

GPM Ground Validation NASA Micro Rain Radar (MRR) GCPE_x

Introduction

The GPM Ground Validation NASA Micro Rain Radar (MRR) is a vertically pointing Doppler radar which provided measurements of vertical velocity, drop size distribution, rainfall rate, attenuation, liquid water content, and reflectivity factors during the GPM Cold-season Precipitation Experiment (GCPE_x) which took place in Canada during the winter season of 2011-2012.

Campaign

The [GPM Cold-season Precipitation Experiment \(GCPE_x\)](#) occurred in Ontario, Canada during the winter season of 2011-2012. GCPE_x 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 GCPE_x which is to characterize the ability of multi-frequency active and passive microwave sensors to detect and estimate falling snow.

During GCPE_x, an MRR was located at each of the five ground instrumentation sites. This data set only contains the data collected by the NASA MRR instruments, which were located at the following sites:

CARE: Lat: 44 degrees 13'59.45"N; Lon: 79 degrees 46'50.11"W
Huronia: Lat: 44 degrees 41'10.25"N; Lon: 79 degrees 55'40.60"W
SteamShow: Lat: 44 degrees 10'50.27"N; Lon: 79 degrees 43'4.63"W

The NASA MRR deployed at the Huronia site experienced a component failure soon after deployment, and thus no usable MRR data was collected at this site during the campaign. Further details on GCPE_x are available at <https://ghrc.nsstc.nasa.gov/home/field-campaigns/gcpex>. Information on the Global Precipitation Measurement (GPM) mission is available at <http://pmm.nasa.gov/GPM>. Additional campaign collections containing NASA MRR data can be found at <http://ghrc.nsstc.nasa.gov>.

Instrument Description

The NASA MRR is a frequency-modulated continuous wave (FMCW) vertically pointing Doppler radar, which operates at 24.24GHz. The MRR measures profiles of

Doppler spectra and derives drop size distributions, rain rates, and liquid water rates. The MRR is the second generation of the instrument manufactured by METEK. Additional information is available at <http://www.metek.de/product-details/mrr-2.html>.

Three types of data were provided by the NASA MRR: raw data or raw spectrum, processed or instantaneous data, and averaged data. The raw data contains measurements of raw mean spectral power. The processed data contains measurements of spectral reflectivity, drop size distribution, spectral drop density, fall velocity, attenuation, radar reflectivity and integral rainfall parameters derived from one raw spectrum. Averaged data contains the same derived parameters as the processed data, but it is derived from multiple raw spectra.

*Disclaimer: Since the derived fields (e.g., attenuation, radar reflectivity, rain rate, liquid water content) in level 1 and 2 data assume rain and no vertical wind, caution should be used when using these derived fields if any snow may have been falling or in the presence of strong vertical motions (Peters et al. 2005). Attenuation correction is only performed for PIA less than or equal to 10 dB (Peters et al. 2010).

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File Naming Convention

The MRR data set is contained within daily compressed tar archives. The daily archive is named with the following convention:

`mrr_gcpex_[site]_[latitude_longitude]_[YYYYMMDD].tar.gz`

where,

mrr = Micro Rain Radar
gcpex = GPM Cold-season Precipitation Experiment

site = site name

latitude_longitude = geographic location of instrument (e.g., N363442.07_@0972640.90 is North 36 degrees 34'42.07" and West 97 degrees 26'40.90")

YYYYMMDD = the year, month and day of the data (e.g., 20110422)

tar = "tar archive" is a method of bundling multiple files into one file

gzip = data compression file or "gzipped"

and consists of ASCII formatted files containing measurements of the received spectral power and parameters derived from the measurements.

The following files are contained within the tar archive:

mrr_YYYYMMDD.raw

mrr_YYYYMMDD.pro

mrr_YYYYMMDD.ave

The file naming convention is defined similarly as shown above with the addition of the following:

raw = raw data or raw spectrum

pro = processed or instantaneous data

ave = averaged data

Data Format

The GPM Ground Validation NASA Micro Rain Radar (MRR) GCPEX data set consists of ASCII text files.

Citation

Our data sets are provided through the NASA Earth Science Data and Information System (ESDIS) Project and the Global Hydrology Resource Center (GHRC) Distributed Active Archive Center (DAAC). GHRC DAAC is one of NASA's Earth Observing System Data and Information System (EOSDIS) data centers that are part of the ESDIS project. ESDIS data are not copyrighted; however, in the event that you publish our data or results derived by using our data, we request that you include an acknowledgment within the text of the article and a citation on your reference list. Examples for general acknowledgments, data set citation in a reference listing, and crediting online web images and information can be found at: <https://ghrc.nsstc.nasa.gov/home/about-ghrc/citing-ghrc-daac-data>

References

Peters, Gerhard, Bernd Fischer, Hans Munster, Marco Clemens, Andreas Wagner, 2005: Profiles of Raindrop Size Distributions as Retrieved by Microrain Radars. *J. Appl. Meteor.*, 44, 1930-1949.

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Peters, Gerhard, Bernd Fischer, Marco Clemens, 2010: Rain Attenuation of Radar Echoes Considering Finite-Range Resolution and Using Drop Size Distributions. *J. Atmos. Oceanic Technol.*, 27, 829–842.

doi: <http://dx.doi.org/10.1175/2009JTECHA1342.1>

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