National Aeronautics and Space Administration Goddard Earth Science Data Information and Services Center (GES DISC)

README Document for the NOAA NCEP/CPC Half Hourly 4km Global (60S - 60N) Merged IR

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Revision History

Revision Date	***Changes***	***Author***
July 18, 2018	This document was first created.	Andrey Savtchenko

Table of Contents

1.0 Introduction

This document provides basic information for using the NOAA NCEP/CPC L3 Half Hourly 4km Global (60S - 60N) Merged Infrared brightness temperatures from geostationary satellites.

These data originate from NOAA/NCEP.

The NOAA Climate Prediction Center/NCEP/NWS is making the data available originally in binary format, in a weekly rotating archive. The NASA GES DISC is acquiring the binary files as they become available, converts them into CF (Climate and Forecast) -convention compliant netCDF-4 format, and stores the product in a permanent archive.

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1.1 Dataset/Mission Instrument Description

The data contain globally-merged (60S-60N) 4-km pixel-resolution IR brightness temperature data (equivalent blackbody temperatures), merged from the European, Japanese, and U.S. geostationary satellites over the period of record (GOES-8/9/10/11/12/13/14/15/16, METEOSAT-5/7/8/9/10, and GMS-5/MTSat-1R/2/Himawari-8).

The timeline of inclusion of each satellite can be found here:

https://docserver.gesdisc.eosdis.nasa.gov/public/project/GPM/CPC-4kmIR-Sats.pdf

The leading edge of data availability is delayed by about 24 hours from real-time to abide by international data exchange agreements between NOAA and EUMETSAT (the METEOSAT data providers).

1.2 Algorithm Background

These global IR have been corrected for "zenith angle dependence", i.e. IR temperatures for locations far from satellite nadir are erroneously cold due to a combination of geometric effects and radiometric path extinction effects. This correction allows for the merging of the IR data from the various geostationary satellites with greatly reduced discontinuities at their boundaries. Some residual differences among the data exist since the IR channels aboard the various spacecraft have slightly different characteristics and no intercalibration among the sensors has been performed. NOAA are in the process of performing such an intercalibration, although this effect is considerably smaller than the zenith angle effects.

1.3 Data Disclaimer

1.3.1 Acknowledgement

The original data production at NOAA is supported by funding from the NOAA Office of Global Programs for the Global Precipitation Climatology Project (GPCP and by NASA via the Tropical Rainfall Measuring Mission (TRMM).

The permanent archive at GES DISC is supported by NASA's HQ Earth Science Data Systems (ESDS) Program.

1.3.2 Contact Information

If you need assistance or wish to report a problem with data as distributed from NASA, please use the following contact information:

Email: gsfc-dl-help-disc at mail.nasa.gov
Voice: 301-614-5268
Fax: 301-614-5268

Address:
Goddard Earth Sciences Data and Information Services Center (GES DISC)
NASA Goddard Space Flight Center
Code 610.2
Greenbelt, MD 20771 USA

For assistance with the original data from NOAA, and algorithm background:

Dr. Pingping Xie, Pingping.Xie@noaa.gov

2.0 Data Organization

Similarities with the original:

As in the original binaries, every netCDF-4 file covers one hour, and contains two half-hourly grids, at 4-km grid cell resolution.

Differences from the original:

1. The data in the netCDF-4 files are already converted to real (float) values of Brightness Temperatures in Kelvin. There is no need to further scale these data. The netCDF-4 format is machine-independent and users need not worry about the endian-ness of their machines.

2. To meet the requirements of collection spatial metadata, the grid is re-ordered from the original and now goes from -180 (West) to 180 (East). It is also starting from -60 (South).

2.1 File Naming Convention

File names are preserved as in the original, except of course for the suffux:

merg_yyyymmddhh_4km-pixel.nc4

Where:

- yyyy Year.
- mm Month
- dd Day of Month
- hh Begin hour

2.2 File Format and Structure

The permanent archive at NASA is curating these data in a self-documenting, CF-compliant, internally-compressed, netCDF-4 format. Since it is built upon HDF5, it is compatible with HDF5 routines and tools.

This allows a broad range of applications to access the data directly, without the need to cope with the original binary data format. In addition to the direct download of netCDF-4 data, the GES DISC provides data download in binary, ASCII, and netCDF-3 formats using the OPeNDAP interface.

2.3 Key Science Data Fields

The data files contain only brightness temperatures, Tb, as science data.

3.0 Data Contents

File contents are easily understood by using ncdump -h against an example file. The following command line must print on the monitor:

```
ncdump -h merg_2018071623_4km-pixel.nc4

netcdf merg_2018071623_4km-pixel {
dimensions:
        lon = 9896 ;
        lat = 3298 ;
        time = 2 ;
variables:
        float Tb(time, lat, lon) ;
                string Tb:units = "K" ;
                string Tb:standard_name = "brightness_temperature" ;
                string Tb:coordinates = "time lat lon" ;
                Tb:_FillValue = -9999.f ;
        float lon(lon) ;
                string lon:units = "degrees_east" ;
                string lon:standard_name = "longitude" ;
        float lat(lat) ;
                string lat:units = "degrees_north" ;
                string lat:standard_name = "latitude" ;
        double time(time) ;
                string time:units = "days since 1970-01-01 00:00:00" ;
                string time:standard_name = "time" ;

// global attributes:
                :BeginDate = "2018-07-16" ;
                :BeginTime = "23:00:00.000Z" ;
                :EndDate = "2018-07-16" ;
                :EndTime = "23:59:59.999Z" ;
```

```
                :FileHeader = "StartGranuleDateTime=2018-07-
16T23:00:00.000Z;\nStopGranuleDateTime=2018-07-16T23:59:59.999Z" ;
                :InputPointer = "merg_2018071623_4km-pixel" ;
                :title = "NCEP/CPC 4km Global (60N - 60S) IR Dataset" ;
                :ProductionTime = "2018-07-18T00:24:50.744Z" ;
}
```

Resolution

These data are at 4 kilometers global resolution. In case GrADS is used on the NASA format, it is suggested to use:

```
XDEF 9896 LINEAR   -179.9818 0.036378335
YDEF 3298 LINEAR   -59.9818 0.036383683
```

The temporal resolution is 30 minutes.

4.0 Options for Reading the Data

All tools and routines that use recent HDF5 or netCDF-4 libraries can easily read these data..

4.1 Utilities and Programs

4.1.1 GrADS

For GrADS recipe please visit:
https://disc.gsfc.nasa.gov/information/faqs/5a95c13655f6c7b4c0b5ac86/what-is-the-gr-ads-ctl-file-for-the-ncep-merged-ir-product-in-nc-4?keywords=merged

4.1.2 MATLAB/IDL/Python/NCL

Code examples from

https://hdfeos.org/zoo/index_openGESDISC_Examples.php

can be easily adjusted to these data. Since the formats of GPM, OCO2, MERRA, are similar, their examples can be perused.

4.1.3 h5dump/ncdump

These pre-compiled utilities are convenient for quick scouting of files content from the command line.

H5dump is available from:

https://www.hdfgroup.org/package/h5dump/

Please, make sure you acquire the latest ncdump from the netCDF-4 libraries:

https://www.unidata.ucar.edu/downloads/netcdf/index.jsp

4.2 Tools

The following are user-friendly tools that work through java-based user interface.

4.2.1 HDFView/Panoply

HDFView is a simple tool to inspect files, and data objects inside, in practically all HDF and netCDF formats. Download from:

https://support.hdfgroup.org/products/java/hdfview/

Panoply can also inspect file contents and make geo-referenced plots. It works best with CF-compliant files. Download:

https://www.giss.nasa.gov/tools/panoply/download/

Note with Panoply you don't have to download files and work with so called hyrax catalogs. In Panoply, go to File->Open Remote Catalog, and paste in:

https://disc2.gesdisc.eosdis.nasa.gov/opendap/MERGED_IR/catalog.xml

5.0 Data Services

Please, visit the dataset landing page for all available data search and download services:

https://disc.gsfc.nasa.gov/datacollection/GPM_MERGIR_1.html

Users must register first to be able to acquire these data:

https://disc.gsfc.nasa.gov/data-access

If you need assistance or would like to report a problem:

Email: gsfc-dl-help-disc at mail.nasa.gov
Voice: 301-614-5224
Fax: 301-614-5268

Address:
Goddard Earth Sciences Data and Information Services Center
NASA Goddard Space Flight Center
Code 610.2
Greenbelt, MD 20771 USA

6.0 More Information

The original NOAA rolling archive (the most recent two weeks) is located at:
http://ftp.cpc.ncep.noaa.gov/precip/global_full_res_IR/
http://www.cpc.ncep.noaa.gov/products/global_precip/html/README

7.0 Acknowledgements

The creation of the original data at NOAA/NCEP is supported by funding from the NOAA Office of Global Programs for the Global Precipitation Climatology Project (GPCP) and by NASA via the Tropical Rainfall Measuring Mission (TRMM).

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