Global Hydrology Resource Center

Data User Guide

GPM Ground Validation Environment Canada (EC) Weather Station XET C3VP

Introduction

The GPM Ground Validation Environment Canada (EC) Weather Station XET C3VP dataset consists of surface meteorological data collected at the Environment Canada (EC) XET station at the Centre for Atmospheric Research Experiments (CARE) during the Canadian CloudSat/CALIPSO Validation Project (C3VP) field campaign. The campaign took place in southern Canada in support of multiple science missions, including the NASA GPM mission, in order to improve the modeling and remote sensing of winter precipitation. The XET C3VP dataset file includes temperature, pressure, wind speed and direction, relative humidity, solar radiation, grass temperature, soil temperature, snow depth, sunshine, and precipitation measurements from October 4, 2006 through March 31, 2007 in ASCII-csv format.

Citation

Rodriguez, Peter. 2020. GPM Ground Validation Environment Canada (EC) Surface Meteorological Station C3VP [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/C3VP/METSTATION/DATA201

Keywords:

NASA, GHRC, EC, C3VP, CARE, XET, air temperature, air pressure, wind speed/direction, relative humidity, solar radiation, sunshine, soil temperature, grass temperature, snow depth, precipitation

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 GPM GV (Ground Validation) mission. More information about the GPM mission is available on the Precipitation Measurement Mission (PMM) Ground Validation webpage.

The Canadian CloudSat/CALIPSO Validation Project (C3VP) was an collaborative international field campaign that took place in southern Canada during the 2006/2007 winter season. With the help of multiple organizations, including the NASA GPM and PMM science teams, the campaign used various ground-based and airborne instrumentation to thoroughly study cold season precipitation systems and therefore improve the modeling and remote sensing of snowfall. The campaign took place in the vicinity of the Centre for Atmospheric Research Experiments (CARE) in the Great Lakes region of Ontario, Canada (Figure 1). The site was operated by the Meteorological Service of Canada (MSC). The main objectives of the campaign were to capture more ground and airborne observations of winter precipitation, to validate data from the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) and NASA CloudSat satellites, and to further improve the remote sensing and modeling of winter precipitation. More information about the C3VP field campaign is available on the NASA GPM C3VP webpage.

Figure 1: CARE facility located in the southern Canadian province of Ontario (left); CARE site in relation to NASA CloudSat overpasses (right)
(Image source: NASA GPM C3VP webpage)

Instrument Description

The Environment Canada (EC) Egbert, Ontario Weather Station is located at the Centre for Atmospheric Research Experiments (CARE) in Egbert, Ontario (Figure 2). XET is the station

identification label. The site hosts a number of atmospheric observation systems designed to monitor weather conditions, air pollution, and climate for various programs and campaigns. There are several instruments located at the XET weather station that provided data for C3VP. These instruments include temperature sensors, pressure sensors, anemometers, humidity sensors, solar radiation sensors, ultrasonic snow depth sensor, sunshine recorder, and precipitation gauges. Table 1 lists details about each meteorological variable and instrument.

Table 1: EC XET Weather Station meteorological variables and instrument descriptions

Variable	Instrument Description
Temperature	Air temperature is measured using liquid in glass thermometers, bimetal thermographs, or electrical thermometers.
Pressure	Atmospheric pressure is measured using sensors based on aneroid pressure transducers which provide a proportional electrical signal.
Wind direction/Speed	An anemometer is used to measure wind speed and a wind vane is used to determine wind direction.
Relative humidity	Humidity instruments include psychrometers, dewcels and hygrographs. Relative humidity is computed from these measurements.
Solar radiation	The solar radiant energy is divided into groups called Radiation Fields (RF). Each RF measures a specific type of long- or short-wave radiation using pyranometers, illuminometers, and pyrgeometers.
Soil temperature	Soil temperatures are usually measured with an electrical thermometer buried at various depths below the ground surface.
Snow depth	The Campbell Scientific Ultrasonic Snow Depth Sensor, a sonic ranging device, is used for snow depth measurements.
Sunshine	Bright sunshine measurements are made using the Campbell-Stokes Sunshine Recorder. The instrument focuses solar rays using a glass sphere to measure the duration of bright sunlight.
Precipitation	Total rainfall, total snowfall, total precipitation, and rainfall intensity are measuring using a Type A (copper) rain gauge, Type B (plastic) rain gauge, ruler, Nipher precipitation gauge, or tipping bucket rain gauge

Note: the dataset also includes battery information.

More information about the XET weather station instruments is available in the EC Atmospheric Environment Service Climatological Station Guidelines document. More information about the CARE site can be found on the Ontario environmental science centres webpage.

Figure 2: Center for Atmospheric Research Experiments (CARE) in Egbert, Ontario (Image source: IADN Sites - Monitoring Networks (ec.gc.ca))

Investigators

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Data Characteristics

The GPM Ground Validation Environment Canada (EC) Weather Station XET C3VP dataset file is stored in ASCII-csv format. The dataset includes surface meteorological data collected at the XET station. The meteorological data are listed every 1 minute and are available at a Level 2 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 2 below.

Table 2: Data Characteristics

Characteristic	Description
Platform	Environment Canada (EC) Weather Station (XET)
Instrument	Thermometers, pressure transducer, anemometer, wind vane, pyranometers, illuminometer, pyrgeometer, ultrasonic snow depth sensor, sunshine recorder
Spatial Coverage	N: 44.24 , S: 44.22 , E: -79.77, W: -79.79 (Southern Ontario, Canada)
Spatial Resolution	Point
Temporal Coverage	October 4, 2006 - March 31, 2007
Temporal Resolution	1 minute
Sampling Frequency	5 seconds (Precipitation: 5 seconds or 1-minute)

Parameter	Temperature, pressure, wind speed and direction, relative humidity, solar radiation, soil temperature, grass temperature, snow depth, sunshine, precipitation
Version	1
Processing Level	2

File Naming Convention

The GPM Ground Validation Environment Canada (EC) Weather Station XET C3VP dataset file is named using the following convention:

Data files: C3VP_XET.csv

Table 3: File naming convention variables

Variable	Description
.csv	ASCII-csv format

Data Format and Parameters

The GPM Ground Validation Environment Canada (EC) Weather Station XET C3VP dataset is stored in one ASCII-csv file. The data fields included in this file are listed in Table 4 below. The data for each field are listed in 1-minute intervals.

Table 4: EC XET Weather Station ASCII-csv Data Fields

Field Name	Description	Unit
ISO8601	Date and local time e.g. *3/31/2007 11:59:00 PM*	-
SYSTIME	System time	-
BOX_TEMP_DEGC	Box temperature	°C
TEMP_DEGC	Temperature	°C
PRESS_MB	Pressure	millibars
WIND_DIR_10M_DEG	10-minute wind direction	degrees
WIND_SPD_10M_KTS	10-minute mean speed (in knots)	knots
WIND_SPD_10M_MS	10-minute mean speed (in meters per second)	m/s
WIND_SPD_02M_KTS	2-minute mean speed (in knots)	knots
WIND_SPD_02M_MS	2-minute mean speed (in meters per second)	m/s
RH_PCT	Relative humidity	%
SOLAR_RAD_10KWM2	Solar radiation	kW/m^2
GRASS_TEMP_DEGC	Grass temperature	°C
SOIL_005	Soil temperature at 0.05 m	°C
SOIL_010	Soil temperature at 0.10 m	°C
SOIL_020	Soil temperature at 0.20 m	°C
SOIL_050	Soil temperature at 0.50 m	°C

SOIL_100	Soil temperature at 1.0 m	°C
SOIL_150	Soil temperature at 1.5 m	°C
SOIL_300	Soil temperature at 3.0 m	°C
SNOW_DEPTH_CM	Snow depth	cm
SUNSHINE	Hours of sunshine	-
PRECIP_MM	Precipitation	mm
BATTERY_V	Battery level	V

Additional information about the XET Weather Station data is available in the EC Atmospheric Environment Service Climatological Station Guidelines document.

Algorithm

After the station data are sampled and the instantaneous data values are obtained, the sensor readings are averaged/totalized over the designated time period depending on the variable. Wind direction and speeds are averaged over 2- and 10-minute periods (before the hour). Air temperature, relative humidity, soil temperature, total precipitation, radiation, and sunshine hours are averaged over 1-minute periods (on the hour). More information about the EC XET station data processing procedures is available in the EC Atmospheric Environment Service Climatological Station Guidelines document.

Quality Assessment

The quality assurance procedures test whether an observation is within its expected range limits and then tests for a reasonable rate of change of an observation over time. An observation that passes both tests is assigned a blank flag and can proceed to the next level of quality assurance. When an observation fails either test, the observed value is rejected and flagged as missing using a modification that is described in detail in the EC Atmospheric Environment Service Climatological Station Guidelines document.

Software

No special software is needed to view the ASCII-csv file. The file can be easily opened and viewed in spreadsheet software such as Microsoft Excel.

Known Issues or Missing Data

There were no sunshine or grass temperature data recorded during this period.

References

Environment Canada. (2017). Egbert, Ontario. https://www.ec.gc.ca/rs-mn/default.asp?lang=En&n=F382596F-1

Environment Canada Atmospheric Environment Service. (1992). AES Guidelines for Co-Operative Climatological Autostations - Version 2.0.

https://www.ocean-ops.org/dbcp/doc/AES_Canada_Guide20.pdf

NASA GSFC. (2020). C3VP: Winter 2006-2007 Snowfall Field Campaign. https://gpm.nasa.gov/science/ground-validation/C3VP

Related Data

Other datasets collected during the C3VP field campaign are considered to be related and can be located by searching 'C3VP' in the GHRC HyDRO 2.0 search tool.

Contact Information

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

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