

H SAF precipitation products download and visualization

Claudio Giorgi – 

H SAF products technical info and download procedure

- Summary of H SAF products related to rainfall available to the users
- Procedure to get access to the data - short range repository and long time archive
- Data formats used at the moment and near future perspectives
- Procedure to transform the data in MATLAB readable formats
- Procedure to plot the data for the area of interest

H SAF products technical info and download procedure

Summary of H SAF products related to rainfall available to the users

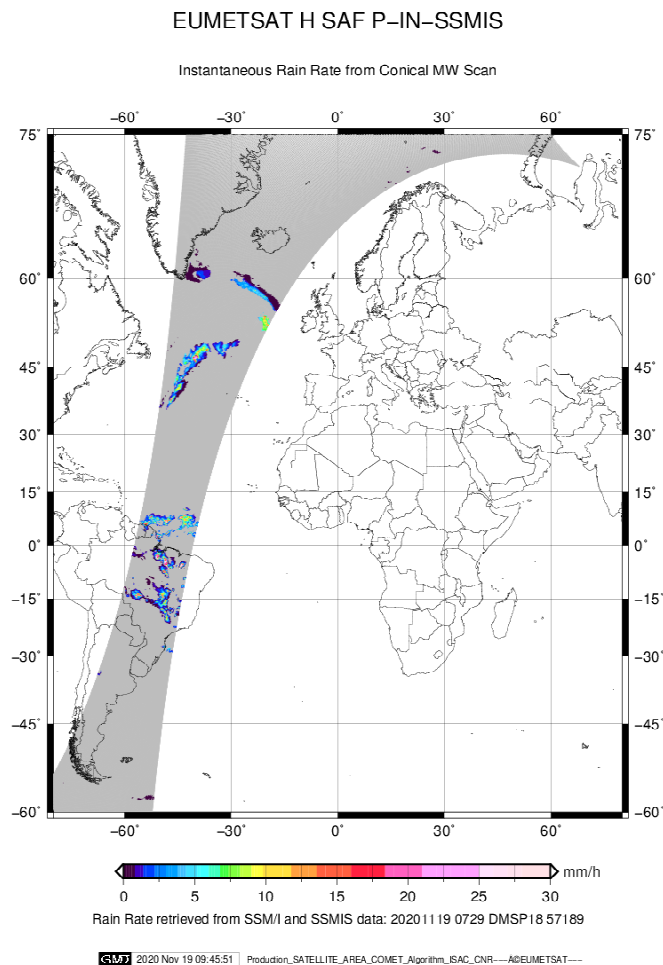
- Procedure to get access to the data - short range repository and long time archive
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H SAF products technical info and download procedure - summary

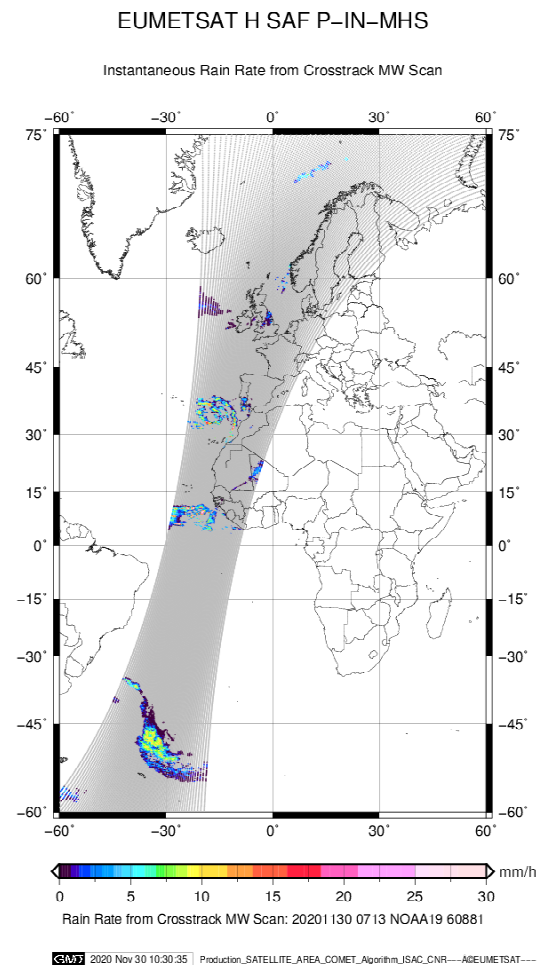
- Operational :
 - H01 H02B H03B H05B H18
- Pre-operational :
 - H15
- Development (not yet available)
- Demonstrational (testing use only)
- Auxiliary (available on request) :
 - H17 H20 H23

Product ID	Description	Grid	Timeliness	Status	Area
P-IN-SSMIS H01	MW conical scanners SSMIS	SSMIS hi-res channel orbital grid	2.5 hrs	Operational	Full disk
P-IN-MHS H02B	MW cross-track scanners AMSU/MHS	MHS orbital grid	1 hr	Operational	Full disk
H-AUX-17 H17	MW conical scanner AMSR-2	AMSR.2 orbital grid	1.5 hrs	Auxiliary	
P-IN-ATMS H18	MW cross-track scanners ATMS	ATMS orbital grid	1.5 hrs	Operational	Full disk
H-AUX-20 H20	MW conical scanners GMI	GMI hi-res channel orbital grid	1.5 hrs	Auxiliary	Global

H01



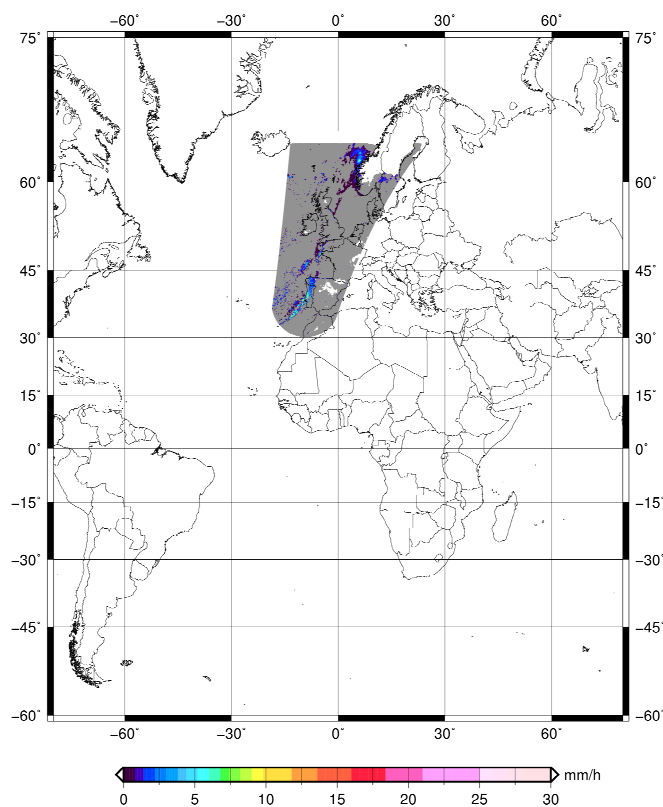
H02B



H17

EUMETSAT H-SAF PR-OBS-17

Instantaneous Rain Rate from AMRS-2 conical scanner



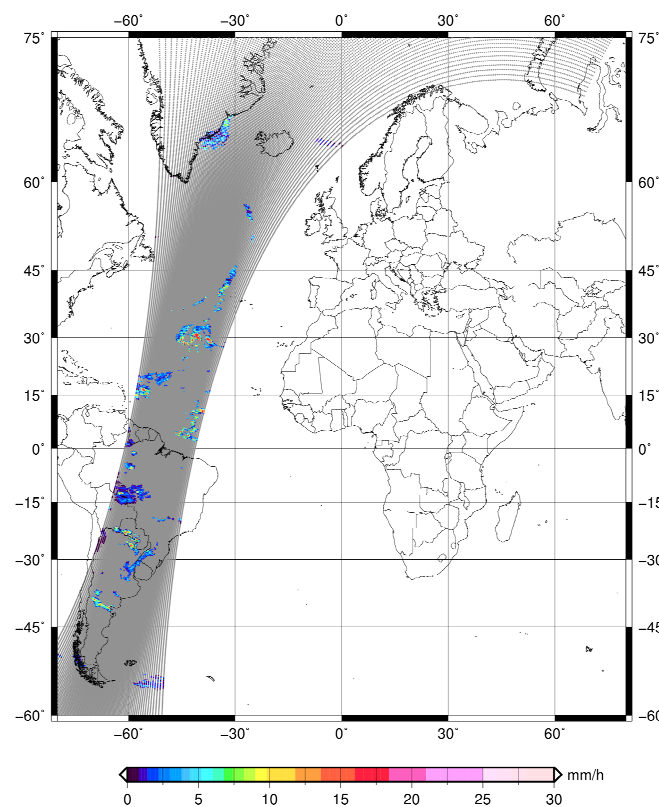
Precipitation rate at around by AMSR-2 MW conical scanner: 20201125 0225 GCOM-W1 45340

SM 2020 Nov 25 04:39:09 | Production_SATELLITE_AREA_COMET_Algorithm_ISAC_CNIR---AREUMETSAT---

H18

EUMETSAT H SAF P-IN-ATMS

Instantaneous Rain Rate from Crosstrack ATMS-MW Scan



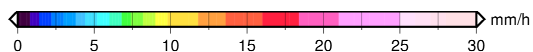
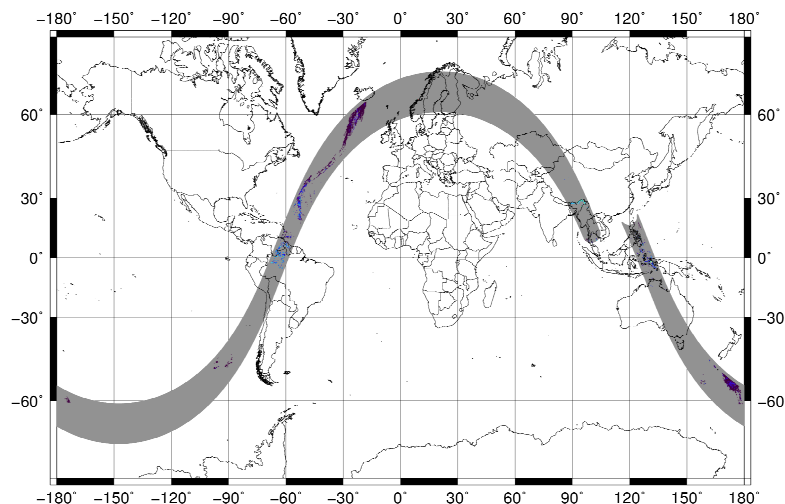
Rain Rate from Crosstrack ATMS-MW Scan: 20201109 0422 NPP 46816

SM 2020 Nov 09 06:30:48 | Production_SATELLITE_AREA_COMET_Algorithm_ISAC_CNIR---AREUMETSAT---

H2O

EUMETSAT H-SAF PR-OBS-20

Instantaneous Rain Rate from GMI conical scanner



Precipitation rate at ground by GMI MW conical scanner: 20201125 2030-2205

GMI 2020 Nov 25 22:44:21 | Production_SATELLITE_AREA_COMET_Algorithm_ISAC_CNR-----EUMETSAT----

H SAF products technical info and download procedure – summary blending MW-IR

Product ID	Description	Grid	Timeliness	Status	Area
P-IN-SEVIRI H03B	GEO/IR plus LEO/MW	MSG SEVIRI grid	15 min	Operational	Full disk
P-IN-SEVIRI-CO H15	SEVIRI convection area plus LEO/MW convective prec.	MSG SEVIRI grid	15 min	Pre-op	H SAF

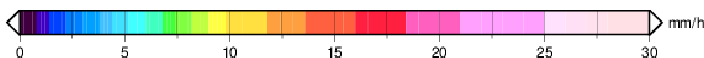
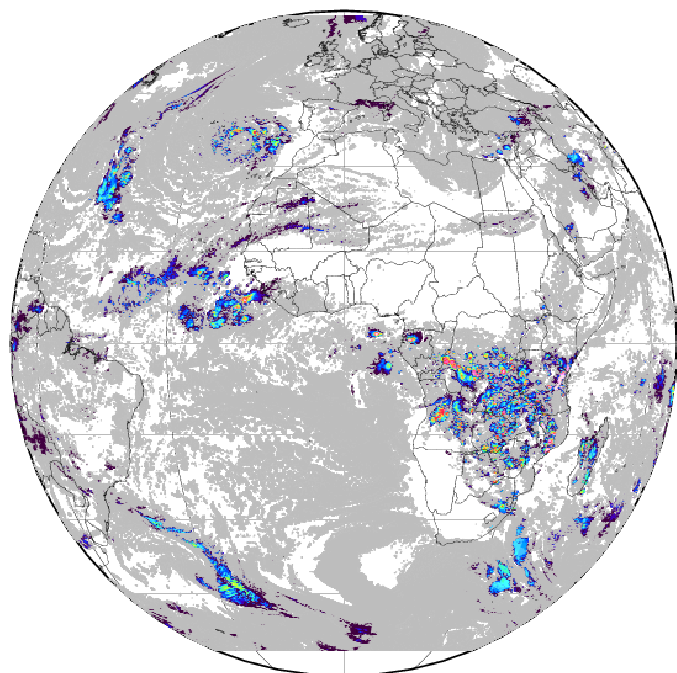
H SAF H SAF products technical info and download procedure – summary blending MW-IR

H03B

EUMETSAT H SAF P-IN-SEVIRI

Instantaneous Rain Rate retrieved from IR-MW blending data

Blending of: SEVIRI IR + SSMI-SSMIS MW + AMSU MW: 20201201 1245

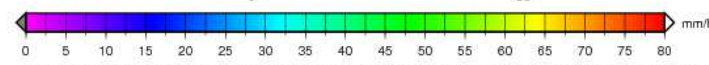
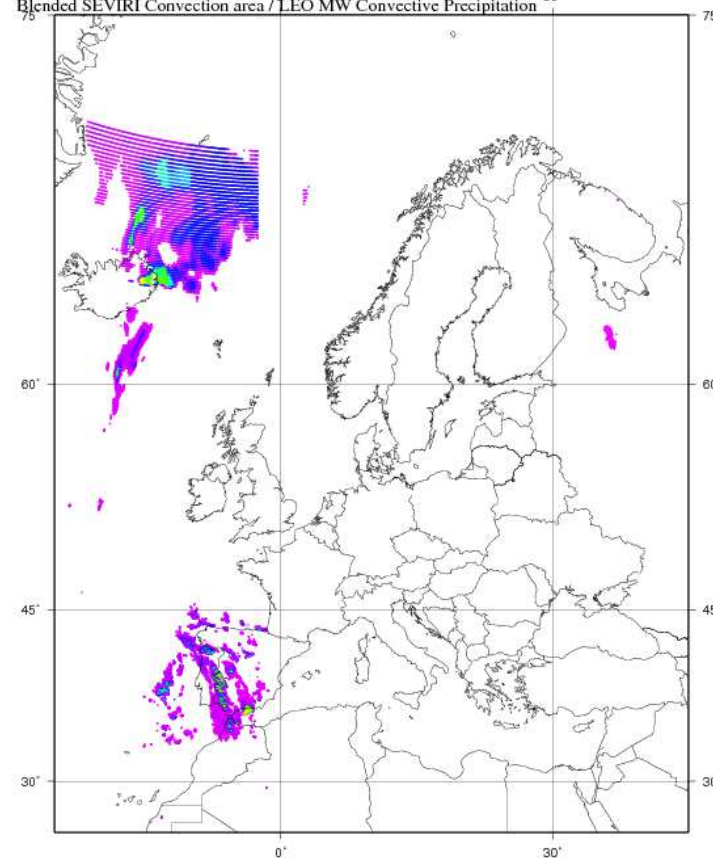


2020 Dec 01 13:08:20 Production_SATELLITE_AREA_COMET_Algorithm_ISAC_CNR-@EUMETSAT-

H15

EUMETSAT H SAF P-IN-SEVIRI-CO

Blended SEVIRI Convection area / LEO MW Convective Precipitation



Blending of: NEFODINA + SEVIRI IR + SSMI-SSMIS MW + AMSU MW 20201126 0412

2020 Nov 26 04:24:22 Production_SATELLITE_AREA_COMET_Algorithm_ISAC_CNR-@EUMETSAT-

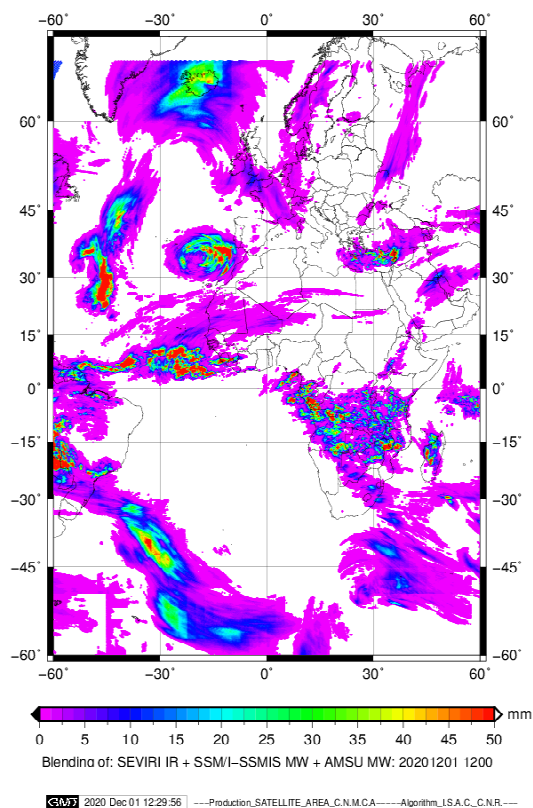
and download procedure – summary accumulated/daily mean

Product ID	Description	Grid	Timeliness	Status	Area
P-AC-SEVIRI H05B	GEO/IR plus LEO/MW	MSG SEVIRI grid	3 hrs	Operational	Full disk
P-DM-PMW H23	PMW inst.prec. estimates	Regular grid 0.25° x 0.25°	24 hrs	Auxiliary	Full disk

H05B

EUMETSAT H SAF P-AC-SEVIRI

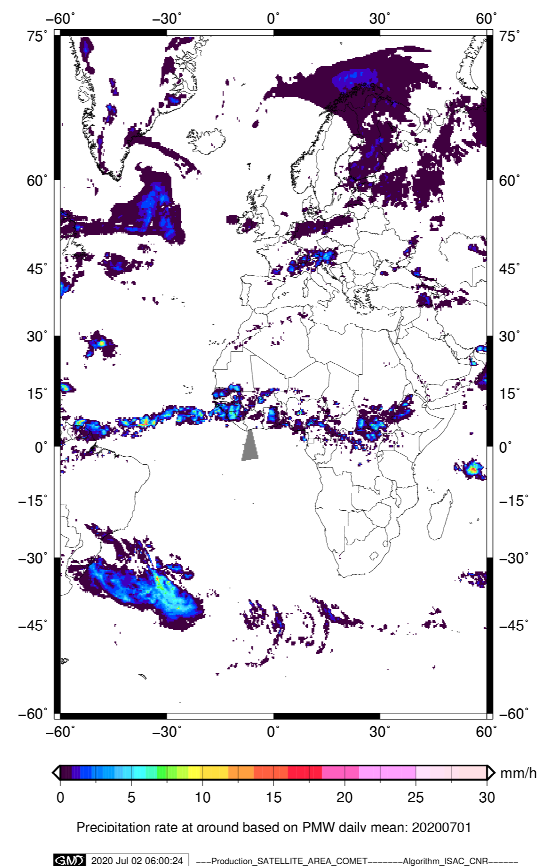
Accumulated Precipitation in the previous 24 hours



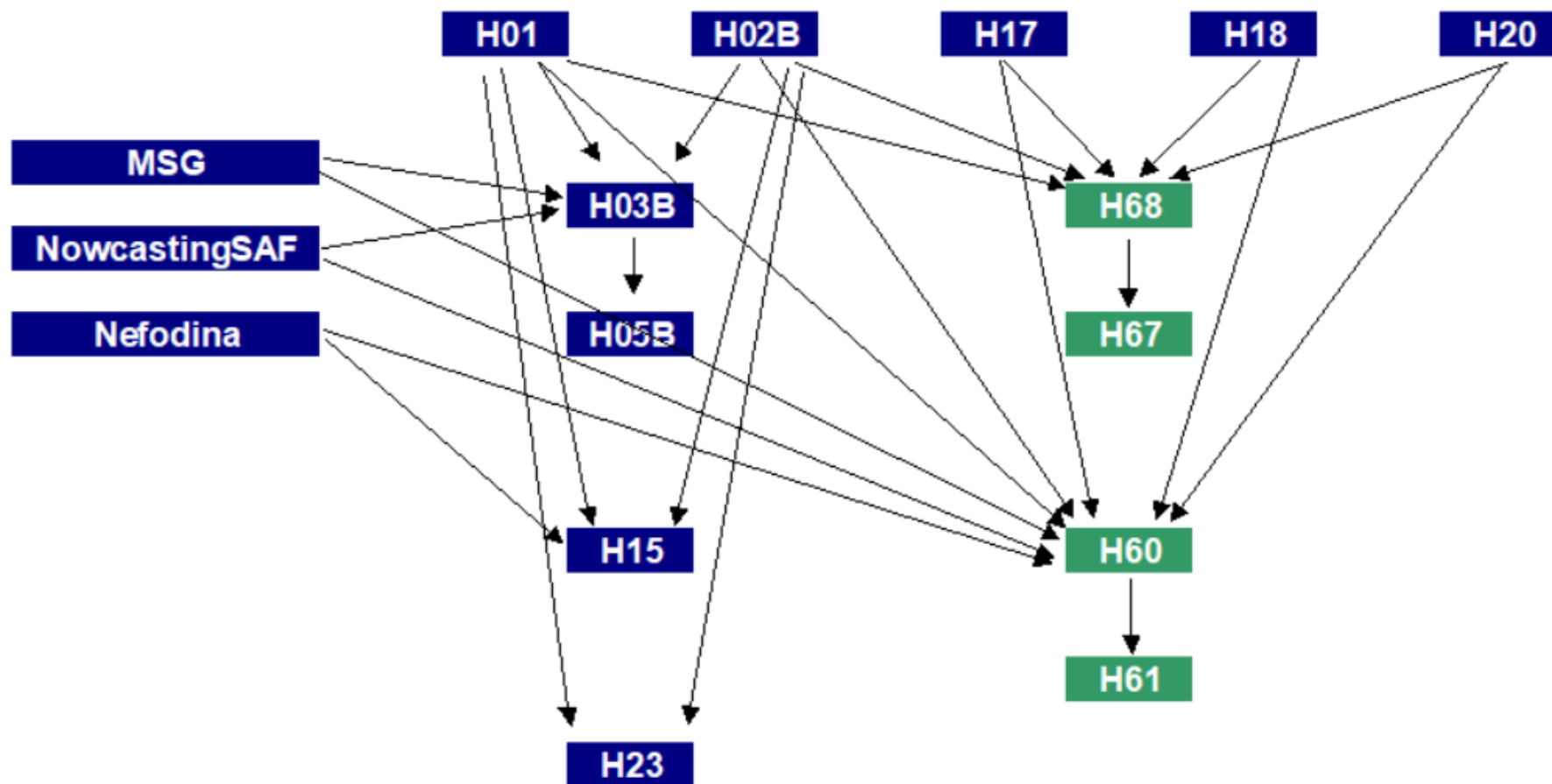
H23

EUMETSAT H-SAF P-DM-RME-PMW

Gridded daily mean precipitation



H SAF products technical info and download procedure – dependencies



H SAF products technical info and download procedure - documentation

- PUM (Product User Manual)
- ATBD (Algorithm Teoretical Baseline Document)
- PVR (Product Validation Report)
- For all these documents please browse to <https://hsaf.meteoam.it>

H SAF products technical info and download procedure – web site

The screenshot shows the EUMETSAT H SAF website interface. At the top, there is a teal navigation bar with a 'HOME' link and social media icons. Below this is a white header area containing the EUMETSAT H SAF logo and a main navigation menu with links for 'HOME', 'ABOUT', 'PRODUCTS', 'NEWS & MEDIA', and 'SUPPORT'. The 'HOME' link is highlighted. The main content area features a large hero image of a stormy sky with lightning, overlaid with the word 'Precipitation' in a large white font. Below the hero image, there are three columns of content:

- Latest news**: This section is currently empty.
- Latest products**: This section displays a product entry: 'Product : P-IN-SSMIS (H01) (Precipitation rate at ground by MW cross)'. The text is partially cut off at the bottom.
- User notifications**: This section displays an announcement: 'announcement 02/12/2020 From 14 to 18 December, 2020'.

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EUMETSAT

H SAF

H SAF products technical info and download procedure – registration

<https://hsaf.meteoam.it>

• Click on “new user”

The screenshot displays the H SAF website interface. At the top, there is a navigation menu with the following items: HOME, ABOUT, PRODUCTS, NEWS & MEDIA, LOGIN, NEW USER, and PASSWORD RECOVERY. The 'NEW USER' link is circled in red, and a large red arrow points to it from the right side of the page. Below the navigation menu is a large banner image featuring water droplets on a surface, with the text 'Soil-Moisture' overlaid in white. At the bottom of the page, there are three columns of content: 'Latest news', 'Latest products', and 'User notification'. The 'Latest products' column shows a product entry: 'Product : P-IN-SEVIRI-CO (H15) (Blended SEVIRI Convection area / LEO)'. The 'User notification' column shows an announcement dated '02/12/2020'.

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H SAF

H SAF products technical info and download procedure – registration

<https://hsaf.meteoam.it>

- Fill in the form
- Send it
- Read your email and follow the link

HOME / REGISTER

 EUMETSAT
H SAF
SUPPORT TO OPERATIONAL
HYDROLOGY AND WATER
MANAGEMENT

HOME ABOUT PRODUCTS NEWS & MEDIA SUPPORT

Registered users are able to receive news and periodic updates on H-SAF (news on products characteristics, on program events, on training courses), and will be able to have access to restricted sections of the website as "H-SAF Download Data Centre" and product viewer on the Google Maps. Furthermore, registration is necessary to perform the products downloading free of charge by means of a secure FTP server and to receive support on H-SAF products.

Email *	Email Confirmation *
<input type="text"/>	<input type="text"/>
Name *	Surname *
<input type="text"/>	<input type="text"/>
Password *	Password Confirmation *
<input type="text"/>	<input type="text"/>
Address	Postal Code
<input type="text"/>	<input type="text"/>

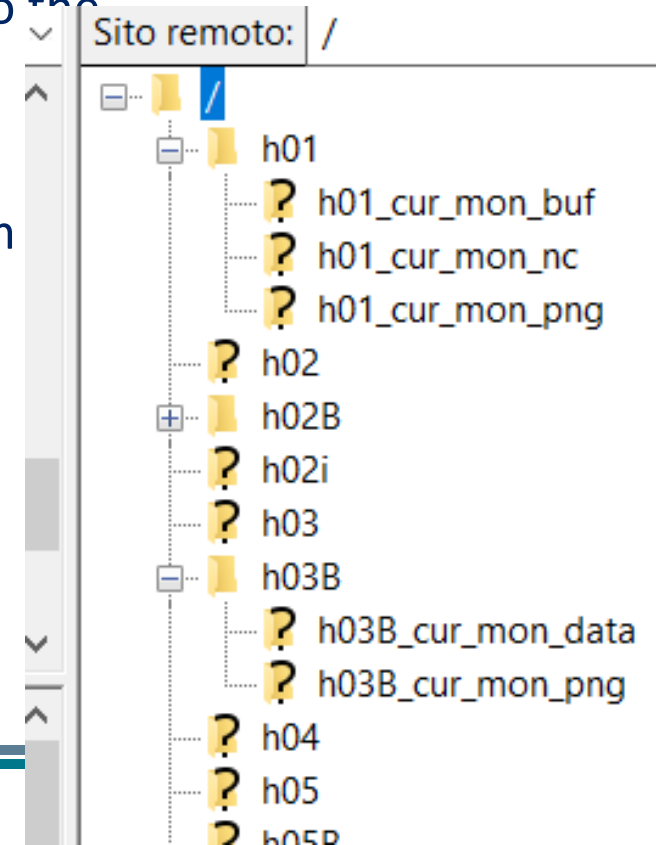
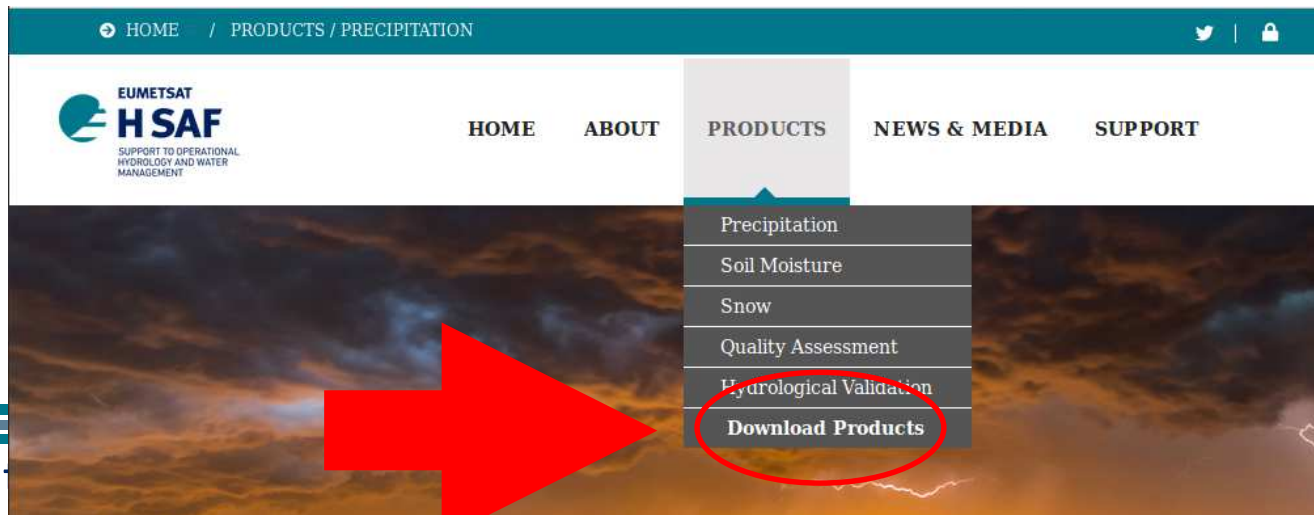
H SAF products technical info and download procedure – download

Recent data (less than 60 days)

- Using any FTP client, do access to [ftphsaf.meteoam.it](ftp://ftphsaf.meteoam.it) using the account created at registration time
- Enter the web site <https://hsaf.meteoam.it>, login and access to the Download page

Older data

- Request for data older than 60 days can be done using the form request in the web site <https://hsaf.meteoam.it>



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H SAF products technical info and download procedure – file names

- For each product at least two files are available via ftp:
 - **Data** (BUFR, GRIB, NetCDF), usually gzip compressed
 - **Image** (PNG), not available for data older than 60 days
 - **Quality** (H15, GRIB format)
- The filename always specify the product name and its time reference
 - `h03B_20201201_1400_fdk.grb.gz`
- Other infos can be available thru the file name
 - `h02B_20201201_105221_METOPB_42575_fdk.buf.gz`
 - `h05B_20201201_1200_12_fdk.grb.gz`

H SAF products technical info and download procedure – file formats

Short	Product ID	Example	Format
H01	P-IN-SSMIS	h01_20201201_1323_DMSP17_72635_rom.nc.gz	BUFR, NetCDF
H02B	P-IN-MHS	h02B_20201201_101921_NOAA19_60897_fdk.nc.gz	BUFR, NetCDF
H17	H-AUX-17	h17_20201201_1253_GCOM-W1_45433_fdk.nc.gz	NetCDF
H18	P-IN-ATMS	h18_20201201_1237_NPP_47133.nc.gz	NetCDF
H20	H-AUX-20	h20_20201201_1220_1350_GMI.nc.gz	NetCDF
H03B	P-IN-SEVIRI	h03B_20201201_1415_fdk.grb.gz	GRIB
H15	P-IN-SEVIRI-CO	h15_20201201_1427_rom.grb.gz	GRIB
H05B	P-AC-SEVIRI	h05B_20201201_1200_24_fdk.grb.gz	GRIB
H23	P-DM-PMW	h23_20201130.nc.gz	NetCDF

H SAF products technical info and download procedure – file formats

- H SAF is made of a growing set of products, which are in constant evolution
- New products are going to appear and older ones will be discontinued
- The same applies to file formats
- BUFR is the oldest file type, still distributed for H01 and H02B.
- This format is going to be discontinued. NetCDF files are currently distributed in parallel to BUFR ones for H01 and H02B.
- In the near future BUFR files will be no longer produced.
- GRIB files (H03B, H15, H05B) will remain in use until these products will be substituted by newer ones
- We suggest to prefer NetCDF format whenever possible. NetCDF is a self-describing file format designed to manage huge amounts of data. Please refer to <http://cfconventions.org/> for details.
- A conversion software from NetCDF to BUFR is available at <ftp://phsaf.meteoam.it> in the directory [utilities/netcdf2bufr](ftp://phsaf.meteoam.it/utilities/netcdf2bufr)

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H SAF products technical info and download procedure – intro

- There are three formats: BUFR, GRIB and NetCDF
- The first two are recommended by WMO, the third is widely used in scientific laboratories
- H SAF is moving towards NetCDF to be more user-friendly
- The utilities needed to have access to BUFR and GRIB files can be obtained from ECMWF web site
- Other utilities are available for GRIB files too

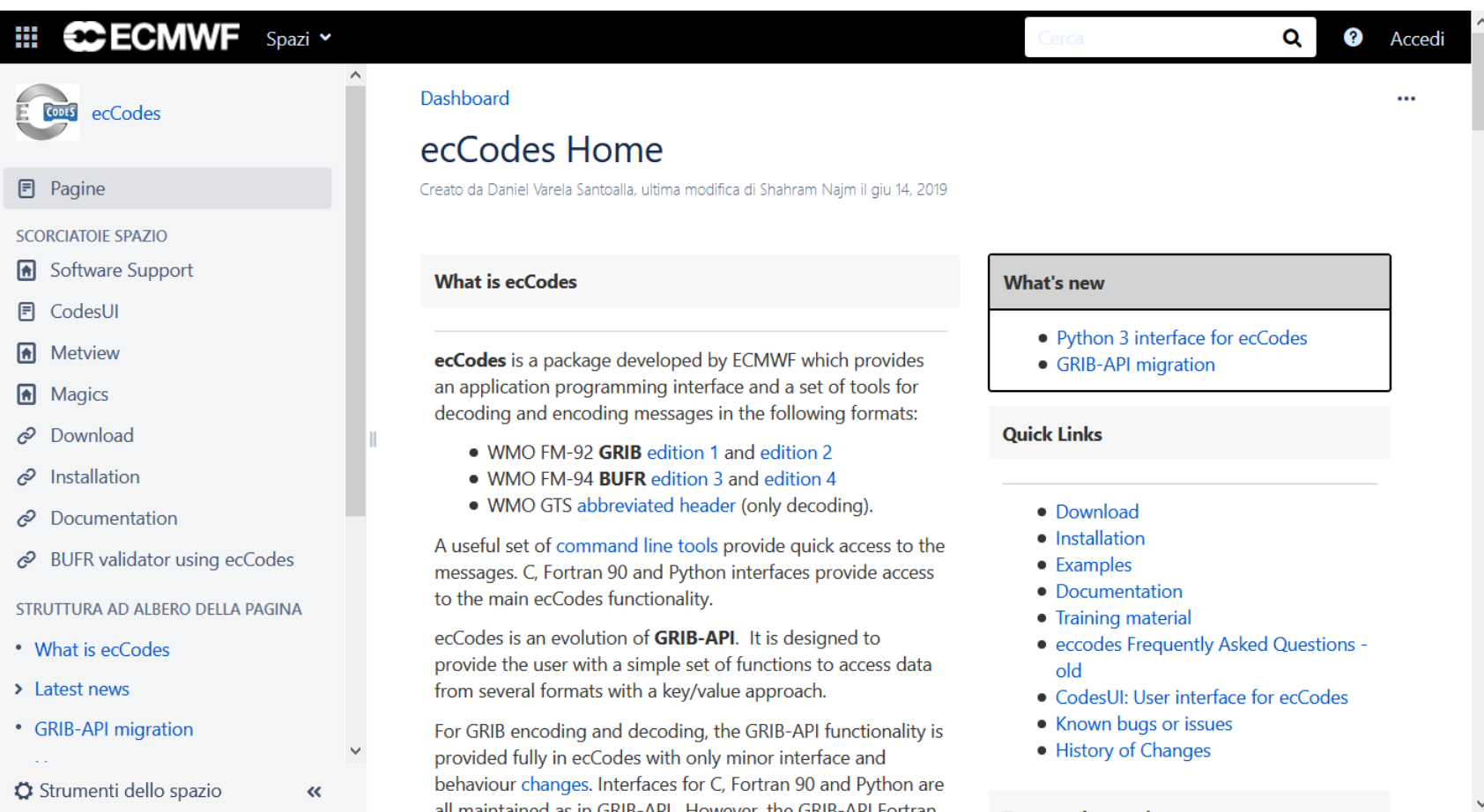
H SAF products technical info and download procedure – ecCodes

- **ecCodes** is a package developed by ECMWF which provides an application programming interface and a set of tools for decoding and encoding messages in the following formats:
- WMO FM-92 **GRIB** edition 1 and edition 2
- WMO FM-94 **BUFR** edition 3 and edition 4

<https://confluence.ecmwf.int/display/ECC>

H SAF products technical info and download procedure – ecCodes

<https://confluence.ecmwf.int/display/ECC>

A screenshot of the ecCodes Confluence page. The page has a dark header with the ECMWF logo and a search bar. The main content area is titled 'Dashboard' and 'ecCodes Home', with a sub-header 'What is ecCodes'. The text describes ecCodes as a package developed by ECMWF for decoding and encoding messages. It lists supported formats: WMO FM-92 GRIB edition 1 and 2, WMO FM-94 BUFR edition 3 and 4, and WMO GTS abbreviated header. It also mentions command line tools and the evolution from GRIB-API. A 'What's new' section highlights 'Python 3 interface for ecCodes' and 'GRIB-API migration'. A 'Quick Links' section lists 'Download', 'Installation', 'Examples', 'Documentation', 'Training material', 'eccodes Frequently Asked Questions - old', 'CodesUI: User interface for ecCodes', 'Known bugs or issues', and 'History of Changes'. A left sidebar contains navigation links like 'Software Support', 'CodesUI', 'Metview', 'Magics', 'Download', 'Installation', 'Documentation', and 'BUFR validator using ecCodes'.

ECMWF Spazi

Cerca

Accedi

ecCodes

Pagine

SCORCIATOIE SPAZIO

- Software Support
- CodesUI
- Metview
- Magics
- Download
- Installation
- Documentation
- BUFR validator using ecCodes

STRUTTURA AD ALBERO DELLA PAGINA

- What is ecCodes
- Latest news
- GRIB-API migration

Strumenti dello spazio

Dashboard

ecCodes Home

Creato da Daniel Varela Santoalla, ultima modifica di Shahram Najm il giu 14, 2019

What is ecCodes

ecCodes is a package developed by ECMWF which provides an application programming interface and a set of tools for decoding and encoding messages in the following formats:

- WMO FM-92 **GRIB** edition 1 and edition 2
- WMO FM-94 **BUFR** edition 3 and edition 4
- WMO GTS **abbreviated header** (only decoding).

A useful set of [command line tools](#) provide quick access to the messages. C, Fortran 90 and Python interfaces provide access to the main ecCodes functionality.

ecCodes is an evolution of **GRIB-API**. It is designed to provide the user with a simple set of functions to access data from several formats with a key/value approach.

For GRIB encoding and decoding, the GRIB-API functionality is provided fully in ecCodes with only minor interface and behaviour [changes](#). Interfaces for C, Fortran 90 and Python are all maintained as in GRIB-API. However, the GRIB-API Fortran

What's new

- Python 3 interface for ecCodes
- GRIB-API migration

Quick Links

- Download
- Installation
- Examples
- Documentation
- Training material
- eccodes Frequently Asked Questions - old
- CodesUI: User interface for ecCodes
- Known bugs or issues
- History of Changes

H SAF products technical info and download procedure – wgrib2

- **wgrib2** is a software utility created by NOAA-CPC upgrading the wgrib program
- It may be used on a wide set of operating systems
- Quite easy to install and free

https://www.cpc.ncep.noaa.gov/products/wesley/wgrib2/compile_questions.html

H SAF products technical info and download procedure – wgrib2

https://www.cpc.ncep.noaa.gov/products/wesley/wgrib2/compile_questions.html

The screenshot shows the National Weather Service Climate Prediction Center website. The page title is "Compiling wgrib2 v3.0.0". The breadcrumb trail is: HOME > Monitoring_and_Data > Oceanic and Atmospheric Data > Reanalysis: Atmospheric Data > wgrib2 questions. The page content includes a list of steps for compiling wgrib2 v3.0.0 and a table of environment variables for different operating systems.

Compiling wgrib2 v3.0.0

- 1) Download <ftp://ftp.cpc.ncep.noaa.gov/wd51we/wgrib2/wgrib2.tgz>
- 2) remove pre-existing grib2 directory if exists: `rm -r grib2`
- 3) `untar wgrib2.tgz: tar -xzf wgrib2.tgz (use gnu tar)`
- 4) `cd to main directory: cd grib2`
- 5) Update makefile
`$ curl -o makefile "https://ftp.cpc.ncep.noaa.gov/wd51we/wgrib2/makefile_v2_for_wgrib2_v3.0.0"`

The makefile uses two and one optional environment variables that have to be set.

linux, bsd-type OS, gcc/gfortran compilers:	COMP_SYS=gnu_linux CC=gcc FC=gfortran
Windows, cygwin gcc and gfortran:	COMP_SYS=cygwin_win CC=gcc FC=gfortran
MacOS, real gcc and gfortran:	COMP_SYS=gnu_mac CC=gcc FC=gfortran
linux, AOCC:	COMP_SYS=clang_linux CC=clang

H SAF products technical info and download procedure – wgrib2

After installing wgrib2, you need only a few steps to convert GRB to TXT:

```
➤ wgrib2 YOURFILE.GRB -d 1 -csv DUMP.TXT  
➤ awk '{FS = ","}; { print $5, $6, $7*3600}' DUMP.TXT >  
  SHORT_DUMP.TXT  
➤ sed '1d' SHORT_DUMP.TXT > YOURFILE.TXT
```

H SAF products technical info and download procedure – GRIB to txt

By running the utility on the proper Hxx file, a text file will be created:

38.250	38.130	0.000
38.200	38.030	0.000
38.150	37.920	0.000
38.100	37.810	3.600
38.050	37.700	3.564
38.010	37.600	0.000
37.970	37.490	0.000
37.930	37.380	0.000
37.890	37.270	3.996
37.850	37.160	6.048
37.820	37.050	2.808
37.790	36.940	0.000
37.760	36.820	2.196
37.730	36.710	3.960
37.700	36.600	6.264
37.680	36.490	3.816
37.660	36.380	2.088
37.640	36.260	2.736
37.620	36.150	1.692
37.600	36.040	4.104

In this example we have three columns, showing:

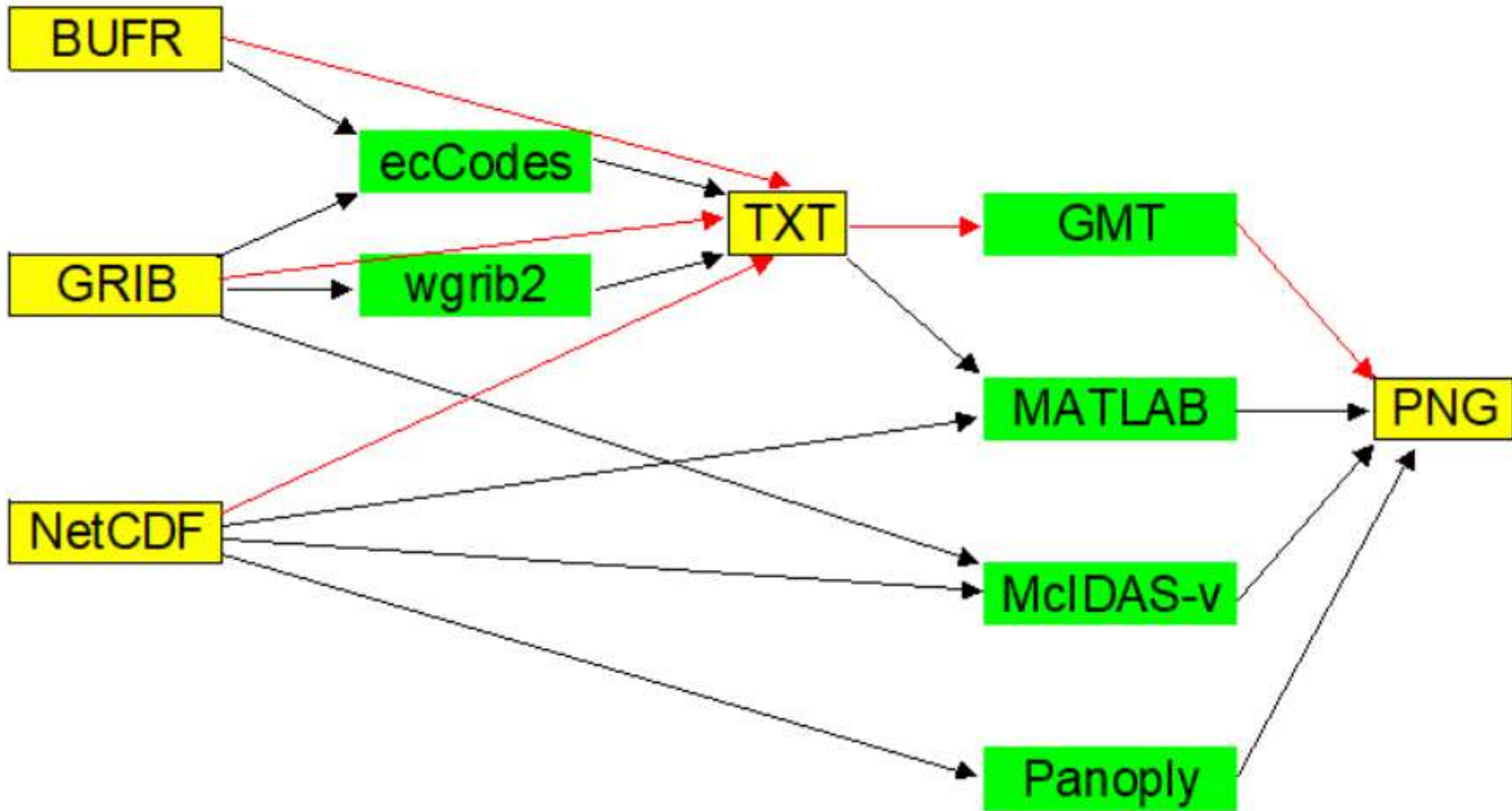
- Longitude, degrees
- Latitude, degrees
- Rain rate, mm/h

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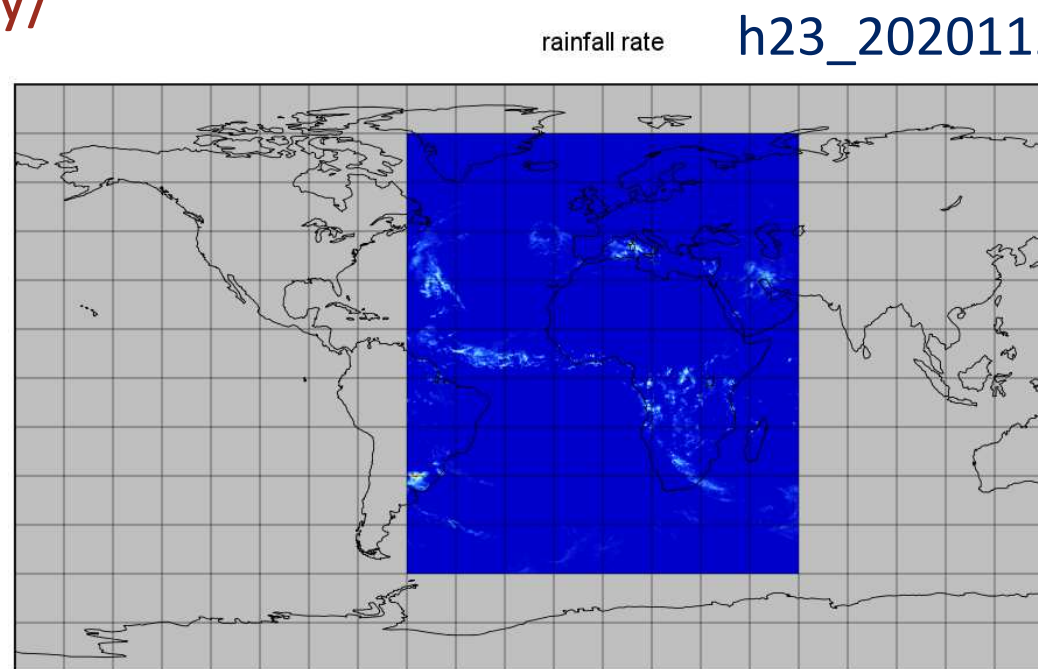
Procedure to plot the data for the area of interest

H SAF products technical info and download procedure – file formats



H SAF products technical info and download procedure – Panoply

- A good resource for having a quick look to NetCDF files is **PANOPLY**
- It is a free software from NASA-GISS which allows to open a NetCDF file, have infos about its content and draw a simple plot from its data
- <https://www.giss.nasa.gov/tools/panoply/>



and download procedure – Other resources

- When the user needs a better control on the geographical area or has file formats different from NetCDF, a more powerful software is required
- Plotting can be done in many ways:
 - GMT (Generic Mapping Tools)
<http://gmt.soest.hawaii.edu/projects/gmt/wiki/Installing>
 - General purposes languages (Python)
 - MATLAB
 - McIDAS-V
- Two **MATLAB** scripts are introduced to create PNG files from NetCDF or TXT sources

```

>> % SET THE INPUT FILE

filename='h20_20201128_1625_1800_GMI.nc';

% READING THE DATA

Lat=ncread(filename,'lat');
Lon=ncread(filename,'lon');
RR =ncread(filename,'rrr');

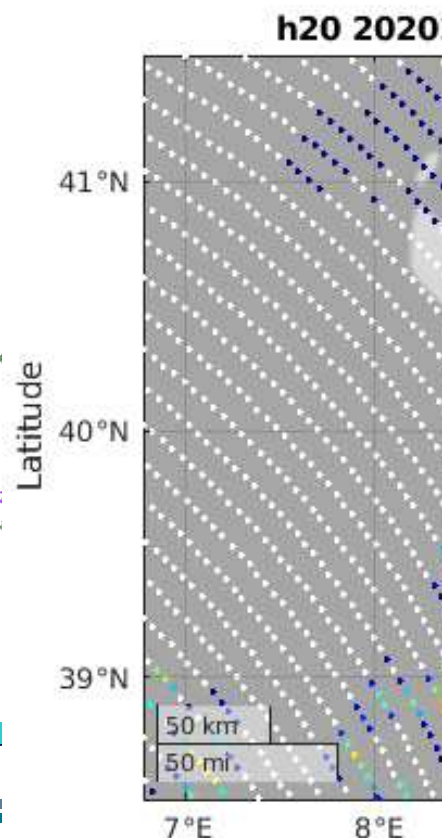
dim=size(RR);
pdim=dim(1)*dim(2);
Lat=double(reshape(Lat,pdim,1)); % converts matrices to arrays for plotting
Lon=double(reshape(Lon,pdim,1));
RR =double(reshape(RR ,pdim,1));

% PLOTTING

figure
geoscatter(Lat,Lon,6,RR,'filled') % plots the rain rate
geobasemap darkwater % background with its default, which does not require
geolimits ([-65 71],[-80 80]); % longitude and latitude limits
RainLimit = [0 30];
caxis(RainLimit); % sets the rain rate limit
h = colorbar;
set(get(h,'title'),'string','mm/h','fontName','Helvetica','fontWeight','bold','fontSize',12);
colormap([1 1 1;jet(30)]); % standard color map with white as color for zero rain
grid on
T=strrep(filename,'_',' '); % just to avoid misprinting
title(T)

% SAVING
saveas(gcf, filename(1:(end-3)),'png');

```



H SAF products technical info and download procedure – txt plot

```

>> % SET THE INPUT FILE

filename='h01_20201201_1423_DMSP16_88351_rom.txt';

% READING THE DATA
LonLatRR=importdata(filename);
Lat=LonLatRR(:,2); % suppose latitude in second column
Lon=LonLatRR(:,1); % suppose longitude in first column
RR =LonLatRR(:,3); % suppose rain rate in third column

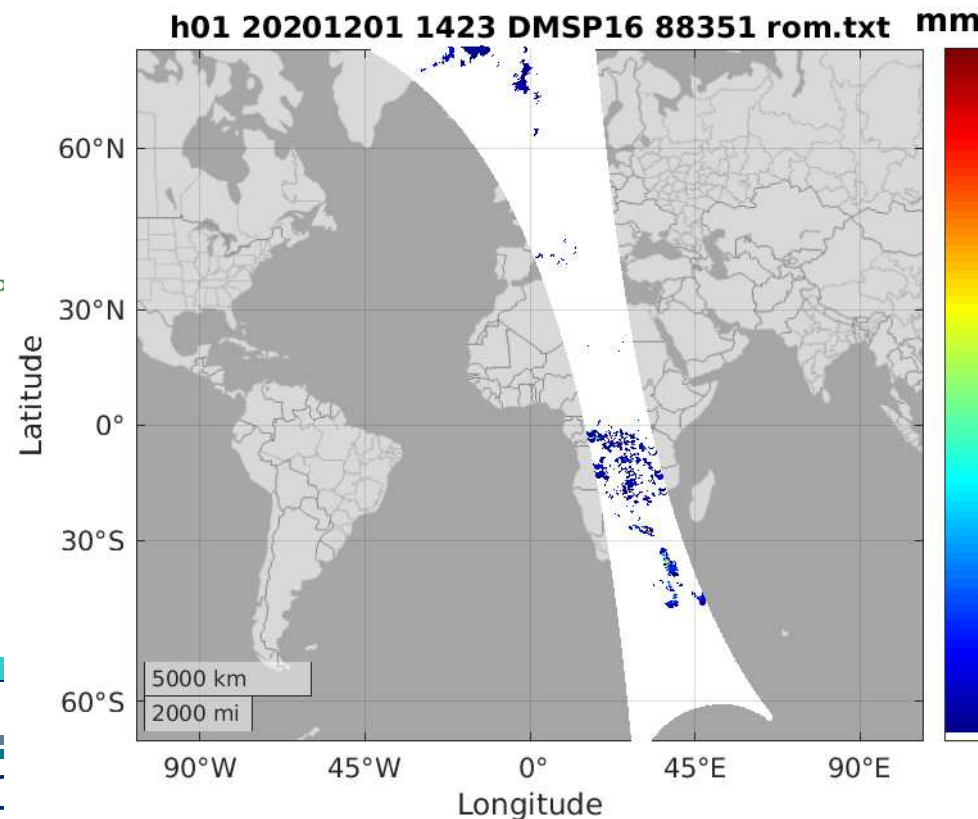
dim=size(RR);
pdim=dim(1)*dim(2);
Lat=double(reshape(Lat,pdim,1)); % converts matrices to arrays for plotting
Lon=double(reshape(Lon,pdim,1));
RR =double(reshape(RR ,pdim,1));

% PLOTTING

figure
geoscatter(Lat,Lon,6,RR,'filled') % plots the rain rate
geobasemap darkwater % background with its default, which does not require access to
geolimits ([-65 71],[-80 80]); % longitude and latitude limits
RainLimit = [0 30];
caxis(RainLimit); % sets the rain rate limit
h = colorbar;
set(get(h,'title'),'string','mm/h','fontName','Helvetica','fontWeight','bold','fontSize',12);
colormap([1 1 1;jet(80)]); % standard color map with white as color for zero rain
grid on
T=strep(filename,'_',' '); % just to avoid misprinting
title(T)

% SAVING
saveas(gcf, filename(1:(end-4)),'png');

```



H SAF products technical info and download procedure – txt plot

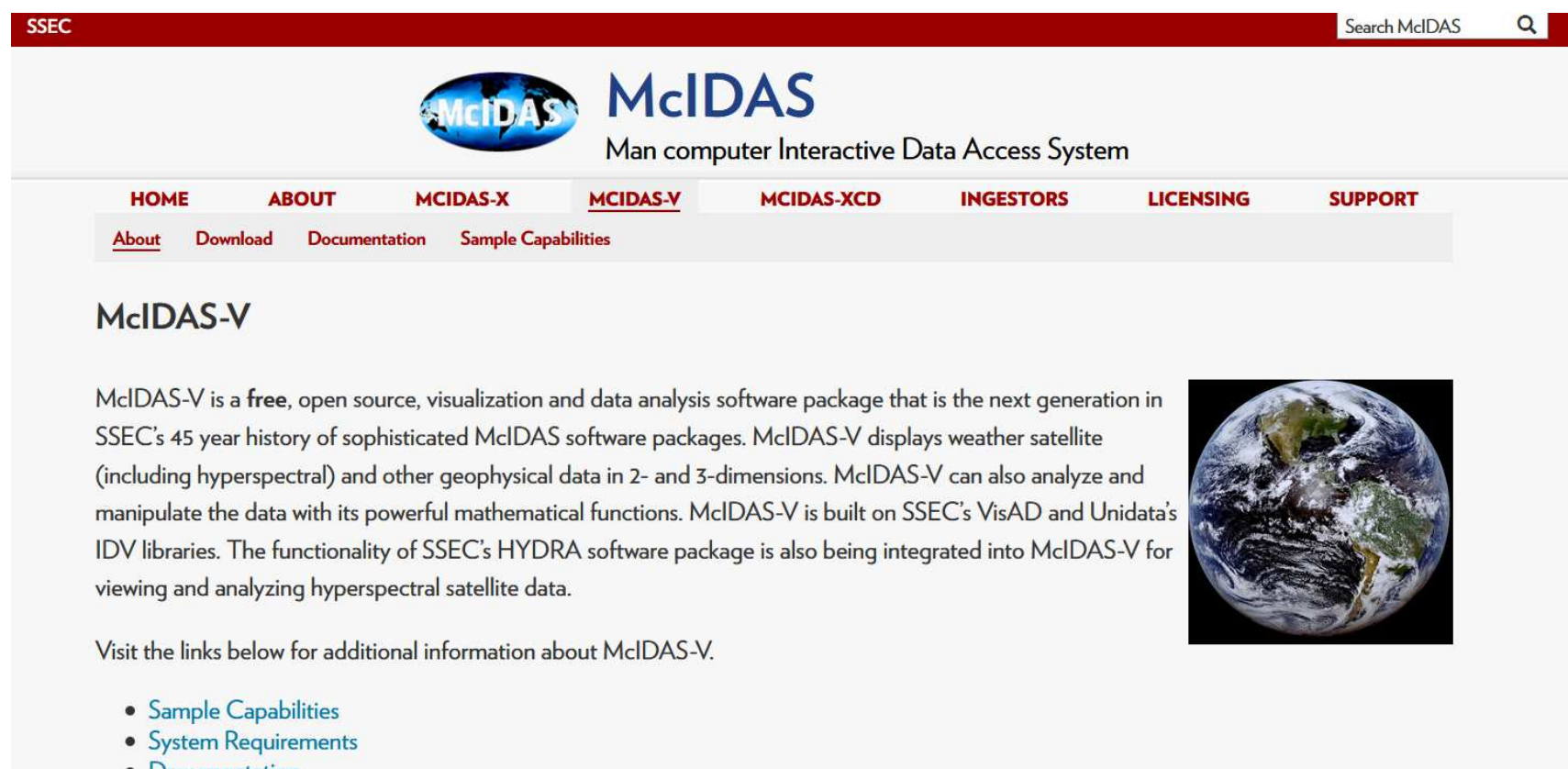
- The two sample codes can be found on:
ftphsaf.meteoam.it directory `utilities/matlab_code`
- `plot_nc.m`
- `plot_txt.m`

H SAF products technical info and download procedure – McIDAS-v

- **McIDAS-V** is a free, open source, visualization and data analysis software package released from the University of Wisconsin
- It may be used on a wide set of operating systems
- <https://www.ssec.wisc.edu/mcidas/software/v/>

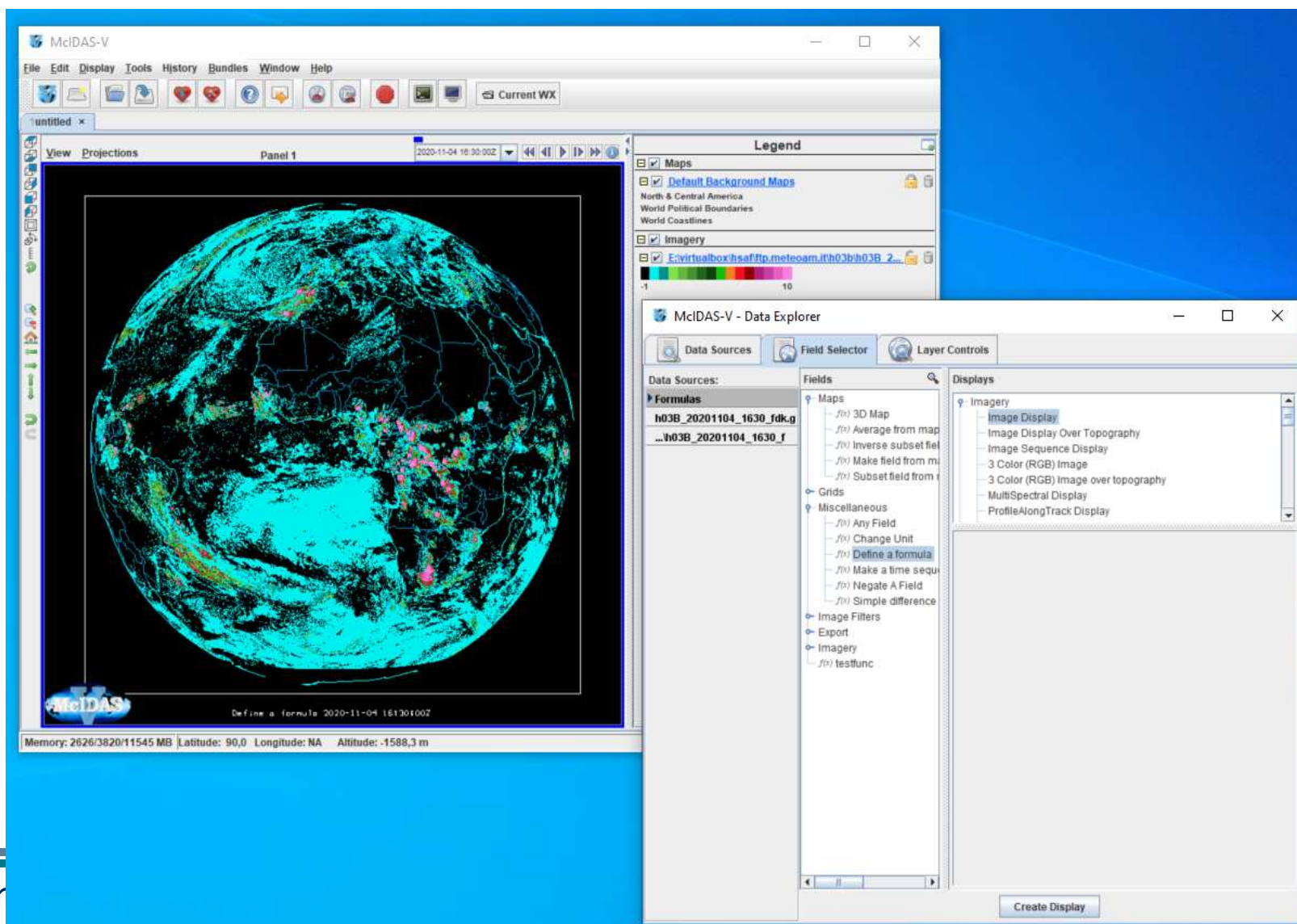
H SAF products technical info and download procedure – McIDAS-v

<https://www.ssec.wisc.edu/mcidas/software/v/>



The screenshot shows the McIDAS-V website homepage. At the top, there is a red navigation bar with the SSEC logo on the left and a search box labeled "Search McIDAS" on the right. Below this is a white header area featuring the McIDAS logo (a globe with "McIDAS" text) and the text "McIDAS Man computer Interactive Data Access System". A secondary navigation bar contains links for HOME, ABOUT, MCIDAS-X, MCIDAS-V (which is underlined), MCIDAS-XCD, INGESTORS, LICENSING, and SUPPORT. Below this is a sub-navigation bar with links for About, Download, Documentation, and Sample Capabilities. The main content area is titled "McIDAS-V" and contains a paragraph describing the software as a free, open source visualization and data analysis package. To the right of the text is a circular image of Earth from space. At the bottom of the main content area, there is a link to "Visit the links below for additional information about McIDAS-V." followed by a bulleted list of links: Sample Capabilities, System Requirements, and Documentation.

H SAF products technical info and download procedure – McIDAS-v



H SAF precipitation products download and visualization

Thank you

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