Global Hydrology Resource Center

Data User Guide

GPM Ground Validation Met One Rain Gauge Pairs IFloodS V2

Introduction

The GPM Ground Validation Met One Rain Gauge IFloodS V2 data were collected during the Iowa Flood Studies (IFloodS) ground measurement campaign by using Met One Model 380 tipping bucket precipitation gauges from May 1 to June 15, 2013. The gauges were deployed alongside Autonomous Parsivel Units (APU) to directly measure precipitation amounts. The dataset includes two ASCII files per rain gauge with two rain gauges on a platform at each station location. The gag dataset is quality-controlled recorded precipitation in millimeters at a temporal resolution of 1 second and the gmin dataset contains cubic spline interpolated rain rates in millimeters per hour at 1 min resolution.

Notice:
Version 1 has been available at GHRC since July 2014. This version 2 is an updated IFloodS rain gauge dataset with updated values and a different file format and was released in July 2016. Version 2 data now include the latitude and longitude of each platform on each data line.

Citation

Petersen, Water A., David Wolff, Jianxin Wang and Ali Tokay. 2016. GPM Ground Validation Met One Rain Gauge Pairs IFloodS V2 [indicate subset used]. Data set 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/IFLOODS/GAUGE/DATA202

Keywords:

NASA, GHRC, IFloodS, IFloods-v2, GPM GV; precipitation measurements, precipitation amount, precipitation rate, Iowa, tip bucket, cubic spline, rain-gauges-ifc, rain-gauges-nasa

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/.

The Iowa Flood Studies (IFloodS) campaign was a ground measurement campaign that took place in eastern Iowa from May 1 to June 15, 2013. The goals of the campaign were to collect detailed measurements of precipitation at the Earth's surface using ground instruments and advanced weather radars and to simultaneously collect data from satellites passing overhead. The ground instruments characterize precipitation – the size and shape of raindrops, the physics of ice and liquid particles throughout the cloud and below as it falls, temperature, air moisture, and distribution of different size droplets – to improve rainfall estimates from the satellites, and in particular the algorithms that interpret raw data for the GPM mission's Core Observatory satellite, which launched in 2014. More information about IFloodS is available at http://gpm.nsstc.nasa.gov/ifloods/. Additional information about the Iowa Flood Center is available at http://iowafloodcenter.org/.

Instrument Description

The Met One Model 380 Precipitation Gauge, manufactured by Met One Instruments Inc., is a tipping bucket rain gauge which measures the amount of fallen precipitation. The gauge has a 12 inch (30.5cm) diameter catchment funnel that directs precipitation to a tipping bucket assembly. When 0.01 inch (0.254mm) of precipitation is collected, the tipping bucket assembly tips, draining the collection and activating a mercury switch for recording data. Figure 1 below shows an example of two rain gauges at a NASA platform.

More information about the Met One Model 380 Precipitation Gauge can be found at http://www.metone.com/docs/370_380_precipitation_gauge.pdf.

Fig 1: Dual tipping rain gauge bucket used for GPM GV
(image source: http://gpm-gv.gsfc.nasa.gov/Gauge/)

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File Naming Convention

The GPM Ground Validation Met One Rain Gauge IFloodS Version 2 dataset consists of 2 ASCII files per rain gauge. There may be 1 or 2 rain gauges per site. The sites are named by either the APU instrument at which the rain gauge is located at or the file may be named for the NASA site which contains two gauges. The data file names have the following file naming convention:

APU site:
ifloods_raingauge_APU##_[YYYYMMDD_start]_[YYYYMMDD_end]_[gag|gmin].txt

NASA site:
ifloods_raingauge_NASA00##_X_[YYYYMMDD_start]_[YYYYMMDD_end]_[gag|gmin].txt

Table 1: File naming convention variables

Variable	Description
APU##	APU station identifier
NASA00##_X	Station platform number and rain gauge letter (A or B) equipped on

	each platform
YYYYMMDD_start	YYYY = year, MM = month of year, DD = day of month
YYYYMMDD_end	YYYY = year, MM = month of year, DD = day of month
gmin	Cubic spline interpolated 1-hour rain rates (mm/h) with 1-min resolution calculated using the algorithm of Wang et al. 2008 (See References)
gag	Quality controlled reformatted 1-second rainfall data (mm)

Data Format Description

This data product contains text files organized by data type, rain gauge, and platform. Two types of files exist for each gauge, .gag and .gmin. Each file contains two header lines followed by the platform data. The files contain non-zero rainfall data only and are therefore not a complete time series.

The first header line contains the data year, field program, platform number, gauge identification, gauge type, and bucket resolution. The second header line contains the column headers for each file type.

For gag files:

year, month, day, Julian day, hour, minute, second, rain rate (mm), latitude, and longitude

For gmin files:

year, month, day, Julian day, hour, minute, interpolated one minute rain rate (mm/hr), latitude, and longitude

Table 2: Data Characteristics

Characteristic	Description
Platform	GPM Ground Validation Campaign Reports Version 2 (gpmgvifloodsv2)
Instrument	Met One Rain Gauge Pairs
Projection	N/A
Spatial Coverage	Each platform is at a specific geographic location, collectively the data set is located between 42.3 and 43.4 deg latitude and -91.2 and -93.5 deg longitude
Spatial Resolution	Point source
Temporal Coverage	Extended measurement program starts April 2013 and continues to December 2013. The intense operation period is May 1, 2013 to June 15, 2013. These data files cover the extended measurement time period. Each file contains data for the year 2013.
Temporal Resolution	1 second (gag files) or 1 minute interpolated (gmin files)
Sampling Frequency	1 second
Parameter	precipitation, precipitation amount, precipitation rate
Version	2
Processing Level	2

Data Parameters

There are two rain values associated with this data products, 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 on a 1 minute resolution are in the gmin files. The latitude and longitude of each rain gauge is provided in the file.

Algorithm

To create a quasi-continuous 1-minute time series of rain rates, a cubic-spline algorithm is used to interpolate the 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 measurements have been reported in Wang et al. 2008, Wang et al., 2010, and Ciach, 2003.

References

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