Global Hydrology Resource Center

Data User Guide

Hurricane and Severe Storm Sentinel (HS3) Cooperative Institute for Meteorological Satellite Studies (CIMSS) Cloud Top Height

Introduction

The Hurricane and Severe Storm Sentinel (HS3) Cooperative Institute for Meteorological Satellite Studies (CIMSS) Cloud Top Height dataset contains could top height images obtained from infrared observations of the 15th Geostationary Operational Environmental Satellite (GOES-15) and the 10th Meteorological Satellite (METEOSAT-10) using the Algorithm Working Group (AWG) Cloud Height Algorithm (ACHA) for the Hurricane and Severe Storm sentinel (HS3) field campaign. Goals for the HS3 field campaign included assessing the relative roles of large-scale environment 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. The images are available for dates between August 14, 2014 and October 3, 2014 at 15 minutes intervals in PNG format.

Citation

Space Science and Engineering Center (SSEC) of the University of Wisconsin-Madison. 2018. Hurricane and Severe Storm Sentinel (HS3) Cooperative Institute for Meteorological Satellite Studies (CIMSS) Cloud Top Height [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/CIMSS/DATA201

Keywords:

NASA GOES-15, METEOSAT-10, HS3, Infrared, cloud top height, GOES-15 Imager, SEVIRI, EUMETSAT, CIMSS, AWG, ACHA

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.

Instrument Description

The 15th Geostationary Operational Environmental Satellite (GOES-15) is a U.S. satellite in geostationary orbit over the equator in an Earth synchronous orbit. Launched on March 4, 2010, GOES-15 is part of the GOES N-Series (including GOES-13 through 15). GOES-15 was placed in orbit originally as a spare, but on December 6, 2011 GOES-15 was positioned in GOES-West satellite location at 135 degrees west longitude, replacing GOES-11. The GOES-15 Imager is a five-channel (one visible, four infrared) imaging radiometer designed to sense radiant and solar reflected energy from sampled areas of the Earth. The GOES-West location allowed for views of the HS3 field campaign region during the August through October 2014 time period.

The Meteorological Satellite (METEOSAT)-10 was launched on July 5, 2012 by the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT). It is the third of the METEOSAT Second Generation satellites. The Spinning Enhanced Visible and Infrared Imager (SEVIRI) is the primary instrument onboard the METEOSAT-10 satellite, which has the capacity to observe the Earth in 12 different visible and infrared wavelengths at intervals of 15 minutes.

The cloud top height images in this dataset are derived from the infrared channels of GOES-15 and METEOSAT-10 using the AWG Cloud Height Algorithm (ACHA).

Investigators

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Data Characteristics

The HS3 CIMSS Cloud Top Height dataset contains cloud top height images derived from the GOES-15 and METEOSAT-10 infrared channels for the HS3 campaign. The image files are in PNG format at Level 4 processing level. More information about the NASA data processing levels are available on the NASA Data Processing Levels website.

Table 1: Data Characteristics

Characteristic	Description
Platform	GOES-15, METEOSAT-10
Instrument	GOES-15 Imager Spinning Enhanced Visible and Infrared Imager (SEVIRI)
Spatial Coverage	N: 52.0 , S: 12.0, E: -60.0, W: -180.0
Spatial Resolution	4 km for GOES-15, 3 km for METEOSAT-10
Temporal Coverage	August 14, 2014 to October 3, 2014
Temporal Resolution	15 minutes
Sampling Frequency	< 1 second
Parameter	Cloud top height
Version	1
Processing Level	4

File Naming Convention

The HS3 CIMSS Cloud Top Height dataset has the file naming convention shown below. These images include cloud top height estimates throughout the HS3 field campaign study area in PNG format.

Browse files: hs3_CIMSS_CT_ACHA_YYYYMMDDhhmmss.png

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
ss	Two-digit second in UTC
.png	Portable Network Graphics format

Data Format and Parameters

The HS3 CIMSS Cloud Top Height dataset files are available in PNG format and contain cloud top height images during the 2014 HS3 campaign period.

Algorithm

These cloud top height images are obtained from GOES-15 and METEOSAT-10 infrared observations using the ACHA. The ACHA uses analytical radiative transfer equations in an Optimal Estimate (OE) framework. Cloud top height are derived from the cloud top temperature product and the atmospheric temperature profile provided by Numerical Weather Prediction (NWP) data. The ACHA uses only infrared observations in order to provide products that are consistent for day, night and terminator conditions. More detailed information about ACHA can be found at https://ghrc.nsstc.nasa.gov/pub/fieldCampaigns/hs3/CIMSS/Cloud_Top_Height/doc/ATBD_EPS_Cloud_ACHA_v3.0.pdf.

Software

No specific software is required to view these images.

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 to this HS3 CIMSS Cloud Top Height dataset. Other HS3 data can be located using the GHRC HyDRO 2.0 search tool with the search term 'HS3'.

In addition, other CIMSS data are available and listed below:

HS3 CIMSS Brightness Temperature dataset
(http://dx.doi.org/10.5067/HS3/CIMSS/DATA101)

HS3 CIMSS Tropical Overshooting Tops dataset
(http://dx.doi.org/10.5067/HS3/CIMSS/DATA301)

Contact Information

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

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