



Data User Guide

NAMMA Raw DC-8 Dropsonde

Introduction

The NAMMA Raw DC-8 Dropsonde dataset consists of high-resolution vertical profiles of ambient pressure, temperature, relative humidity, wind speed, and wind direction obtained by the DC-8 dropsonde system during the NASA African Monsoon Multidisciplinary Analyses (NAMMA) field campaign. The NAMMA field campaign was based in the Cape Verde Island, 350 miles off the coast of Senegal in west Africa. Commencing in August 2006, NASA scientists employed surface observation networks and aircraft to characterize the evolution and structure of African Easterly Waves (AEWs) and Mesoscale Convective Systems over continental western Africa, and their associated impacts on regional water and energy budgets. The DC-8 dropsonde system uses an integrated, highly accurate, Global Positioning System (GPS)-located atmospheric profiling dropsonde measuring and recording current atmospheric conditions in a vertical column below the aircraft. Data files are available in ASCII format for the period of August 7, 2006 through September 12, 2006.

Citations

Heysmsfield, Gerald M. and Thomas Northam. 2020. NAMMA Raw DC-8 Dropsonde [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/NAMMA/DROPSONDE/DATA301>

Keywords:

NASA, GHRC, NAMMA, DC-8, dropsonde, African Easterly Waves, mesoscale convective system, western Africa

Campaign

The NASA African Monsoon Multidisciplinary Analyses (NAMMA) field campaign was a field research investigation sponsored by the Science Mission Directorate of NASA. This mission was based in the Cape Verde Islands, 350 miles off the coast of Senegal in west Africa. Commenced in August 2006, NASA scientists employed surface observation networks and aircraft to characterize the evolution and structure of African Easterly Waves

(AEWs) and Mesoscale Convective Systems over continental western Africa, and their associated impacts on regional water and energy budgets. NASA also made extensive use of its orbiting satellites (including Aqua, Tropical Rainfall Measuring Mission (TRMM), CloudSat, and Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO)) and modeling capabilities to improve its forecasts and flight plans. For more information about the NAMMA Campaign, go to the NAMMA web site: <https://ghrc.nsstc.nasa.gov/home/field-campaigns/namma>

Instrument Description

The DC-8 dropsonde system is an Airborne Vertical Atmospheric Profiling System (AVAPS) which uses an integrated, highly accurate, GPS-located atmospheric profiling dropsonde to measure and record current atmospheric conditions (pressure, temperature, humidity, and wind) in a vertical column below the aircraft. The dropsonde, also known as dropwindsonde or parachute radiosonde, is a small, lightweight (less than 1 lb) cylindrical instrument. It is ejected from a tube in the underside of the DC-8 aircraft. A unique square-cone parachute is used to reduce the initial shock load and to slow and stabilize the descending dropsonde. The parachute is deployed immediately on exit from the launch chute and takes about five seconds to be filled by ram-air. The square-cone parachute is very stable during the descent, reducing or eliminating any pendulum motion of the dropsonde.

As the dropsonde floats to the ground on a parachute, it continuously measures and transmits measurements via a 400 MHz meteorological band telemetry link, pressure, temperature, and relative humidity, as well as GPS-based wind formation data, to the receiving system onboard the aircraft. Sensitive atmospheric sensors and computer electronics inside the dropsonde can measure changes in temperature to within 0.2 deg C, 2% variations in moisture, and wind speeds to within 0.5 m/s. The winds are computed using the GPS and thus the dropsonde also contains a special antenna to track the progress of these satellites. The dropsonde is designed and manufactured through a partnership between the National Center for Atmospheric Research (NCAR) and Vaisala, Inc.

During the NAMMA field campaign, 197 dropsonde soundings were collected during 13 research flights, off of the West coast of Africa. Two different versions of the dropsonde were used. The Rev. D dropsonde, also referred to as GPS121, is an older version. The newer Rev. F version dropsonde uses a GPS receiver based upon u-Blox GPS receiver technology. It is a code-correlating receiver providing a 12 channel receiver with a significantly improved tracking performance and reliability over the previous codeless GPS receiver used in the Rev. D dropsonde. The new GPS receiver module also provides superior latitude, longitude, and altitude information.

Additional information about dropsondes can be found at [What is a Dropsonde?](#), [AVAPS Dropsonde System](#) and [Dropsonde for Weather](#).

Investigators

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Data Characteristics

The NAMMA Raw DC-8 Dropsonde data were collected by the DC-8 dropsonde system over western Africa during the NAMMA campaign. These raw data are available at a Level 1A processing level. More information about the NASA data processing levels is available on the [EOSDIS Data Processing Levels webpage](#). The characteristics of this dataset are listed in Table 1 below.

Table 1: Data Characteristics

Characteristic	Description
Platform	NASA DC-8
Instrument	Dropsonde
Spatial Coverage	N: 47.453, S: 7.485, E: -12.741, W: -93.799 (Cape Verde Island)
Spatial Resolution	point
Temporal Coverage	August 7, 2006 - September 12, 2006
Temporal Resolution	Hourly -< Daily
Sampling Frequency	0.5 second
Parameter	Atmospheric pressure, temperature, relative humidity, and wind
Version	1
Processing Level	1A

File Naming Convention

The NAMMA Raw DC-8 Dropsonde dataset consists of raw data files in ASCII format. These files are named using the following convention:

Data files: NAMMA_DROP_YYYYMMDD_hhmmss_P.dat

Table 2: File naming convention variables

Variable	Description
YYYY	Four-digit year

MM	Two-digit month
DD	Two-digit day
hh	Two-digit hour (UTC)
mm	Two-digit minute (UTC)
ss	Two-digit second (UTC)
.dat	ASCII file format

Data Format and Parameters

The NAMMA Raw DC-8 Dropsonde dataset consists of atmospheric pressure, temperature, relative humidity, and wind measurements obtained by dropsondes released from the DC-8 aircraft. Data files are at a Level 1A processing level and provided in ASCII format.

Each raw data file consists of 3 parts: (A) the 5-line header, (B) individual data records and (C) the 20-line additional information. For all 3 parts, the first column gives AVAPS receiving channel and the second column gives a data source indicator (i.e., STA, COM, LAU, A##, P##, S##, VER, FMT, TOF, END).

(A) Header

Line 1: basic information including unique sonde id and date and time of launch

Line 2: description of the data contained in the columns below

Line 3: continuation of description of the data contained in the columns below

Line 4: corresponding units for the data contained in the columns below

Line 5: dashes (--- characters) signifying the end of the header.

(B) Data Records

The data records have 20 data columns as listed in Table 3. The first data line contains 5 fields only: AVAPS receiving channel, data source indicator, sonde id, actual release time (date, time) of the dropsonde. Missing data are indicated by values 99999.00, 9999.00, 999.00, 999.000000 or 99.00.

Table 3. Data columns in NAMMA Raw DC-8 Dropsonde data files.

Column #	Field Name	Description	Units
1	AVAPS-###	AVAPS receiving channel	-
2	A##, P##, S##	Data source indicator	-
3	Sonde ID	Unique sonde ID	-
4	UTC Date	UTC Date (YYMMDD)	-
5	UTC Time	UTC Time (hhmmss.ss)	-
6	Air Press	Air Pressure	mb
7	Air Temp	Air Temperature	Degrees Celsius
8	Rel Humid	Relative Humidity	%
9	Wind Dir	Wind Direction	Degrees with respect to North

10	Wind Spd	Horizontal Wind Speed	m/s
11	Vert Veloc	Vertical Wind Speed	m/s
12	GPS Longitude	GPS Longitude	Degrees East
13	GPS Latitude	GPS Latitude	Degrees North
14	Geopoten Altitude	Geopotential Altitude	m
15	GPS Wnd Sat	Number of GPS Satellites used for wind retrieval	-
16	Sonde RH1	Individual Sensor Relative Humidity	%
17	Sonde RH2	Individual Sensor Relative Humidity not relevant for newer dropwindsondes	%
18	GPS Snd Sat	Total Number of GPS Satellites	-
19	Wind Error	Wind Error estimated from AVAPS system	m/s
20	GPS Altitude	GPS reported Geometric Altitude	m

(C) Additional Information

This section contains 20 lines providing additional information about the data in this file. An example is given below.

```

AVAPS-T01 COM Data Type/Data Channel: AVAPS SOUNDING DATA, Channel 1
AVAPS-T01 COM Project Name/Mission ID: NAMMA, RF#2
AVAPS-T01 COM Aircraft Type/ID: McDonnell Douglas DC-8, N817NA
AVAPS-T01 COM Launch Time (y,m,d,h,m,s): 2006/08/07, 19:31:32.71
AVAPS-T01 COM Sounding Name: none
AVAPS-T01 COM Sonde ID/ID$/Built/Firmware/Type: 060226333, B0226333, 2006/02/23, 2.00, Vaisala RSS903 & Ublox TIM-Lx
AVAPS-T01 COM Sonde Freq/Batt/Shutoff/Sensor: 400.90 MHz, 16.4 v, 99999.0 sec, RSS903 (binary coeff)
AVAPS-T01 COM Sonde Baseline Errors (p,t,h1,h2): 0.0 mb, 0.0 C, 0.0 %, 0.0 %
AVAPS-T01 COM Sonde Dynamic Errors (p,t,h): -0.4 mb, 0.0 C, 0.0 %
AVAPS-T01 COM Pre-launch Obs Data System/Time: NASA DC-8 (DADS), 19:31:24.00
AVAPS-T01 COM Pre-launch Obs (p,t,d,h): 197.3 mb, -52.3 C, 0.0 C, 999.0 %
AVAPS-T01 COM Pre-launch Obs (wd,ws): 275.0 deg, 46.8 m/s
AVAPS-T01 COM Pre-launch Obs (lon,lat,alt): -93.851667 deg, 46.851667 deg, 11889.6 m, ( 93 51.1000'W, 46 51.1000'N)
AVAPS-T01 COM Operator Name/Comments: RWP, test
AVAPS-T01 COM Standard Comments: none
AVAPS-T01 VER 4.4.6 SOFTWARE VERSION 4.4.6 - 20 JUN 2006; ADDS:
AVAPS-T01 FMT NOAA 1.6 FORMAT VERSION NOAA 1.6 - 01 MAR 2005; ADDS: GPS ALTITUDE; UTC TIMESTAMP
RESOLUTION INCREASED TO 0.01 SEC; GPS LON & LAT RESOLUTION INCREASED TO 6 PLACES
AVAPS-T01 TOF 0.00 Met/Wind Offset: ptu data leads wind data by 0.00 sec
AVAPS-T01 END 060226333 060807 193337.19

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Quality Assessment

No quality control has been applied to these data and it is not suitable for scientific research without first processing with software such as The National Center for Environmental Research (NCAR) Atmospheric Sounding Processing Environment (ASPEN) program. The ASPEN software is freeware and can run on any Windows, Mac or Linux compatible computer platform. To download a copy of the latest version and obtain

documentation, please visit the following website from the NCAR Atmospheric Technology Division (ATD): <http://www.eol.ucar.edu/software/aspn>

Software

These data files are in ASCII format and do not require any specific read software.

Known Issues or Missing Data

Missing data are indicated by values 99999.00, 9999.00, 999.00, 999.000000, 99.00, or 99.000000.

References

UCAR/NCAR - Earth Observing Laboratory. (1993). NCAR Airborne Vertical Atmospheric Profiling System (AVAPS). UCAR/NCAR - Earth Observing Laboratory.

<https://doi.org/10.5065/D66W9848>

Hock, T. F., Franklin, J. L. (1999). The NCAR GPS Dropwindsonde. Bull. Amer. Meteor. Soc., 80, 407-420.

<https://journals.ametsoc.org/doi/pdf/10.1175/1520-0477%281999%29080%3C0407%3ATNGD%3E2.0.CO%3B2>

Contact Information

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

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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/>

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