



Data User Guide

GRIP DC-8 Dropsonde V3

Introduction

The GRIP DC-8 Dropsonde V3 dataset consists of atmospheric pressure, dry-bulb temperature, dew point temperature, relative humidity, wind direction, wind speed, and fall rate measurements taken during 16 research flights during the Genesis and Rapid Intensification Processes (GRIP) campaign from August 17, 2010 to September 22, 2010. The GRIP campaign was conducted to better understand how tropical storms form and how these storms develop into major hurricanes. The DC-8 Airborne Vertical Atmospheric Profiling System (AVAPS) deploys integrated, highly accurate, GPS-located atmospheric profiling dropsondes to measure and record current atmospheric conditions in a vertical column below the aircraft. The dropsondes are ejected from a tube in the underside of the DC-8 aircraft. As the dropsonde descends to the surface via a parachute, it continuously measures and transmits data to the aircraft using a 400 MHz meteorological band telemetry link. Pressure, temperature and relative humidity, as well as GPS-based wind data were collected from 328 dropsondes. These Dropsonde data are in ASCII-csv file format.

Notice:

The Version 2 data were never made public. Version 1 was the dataset previous to this Version 3. The Version 3 data have been corrected for a temperature dependent dry bias, temperature dependent relative humidity bias, and a dew point bias. Dew point temperature has been recalculated using the corrected relative humidity measurements.

Citation

Heymfield, Gerald M. 2016. GRIP DC-8 Dropsonde V3 [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/GRIP/DROPSONDE/DATA202>

Keywords:

NASA, GHRC, GRIP, DC-8, Dropsonde, AVAPS, atmospheric wind, atmospheric temperature, atmospheric pressure, atmospheric water vapor, dry-bulb temperature, dew point

temperature, relative humidity, wind speed, wind direction, ascension rate, geopotential altitude;

Campaign

The Genesis and Rapid Intensification Processes (GRIP) campaign occurred from August 17, 2010 to September 22, 2010 and was conducted to better understand how tropical storms form and how these storms develop into major hurricanes. NASA used the DC-8 aircraft, the WB-57 aircraft, and the Global Hawk Unmanned Airborne System (UAS), configured with a suite of in situ and remote sensing instruments that were used to observe and characterize the lifecycle of hurricanes. This campaign also capitalized on a number of ground networks and space-based assets, in addition to the instruments deployed on aircraft from Ft. Lauderdale, Florida (DC-8), Houston, Texas (WB-57), and NASA Dryden Flight Research Center, California (Global Hawk). More information about this Campaign is available at <http://airbornescience.nsstc.nasa.gov/grip>.

Instrument Description

The NCAR GPS Dropsonde system, also known as AVAPS (Airborne Vertical Atmospheric Profiling System) flew on the DC-8 aircraft which made 16 research flights during the GRIP campaign. The system uses an integrated, highly accurate, GPS-located atmospheric profiling dropsonde, which measures and records current atmospheric conditions in a vertical column below the aircraft. The NCAR GPS dropsonde is built by Vaisala (model RD93). The dropsonde is a small, lightweight (less than 400 grams) cylindrical instrument that falls freely through the atmosphere, slowed and stabilized by a small inflatable parachute. The dropsonde instrument is ejected from a tube in the underside of the DC-8 aircraft and the square-cone parachute deploys on exit and aids in slowing the descending dropsonde reducing or eliminating any dropsonde pendulum motion. As the dropsonde descends, it continuously measures and transmits the pressure, temperature and relative humidity, and wind data to the receiving system onboard the aircraft. Once deployed, the instrument is not recovered, as the cost of recovering a dropsonde would likely exceed its value. More information about the NCAR GPS Dropsonde system is available at <https://www.eol.ucar.edu/rtf/facilities/dropsonde/>. The DC-8 dropsondes were deployed over a series of flights as shown in Figure 1.

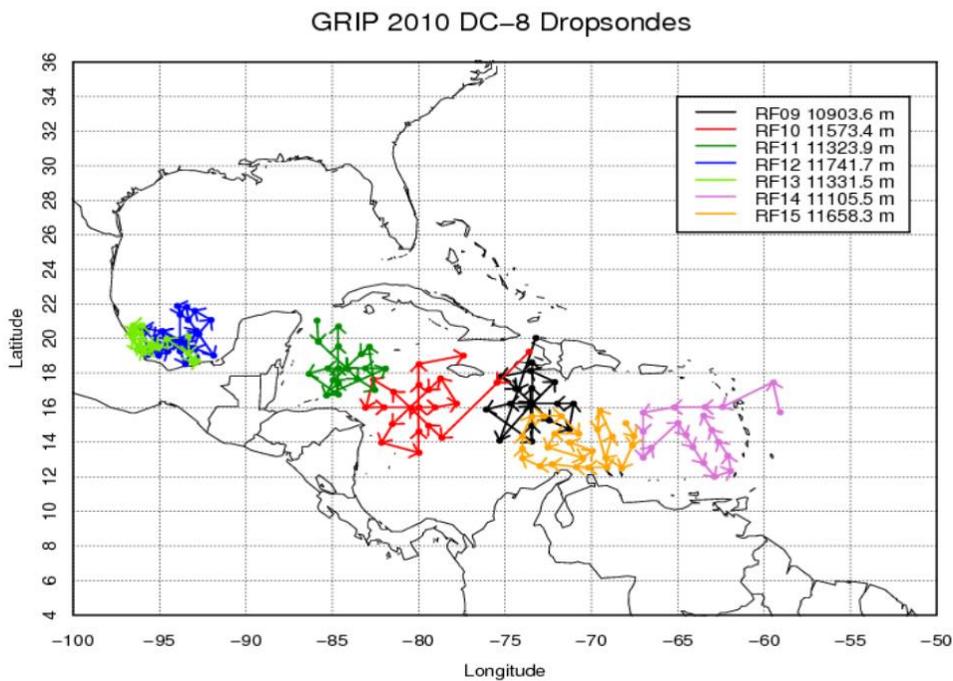
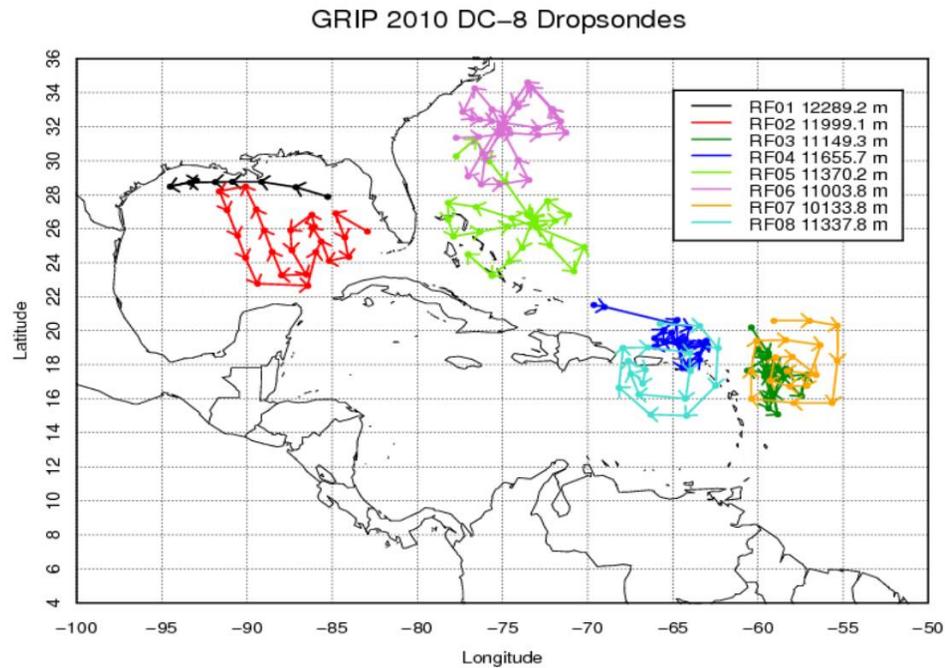


Figure 1. DC-8 dropsonde deployments during 15 GRIP campaign research flights. Each color represents a different flight. The dot at each arrow represents one dropsonde deployment. The numbers in the legend (in meters) are average flight altitude for that research flight [Figures from Young et al, 2011 GRIP Dropsonde Data Quality Report]

Investigators

Gerald Heymsfield
NASA Goddard Space Flight Center
Greenbelt, Maryland

Kathryn Young
NCAR/EOL
Boulder, Colorado

File Naming Convention

The GRIP DC-8 Dropsonde V3 dataset are in the following naming convention.

Data Files: DYYYYMMDD_hhmmss_P.QC.eol

Table 1: 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
.QC	Identifies that these are the bias corrected files
.eol	Earth Observing Laboratory (EOL) sounding file format. This is an ASCII comma separated format.

Data Format Description

The GRIP DC-8 Dropsonde V3 data consists of ASCII-csv files. The first 11 rows of these data are header lines, row 12 contains the column titles, and row 13 the column units. All rows from 14 onward are the measured data. Table 3 describes each column of data.

A dry bias in the relative humidity measurements was discovered in Spring 2016 in all dropsonde data within this dataset. All sounding files were corrected for this error and contain the flag, "TDDryBiasCorrApplied", in the last line of the header to confirm that this correction has been applied. More information about these EOL specific data files are available in the [PI documentation](#).

Table 2: Data Characteristics

Characteristic	Description
Platform	NASA DC-8
Instrument	NCAR GPS Dropsonde
Projection	Not applicable

Spatial Coverage	N: 34.736 , S: 12.004, E: -96.602, W: -55.385
Spatial Resolution	point
Temporal Coverage	Start date: August 17, 2010 Stop date: September 22, 2010
Temporal Resolution	varies
Sampling Frequency	varies - less than a second
Parameter	atmospheric pressure, dry-bulb temperature, dew point temperature, relative humidity, wind direction, wind speed, and fall rate measurements
Version	3
Processing Level	2

Table 3: Data Field Descriptions

Column number	Field Name	Description	Unit
1	Time	Seconds since launch	seconds
2	-- UTC -- hh	Hour in UTC	hour
3	-- UTC -- mm	Minute in UTC	minute
4	-- UTC -- ss	Second in UTC	second
5	Press	Atmospheric pressure	mb
6	Temp	dry-bulb temperature	°C
7	Dewpt	Dew point temperature	°C
8	RH	Relative humidity	%
9	Uwind	U wind component (positive Easterly winds, negative Westerly winds)	m/s
10	Vwind	V wind component (positive Northerly winds, negative Southerly winds)	m/s
11	Wwind	wind speed	m/s
12	Dir	Wind direction	degrees
13	dZ	Fall rate	m/s
14	GeoPoAlt	Geopotential altitude	meters
15	Lon	longitude	degrees
16	Lat	latitude	degrees
17	GPSAlt	GPS altitude	m

Data Parameters

The GRIP DC-8 Dropsonde V3 data files are in ASCII-csv format and consists of atmospheric pressure, dry-bulb temperature, dew point temperature, relative humidity, wind direction,

wind speed, and ascension rate measurements for a given time, place and altitude. Table 3 identifies the data column for each parameter.

Quality Assessment

Profiles of the raw temperature, relative humidity, wind speed, pressure, and fall rate (DZ/DT) were examined to determine if there were any errors with the data. Raw sounding files were then processed through the [Atmospheric Sounding Processing ENvironment \(ASPEN\)](#) software. This software analyzed the data, removed suspect data, and performed smoothing. Time series plots of relative humidity, fall rate, temperature, and wind speed with respect to altitude were used to examine the consistency of soundings launched throughout each flight. Also, this was to determine if the sounding did not transmit data to the surface or if there were issues with the parachute. The profiles that were created by these quality controlled soundings were visually evaluated for outliers. There were a total of 342 dropsondes released in the GRIP campaign, but 14 did not pass quality control for various reason that are listed in the PI Documentation. The document also summarizes soundings that had data lost. More information about the quality of the data is available in the [PI Documentation](#).

A dry bias in the relative humidity measurements was discovered in Spring 2016 in all dropsonde data within this dataset. This dry bias is strongly temperature dependent. During warm temperatures, it is considered small; and it is most significant at cold temperatures. All sounding files have been corrected for this error and now contain the flag, "TDDryBiasCorrApplied", in the last line of the header as confirmation. More information about this correction is available at [https://www.eol.ucar.edu/system/files/software/Aspen/Windows/W7/documents/Tech%20Note%20Dropsonde Dry Bias 20160527 v1.3.pdf](https://www.eol.ucar.edu/system/files/software/Aspen/Windows/W7/documents/Tech%20Note%20Dropsonde%20Dry%20Bias%2020160527%20v1.3.pdf).

Table 4: Dropsonde Sensor Specifications

	Range	Accuracy	Resolution
Pressure	1080 - 100 hPa	±1.0 hPa	0.1 hPa
Temperature	-90 to +60 °C	±0.2 °C	0.1 °C
Humidity	0 - 100%	±5 %	1.0%
Horizontal Wind	0 - 200 m/s	±0.5 m/s	0.1 m/s

The NCAR GPS Dropsonde sensor specifications are shown above. More information about the NCAR GPS Dropsonde is at <https://www.eol.ucar.edu/rtf/facilities/dropsonde/>.

Software

This dataset contains ASCII-csv data files. No software is required to view the GRIP DC-8 Dropsonde V2 data.

References

2011, K. Young, J. Wang, T. Hock and D. Lauritsen, 2011: Genesis and Rapid Intensification Processes (GRIP) 2010 quality controlled dropsonde data set GRIP Data Quality Report.

Available at

https://fcportal.nsstc.nasa.gov/pub/grip/Dropsonde_DC8/doc/readme.V3.GRIP-2010.DC8.dropsondes.pdf

NCAR/EOL Technical Note Dropsonde Dry Bias. Available at

[https://www.eol.ucar.edu/system/files/software/Aspen/Windows/W7/documents/Tech%20Note%20Dropsonde Dry Bias 20160527 v1.3.pdf](https://www.eol.ucar.edu/system/files/software/Aspen/Windows/W7/documents/Tech%20Note%20Dropsonde%20Dry%20Bias%2020160527%20v1.3.pdf)

NCAR GPS Dropsonde System (AVAPS). Available at

<https://www.eol.ucar.edu/rtf/facilities/dropsonde/>

Contact Information

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

NASA Global Hydrology Resource Center DAAC

User Services

320 Sparkman Drive

Huntsville, AL 35805

Phone: 256-961-7932

E-mail: support-ghrc@earthdata.nasa.gov

Web: <https://ghrc.nsstc.nasa.gov/>