Data User Guide

GPM Ground Validation UND Citation Cloud Microphysics GCPEx Version 2

Introduction

The GPM Ground Validation UND Citation Cloud Microphysics GCPEx dataset includes instrument measurements of cloud microphysics, state of the atmosphere parameters, bulk aerosols, three-dimensional winds, and turbulence. These measurements were taken by the University of North Dakota's (UND) Cessna Citation aircraft, an in situ platform used during the GCPEx campaign. The GPM Ground Validation UND Citation Cloud Microphysics GCPEx data are stored as a separate file for each flight, including both a primary file containing direct and derived parameters, and raw data files for each cloud instrument aboard the Citation. This dataset contains measurements collected across 12 data missions from January 19, 2012 through February 24, 2012.

Notice:
Version 2 of this data contains updated navigation information as of May 23, 2016.

Citation

Delene, David and Michael R Poellot. 2016. GPM Ground Validation UND Citation Cloud Microphysics GCPEX V2 [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A.
https://fcportal.nsstc.nasa.gov/pub/gpm_validation/gcpex/cloud_microphysics_Citation/UND_cloud_microphysics/
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Keywords:

Aerosols; atmospheric water vapor; clouds

Campaign

The Global Precipitation Measurement (GPM) Cold-season Precipitation Experiment (GCPEx) occurred in Ontario, Canada during the winter season of 2011-2012. GCPEx addressed shortcomings in the GPM snowfall retrieval algorithm by collecting microphysical properties associated remote sensing observations, and coordinated model simulations of precipitating snow. These data sets were collected to aid in the achievement of the overarching goal of GCPEx, which is to characterize the ability of multi-frequency active and passive microwave sensors to detect and estimate falling snow.

Further details on GCPEx are available at http://gpm.nsstc.nasa.gov/gcpex. More information on the GPM mission is available at http://pmm.nasa.gov/GPM.

Instrument Description

The UND Cessna Citation II Research Aircraft used for the GCPEx experiment is owned and operated by the University of North Dakota. The Citation II is a twin-engine fanjet with an operating ceiling of 43,000 feet (13.1 km). The turbofan engines provide sufficient power to cruise at speeds of up to 340 knots (175 ms^{-1}) or climb at 3300 feet per minute (16.8 ms^{-1}). These high performance capabilities are accompanied by relatively low fuel consumption at all altitudes, giving the Citation an on-station time of 3-5 hours, depending on mission type. The UND Citation II has long wings allowing it to be operated out of relatively short airstrips, and to be flown at the slower speeds of 140 kts (72 ms^{-1}) which are necessary for many types of measurements. The Citation is certified for flight into known icing conditions. Further details on the UND Cessna Citation II are available at http://cumulus.atmos.und.edu/ .

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File Naming Convention

The files are named using the following naming convention.

Quality Controlled Data:
yyyy_mm_dd_hh_mi_ss.conc.cdp.1Hz
yyyy_mm_dd_hh_mi_ss.gcpex

Raw Data:

yyyymmdd_hhmiss_mmddhhmi.roi
yyyy_mm_dd_hh_mi_ss.sea
NAVyyyymmddhhmiss.HVPS
baseyyyymmddhhmiss.HVPS

Table 1: File naming convention variables

Variable	Description
yyyy	Four-digit year
mm	Two-digit month
dd	Two-digit day
hh	Two-digit hour
mm	Two-digit minute
ss	Two-digit second
conc	Concentration
cdp	Cloud Droplet Probe
HZ	Hertz
gcpex	GPM Cold-season Experiment
roi	Report object instance
sea	Science Engineering Associates
HVPS	High Volume Precipitation Spectrometer
NAV	Navigation

Data Format Description

The GPM Ground Validation UND Citation Cloud Microphysics GCPEx dataset consists of QC processed (.conc.cdp.1Hz and .gcpex) files. Processed data files are in the UND-NASA-AMES format. The dataset also contains the raw (.roi, .sea, and .HVPS) files. The Science Engineering and Associates (SEA) model M300 data system manual contains file format information for the .sea files. In order to process the raw .sea data files, the M300 instrument tag numbers need to be used. The SPEC Inc. Cloud Particle Imager manual contains file format information for the .roi files. File format information for the .HVPS files is available in the SPEC Inc. HVPS3 manual. The CPI and HVSP manuals can be downloaded at http://www.specinc.com/downloads.

More information on the GPM Ground Validation UND Citation Cloud Microphysics GCPEx dataset can be found in the UND Citation Data Summary document.

Table 2: Data Characteristics

Characteristic	Description
Platform	University of North Dakota (UND) Cessna Citation aircraft II (UND CITATION II)
Instrument	Multiple instruments, see table 3
Spatial Coverage	N: 46.5, S: 43.5, E: -78, W: -81 (Ontario, Canada)
Temporal Coverage	Start date: 01-19-2012 Stop date: 02-24-2012

Temporal Resolution	One flight per day
Parameter	Cloud microphysics
Version	2
Processing Level	2
Data Format	ASCII, BIN

Data Parameters

The GPM Ground Validation UND Citation Cloud Microphysics GCPEx dataset contains the following instruments and measurements described in table 3.

Table 3: Data Fields

Parameter Measured	Instrument	Instrument Description
State Parameters	Total Temperature Probe Pressure Transducer Cooler Mirror Hydrometer Laser Hygrometer	Flight Level Temperature Flight Level Pressure Dew/Frost Point Dew/Frost Point Temperature
Winds and Turbulence	Gust Probe Pitot Tube	Airspeed, Angles and Attack & Slideslip Airspeed, Turbulence
Cloud Imaging and Sizing	CDP PMS 2DC Cloud Imaging Probe (CIP) CPI HVPS-3	Cloud Droplet Concentration & Size Cloud Particle Imaging Probe Cloud Particle Imaging Probe Small Cloud Particle Imaging Probe Precipitation Particle Imaging Probe
Water	King Probe Nevzorov Probe Rosemount Icing Detector	Liquid Water Content Liquid Water & Total Water Content Supercooled Liquid Water Presence & Content
Aerosols	CPC	Condensation Particle Counter
Aircraft	Applanix	Inertial Platform with Integrated GPS

The complete list of measurements and associated instruments is available in the header block of the QC processed data files. More information on Citation flight days can be found in the GCPEx Citation Mission Summary document. Additional campaign collections containing UND Citation Cloud Microphysics data can be found at http://ghrc.nsstc.nasa.gov.

Quality Assessment

More information on missing data and data quality can be found in the GCPEx Citation Data Edit Overview document.

References

Delene, D. J., Airborne Data Processing and Analysis Software Package, Earth Science Informatics, 4(1), 29-44, 2011, URL: http://dx.doi.org/10.1007/s12145-010-0061-4, DOI: 10.1007/s12145-010-0061-4.

Contact Information

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

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