Data User Guide

Integrated Multi-satellitE Retrievals for GPM (IMERG) CPEX

Introduction

The Integrated Multi-satellitE Retrievals for GPM (IMERG) CPEX dataset includes measurements gathered by IMERG during the Convective Processes Experiment (CPEX) field campaign. IMERG combines precipitation estimates from multiple passive microwave (PMW) sensors available in a 30-minute analysis time. These estimates are retrieved using the Goddard Profiling (GPROF) algorithm that converts PMW brightness temperatures to a precipitation estimate. The CPEX field campaign took place in the North Atlantic-Gulf of Mexico-Caribbean Sea region and conducted a total of sixteen DC-8 missions. The CPEX campaign collected data to help explain convective storm initiation, organization, growth, and dissipation in the North Atlantic-Gulf of Mexico-Caribbean Oceanic region during the early summer of 2017. IMERG combines information from the GPM satellite constellation to estimate precipitation over the majority of the Earth's surface. Data are available from May 24, 2017 through July 16, 2017 in netCDF-3 format.

Citation

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Keywords:

NASA, GHRC, CPEX, IMERG, GPM, global precipitation, atmospheric precipitation

Campaign

The NASA Convective Processes Experiment (CPEX) aircraft field campaign took place in the North Atlantic-Gulf of Mexico-Caribbean Sea region from 25 May-25 June 2017. CPEX conducted a total of sixteen DC-8 missions from 27 May-24 June. The 16 missions covered a wide range of weather conditions from clear and calm wind, isolated convective cloud systems, to Tropical Storm Cindy (2017). It is the first field campaign that collected airborne observations continually from pre-tropical disturbance in the Caribbean Sea, to tropical depression, and formation of Tropical Storm Cindy in the Gulf of Mexico prior to landfall. The three main science objectives of CPEX were: 1) Improve understanding of convective processes including cloud dynamics, downdrafts, cold pools and thermodynamics during initiation, growth, and dissipation. 2) Obtain a comprehensive set of simultaneous wind, temperature, and moisture profiles, using Doppler wind lidar (DAWN), microwave radiometer and sounder (HAMSR/MASC), and GPS dropsondes, conduct a quantitative evaluation of those profiles in the vicinity of scattered and organized deep convection measured by airborne precipitation radar (APR2), in all phases of convective life cycle. 3) Improve model representation of convective and boundary layer processes over the tropical oceans using a cloud-resolving, fully coupled atmosphere-ocean model, and assimilate the wind, temperature and humidity profiles into the model. More information is available from NASA's Jet Propulsion Laboratory's CPEX field campaign webpage.

Figure 1: CPEX field campaign logo
(Image source: CPEX)

Product Description

The Integrated Multi-satellitE Retrievals for GPM (IMERG) algorithm combines information from the GPM satellite constellation to estimate precipitation over the majority of the Earth's surface. This algorithm is particularly valuable over the majority of the Earth's surface that lacks precipitation-measuring instruments on the ground. Now in the latest

Version 06 release of IMERG the algorithm fuses the early precipitation estimates collected during the operation of the TRMM satellite (2000 - 2015) with more recent precipitation estimates collected during operation of the GPM satellite (2014 - present). The longer the record, the more valuable it is, as researchers and application developers will attest. By being able to compare and contrast past and present data, researchers are better informed to make climate and weather models more accurate, better understand normal and extreme rain and snowfall around the world, and strengthen applications for current and future disasters, disease, resource management, energy production and food security. More information about IMERG can be found at NASA GPM.

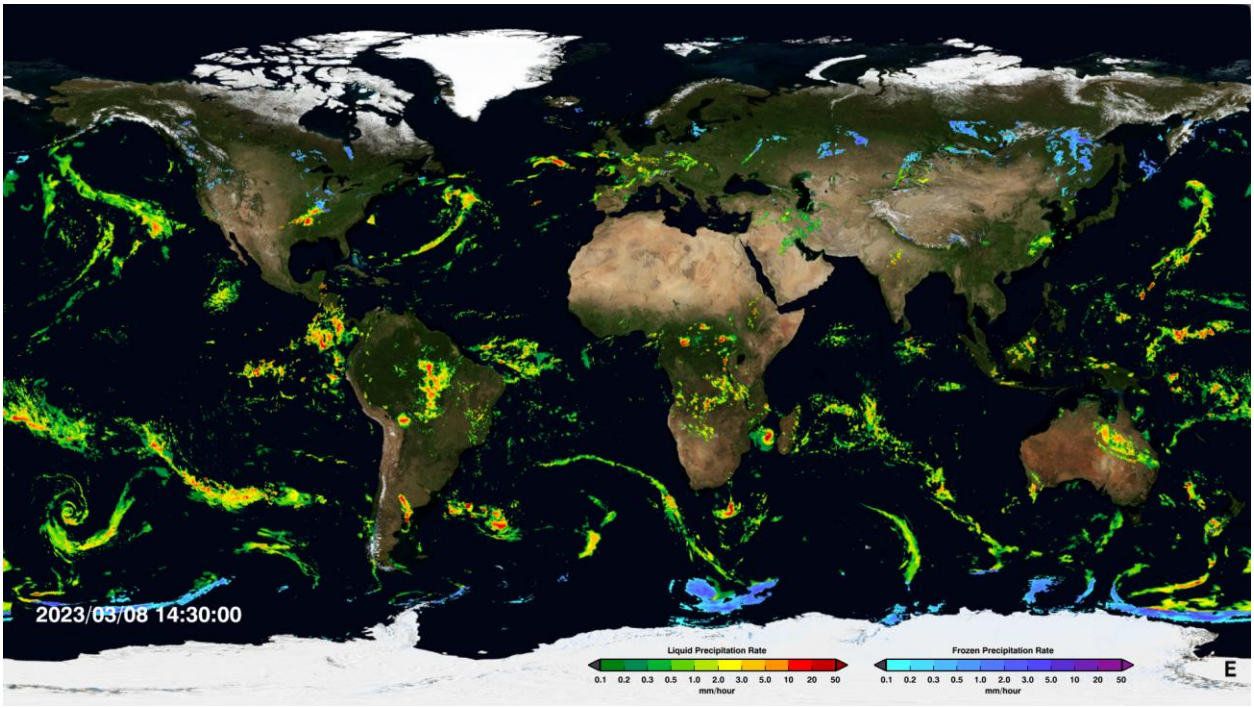

Figure 2: IMERG - Latest Half Hour Image
(Image source: NASA GPM)

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Data Characteristics

The IMERG CPEX dataset consists of files in netCDF-3 format at Level 4 processing level. The IMERG datafiles are available at minute intervals for all dates between May 24, 2017 to June 16, 2017.

Table 1: Data Characteristics

Characteristic	Description
Product	Integrated Multi-satellitE Retrievals for GPM (IMERG)
Spatial Coverage	N: 39.950 S: 5.050 E: -45.050 W: -99.950 (Caribeean)
Spatial Resolution	10 km
Temporal Coverage	May 24, 2017 - July 16, 2017
Temporal Resolution	30 minutes
Parameter	Atmospheric precipitation
Version	1
Processing Level	4

File Naming Convention

The IMERG CPEX data are within netCDF-3 files and are named using the following convention:

Data files: CPEX_3B_HHR_E_MS_MRG_3IMERG_YYYYMMDD_S<Lat>_E<Lon>_1080_V04B.nc

Table 2: File naming convention variables

Variable	Description
YYYY	Four-digit year
MM	Two-digit month
DD	Two-digit day
<Lat>	Latitude
<Lon>	Longitude
.nc	netCDF-3 format

Data Format and Parameters

The IMERG CPEX data are available in netCDF-3 format. The dataset files are separated by date and time, and contain rainfall rates at a specific latitude and longitude. Please refer to Table 3 for additional data field information.

Table 3: Data Fields

Variable	Description	Unit
lat	Latitude	-
lon	Longitude	-

RainRate	Rate of rainfall	mm/hr

Algorithm

IMERG combines precipitation estimates from multiple passive microwave (PMW) sensors available in a 30-minute analysis time. These estimates are retrieved using the Goddard Profiling (GPROF) algorithm that converts PMW brightness temperatures to a precipitation estimate. The GPROF algorithm is based upon the concept that the GPM core satellite, with its Dual Frequency Radar (DPR) and GPM Microwave Imager (GMI), will be used to build a consistent a-priori database of cloud and precipitation profiles to help constrain possible solutions from the constellation radiometers.

Software

This dataset is in netCDF-3 format and does not require any specific software to read. However, the data are easily readable and viewed in Panoply.

Known Issues or Missing Data

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

References

Comparisons of IMERG Version 06 Precipitation At and Between Passive Microwave Overpasses in the Tropics. 2017.
https://gpm.nasa.gov/sites/default/files/meeting_files/PMM%20Science%20Team%20Meeting%202020/Posters/ZipserPosterFinal.pptx

GPM GPROF Algorithm Theoretical Basis Document (ATBD)
https://gpm.nasa.gov/resources/documents/gpm-gprof-algorithm-theoretical-basis-document-atbd

IMERG: Integrated Multi-satellitE Retrievals for GPM
https://gpm.nasa.gov/data/imerg

Related Data

All other datasets collected as part of the CPEX campaign are considered related and can be located by searching the term “CPEX” in the Earthdata Search.

Contact Information

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

NASA Global Hydrometeorology Resource Center DAAC

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