

IMERG V07 Daily and Grand Climatology Products

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1. Introduction

These climatology products contain the daily and “grand” climatological precipitation from the Integrated Multi-satellitE Retrievals for GPM (IMERG) V07B in netCDF4 and GeoTIFF formats. IMERG provides precipitation estimates globally at $0.1^\circ \times 0.1^\circ$ every half-hour beginning June 2000 to the delayed present. See <https://gpm.nasa.gov/data/imerg> and Huffman et al. (2023a) for more information and <https://gpm.nasa.gov/data/directory> for access to the data at the half-hourly, daily, and other time resolutions. These climatology products are computed from the Final Run.

The IMERG Daily Climatology product is derived from the daily precipitation data by averaging the non-missing precipitation values in every 0.1° grid box for a specific day of the year, over a range of years. For example, the daily climatology for 21 Mar is the average of the daily precipitation on 21 Mar 2001, 21 Mar 2002, ..., and 21 Mar 2022. At this time of writing, the range of years is 2001 to 2022, but it may be extended in future updates. The precise date range is recorded in the filenames and, for the netCDF4 files, the file metadata. For example, the file for the daily climatology of 21 Mar from 2001 to 2022 is “IMERG-Final.CLIM.2001-2022.0321.V07B.[ext]”, where [ext] is “nc4” for netCDF4 files and “tif” for GeoTIFF files.

The IMERG Grand Climatology product is derived from the daily precipitation data by averaging the non-missing precipitation values in every 0.1° grid box for all days over a specified period. At this time of writing, the period is Jun 2000 to May 2023, but it may be extended in future updates. The precise date range is recorded in the filenames and, for the netCDF4 files, the file metadata. For example, the file for the grand climatology from Jun 2000 to May 2023 is “IMERG-Final.CLIM.200006-202305.V07B.[ext]”, where [ext] is “nc4” for netCDF4 files and “tif” for GeoTIFF files.

The URLs for the files and the scripts used to compute these files are posted on <https://gpm.nasa.gov/data/imerg/precipitation-climatology>.

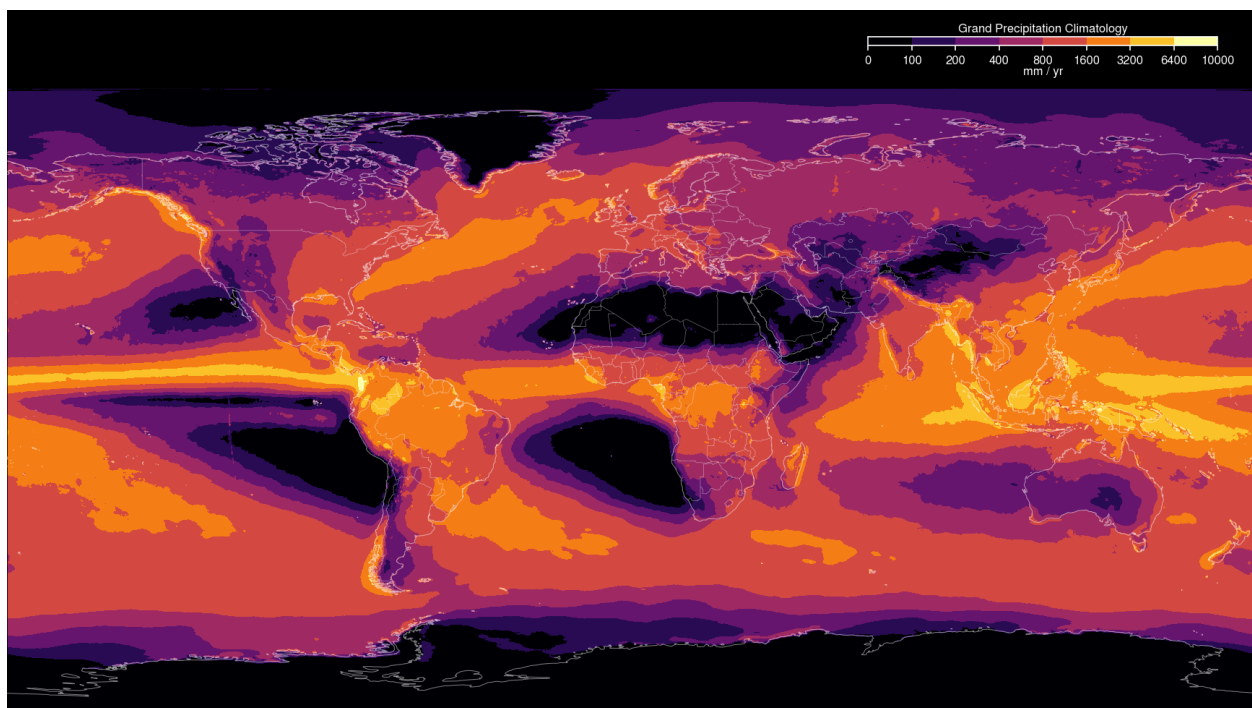
2. Usage Guidelines

- *Units.* The unit of the daily climatological precipitation is mm / day. The unit of the grand climatological precipitation is mm / yr.
- *Leap day.* The daily climatological precipitation is not provided for Feb 29 due to limited sample size. We suggest re-using the Feb 28 value or using the average of Feb 28 and Mar 1 should the climatology of Feb 29 is needed.
- *Sampling and noise.* Due to the shortness of the record and the relatively larger uncertainties in satellite estimates, the climatological precipitation exhibits non-trivial day-to-day variability, so it is recommended that additional processing (e.g., a 30-day running mean) be implemented by data users to filter out the high-frequency variations that are unlikely to represent the background climatology. Note that a trailing 30-day

logarithmically-weighted smoothing is applied to the climatology used in the visualization of the precipitation anomaly (<https://svs.gsfc.nasa.gov/4897>).

- *Missing values.* While substantially more complete than V06, IMERG V07 still contains occasional missing values, especially in the vicinity of the North and South Poles. This means that the precipitation values for a particular day of the year may be available for only some of the years in the record. The grand climatological average is computed for a day only when at least 90% data is available. This 90% threshold is a subjective choice. In grid boxes with less sampling, the daily or grand climatological average precipitation is recorded as missing and indicated with a value of -9999.9. For example, for a 22-year input window, the daily climatological precipitation is set to missing if there are fewer than 20 years of input data.

3. Example of the Grand Climatology



4. Final Remarks

This IMERG Daily and Grand Climatology products are provided by the IMERG Algorithm Team as a convenience to users. Please verify the data and work with the developers if you find discrepancies. Direct your queries to <https://gpm.nasa.gov/contact>.

To cite these climatology products, you should cite the IMERG daily product (Huffman et al. 2023b) from which they are computed. On top of that, you can also cite the dataset or this document; one possible format is:

Huffman G. J., and J. Tan, 2023: IMERG V07 Daily and Grand Climatology Products. NASA's Precipitation Processing Center, accessed <DATE>, <URL>.

As well, an acknowledgment statement is appreciated. See <https://gpm.nasa.gov/data/policy> for more information.

5. License

The authors declare the IMERG Daily and Grand Climatology products to be in public domain. These products can be freely used or modified in accordance with the public domain license.

6. References

Huffman, G. J., and Coauthors, 2020: Integrated Multi-satellite Retrievals for the Global Precipitation Measurement (GPM) Mission (IMERG). Satellite Precipitation Measurement, V. Levizzani, C. Kidd, D.B. Kirschbaum, C.D. Kummerow, K. Nakamura, and F.J. Turk, Eds., Vol. 67 of Advances in Global Change Research, Springer International Publishing, 343–353, doi:10.1007/978-3-030-24568-9_19.

Huffman, G. J., and Coauthors, 2023a: Algorithm Theoretical Basis Document (ATBD). NASA Global Precipitation Measurement (GPM) Integrated Multi-satellitE Retrievals for GPM (IMERG) Version 07. NASA, <https://gpm.nasa.gov/resources/documents/imergv07-atbd>.

Huffman, G. J., E. F. Stocker, D. T. Bolvin, E. J. Nelkin, J. Tan, 2023b: GPM IMERG Final Precipitation L3 1 day 0.1 degree x 0.1 degree V07. Edited by A. Savtchenko, Greenbelt, MD, Goddard Earth Sciences Data and Information Services Center (GES DISC), doi:10.5067/GPM/IMERGDF/DAY/07.

7. Example netCDF4 Header

This is an example netCDF4 header information of a daily climatology file.

```
netcdf IMERG-Final.CLIM.2001-2022.0321.V07B {
dimensions:
    lat = 1800 ;
    lon = 3600 ;
variables:
    float lat(lat) ;
        lat:units = "degrees_north" ;
        lat:long_name = "Latitude" ;
    float lon(lon) ;
        lon:units = "degrees_east" ;
        lon:long_name = "Longitude" ;
    float precipitation(lon, lat) ;
        precipitation:_FillValue = -9999.9f ;
        precipitation:long_name = "climatological precipitation" ;
        precipitation:units = "mm / day" ;
        precipitation:coordinates = "lat lon" ;

// global attributes:
    :title = "IMERG Final Daily Climatological Precipitation (2001 to 2022)" ;
    :author = "Jackson Tan (jackson.tan@nasa.gov)" ;
    :description = "Average of all valid daily precipitation on March 21 from 2001 to
2022 at every 0.1 deg." ;
    :version = "V07B" ;
    :history = "File created on 2024-01-16 21:59:25 UTC. Inputs:3B-
DAY.MS.MRG.3IMERG.20010321-S000000-E235959.V07B.nc4;3B-DAY.MS.MRG.3IMERG.20020321-S000000-
E235959.V07B.nc4;3B-DAY.MS.MRG.3IMERG.20030321-S000000-E235959.V07B.nc4;3B-
DAY.MS.MRG.3IMERG.20040321-S000000-E235959.V07B.nc4;3B-DAY.MS.MRG.3IMERG.20050321-S000000-
E235959.V07B.nc4;3B-DAY.MS.MRG.3IMERG.20060321-S000000-E235959.V07B.nc4;3B-
DAY.MS.MRG.3IMERG.20070321-S000000-E235959.V07B.nc4;3B-DAY.MS.MRG.3IMERG.20080321-S000000-
E235959.V07B.nc4;3B-DAY.MS.MRG.3IMERG.20090321-S000000-E235959.V07B.nc4;3B-
DAY.MS.MRG.3IMERG.20100321-S000000-E235959.V07B.nc4;3B-DAY.MS.MRG.3IMERG.20110321-S000000-
E235959.V07B.nc4;3B-DAY.MS.MRG.3IMERG.20120321-S000000-E235959.V07B.nc4;3B-
DAY.MS.MRG.3IMERG.20130321-S000000-E235959.V07B.nc4;3B-DAY.MS.MRG.3IMERG.20140321-S000000-
E235959.V07B.nc4;3B-DAY.MS.MRG.3IMERG.20150321-S000000-E235959.V07B.nc4;3B-
DAY.MS.MRG.3IMERG.20160321-S000000-E235959.V07B.nc4;3B-DAY.MS.MRG.3IMERG.20170321-S000000-
E235959.V07B.nc4;3B-DAY.MS.MRG.3IMERG.20180321-S000000-E235959.V07B.nc4;3B-
DAY.MS.MRG.3IMERG.20190321-S000000-E235959.V07B.nc4;3B-DAY.MS.MRG.3IMERG.20200321-S000000-
```

```
E235959.V07B.nc4;3B-DAY.MS.MRG.3IMERG.20210321-S000000-E235959.V07B.nc4;3B-  
DAY.MS.MRG.3IMERG.20220321-S000000-E235959.V07B.nc4" ;  
    :source = "IMERG Final Daily Precipitation (10.5067/GPM/IMERGDF/DAY/07)" ;  
    :comment = "A value is given only in a grid box if at least 90% of the data over  
the record is available. This product is created as a convenience to users. Please verify the  
data and use them at your own risk. Direct any queries to https://gpm.nasa.gov/contact." ;  
    :Conventions = "CF-1.8" ;
```