study area.

## Software

These data files are browse only imagery in JPG format. No specific software is required to view these files.

## Known Issues or Missing Data

There are no known issues with these data or any known gaps in the dataset.

## References

Braun, Scott A., Paul A. Newman, and Gerald M. Heymsfield (2016). NASA's Hurricane and Severe Storm Sentinel (HS3) Investigation, *American Meteorological Society BAMS*, November 2016, 2085-2102. doi: <https://doi.org/10.1175/BAMS-D-15-00186.1>

## Related Data

All other data collected during the HS3 field campaign are considered related datasets. Other HS3 data can be located using the [GHRC HyDRO 2.0 search tool](#) with the search term 'HS3'.

## Contact Information

To order these data or for further information, please contact:

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