

IMERG-ETC

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Created by Catherine Naud, May 2018.

For more information on the dataset and for citation purposes, refer to:

Naud, C.M., J.F. Booth, M. Lebsack, and M. Grecu, 2018: [Observational constraint for precipitation in extratropical cyclones: Sensitivity to data sources](#). *J. Appl. Meteorol. Climatol.*, **57**, no. 4, 991-1009, doi:10.1175/JAMC-D-17-0289.1.

Description:

Extratropical cyclones are detected and tracked using the MCMS algorithm (Bauer et al., 2016) applied to 6-hourly ERA-interim SLPs. Each file corresponds to one of these 6-hourly detections, however the files also contain information on the overall track that the instantaneous cyclone snapshot belongs to.

For each 6-hourly cyclone detection, we selected all IMERG 30-minute files that were found within ± 3 hours and extracted all IMERG 0.1° grid cells in a 2500 km radius region centered on the low pressure center. The IMERG files contain precipitation retrievals performed with a wide collection of microwave radiometers and calibrated using the radar and radiometer onboard the GPM platform (Huffman et al., 2017; Skofronick-Jackson et al., 2017).

This database provides the precipitation rates, and fraction of liquid precipitation information in 1° resolution grid cells. The files provided here include information on the cyclone and its track, along with the IMERG file names (so with access to the IMERG database new versions of the products can be obtained; there should be between 6 and 12), and the aforementioned precipitation products for each subset. The database contains all files acquired from March 2014 to December 2017.

Data access setup:

Each tar directory contains a month of matched cyclones/IMERG netcdf files. As the database was developed a new version of IMERG became available (initially V04, now V05). The tar files are being replaced as the data is reprocessed, so each tar file name contains the version number so users know which has been replaced. For example, IMERG-ETC_V4_201403.tgz indicates that this month is still using IMERG V04 while IMERG-ETC_V5_201612.tgz contains the latest V05 IMERG data.

Warning: because of the IMERG coverage, the files are large and all cyclone snapshots within a month are included in each tar file. Therefore each tar file is of the order of 1Gb in size but once untarred the directories occupy at least 50 Gb.

Filename convention:

IMERG-ETC_yyyymmdd_tt_lat_long_surfacetype_trackID.ncdf

Where

- yyyymmdd is the date of the storm detection
- tt is the UT time of the detection (it can be 00, 06, 12, or 18)

- lat: is the latitude of the center of the storm (i.e. the location of the minimum SLP)
- long: is the longitude of the center
- surfacetype is either ocean or land and obtained by setting a 50% threshold on the MERRA2 land fraction file
- trackID is the unique identifier of the track this particular storm occurrence belongs to

The files contain the following:

- storminfo: a vector that contains some of the storm specific information, such as the longitude, the latitude, the SLP at the center, the land fraction and the SLP of the closed contour furthest from the center. This last parameter is used to evaluate the strength of the storm: based on the work of Polly and Rossow (2016), the difference in SLP between the outermost closed contour and the center is a good measure of the storm intensity (the largest the more powerful the storm).
- Trackinfo: this array contains the same information as above but for each instance along the track this storm is part of.
- imergfileslist: the list of IMERG files that match the conditions highlighted above for proximity in time to the cyclone detection. The dimension is nbimergfiles.

We preselected some of the data fields in the files, i.e. precipitation rate and liquid fraction. These were extracted and saved in arrays of dimension nbimergfiles x nblong x nblat:

- imerglatitude: latitudes of IMERG grid subset that includes the storm
- imerglongitude: longitudes of IMERG grid subset that includes the storm
- imergprecrate: surface precipitation rate from IMERG
- imergliqfrac: liquid fraction of precipitation

Further Reading and Resources:

- Bauer, M.P., G. Tselioudis, and W.B. Rossow, 2016: A new climatology for investigating storm influences in and on the extratropics. *J. Appl. Meteorol. Climatol.*, **55**, 1287-1303.
- Huffman, G. J., D. T. Bolvin, D. Braithwaite, K. Hsu, R. Joyce, C. Kidd, E. J. Nelkin, S. Sorooshian, J. Tan, and P. Xie, 2017: NASA Global Precipitation Measurement (GPM) Integrated Multi-satellite Retrievals for GPM (IMERG), *Algorithm Theoretical Basis Document (ATBD) Version 4.6*, https://pmm.nasa.gov/sites/default/files/document_files/IMERG_ATBD_V4.6.pdf
- Skofronick-Jackson, G., W. A. Petersen, W. Berg, C. Kidd, E. F. Stocker, D. B. Kirschbaum, R. Kakar, S. A. Braun, G. J. Huffman, T. Iguchi, P. E. Kirstetter, C. Kummerow, R. Managhini, R. Oki, W. S. Olson, Y. N. Takayabu, K. Furukawa and T. Wilheit, 2017: The global precipitation measurement (GPM) mission for science and society. *Bull. Amer. Meteor. Soc.*, **98**, 1679-1695, doi:10.1175/BAMS-D-15-00306.1.

For more information on IMERG data and data download instructions:
<https://pmm.nasa.gov/data-access/downloads/gpm>

MCMS tracking software: <https://gcss-dime.giss.nasa.gov/mcms/>