2D-CLOUDSAT-POES v1

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Contents

1 Introduction

2D-CLOUDSAT-POES provides collocations between CloudSat Cloud Profiling Radar (CPR) and passive operational sensors on-board Polar Orbiting Environmental Satellites (POES), including the National Oceanic and Atmospheric Administration (NOAA) and European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) operational polar orbiting meteorological satellites. The following passive sensors are considered:

- Advanced Microwave Sounding Unit (AMSU)-B (NOAA-15, NOAA-16, NOAA-17)
- Microwave Humidity Sounder (MHS) (NOAA-18, NOAA-19, MetOp-A, MetOp-B)
- High-resolution Infrared Radiation Sounder (HIRS)

Throughout this document, a POES measurement is understood to refer to a measurement of any of the aforementioned sensors. The following satellites are considered:

- NOAA-15
- NOAA-16
- NOAA-17
- NOAA-18

- NOAA-19
- MetOp-A

Collocations are defined as instances where the distance between footprints is at most 15 km and the time interval is at most 900 s (Holl et al., 2010).

Collocations between CloudSat CPR and NOAA-18 occur intermittently globally.

When using this data, please cite Holl et al. (2010).

2 Data format

Data are provided in NetCDF classic format. Granules exist only when there are collocations, so for a particular day, the number of granules may vary between 0 and the number of Cloudsat granules. The time spanned by a 2D-CLOUDSAT-POES granule is at most the time spanned by the equivalent CloudSat granule, but usually it is a subset thereof, because only part of the granule has collocations.

2.1 Filename

The filename format is:

`YYYYDDDHHMMSS_NNNNN_CS_2D-CLOUDSAT-POES_SATNAME_P_R04_E02.nc.gz`

Here:

YYYY is the year, for example "2009"

DDD is the day of year, for example "102"

HH is the hour in 24-hour format at which the granule starts, for example, "19"[1]

MM is the minute at which it starts, for example, "04"

SS is the second at which it starts, for example, "52"

NNNNN is the granule number, for example, "15734"

CS is short for CloudSat

2D-CLOUDSAT-POES is the name of this product

P-R04-E02 is the Cloudsat product the collocations are based on

An example filename is:

`2009102190452_15734_CS_2D-CLOUDSAT-POES_NOAA18_P_R04_E02.nc.gz`

[1] This does not mean there are collocations starting at this time. Rather, the starting time is directly copied from the equivalent CloudSat granule.

2.2 Contents

Each granule contains information for POES and CloudSat. For each collocation, it contains:

- Identification of the POES granule
- Identification of the exact time of the POES measurements
- Coordinates within the POES granule
- Position for the POES measurements
- All brightness temperatures for AMSU and HIRS
- The position of the first and last CPR measurement that are within 15 km and 900 s
- The shortest and longest distances of those collocated measurements
- The shortest and longest time intervals of those measurements

The granules contain measurements for AMSU and HIRS, so that users do not need to download those.

For a full description of the contents, see Appendix A.

2.3 Reading the data

As the data are stored in NetCDF, any NetCDF library can be used to read the data. NetCDF reading routines are available in all popular languages such as Matlab, IDL, Python, C, Fortran, etc.

3 Software

All collocations were generated with the Collocations Toolkit. The Collocations Toolkit is a set of Matlab classes for the collocation of arbitrary pairs of satellite sensors. It provides for easy processing of large amounts of satellite data, collocate data, store collocations to disk, read large amounts of collocations, and more. For more information, a comprehensive User's Guide and information on how to access the code, please visit:

`http://www.sat.ltu.se/projects/collocations/toolkit.php`

References

G. Holl, S. A. Buehler, B. Rydberg, and C. Jiménez. Collocating satellite-based radar and radiometer measurements – methodology and usage examples. *Atmos. Meas. Tech.*, 3:693–708, 2010. doi: 10.5194/amt-3-693-2010.

A Example NetCDF header

```
netcdf test {
dimensions:
        Collocations = 3809 ;
        AMSUB_CHANS = 5 ;
        AMSUA_CHANS = 15 ;
        HIRS_CHANS = 20 ;
        CPR_RANGE = 2 ;

variables:
        long POES_START(Collocations) ;
                POES_START:long_name = "AMSU-B/MHS granule
                    starting time" ;
                POES_START:units = "seconds since
                    1970-01-01T00:00:00Z" ;
        long POES_TIME(Collocations) ;
                POES_TIME:long_name = "AMSU-B/MHS measurement
                    time" ;
                POES_TIME:units = "FIXME" ;
                POES_TIME:valid_range = "FIXME" ;
        short AMSUB_LINE(Collocations) ;
                AMSUB_LINE:long_name = "AMSU-B/MHS scanline
                    number" ;
        byte AMSUB_POS(Collocations) ;
                AMSUB_POS:long_name = "AMSU-B/MHS scanline
                    position" ;
        float AMSUB_LAT(Collocations) ;
                AMSUB_LAT:long_name = "AMSU-B/MHS latitude" ;
                AMSUB_LAT:units = "degrees_north" ;
                AMSUB_LAT:valid_range = -90., 90. ;
        float AMSUB_LONG(Collocations) ;
                AMSUB_LONG:long_name = "AMSU-B/MHS longitude"
                    ;
                AMSUB_LONG:units = "degrees_east" ;
                AMSUB_LONG:valid_range = -180., 180. ;
        float AMSUB_BT(AMSUB_CHANS, Collocations) ;
                AMSUB_BT:long_name = "AMSU-B/MHS Brightness
                    Temperature" ;
                AMSUB_BT:units = "Kelvin" ;
        short AMSUA_LINE(Collocations) ;
                AMSUA_LINE:long_name = "AMSU-A scanline
                    number" ;
        byte AMSUA_POS(Collocations) ;
                AMSUA_POS:long_name = "AMSU-A scanline
                    position" ;
        float AMSUA_LAT(Collocations) ;
                AMSUA_LAT:long_name = "AMSU-A latitude" ;
                AMSUA_LAT:units = "degrees_north" ;
                AMSUA_LAT:valid_range = -90., 90. ;
        float AMSUA_LONG(Collocations) ;
                AMSUA_LONG:long_name = "AMSU-A longitude" ;
                AMSUA_LONG:units = "degrees_east" ;
                AMSUA_LONG:valid_range = -180., 180. ;
```

```
        float AMSUA_BT(AMSUA_CHANS, Collocations) ;
                AMSUA_BT:long_name = "AMSU-A Brightness
                    Temperature" ;
                AMSUA_BT:units = "Kelvin" ;
        short HIRS_LINE(Collocations) ;
                HIRS_LINE:long_name = "HIRS scanline number" ;
        byte HIRS_POS(Collocations) ;
                HIRS_POS:long_name = "HIRS scanline position"
                    ;
        float HIRS_LAT(Collocations) ;
                HIRS_LAT:long_name = "HIRS latitude" ;
                HIRS_LAT:units = "degrees_north" ;
                HIRS_LAT:valid_range = -90., 90. ;
        float HIRS_LONG(Collocations) ;
                HIRS_LONG:long_name = "HIRS longitude" ;
                HIRS_LONG:units = "degrees_east" ;
                HIRS_LONG:valid_range = -180., 180. ;
        float HIRS_BT(HIRS_CHANS, Collocations) ;
                HIRS_BT:long_name = "HIRS Brightness
                    Temperature" ;
                HIRS_BT:units = "Kelvin" ;
        long CPR_LINERANGE(CPR_RANGE, Collocations) ;
                CPR_LINERANGE:long_name = "CloudSat CPR line
                    range within granule" ;
        float MIN_DIST(Collocations) ;
                MIN_DIST:long_name = "Shortest distance CPR
                    to AMSU-B/MHS" ;
                MIN_DIST:units = "km" ;
                MIN_DIST:valid_range = 0., 15. ;
        float MAX_DIST(Collocations) ;
                MAX_DIST:long_name = "Longest distance CPR to
                    AMSU-B/MHS" ;
                MAX_DIST:units = "km" ;
                MAX_DIST:valid_range = 0., 15. ;
        short MIN_INT(Collocations) ;
                MIN_INT:long_name = "Shortest time-interval
                    CPR to AMSU-B/MHS (absolute)" ;
                MIN_INT:units = "seconds" ;
                MIN_INT:valid_range = 0., 900. ;
        short MAX_INT(Collocations) ;
                MAX_INT:long_name = "Longest time-interval
                    CPR to AMSU-B/MHS (absolute)" ;
                MAX_INT:units = "seconds" ;
                MAX_INT:valid_range = 0., 900. ;

// global attributes:
                :Conventions = "CF-1.4" ;
                :title = "Collocations" ;
                :date = "2013-01-25T21:09:32Z" ;
                :institution = "Department of Computer
                    Science, Electrical and Space
                    Engineering, Division of Space
                    Technology, Lule\aa\ University of
                    Technology, Kiruna, Sweden" ;
```

```
                    :source = "Collocation codes, part of atmlab"
                        ;
                    :references = "Holl et al. (2010); John et
                        al. (2012)" ;
                    :software_version = "atmlab-2.1.250" ;
                    :id = "atmlab-2.1.250 -- 2013-01-25T21:09:32Z
                        --
                        /storage3/user_data/gerrit/collocated_datasets/cdpc_2dcp/2007/123/
                        ;
}
```