Global Hydrology Resource Center

Data User Guide

GPM Ground Validation Met One Rain Gauge Pairs IPHEx V2

Introduction

The GPM Ground Validation Met One Rain Gauge IPHEx V2 data were collected during the Integrated Precipitation and Hydrology Experiment (IPHEx) using Met One Model 380 tipping bucket precipitation gauges from September 11, 2013 to October 30, 2014 in the Southern Appalachians, spanning into the Piedmont and Coastal Plain regions of North Carolina. The goal of IPHEx was to evaluate the accuracy of satellite precipitation measurements and use the collected data for hydrology models in the region. The dataset contains two ASCII files per rain gauge with two rain gauges on a station platform. The gag dataset is quality-controlled reformatted precipitation recorded in millimeters at a temporal resolution of 1 minute and the gmin dataset contains cubic spline interpolated rain rates in millimeters per hour at 1 minute resolution.

Notice: Version 1 of this data set was produced by the PI and delivered to GHRC for access on the ftp server, but was never officially published. This version 2 is an updated data set with a different data file configuration.

Citation

Petersen, Water A., David Wolff, Jianxin Wang and Ali Tokay. 2016. GPM Ground Validation Met One Rain Gauge Pairs IPHEx V2, [indicate subset used]. Dataset available online from the NASA Global Hydrology Resource Center DAAC, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org/10.5067/GPMGV/IPHEX/GAUGES/DATA201

Keywords

NASA, GHRC, PMM, IPHEx, GPM GV, North Carolina, rain gauges, tip bucket, Met One, precipitation amount, precipitation rate

Campaign

The Global Precipitation Measurement mission Ground Validation (GPM GV) 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). These field campaigns accounted for the majority of the effort and resources expended by the GPM GV mission. More information about the GPM GV mission is available at the PMM Ground Validation webpage.

One of the GPM GV field campaigns was the Integrated Precipitation and Hydrology Experiment (IPHEx) which was held in North Carolina during 2014 with an intense study period from May 1 to June 15, 2014. The goal of IPHEx was to characterize warm season orographic precipitation regimes and the relationship between precipitation regimes and hydrologic processes in regions of complex terrain. The IPHEx campaign was part of the development, evaluation, and improvement of remote-sensing precipitation algorithms in support of the GPM mission through the NASA GPM GV field campaign (IPHEX_GVFC) and the evaluation of Quantitative Precipitation Estimation (QPE) products for hydrologic forecasting and water resource applications in the Upper Tennessee, Catawba-Santee, Yadkin-Pee Dee, and Savannah river basins (IPHEX-HAP, H4SE). NOAA Hydrometeorology Testbed (HTM) has synergy with this project. More information about IPHEx is available at the IPHEx Field Campaign webpage.

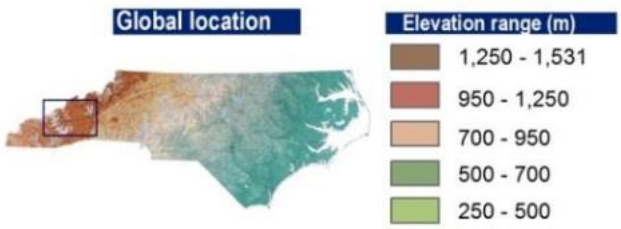

Figure 1: Region of North Carolina IPHEx campaign ground validation (image source: http://gpm-gv.gsfc.nasa.gov/Gauge/)

Instrument Description

The Model 380 precipitation gauge, manufactured by Met One Instruments Inc., is a tipping bucket rain gauge which measures the amount of fallen precipitation (rain and/or snow). The gauge has a 30.5cm (12 inch) diameter catchment funnel that directs precipitation to a tipping bucket assembly. When 0.254mm (.01 inch) of precipitation is collected, the tipping bucket assembly tips, draining the collection and activating a mercury switch for recording data. There are two gauges located on each platform as shown in Figure 2.

Additional details about the Met One Model 380 precipitation gauge can be found in the Met One Model 380 specs documentation.

Figure 2: Dual tipping rain gauge bucket used for GPM-GV
(image source: http://gpm-gv.gsfc.nasa.gov/Gauge/)

Table 1: Rain gauge locations

Station ID	Latitude	Longitude
NASA0026(A|B)	35.464	-83.113
NASA0027(A|B)	35.577	-82.772
NASA0028(A|B)	35.306	-83.202
NASA0029(A|B)	35.373	-83.506
NASA0030(A|B)	35.804	-82.660
NASA0031(A|B)	35.885	-82.584
NASA0032(A|B)	35.620	-83.117
NASA0033(A|B)	35.441	-83.074
NASA0034(A|B)	35.562	-83.497
NASA0035(A|B)	35.616	-82.565
NASA0036(A|B)	35.568	-83.025
NASA0037(A|B)	35.613	-82.847
NASA0038(A|B)	35.425	-82.757
NASA0039(A|B)	35.778	-83.214
NASA0040(A|B)	35.664	-83.590
NASA0041(A|B)	35.686	-83.500
NASA0042(A|B)	35.517	-82.965
NASA0043(A|B)	35.083	-82.870
NASA0044(A|B)	35.195	-82.872
NASA0045(A|B)	35.315	-82.871

*There are slight variations in some gauge locations

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Data Characteristics

The GPM Ground Validation Met One Rain Gauge Pairs IPHEx data product contains text format data files organized by station and rain gauge. Two types of files exist for each gauge, one gag and one gmin. Each text file contains two header lines followed by the station data. The files contain non-zero rainfall data only and are therefore not a complete time series. More information about the NASA data processing levels are available on the EOSDIS Data Processing Levels webpage.

Table 2: Data Characteristics

Characteristic	Description
Platform	Ground station
Instrument	Met One Model 380 Precipitation Gauge
Spatial Coverage	N: 35.8857 S: 35.083 E: -82.5649 W: -83.5908 (North Carolina)
Spatial Resolution	Point
Temporal Coverage	September 11, 2013 - October 30, 2014
Temporal Resolution	Monthly -< Annual
Sampling Frequency	1 second
Parameter	Precipitation, precipitation amount, precipitation rate
Version	2
Processing Level	2

File Naming Convention

The GPM Ground Validation Met One Rain Gauge Pairs IPHEx dataset consists of ASCII files. The files are named with the following convention:

Data files:
iphex_raingauge_NASA00##_X_<YYYYMMDD_start>_<YYYYMMDD_end>_[gag|gmin].txt

Table 3: File naming convention variables

Variable	Description
NASA00##	Station platform number

X	Rain gauge letter (A or B) equipped on each platform
YYYY	Year
MM	Month of year
DD	Day of month
_start	Indicating the start date
_end	Indicating the end date
gmin	Cubic spline interpolated 1-hour rain rates (mm/h) at 1-min intervals calculated using the algorithm of Wang et al. 2008
gag	Quality controlled reformatted rainfall data (mm) with a resolution of 1 second

Data Format and Parameters

There are two rain values associated with this data product, each in separate files. The tipping bucket rain gauge rainfall values (mm) are in the gag files and the cubic-spline interpolated hourly rain rates (mm/hr) provided at 1 minute intervals are in the gmin files. Each station platform has two gauges, referred to as gauge A or B, shown in Figure 2. There is a separate set of files (gmin and gag) for each gauge. The latitude and longitude of each rain gauge is provided in the file. The two file types contain measurements of fallen precipitation at recorded points in time and cubic spline interpolated rain rates during the study period 1-year extended observation period of IPHEx, from October 2013 to October 2014.

The first header line contains the data year, field program, gauge identification number, gauge type and bucket resolution. The second header line contains the column headers for each file type, listed in Table 3 and Table 4 below.

Table 4: Column descriptions for gag files.

Column title	Description	Unit
Year	Year	-
Mon	Month	-
Day	Day	-
Jday	Julian Day	-
Hr	Hour	UTC
Min	Minute	UTC
Sec	Second	UTC
Rain [mm]	Rain Amount	mm
Lat	Latitude	degrees
Lon	Longitude	degrees

Table 5: Column descriptions for gmin files.

Column title	Description	Unit
Year	Year	-
Mon	Month	-

Day	Day	-
Jday	Julian Day	-
Hr	Hour	UTC
Min	Minute	UTC
Rain [mm/h]	Rain Rate	mm/h
Lat	Latitude	degrees
Lon	Longitude	degrees

Algorithm

To create a quasi-continuous time series of 1-minute hourly rain rates, a cubic-spline algorithm is used to interpolate the measured gauge data. The algorithm used is described in Wang et al. 2008.

Quality Assessment

The rain gauges have a reported accuracy of ±0.5% at 13 mm/hr and ±1% at 25 - 75 mm/hr. Errors in tipping-bucket rain gauge measurement have been reported in Ciach, 2003, Tokay et al., 2010, Wang et al., 2008, Wang et al., 2010, and Wang et al., 2012.

Software

No software is required to view these data files. The GPM Ground Validation Met One Rain Gauge Pairs IPHEx ASCII text files can be viewed in a text editor or in a spreadsheet software, such as Microsoft Excel or Notepad++.

Known Issues or Missing Data

There are no known issues with these data or any known gaps in the dataset.

References

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Related Data

All data from other instruments collected during the IPHEx field campaign are related. Other IPHEx campaign data can be located using HyDRO 2.0 with the search term "IPHEx". The complete IPHEx field campaign data collection is available here.

Below are datasets from other GPM GV field campaigns that used the Met One rain gauge pairs.

GPM Ground Validation Met One Rain Gauge Pairs OLYMPEX
(http://dx.doi.org/10.5067/GPMGV/OLYMPEX/GAUGES/DATA201)

GPM Ground Validation Met One Rain Gauge Pairs IFloodS V2
(http://dx.doi.org/10.5067/GPMGV/IFLOODS/GAUGE/DATA202)

GPM Ground Validation Met One Rain Gauge Pairs Wallops Flight Facility (WFF)
(http://dx.doi.org/10.5067/GPMGV/WFF/RAINGAUGE/DATA101)

GPM Ground Validation [Met One] Rain Gauge Pairs MC3E V2
(http://dx.doi.org/10.5067/GPMGV/MC3E/GAUGE/DATA202)

Contact Information

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

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