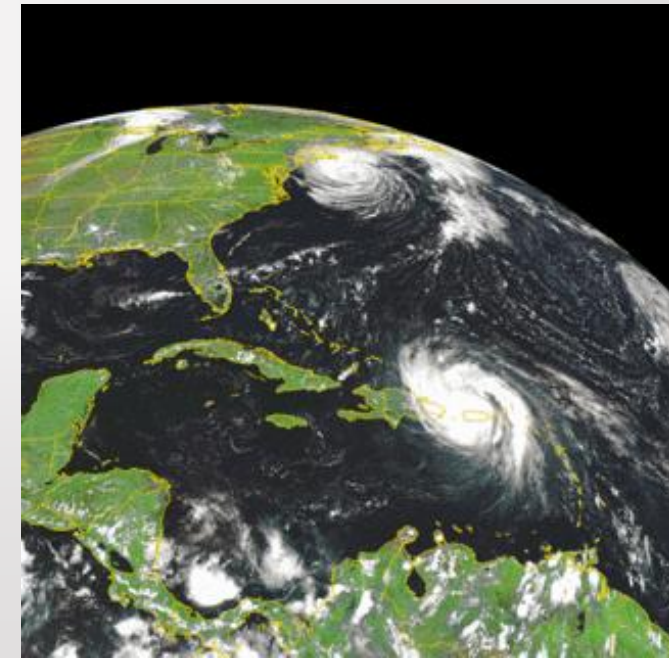


CloudSat Cloud Product

Peng-Jen Chen
大氣環境研究室

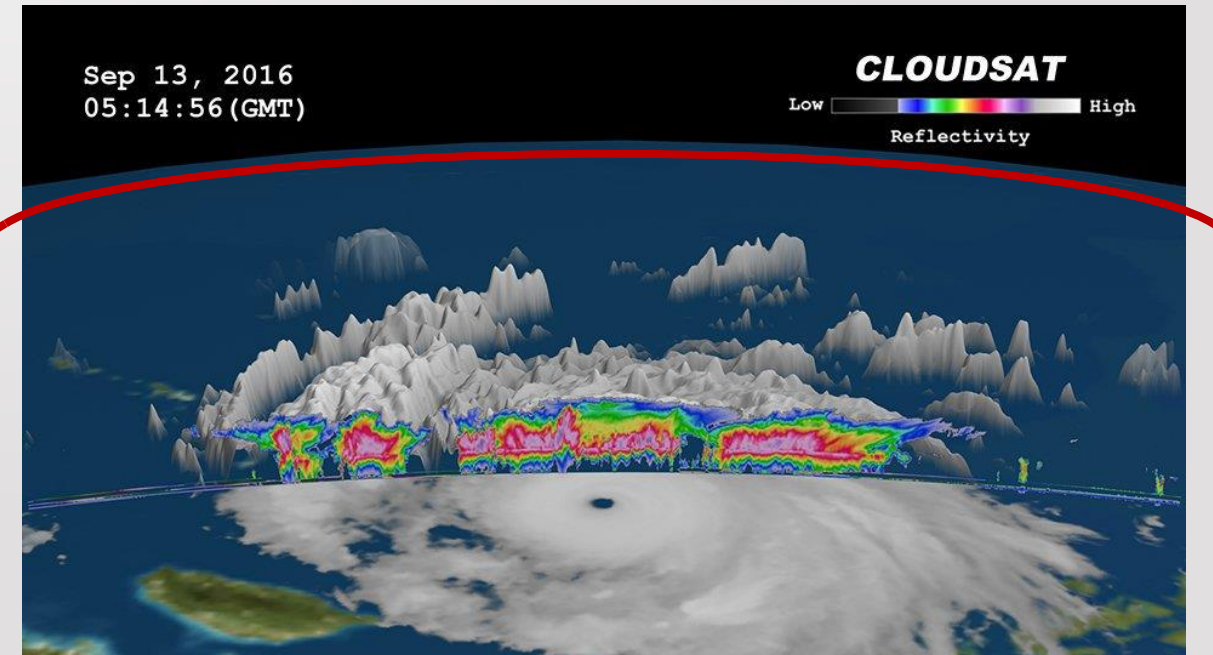
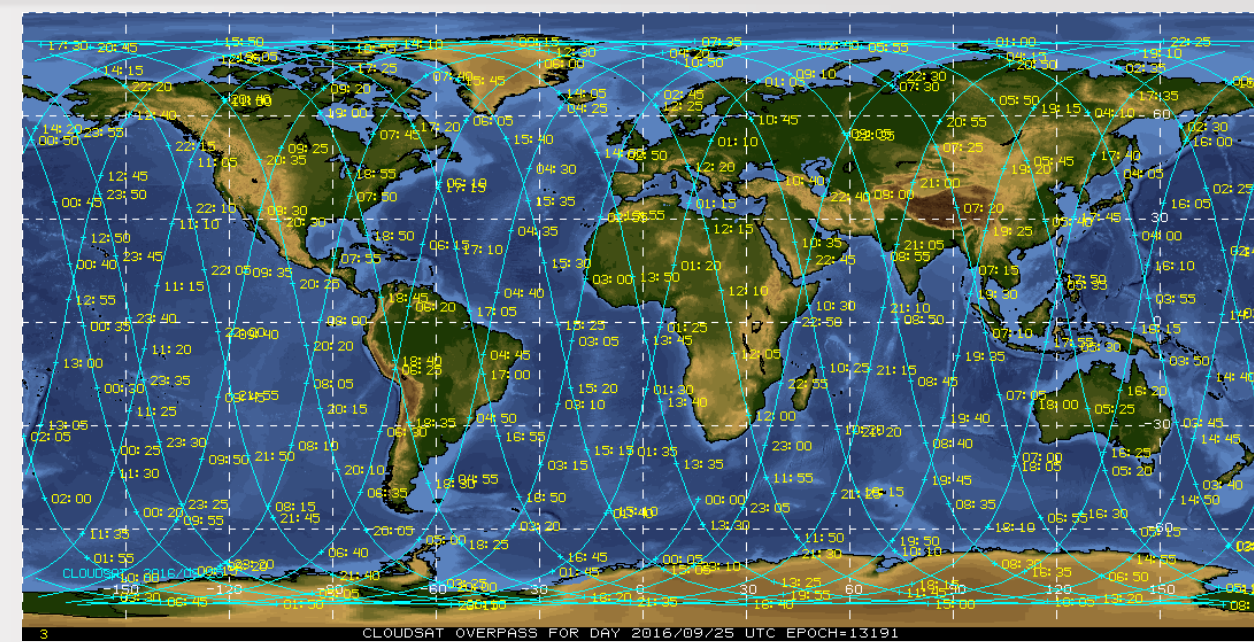
CloudSat Satellite Product

- CloudSat:
 - **A-train** (Afternoon Train) satellite
 - Launch at 28 April 2006
 - 705 km above the Earth
 - Cross the equator at local time 1:30 pm and 1:30 am
 - Due to battery malfunction
 - After 2011 only day-time have observation
 - Exit the A-Train on 2018/2/22
 - Move to lower orbit (688 km) call C-train
 - CALIPSO join C-train from A-train on 2018/09/20



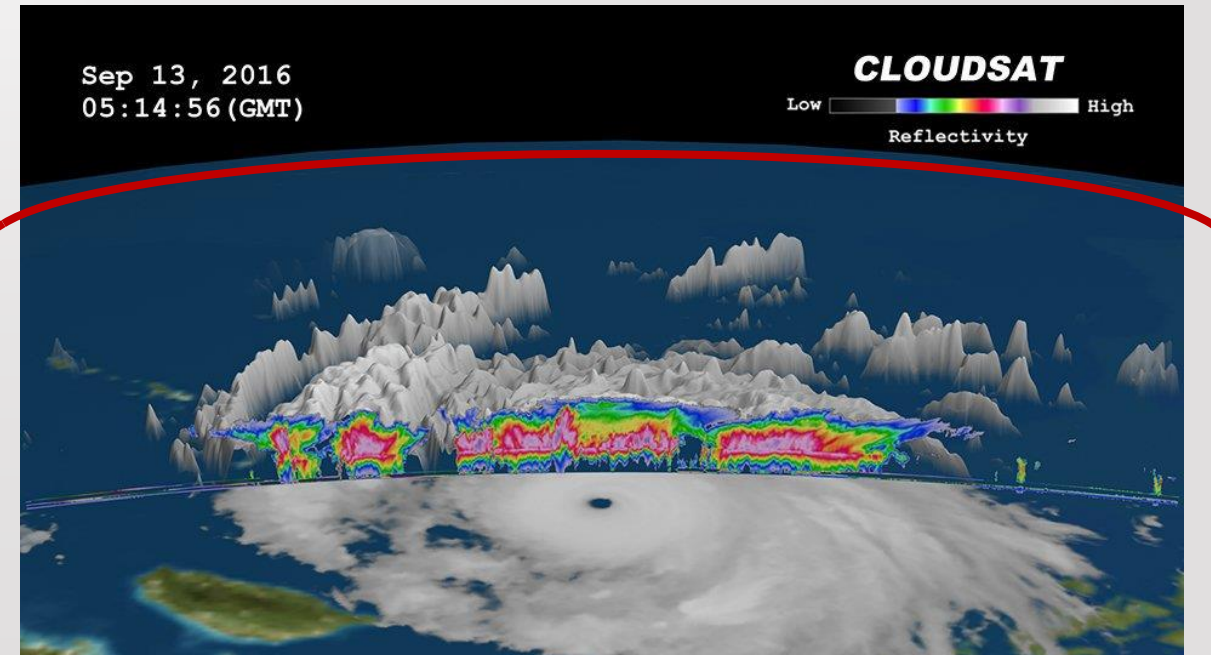
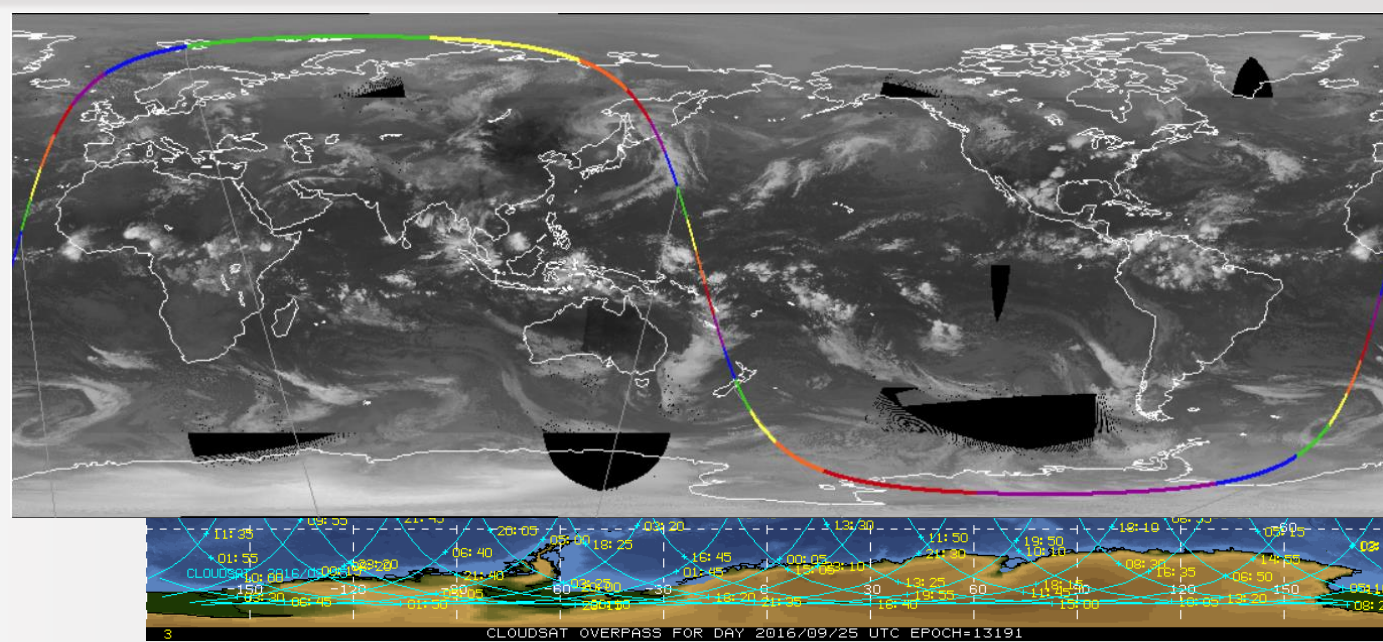
CloudSat Satellite Product

- CloudSat: Polar-orbiting satellite
 - Launch at 28 April 2006
 - **Vertical resolution:** 240m
 - **Horizontal resolution:** 1.1km
- Provide high resolution vertical profile cross the atmosphere
- Weakness:
 - narrow observation domain
 - Temporal resolution is limited to derive diurnal cycle (13:30 LT and 01:30 LT)
- Cloud Profiling Radar (CPR)
- CPR : more sensitive to larger hydrometeors
- Product : HDF format



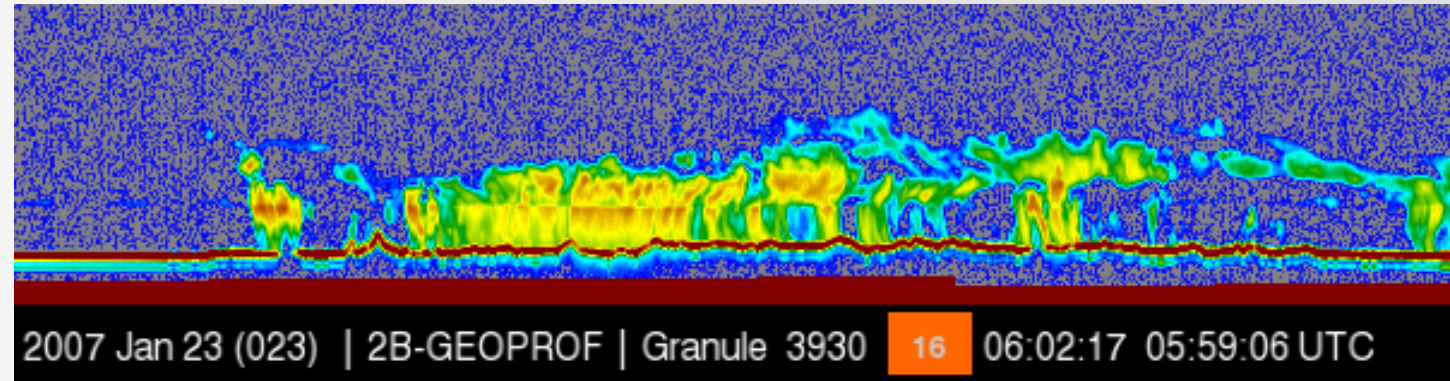
CloudSat Satellite Product

- CloudSat: Polar-orbiting satellite
 - Launch at 28 April 2006
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 - **Horizontal resolution:** 1.1km
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- Product : HDF format

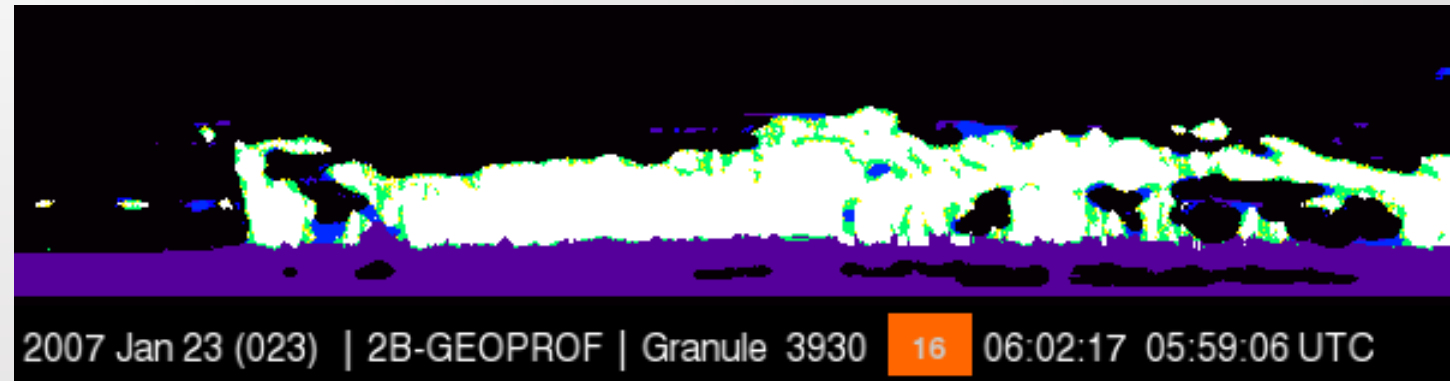


CloudSat Satellite Product

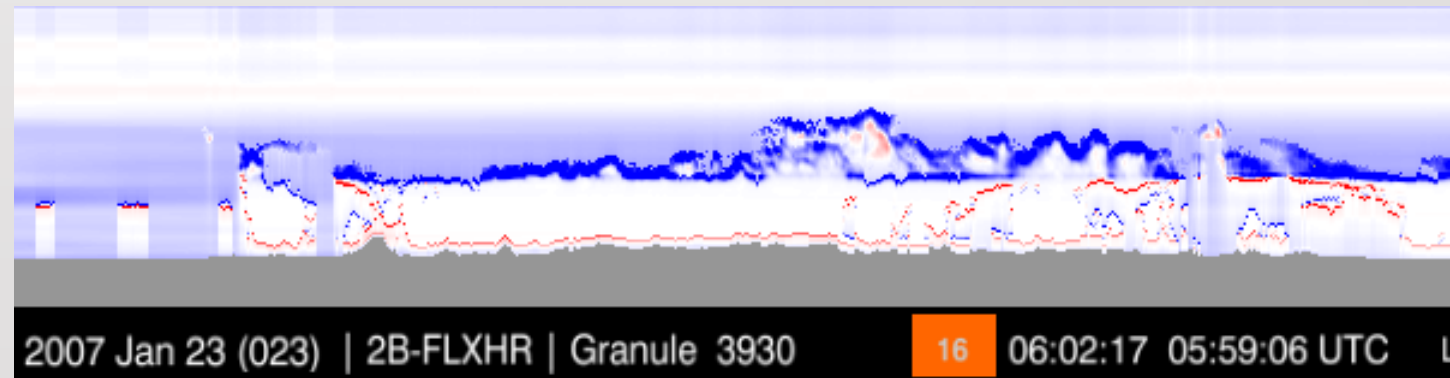
- Radar_Reflectivity



- Cloud_mask



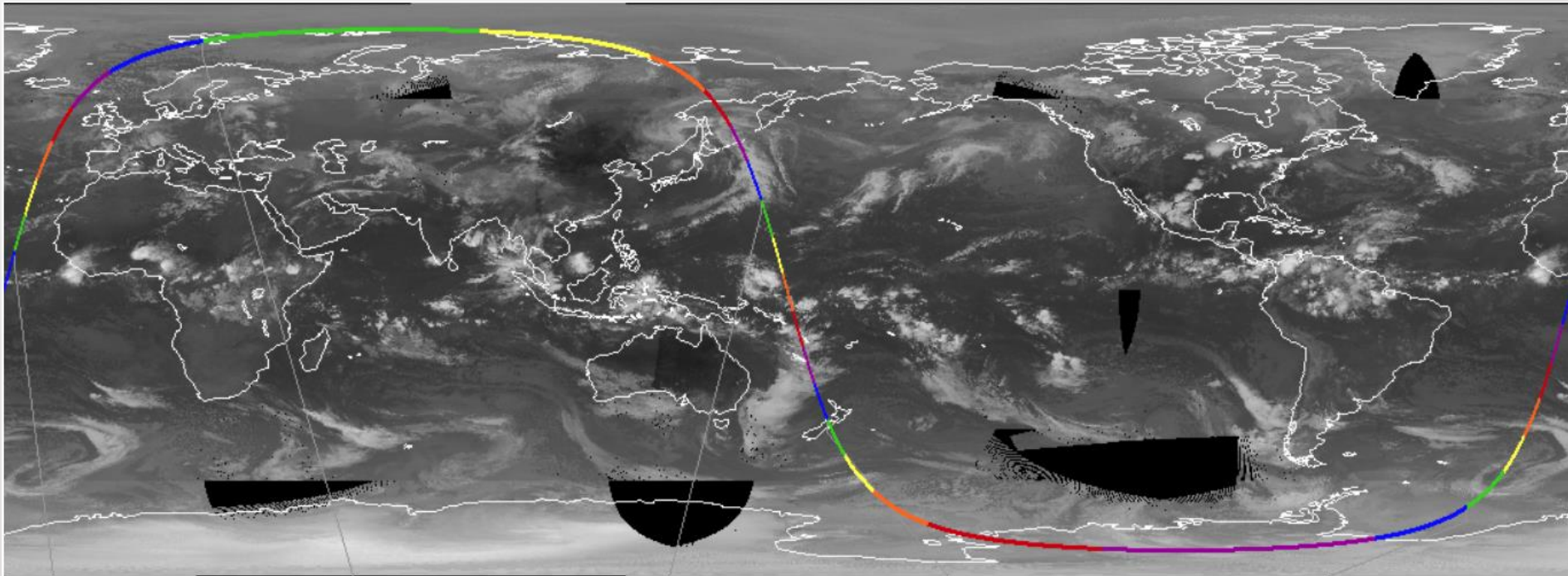
- Radiative Heating Rate



CloudSat Satellite Product

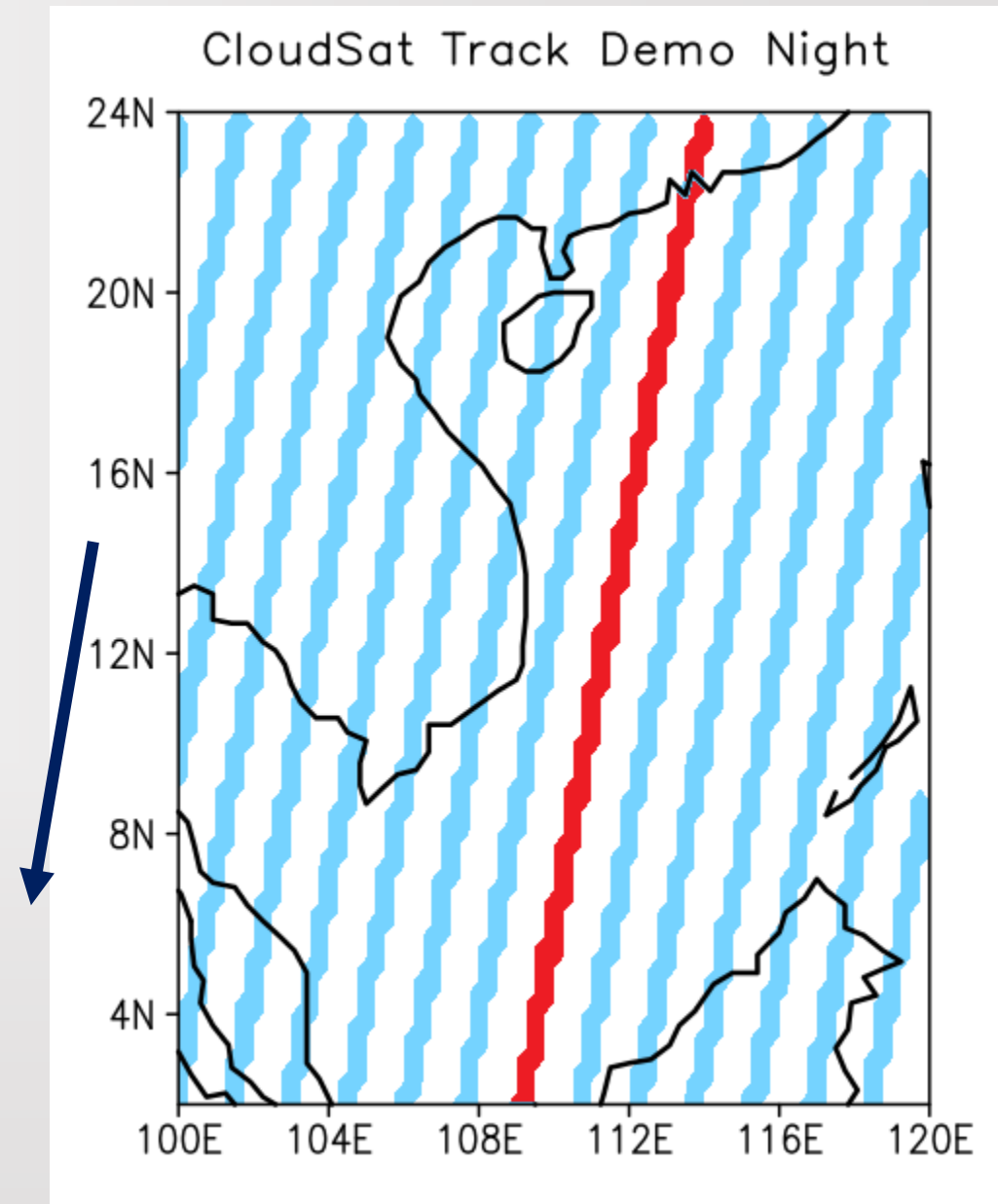
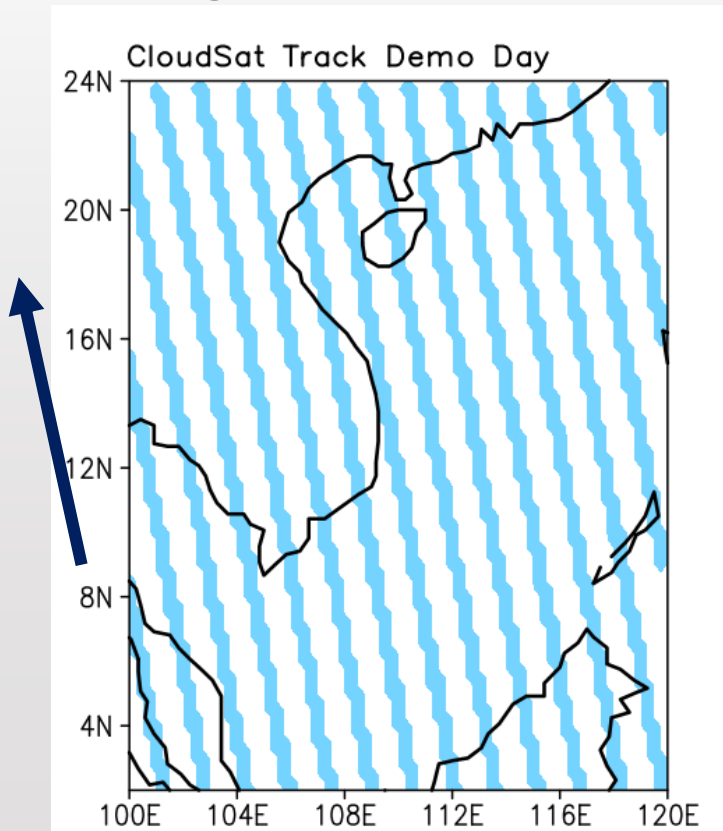
- Level 2 CloudSat Product
- One orbit <--> one hdf file
- Non-gridded data
- Temporal and spatial resolution is limited

2B-FLXHR
2B-GEOPROF
2B-CLDCLASS
⋮



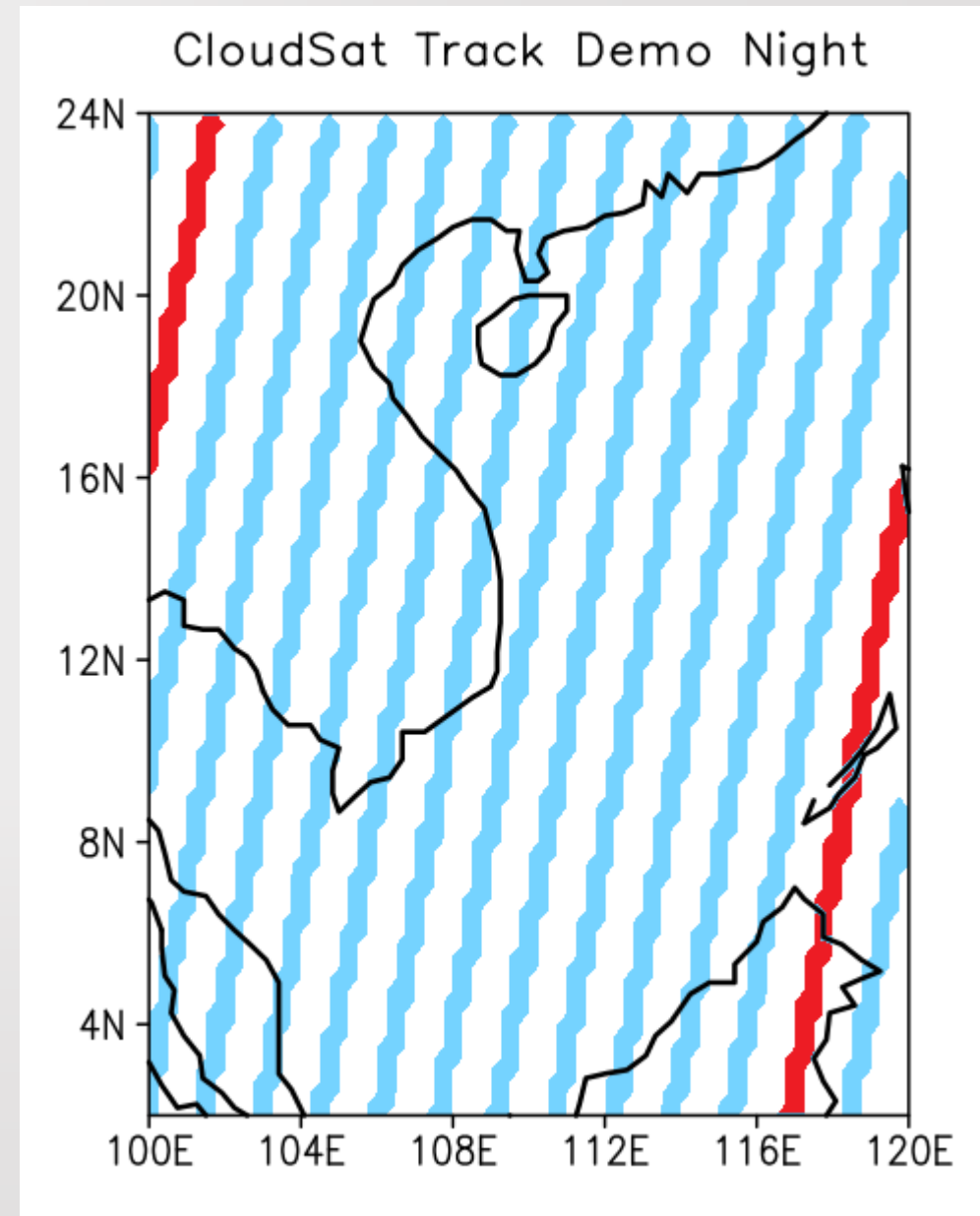
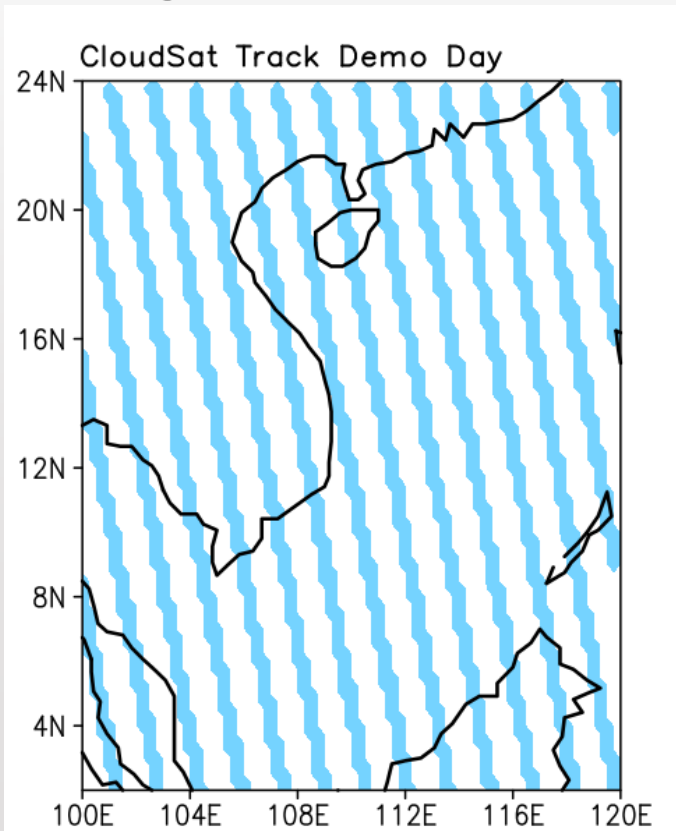
CloudSat Satellite Product

- Level 2 CloudSat Product
- Temporal and spatial resolution is limited
- Non-gridded data



CloudSat Satellite Product

- Level 2 CloudSat Product
- Temporal and spatial resolution is limited
- Non-gridded data



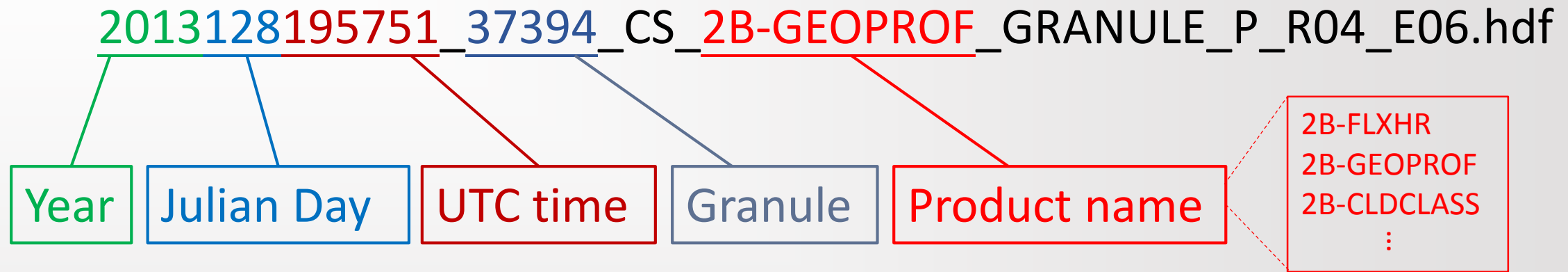
Information from file name

- Example :

2013128195751_37394_CS_2B-GEOPROF_GRANULE_P_R04_E06.hdf

Information from file name


- Example :



2013128195751_37394_CS_2B-GEOPROF_GRANULE_P_R04_E06.hdf

- 2B-GEOPROF
- Year: 2013
- Julian day: 128 ➡ 5/8
- UTC time: start at 19:57:51
- Granule: 37394
- **File path:** dadm1/obs/CloudSat/hdf-GEOPROF/

Hdf file introduction

 CPR_Cloud_mask <37082x125 int8>

Vertical

	4	95	96	97	98		101	102	103	104	
343	0	0	0	8	0	10	10	5	5	5	5
344	0	0	0	0	0	10	10	5	5	5	5
345	0	0	0	0	10	10	10	5	5	5	5
346	0	0	0	10	10	10	20	5	5	5	5
347	0	0	30	10	20	20	20	5	5	5	5
348	20	20	20	20	20	40	40	20	5	5	5
349	40	20	20	20	40	40	40	40	20	5	5
350	40	40	40	40	40	40	40	40	20	5	5
351	40	40	40	40	40	40	40	40	40	5	5
352	40	40	40	40	40	40	40	40	40	5	5
353	40	40	40	40	40	40	40	40	40	5	5
354	40	40	40	40	40	40	40	40	40	5	5
355	40	40	40	40	40	40	40	40	40	5	5
356	40	40	40	40	40	40	40	40	40	5	5
357	40	40	40	40	40	40	40	40	20	5	5
		40	40	40	40	40	40	40	20	5	5
		40	40	40	40	40	40	40	20	5	5

Horizontal

Hdf file introduction

[illegible]

Hdf file introduction

Height x 20841x125 int16

Vertical

Horizontal

	1	2	3	4	5	6	7	8	9	10	11	12
1	25005	24765	24526	24286	24046	23806	23566	23326	23087	22847	22607	22367
2	25008	24768	24528	24288	24048	23809	23569	23329	23089	22849	22609	22370
3	25010	24770	24530	24291	24051	23811	23571	23331	23091	22852	22612	22372
4	25013	24773	24533	24293	24053	23813	23574	23334	23094	22854	22614	22374
5	25015	24775	24535	24296	24056	23816	23576	23336	23096	22857	22617	22377
6	25017	24778	24538	24298	24058	23818	23578	23339	23099	22859	22619	22379
7	25020	24780	24540	24300	24061	23821	23581	23341	23101	22861	22622	22382
8	25022	24782	24543	24303	24063	23823	23583	23344	23104	22864	22624	22384
9	25025	24785	24545	24305	24065	23826	23586	23346	23106	22866	22626	22387
10	25027	24787	24548	24308	24068	23828	23588	23348	23109	22869	22629	22389
11	25030	24790	24550	24310	24070	23831	23591	23351	23111	22871	22631	22392
12	25032	24792	24552	24313	24073	23833	23593	23353	23113	22874	22634	22394
13	25035	24795	24555	24315	24075	23835	23596	23356	23116	22876	22636	22396
14	25037	24797	24557	24318	24078	23838	23598	23358	23118	22879	22639	22399
15	25039	24800	24560	24320	24080	23840	23600	23361	23121	22881	22641	22401
16	25042	24802	24562	24322	24083	23843	23603	23363	23123	22883	22644	22404
17			24565	24325	24085	23845	23605	23365	23126	22886	22646	22406
18			24567	24327	24087	23848	23608	23368	23128	22888	22648	22409
19			24569	24330	24090	23850	23610	23370	23130	22891	22651	22411
20	25052	24812	24572	24332	24092	23852	23613	23373	23133	22893	22653	22413

2008091222318_10246_CS_2B-GEOPROF_GRANULE_P_R04_E02.hdf

View as HDF

2B-GEOPROF

Geolocation Fields

Height

Profile_time

UTC_start

TAI_start

Latitude

Longitude

Range_to_intercept

DEM_elevation

Vertical_binsize

Pitch_offset

Roll_offset

Data Fields

CPR_Cloud_mask

Gaseous_Attenuation

Radar_Reflectivity

Data_quality

Data_status

Data_targetID

SurfaceHeightBin

SurfaceHeightBin_fraction

Sigma-Zero

MODIS_cloud_flag

MODIS_Cloud_Fraction

MODIS_scene_char

MODIS_scene_var

CPR_Echo_Top

sem_NoiseFloor

sem_NoiseFloorVar

sem_NoiseGate

Navigation_land_sea_flag

Clutter_reduction_flag

Swath Attributes

View as EOS

Name: CPR_Cloud_mask

Dimensions:

Name: nray:2B-GEOPROF

Size: 37082

Name: nbin:2B-GEOPROF

Size: 125

Precision: int8

Import: Scientific Data Set

Subset selection parameters

	Start	Increment	Length
1	1	1	37082
2	1	1	125

Reset Selection Parameters

Workspace variable: CPR_Cloud_mask

☐ Import metadata

Dataset import command:

```
CPR_Cloud_mask =  
hdfread('F:\download\hw11\hr\2008091222318_10246_CS_2B-GEOPROF_GRANULE_P_R04_E02.hdf',  
'/2B-GEOPROF/Data Fields/CPR_Cloud_mask' 'Index' {1 1:1 1:1:37082 125})
```

Import

2008091222318_10246_CS_2B-GEOPROF_GRANULE_P_R04_E02.hdf

View as HDF

2B-GEOPROF

Geolocation Fields

Height

Profile_time

UTC_start

TAI_start

Latitude

Longitude

Range_to_intercept

DEM_elevation

Vertical_binsize

Pitch_offset

Roll_offset

Data Fields

CPR_Cloud_mask

Gaseous_Attenuation

Radar_Reflectivity

Data_quality

Data_status

Data_targetID

SurfaceHeightBin

SurfaceHeightBin_fraction

Sigma-Zero

MODIS_cloud_flag

MODIS_Cloud_Fraction

MODIS_scene_char

MODIS_scene_var

CPR_Echo_Top

sem_NoiseFloor

sem_NoiseFloorVar

sem_NoiseGate

Navigation_land_sea_flag

Clutter_reduction_flag

Swath Attributes

View as EOS

Precision: int8

FillValue: -99

factor: 1

offset: 0

long_name: CPR Cloud Mask

valid_range: 0 40

missing: -9

missop: ==

Import: Scientific Data Set

Subset selection parameters

	Start	Increment	Length
1	1	1	37082
2	1	1	125

Reset Selection Parameters

Workspace variable: CPR_Cloud_mask

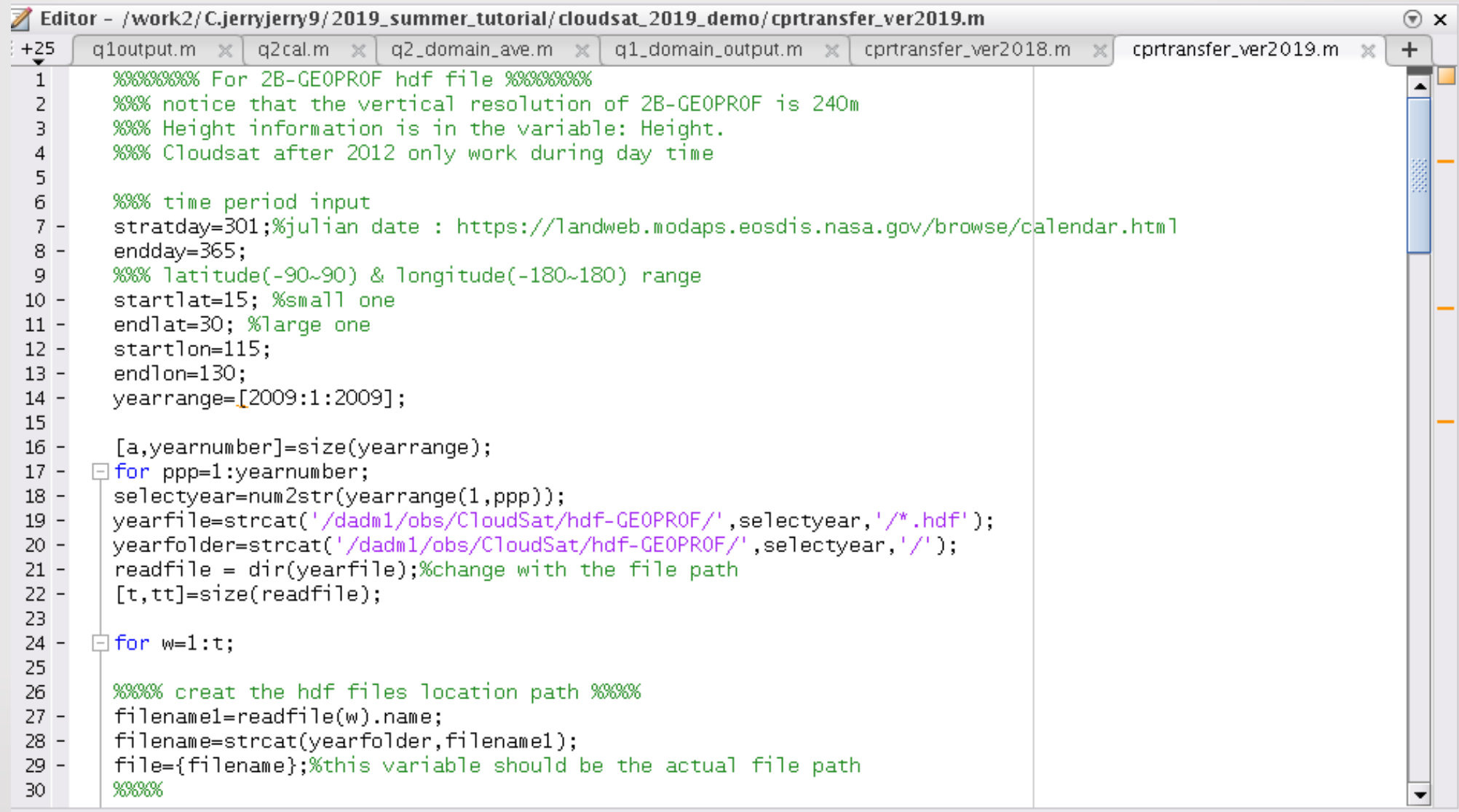
☐ Import metadata

Dataset import command:

```
CPR_Cloud_mask =  
hdfread('F:\download\hw11\hr\2008091222318_10246_CS_2B-GEOPROF_GRANULE_P_R04_E02.hdf',  
'/2B-GEOPROF/Data Fields/CPR_Cloud_mask' 'Index' {1 11 11 11 37082 125});
```

Hdf file introduction

2019_summer_tutorial/cloudsat_2019_demo/cprtransfer_ver2019.m



```
Editor - /work2/C.jerryjerry9/2019_summer_tutorial/cloudsat_2019_demo/cprtransfer_ver2019.m
+25  q1output.m x q2cal.m x q2_domain_ave.m x q1_domain_output.m x cprtransfer_ver2018.m x cprtransfer_ver2019.m x
1      %%%%%%%%% For 2B-GEOPROF hdf file %%%%%%%%%
2      %%% notice that the vertical resolution of 2B-GEOPROF is 240m
3      %%% Height information is in the variable: Height.
4      %%% Cloudsat after 2012 only work during day time
5
6      %%% time period input
7 -   stratday=301;%julian date : https://landweb.modaps.eosdis.nasa.gov/browse/calendar.html
8 -   endday=365;
9      %%% latitude(-90~90) & longitude(-180~180) range
10 -  startlat=15; %small one
11 -  endlat=30; %large one
12 -  startlon=115;
13 -  endlon=130;
14 -  yearrange=[2009:1:2009];
15
16 -  [a,yearnumber]=size(yearrange);
17 -  for ppp=1:yearnumber;
18 -      selectyear=num2str(yearrange(1,ppp));
19 -      yearfile=strcat('/dadml/obs/CloudSat/hdf-GEOPROF/',selectyear,'/*.hdf');
20 -      yearfolder=strcat('/dadml/obs/CloudSat/hdf-GEOPROF/',selectyear,'/');
21 -      readfile = dir(yearfile);%change with the file path
22 -      [t,tt]=size(readfile);
23
24 -  for w=1:t;
25
26      %%% creat the hdf files location path %%%
27 -      filename1=readfile(w).name;
28 -      filename=strcat(yearfolder,filename1);
29 -      file={filename};%this variable should be the actual file path
30      %%%
```

END

website

- <http://www.cloudsat.cira.colostate.edu/>



Welcome to the CloudSat Data Processing Center

CloudSat is a satellite mission designed to measure the vertical structure of clouds from space. The radar data produces detailed images of cloud structures which will contribute to a better understanding of clouds and climate. Please peruse this website to find out more about the CloudSat mission and the Data Processing Center.

Visit the [main CloudSat project website](#) at Colorado State University.

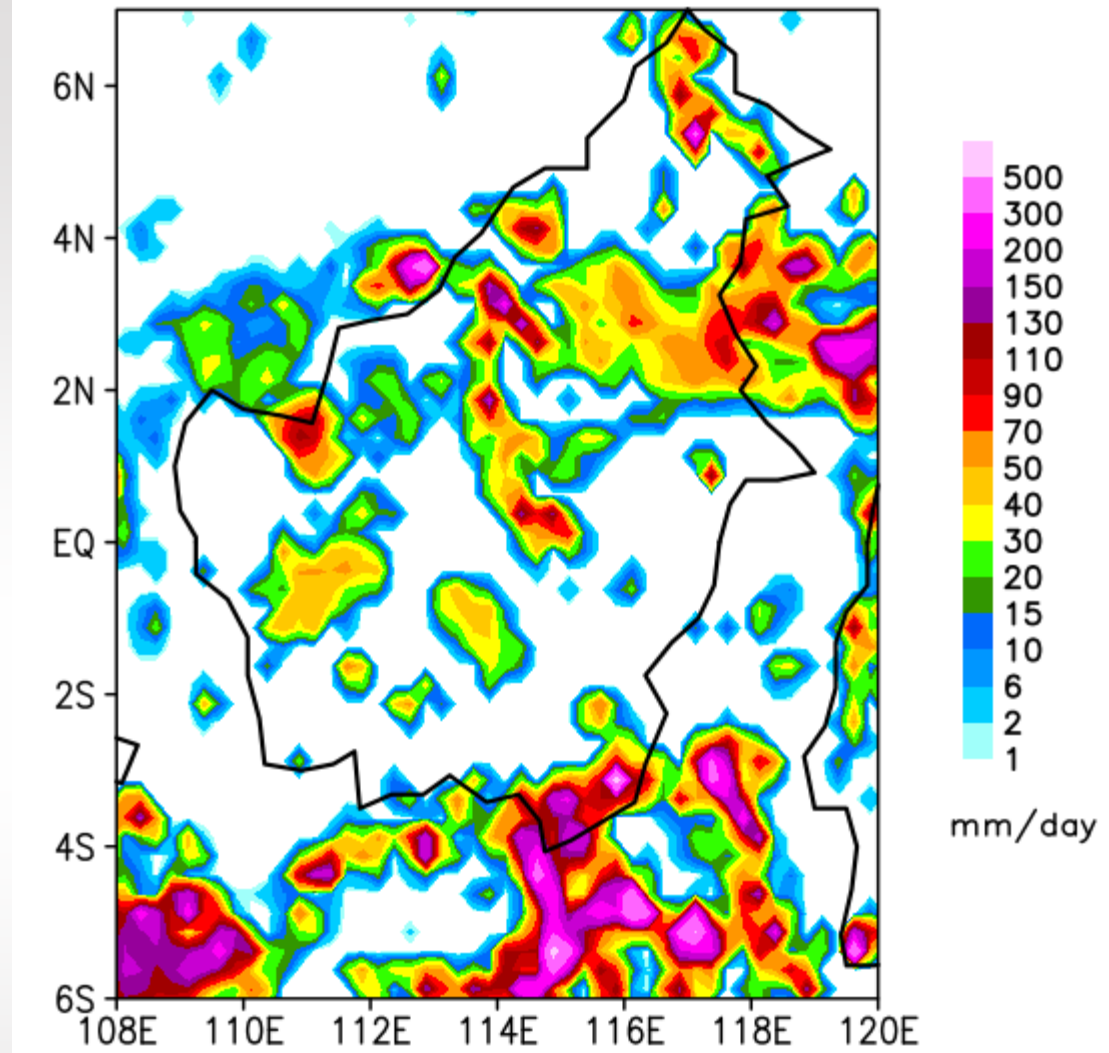
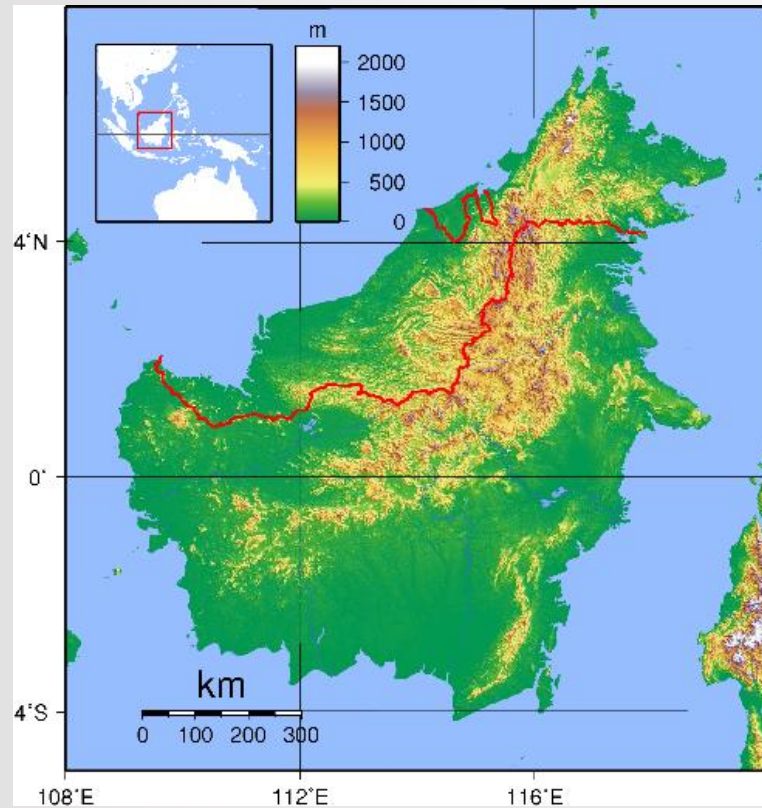
CloudSat releases algorithm uncertainty study

September 1, 2016

The CloudSat algorithm development leads have completed a synthesis of algorithm uncertainties. The synopsis describes the known uncertainties in the Cloudsat algorithms and provides the relevant technical and peer reviewed references for data and users. The algorithm development team plans to update the document periodically as new data releases become available.

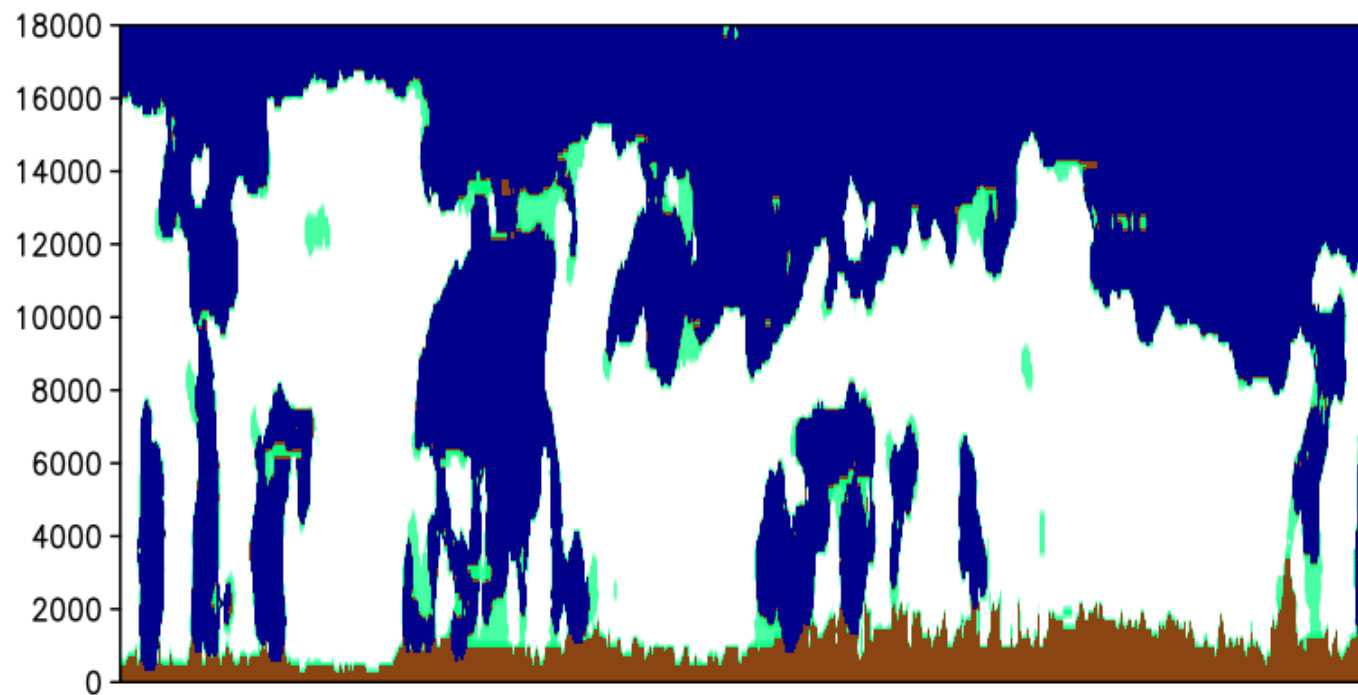
CloudSat sampling

- TRMM : 1400LT
- 2007/1/23

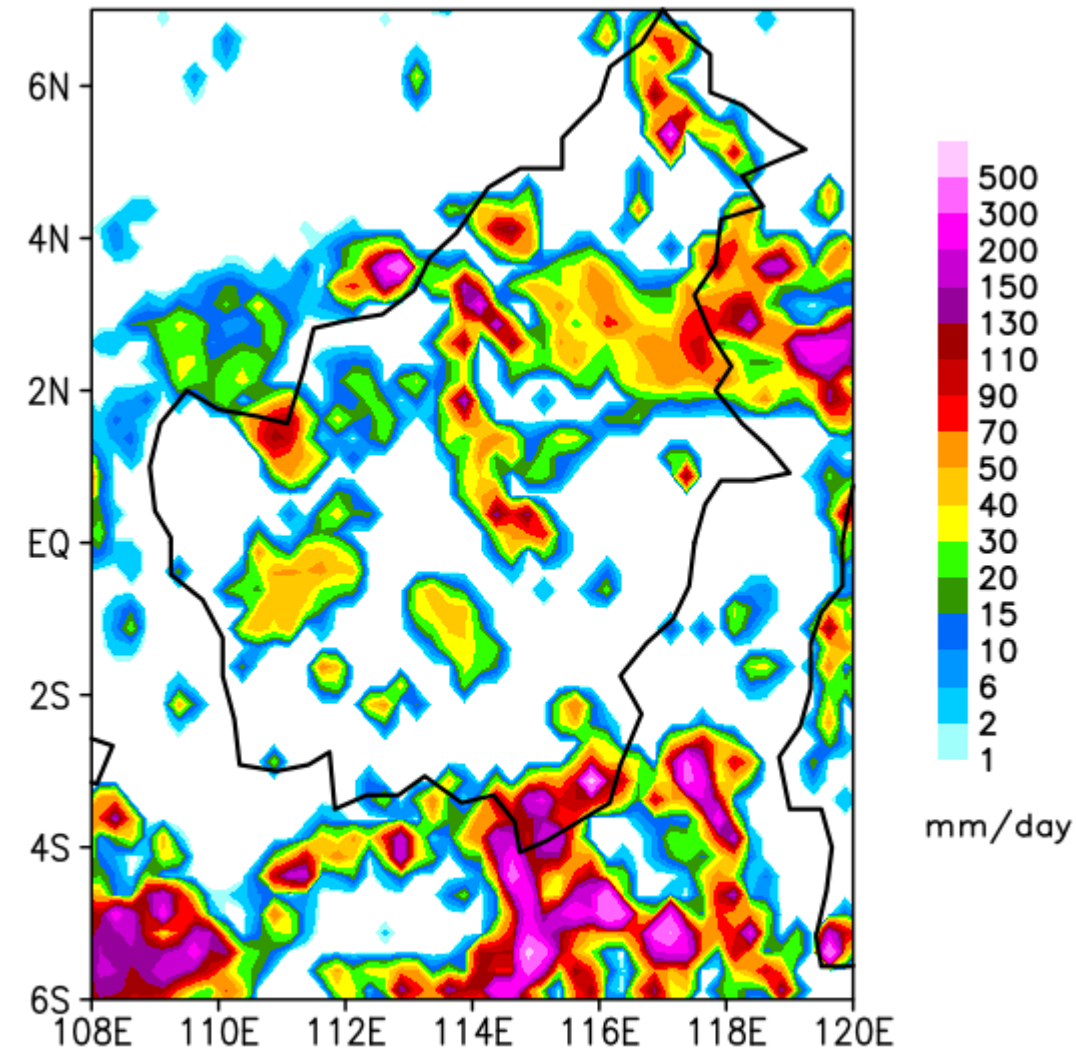


CloudSat sampling

- TRMM : 1400LT
- 2007/1/23
- CloudSat : ~14:00LT

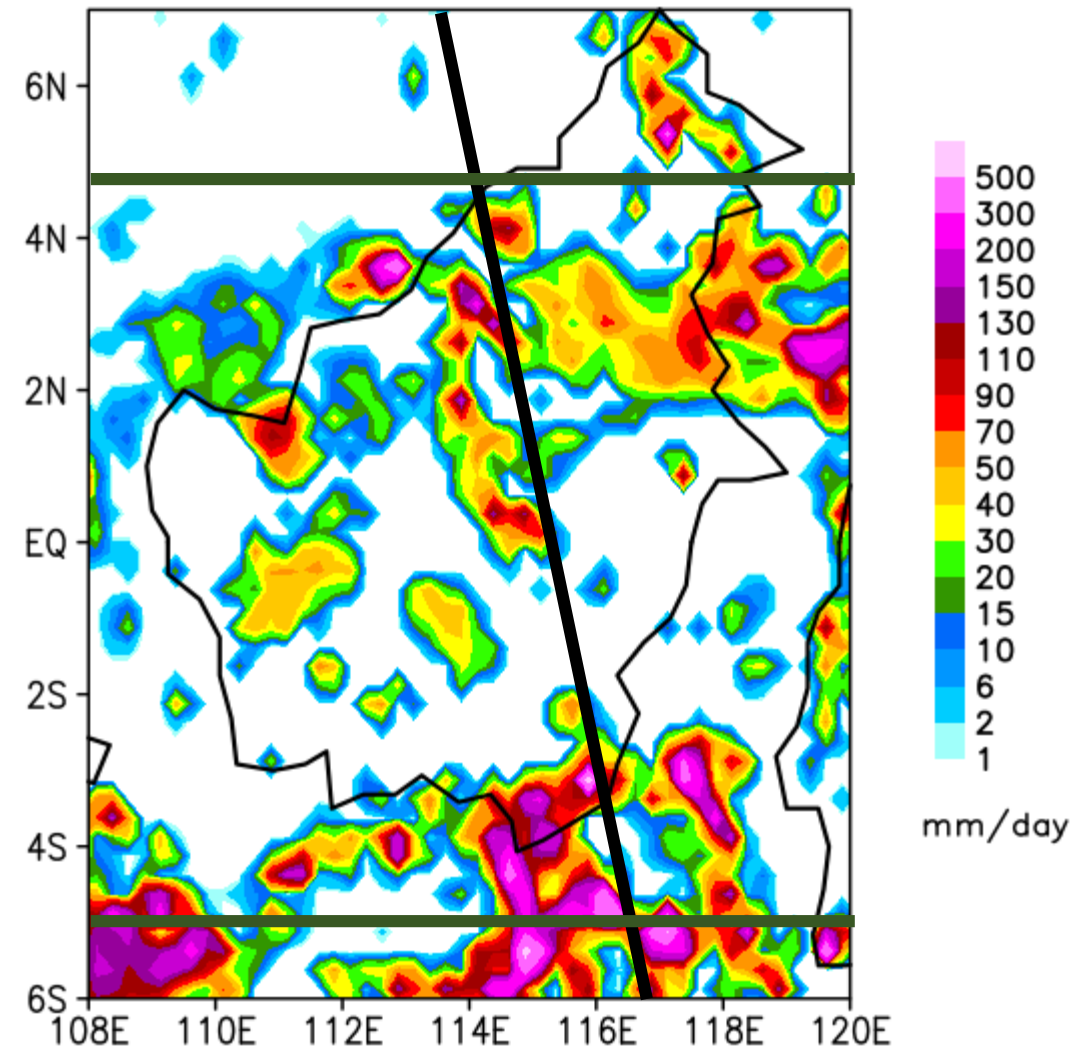
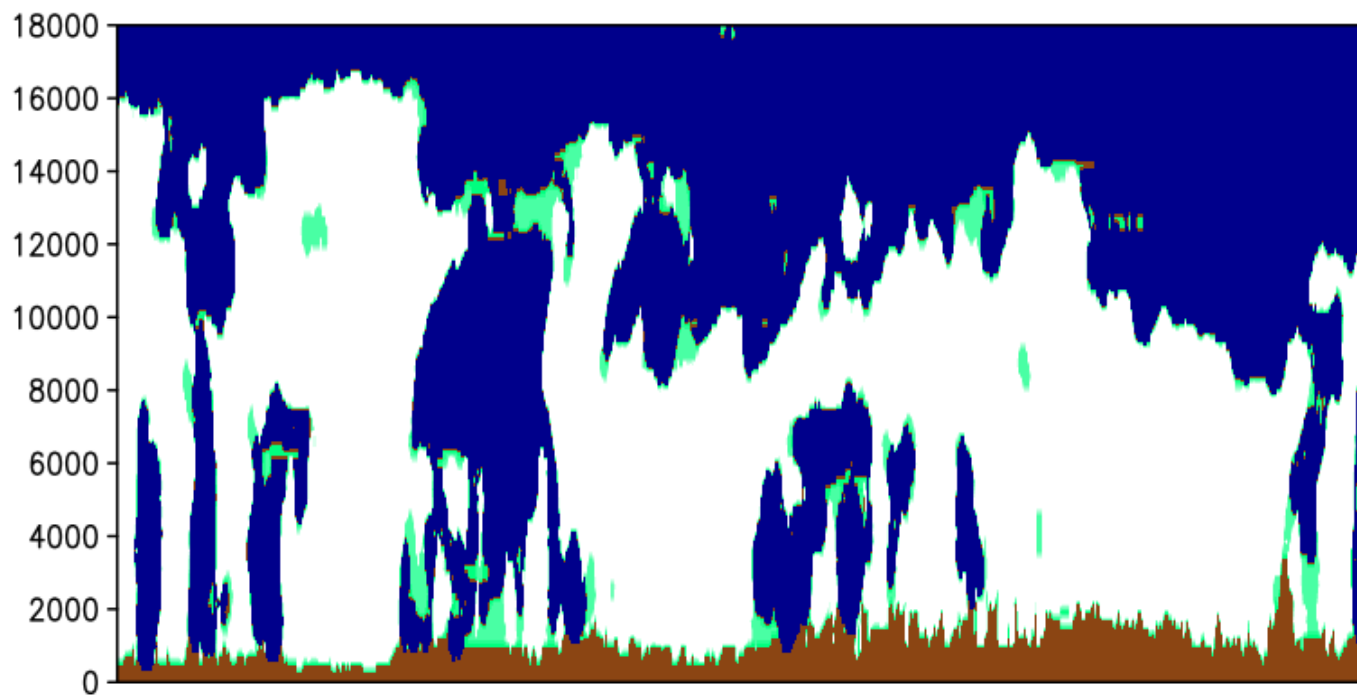


Lat -5 ← Lat 4.6
Lon 116.8 → Lon 114.8



CloudSat sampling

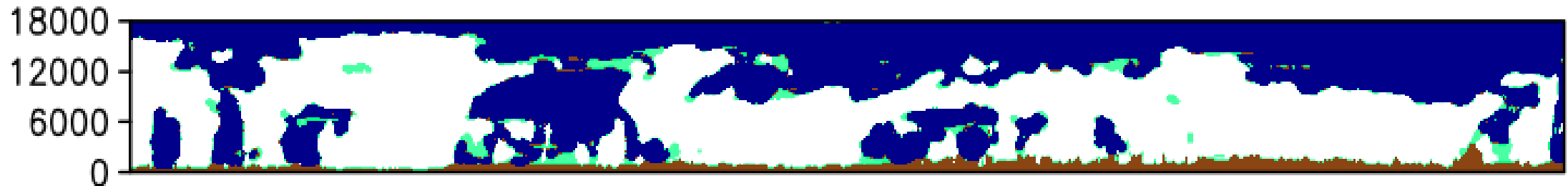
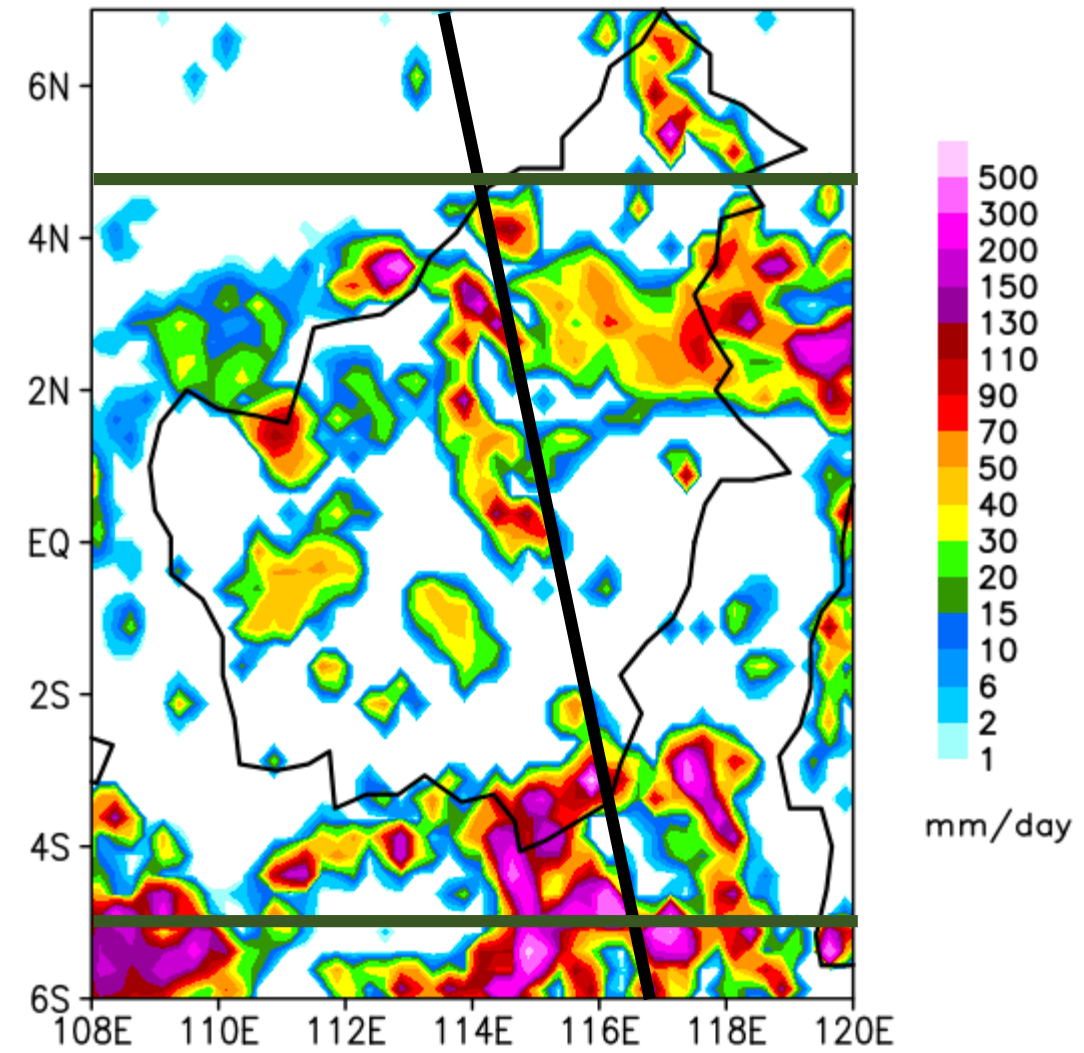
- TRMM : 1400LT
- 2007/1/23
- CloudSat : ~14:00LT



Lat -5 ← Lat 4.6
Lon 116.8 → Lon 114.8

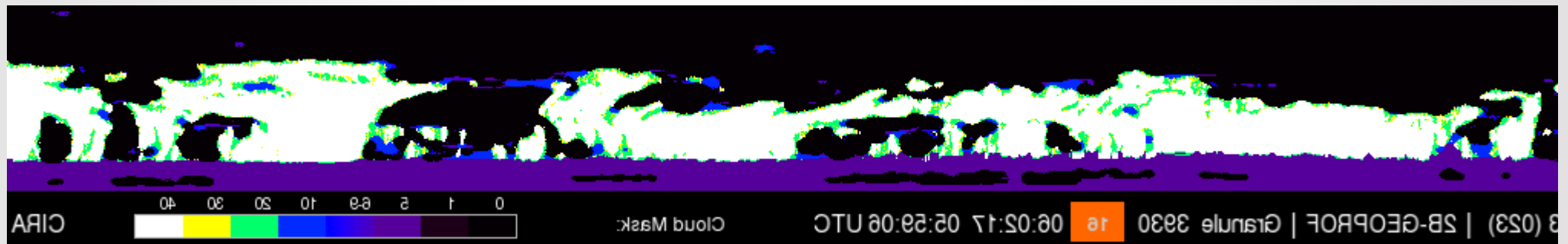
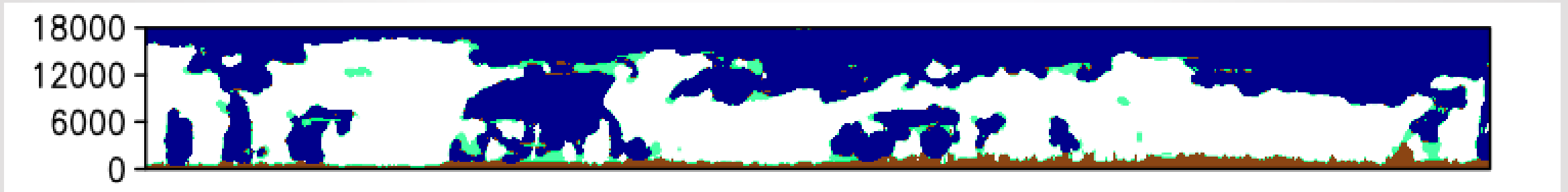
CloudSat sampling

- TRMM : 1400LT
- 2007/1/23
- CloudSat : ~14:00LT



CloudSat sampling

- TRMM : 1400LT
- 2007/1/23
- CloudSat : ~14:00LT



Cloud product processing

Copy “coldsugrge.mat”

mkdir folder

day-5
day-4
day-3
day-2

day4
day5

cprtransfer_ver2018_crossyear.m

CPR_2012005_30262_day.nc

⋮

Variables in .nc :
locationinfo
height
CPRCloudmask
Landseamask

125 * xxxx

Find your own cloud

Example : ppt 10~12

nctodatforcpr_forenv.m

Merge all cases in same
folder to one .dat file

Example:

cpr_day-5_cloud_2786.dat
day-5_2786.ctl

Cloud product processing


```
%%%%%%%% For 2B-GEOPROF hdf file %%%%%%%%%%
%%% notice that the vertical resolution of 2B-GEOPROF is 1000m
%%% Height information is in the variable: Height
%%% Cloudsat after 2012 only work during day time
%julian date : https://landweb.modaps.eosdis.nasa.gov
%%% time period input
yearrange=coldsurgejulian;

%%% latitude(-90~90) & longitude(-180~180) range
startlat=-5; %small one
endlat=30; %large one
startlon=100;
endlon=140;

[casenum,useless]=size(yearrange);
for ppp=1:19;%casenum;
```

- time information in hdf is UTC time.
- If the pressure information is needed, check the “ECMWF-AUX” product.
- No observation at nighttime after 2011/04/17
- 2011’s observation only have 1430 cases (other years : over 4000)

Useful website



[Home](#) [Quicklooks](#) [Data Products](#) [Community Products](#) [Order Data](#) [Publications](#) [Resources](#) [Login](#)

Level 1B

Current Epoch: Epoch 4

Start: 15 May 2012 (day 150)
[More Epoch Information](#)

Level 2B

Level 2C

Level 2D

Level AUX

Level 3

2B-CLDCLASS

2B-CLDCLASS-LIDAR

2B-CWC-RO

2B-CWC-RVOD

2B-FLXHR

2B-FLXHR-LIDAR

2B-GEOPROF

2B-GEOPROF-LIDAR

2B-TAU

Next Release: R04

the first R05 product, 1B-CPR to be released in late summer.

[Home](#) » [Data Products](#) » [Level 2B](#)

2B-GEOPROF

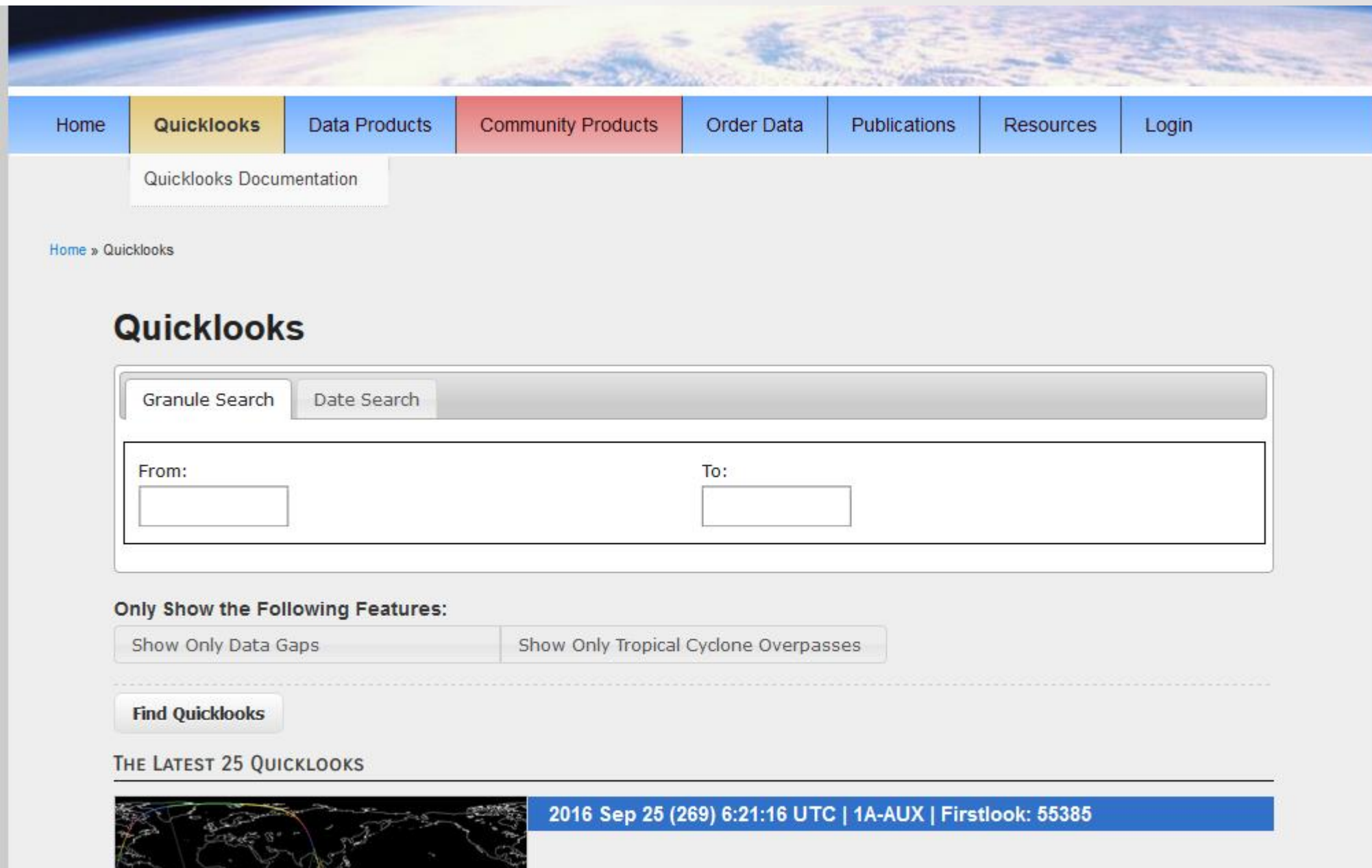
Product Version

2B-GEOPROF P_R04 (Current Version)

Product Availability: Full mission availability except for anomalies and maneuver data gaps.

Useful website

•



The screenshot shows the Quicklooks website interface. At the top is a navigation bar with a header image of Earth from space. The navigation bar contains links: Home, Quicklooks (highlighted), Data Products, Community Products, Order Data, Publications, Resources, and Login. Below the navigation bar is a sub-header with a link to Quicklooks Documentation. The main content area has a breadcrumb trail: Home » Quicklooks. The title "Quicklooks" is displayed. Below the title is a search section with two tabs: Granule Search (selected) and Date Search. The Granule Search section contains two input fields labeled "From:" and "To:". Below the search section is a section titled "Only Show the Following Features:" with two buttons: "Show Only Data Gaps" and "Show Only Tropical Cyclone Overpasses". Below this is a "Find Quicklooks" button. At the bottom, there is a section titled "THE LATEST 25 QUICKLOOKS" with a horizontal line. Below the line is a thumbnail image of a satellite view of Earth, and a blue bar containing the text "2016 Sep 25 (269) 6:21:16 UTC | 1A-AUX | Firstlook: 55385".

Home Quicklooks Data Products Community Products Order Data Publications Resources Login

Quicklooks Documentation

Home » Quicklooks

Quicklooks

Granule Search Date Search

From:

To:

Only Show the Following Features:

Show Only Data Gaps Show Only Tropical Cyclone Overpasses

Find Quicklooks

THE LATEST 25 QUICKLOOKS

2016 Sep 25 (269) 6:21:16 UTC | 1A-AUX | Firstlook: 55385