



Data User Guide

GPM Ground Validation NASA DC-8 Navigation Data OLYMPEX

Introduction

The GPM Ground Validation NASA DC-8 Navigation Data OLYMPEX dataset supplies navigation data collected by the NASA DC-8 aircraft for flights that occurred during November 5, 2015 through December 19, 2015 for the Olympic Mountains Experiment (OLYMPEX) GPM Ground Validation field campaign. This navigation dataset consists of multiple altitude, pressure, temperature, airspeed, and ground speed measurements in ASCII-IWG1 and XML data formats.

Notice:

There is one file per NASA DC-8 aircraft flight. Since flights do not occur on a regular basis during the field campaign, there are missing days between November 5, 2015 through December 19, 2015.

Citation

Yang Martin, Melissa. 2017. GPM Ground Validation NASA ER-2 Navigation Data OLYMPEX [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/GPMGV/OLYMPEX/NAV/DATA301>

Keywords:

NASA, GHRC, OLYMPEX, Washington, DC-8, aircraft, navigation, aircraft characteristics, flight times and locations

Campaign

The Global Precipitation Measurement (GPM) mission Ground Validation campaign used a variety of methods for validation of GPM satellite constellation measurements prior to and after launch of the GPM Core Satellite, which launched on February 27, 2014. The instrument validation effort included numerous GPM-specific and joint agency/international external field campaigns, using state of the art cloud and precipitation observational infrastructure (polarimetric radars, profilers, rain gauges, and disdrometers). Surface rainfall was measured by very dense rain gauge and disdrometer networks at various field campaign sites. These field campaigns accounted for the majority of the effort and resources expended by GPM GV. More information about the GPM mission is available at <https://pmm.nasa.gov/GPM/>.

One of the GPM Ground Validation field campaigns was the Olympic Mountains Experiment (OLYMPEX) which was held in the Pacific Northwest. The goal of OLYMPEX was to validate rain and snow measurements in midlatitude frontal systems as they move from ocean to coast to mountains and to determine how remotely sensed measurements of precipitation by GPM can be applied to a range of hydrologic, weather forecasting, and climate data. The campaign consisted of a wide variety of ground instrumentation, several radars, and airborne instrumentation monitoring oceanic storm systems as they approached and traversed the Peninsula and the Olympic Mountains. The OLYMPEX campaign was part of the development, evaluation, and improvement of GPM remote sensing precipitation algorithms. More information is available from the NASA GPM Ground Validation web site <https://pmm.nasa.gov/olympex> and the University of Washington OLYMPEX web site <http://olympex.atmos.washington.edu/>.



Figure 1: OLYMPEX Domain
(Image Source: <https://pmm.nasa.gov/OLYMPEX>)

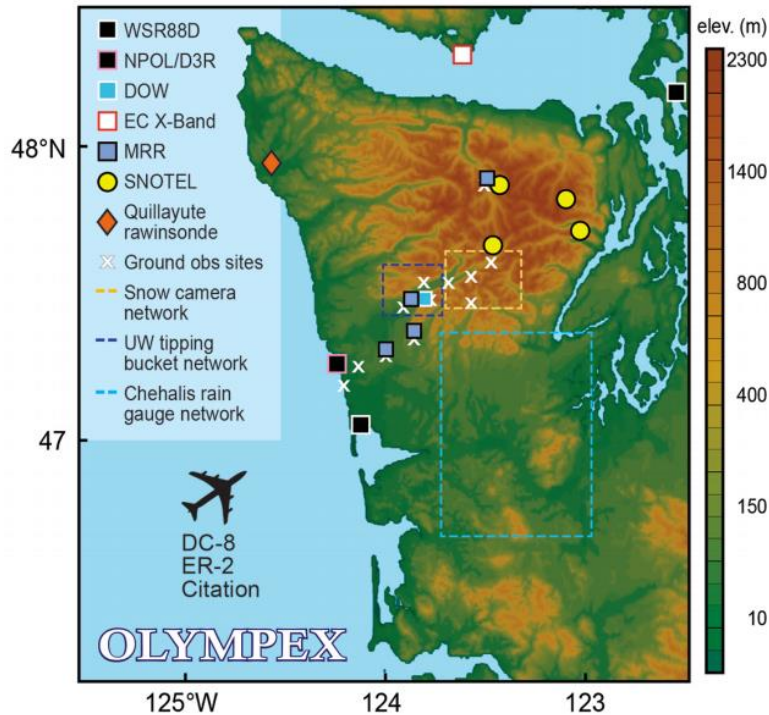


Figure 2: OLYMPEX Field Locations
 (Image Source: <https://pmm.nasa.gov/OLYMPEX>)

Aircraft Description

The NASA DC-8 aircraft is a four-engine jet transport aircraft with the ability to fly at altitudes ranging from 1,000 to 42,000 feet for up to 12 hours. This aircraft can also carry about 30,000 pounds of equipment and scientific instruments, as well as seat up to 45 flight crew and experiments. The NASA DC-8 aircraft is used to collect data in support of many scientific projects and is based at the NASA Armstrong Flight Research Center in Palmdale, California. The DC-8 aircraft has been used for various types of missions including sensor development, space vehicle launch or reentry telemetry data retrieval and optical tracking, satellite sensor verification, and basic surface and atmospheric research. The NASA DC-8 aircraft is a relatively inexpensive way to test and verify satellite instruments. More information about the NASA DC-8 aircraft is available on the [NASA Armstrong Fact Sheet: DC-8 Airborne Science Laboratory](#).



Figure 3: NASA DC-8 aircraft

(Image source: [NASA Armstrong Fact Sheet: DC-8 Airborne Science Laboratory](#))

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Data Characteristics

The GPM Ground Validation NASA DC-8 Navigation Data OLYMPEX data files are available in ASCII-IWG1 and XML formats at a Level 1A data processing level. More information can be found about data processing levels on the [NASA Data Processing Levels website](#).

Table 1: Data Characteristics

Characteristic	Description
Aircraft	NASA DC-8
Projection	n/a
Spatial Coverage	N: 49.334, S: 30.369, E: -117.797, W: -129.061 (Washington)
Temporal Coverage	November 5, 2015 - December 19, 2015
Temporal Resolution	1 file per flight
Sampling Frequency	<1 second
Parameter	Aircraft and atmospheric conditions
Version	1
Processing Level	1A

File Naming Convention

The GPM Ground Validation NASA DC-8 Navigation Data OLYMPEX data files have the file naming convention shown below. The data files are available in ASCII-IWG1 and XML formats. The IWG is a particular style of ASCII file often used for aircraft navigation data. For more information, see the [UCAR IWG1 specifications](#).

There are two data files, one with measurements every second, the other with measurements every 10th of a second (10Hz).

Data files: olympex_navdc8_[IWG1|IWG1_10hz]_YYYYMMDD-hhmm.txt

Data Parameter description files:

olympex_navdc8_[IWG1_10hz_parameters|IWG1_parameters]_YYYYMMDD.xml

Table 2: File naming convention variables

Variable	Description
[IWG1_10hz_parameters IWG1_parameters]	<p>10hz: data file with measurement every 1/10th of a second. Files without the 10hz designation have measurements every 1 second</p> <p>IWG1_10hz_parameters: list of parameters within the IWG1 10hz files</p> <p>IWG1_parameters: list of parameters within the 1 second IWG1 data files</p> <p>There are also files that do not have any of the variables listed above. These files are considered IWG1 files, which is a specific style of file used for aircraft navigation. Platform characteristics are provided over time of the flight.</p>
YYYY	Four-digit year
MM	Two-digit month
DD	Two-digit day
hh	Two-digit hour in UTC
mm	Two-digit minute in UTC
[txt xml]	<p>txt: ASCII-IWG1 file format</p> <p>xml: XML file format</p>

Data Format and Parameters

The GPM Ground Validation NASA DC-8 Navigation Data OLYMPEX dataset consists of ASCII-IWG1 and XML data files. The data files contain platform characteristics of the NASA DC-8 aircraft while in flight during the OLYMPEX field campaign. There is 1 file per DC-8 flight. The IWG1 is a particular style of ASCII file often used for aircraft navigation data. For more information, see the [UCAR IWG1 specifications](#). Table 3 describes the platform characteristics of the OLYMPEX DC-8 files.

Table 3: Data Fields

Field Name	Description	Unit
TimeStamp	UTC system timestamp (Unix epoch)	UTC
Latitude	Latitude, +/- 180 degrees	deg
Longitude	Longitude, +/- 180 degrees	deg
GPS_Alt_MSL	GPS altitude above mean surface level	m
GPS_Altitude	GPS altitude, +/- 30,000 meters	m
Pressure_Altitude	Pressure altitude, 0-131,072 feet	ft
RADAR_Altitude	Radar altitude	ft
Ground_Speed	Ground speed, 0-2,107 m/s	m/s
True_Air_Speed	True air speed, 0-1,054 m/s	m/s
Indicated_Air_Speed	Indicated air speed, 0-1,024 knots	kts
Mach_Number	Mach number, 0-4.096	-
Vertical_Speed	Vertical speed, 0-9,988 m/s	m/s
True_Heading	True heading, 0.0-360.0 degrees	deg
Track_Angle	Track angle, +/- 180 degrees	deg
Drift_Angle	Drift angle, +/- 180 degrees	deg
Pitch_Angle	Pitch angle, +/- 180 degrees	deg
Roll_Angle	Roll angle, +/- 180 degrees	deg
Slip_Angle	Slip angle	deg
Attack_Angle	Angle of attach	deg
Static_Air_Temp	Static air temperature, +/- 512 deg C	deg C
Dew_Point	Dew/frost point temperature	deg C
Total_Air_Temp	Total air temperature, +/- 512 deg C	deg C
Static_Pressure	Static pressure, 0-1,013.25 mb	mb
Dynamic_Pressure	Dynamic pressure	mb
Cabin_Pressure	Cabin pressure, 0-1,333 mb	mb
Wind_Speed	Wind speed, 0-132 m/s	m/s
Wind_Direction	Wind direction, +/- 180 deg	deg
Vert_Wind_Speed	Vertical wind speed	m/s
Solar_Zenith_Angle	Solar zenith angle	deg
Aircraft_Sun_elevation	Sun elevation in aircraft reference frame	deg
Sun_Azimuth	Solar azimuth angle	deg
Aircraft_Sun_Azimuth	Sun azimuth in aircraft reference frame	deg

Software

These data are available in ASCII-IWG1 and XML formats; therefore, no software is required to view these data. XML files can be easier using online XML format tools or open the file with Excel and converted to an Excel sheet.

Known Issues or Missing Data

Since these data files are collected during each NASA DC-8 flight, there are missing days between November 5, 2015 through December 19, 2015 as flights did not occur on a regular bases.

Related Data

All data collected during the OLYMPEX field campaign are related to this dataset. Other OLYMPEX campaign data can be located using the GHRC HyDRO 2.0 search tool by entering "OLYMPEX" in the search bar.

In addition, other data that used the NASA DC-8 aircraft as a platform are related to this dataset. The following instruments flew on the NASA DC-8 aircraft:

GPM Ground Validation Advanced Vertical Atmospheric Profiling System (AVAPS)
OLYMPEX (<http://dx.doi.org/10.5067/GPMGV/OLYMPEX/AVAPS/DATA101>)

GPM Ground Validation Airborne Precipitation Radar 3rd Generation (APR-3) OLYMPEX
(<http://dx.doi.org/10.5067/GPMGV/OLYMPEX/APR3/DATA101>)

GPM Ground Validation Conical Scanning Millimeter-wave Imaging Radiometer (CoSMIR)
OLYMPEX (<http://dx.doi.org/10.5067/GPMGV/OLYMPEX/COSMIR/DATA301>)

Contact Information

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

NASA Global Hydrology Resource Center DAAC

User Services

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