EUMETSAT

MTG Data Access

Erdem ERDI
Data Services User Support Officer

EUMETrain MTG Event Week, Online
29 September 2023

Agenda

Overview of Data Services
The new portfolio

EUMETCast Satellite
EUMETCast Europe Service

EUMETCast Terrestrial
The new push data service

Online Data Services
Data Store, Data Tailor, EUMETView

MTG-FCI Data Handling
File format, data volume, compression, etc.

Conclusions

Overview of Data Services Portfolio

New data services

PULL SERVICES | PUSH SERVICES | SHARED SERVICES

Viewing your data…

EUMETView
https://view.eumetsat.int/

Improving data access…

EUMETSAT Data store
https://data.eumetsat.int/

Customising your data…

Data Tailor

Near-real time data delivery via terrestrial networks.

EUMETCast Terrestrial

ECMWF

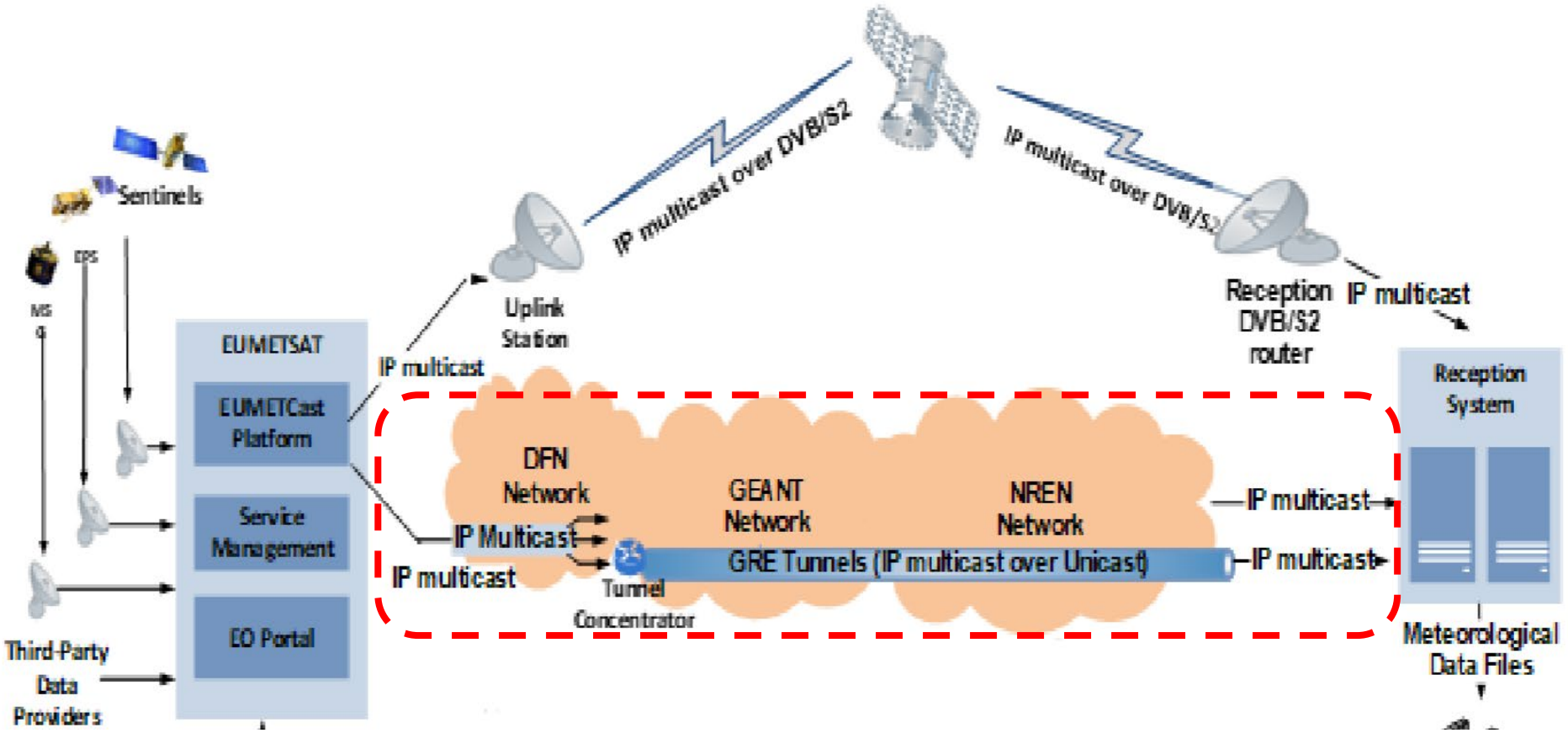
Hosted data processing…

European Weather Cloud

Existing services

- *EUMETCast Satellite*
- *Data Centre*
- *WEkEO*
- *WIS*
- *Direct Dissem.*

EUMETCast satellite and terrestrial

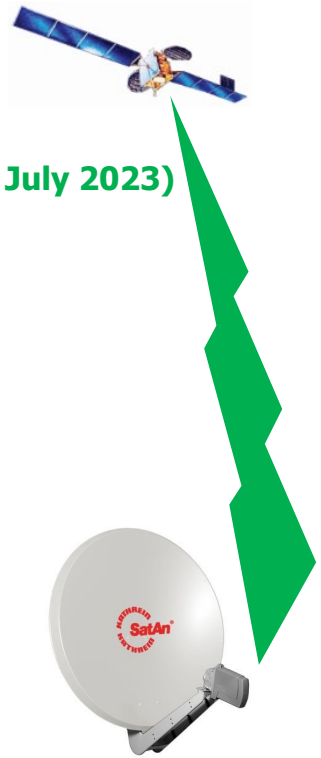


End-User station is almost identical with satellite reception station, without any DVB receiver

Terrestrial Service has all of EUMETCast Satellite data + other datasets

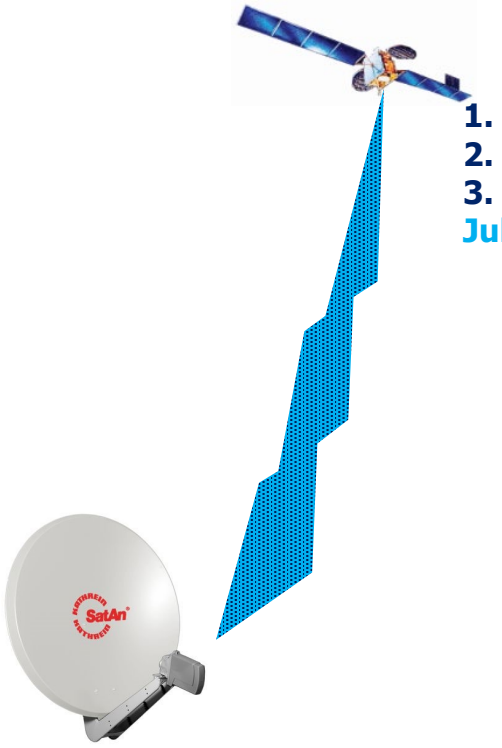
EUMETCast Satellite Evolutions - I

EUTELSAT 10B (E10B)
Active
EUMETCast Europe Prime Satellite



1. Transponder **used**
2. Transponder **used**
3. Transponder **used (from July 2023)**

Hotbird 13C (HB13C)
Standby
EUMETCast Europe Backup Satellite



1. Transponder reserved as **backup**
2. Transponder reserved as **backup**
3. Transponder reserved as **backup (from July 2023)**

Current Prime – Backup concept:

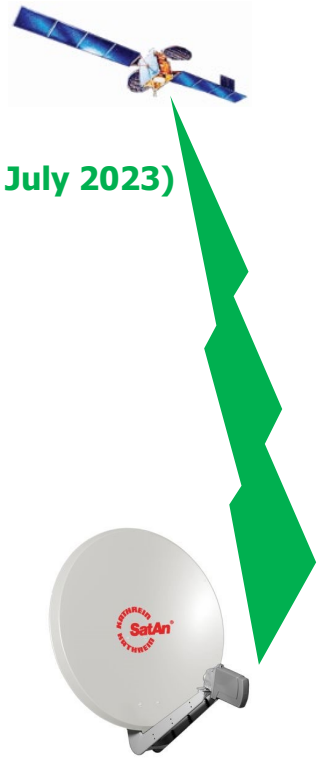
E10B satellite (Prime satellite) -> Active

HB13C satellite (Backup satellite) -> Stand-by

In case of a failure on E10B, HB13C will be activated

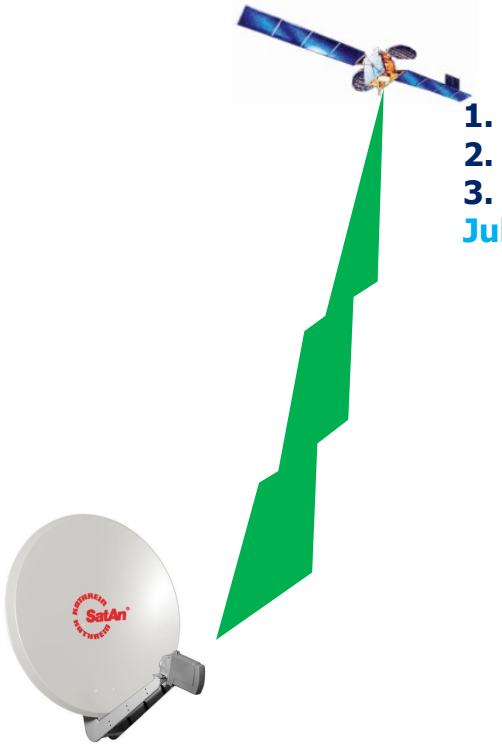
EUMETCast Satellite Evolutions - II

EUTELSAT 10B (E10B)
Active
EUMETCast Europe Restorable Satellite



1. Transponder used
2. Transponder used
3. Transponder used (from July 2023)

Hotbird 13C (HB13C)
Active
EUMETCast Europe Non-restorable Satellite



1. Transponder used from 2024/2025
2. Transponder reserved as backup
3. Transponder reserved as backup (from July 2023)

Note: Transponders 2. & 3. can also be used as needed for non restorable services

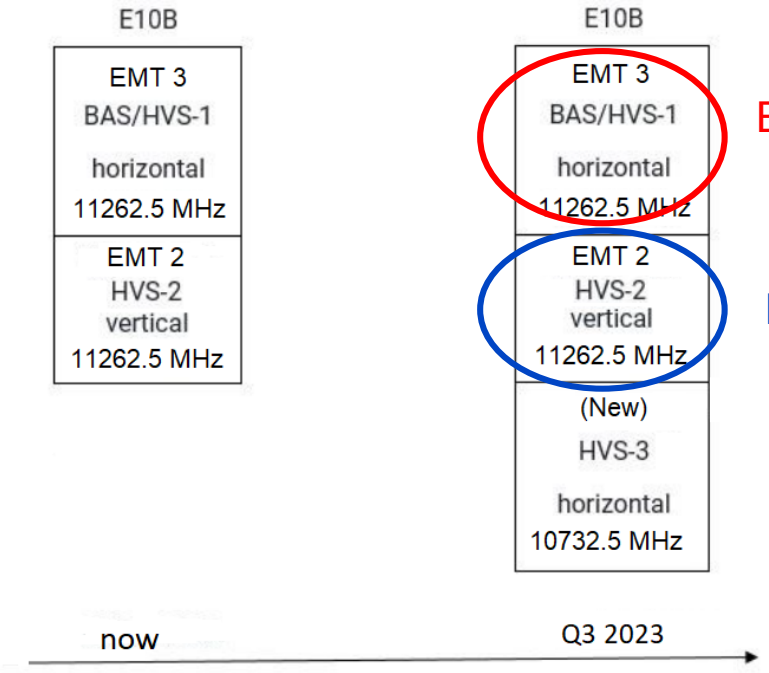
Restorable – Non-restorable concept in the following years:

E10B satellite (Restorable satellite) -> Active

HB13C satellite (Non-restorable satellite) -> Active

In case of a failure on E10B, its data will be restored on HB13C and the data on HB13 not to be disseminated

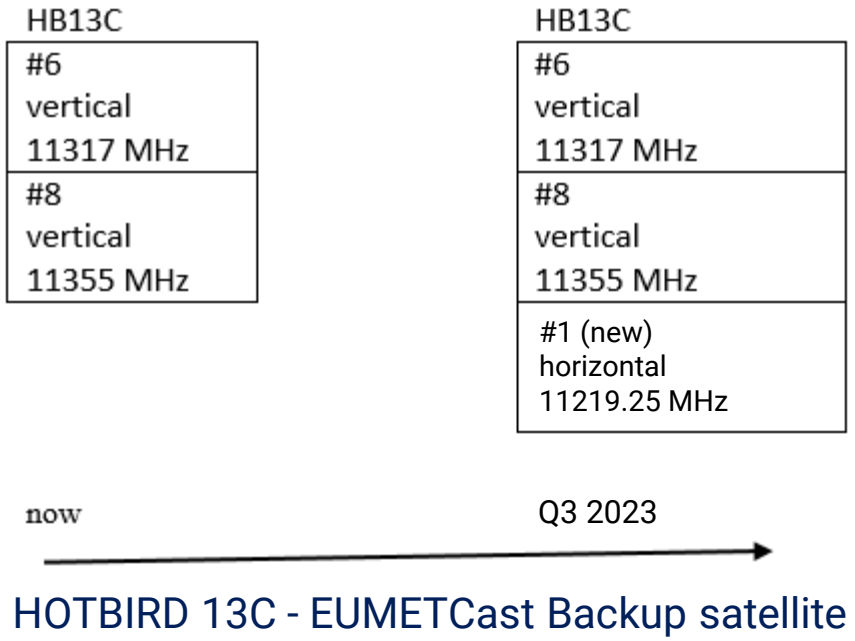
EUMETCast Satellite Evolutions - III



Basic Service: MSG data (0-degree, RSS, IODC)

High Volume Service-2: MTG-I data (0-degree)

EUTELSAT 10B – EUMETCast Prime satellite



HOTBIRD 13C - EUMETCast Backup satellite

Basic Service (EMT3 transponder) – 0.9 meter antenna

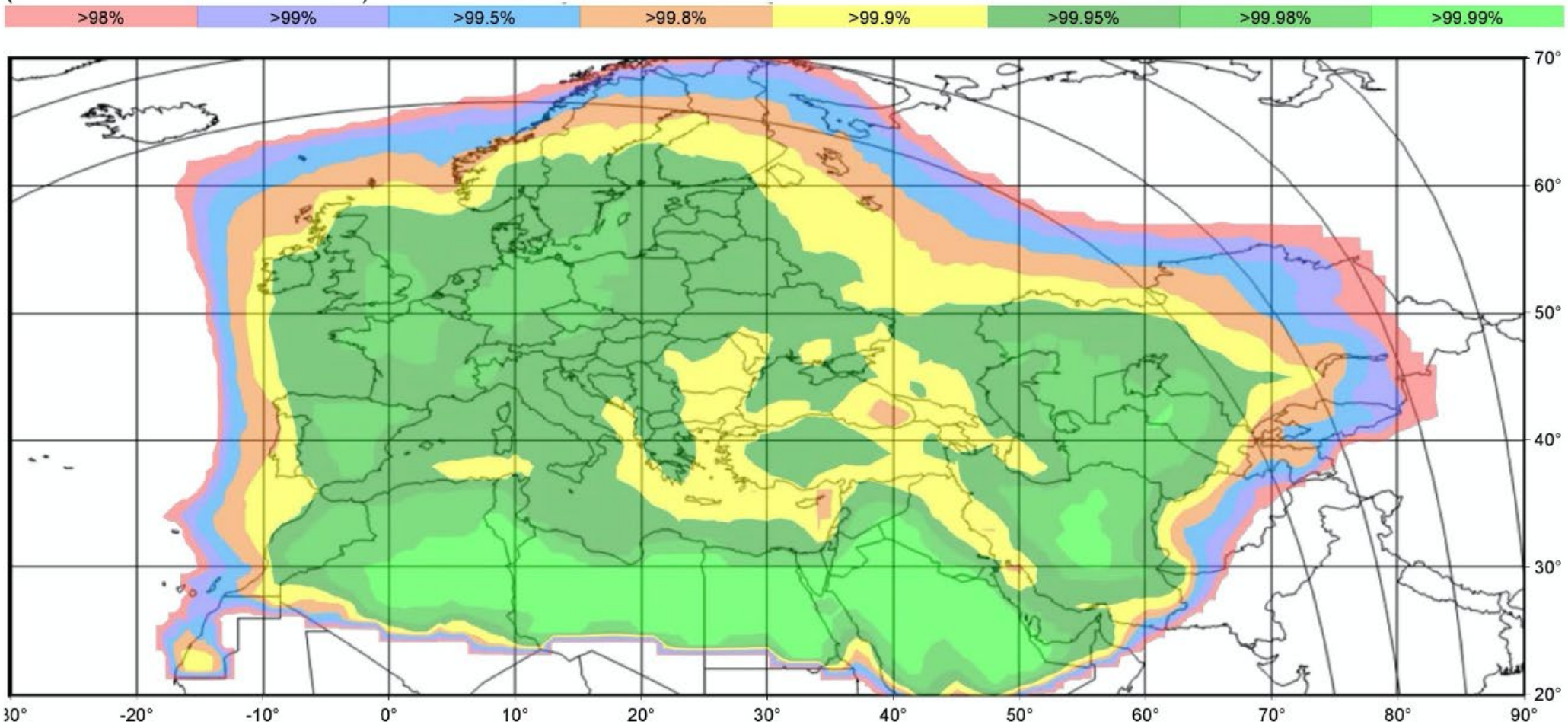
*****Only for MSG*****

EUMETCAST – BASIC SERVICE

Eutelsat E10A (10°E); 8PSK3/5

0.9m reception antenna rain fade availability

(G/T at 12.5 GHz = 18.5 dB/K)



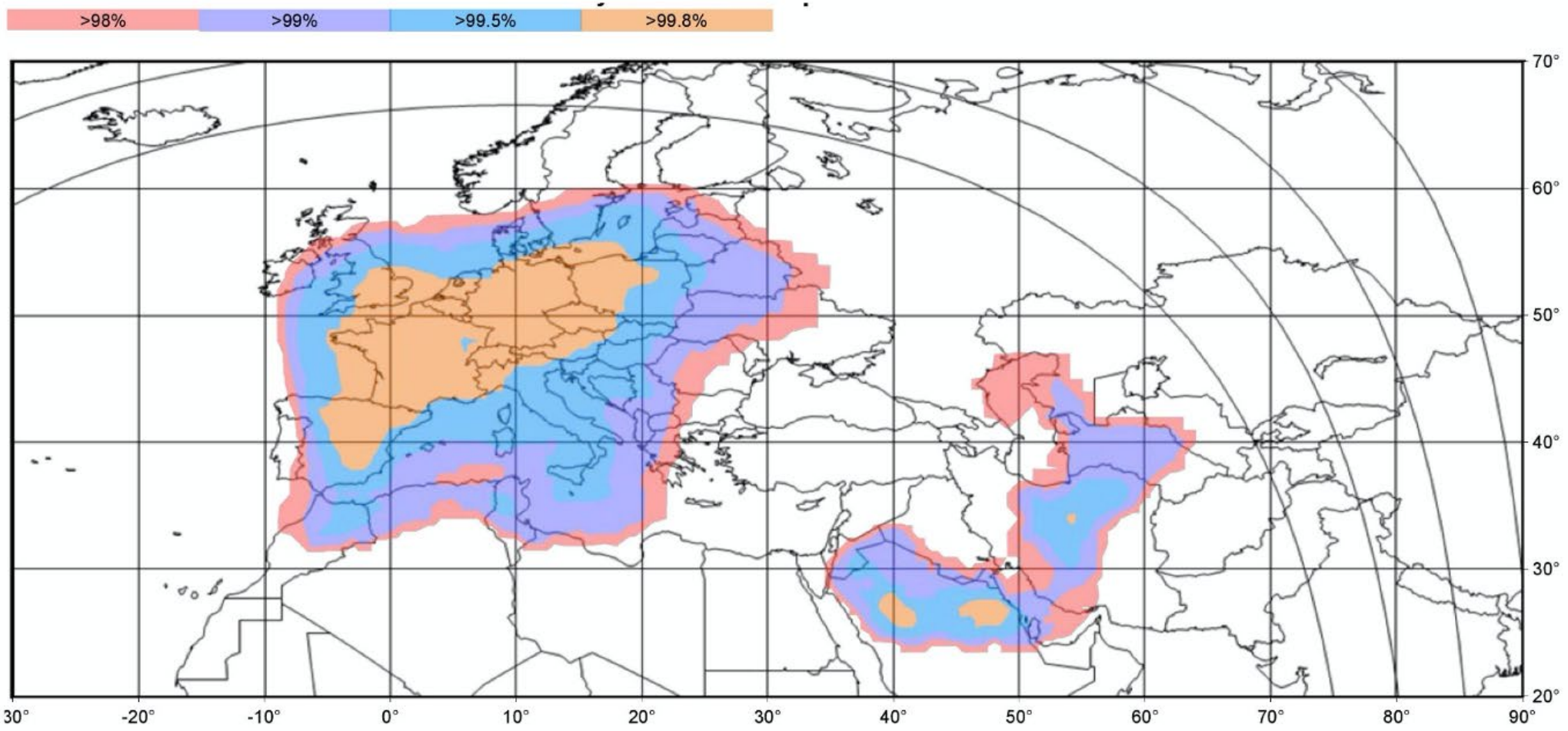
High Volume Service-2 (EMT2 transponder) – 0.9 meter antenna

EUMETCAST – HIGH VOLUME SERVICE

Eutelsat E10A (10°E); 16APSK2/3

for MTG

0.9m reception antenna rain fade availability
(G/T at 12.5 GHz = 18.5 dB/K)



Basic Service (EMT3 transponder) – 1.2 meter antenna

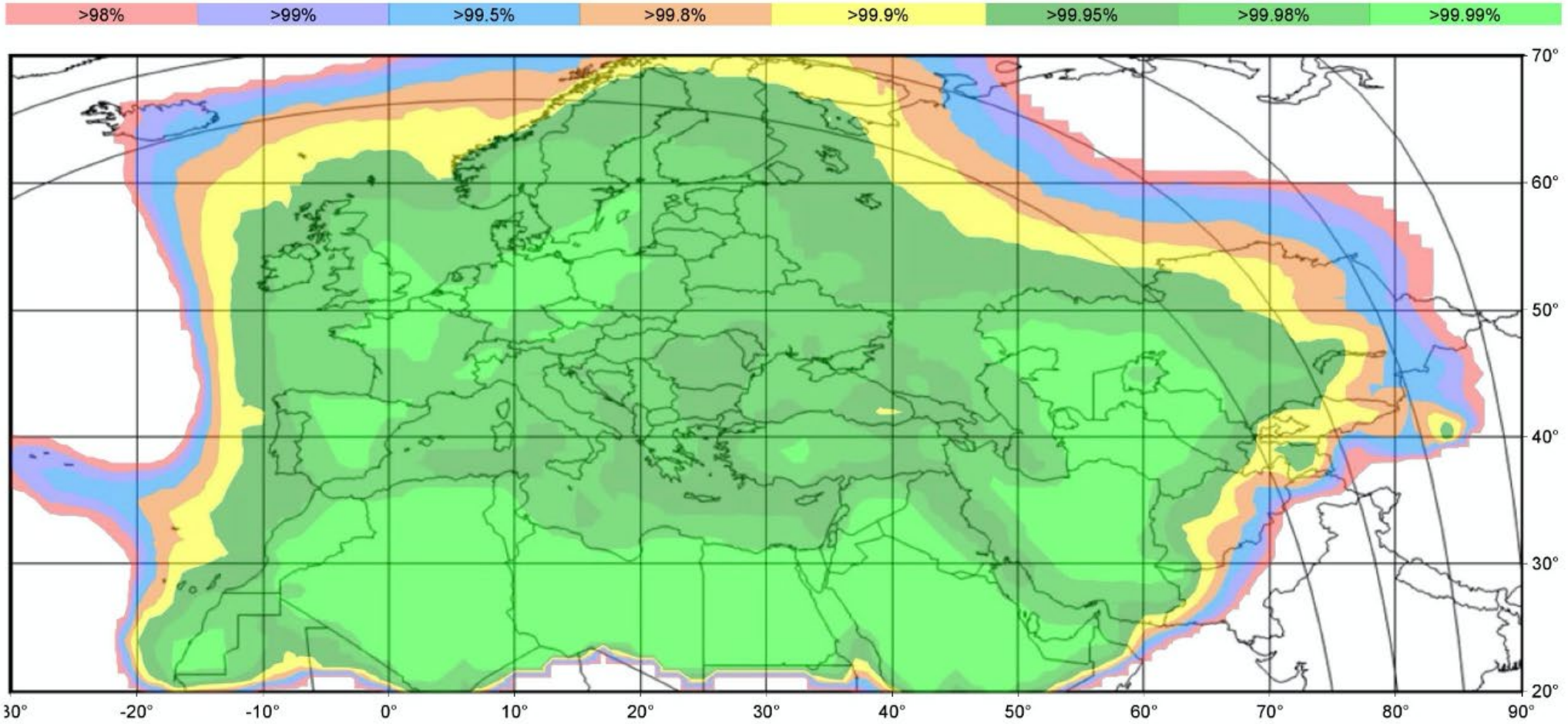
int

EUMETCAST – BASIC SERVICE

Eutelsat E10A (10°E); 8PSK3/5

1.2m reception antenna rain fade availability
(G/T at 12.5 GHz = 20.5 dB/K)

Only for MSG



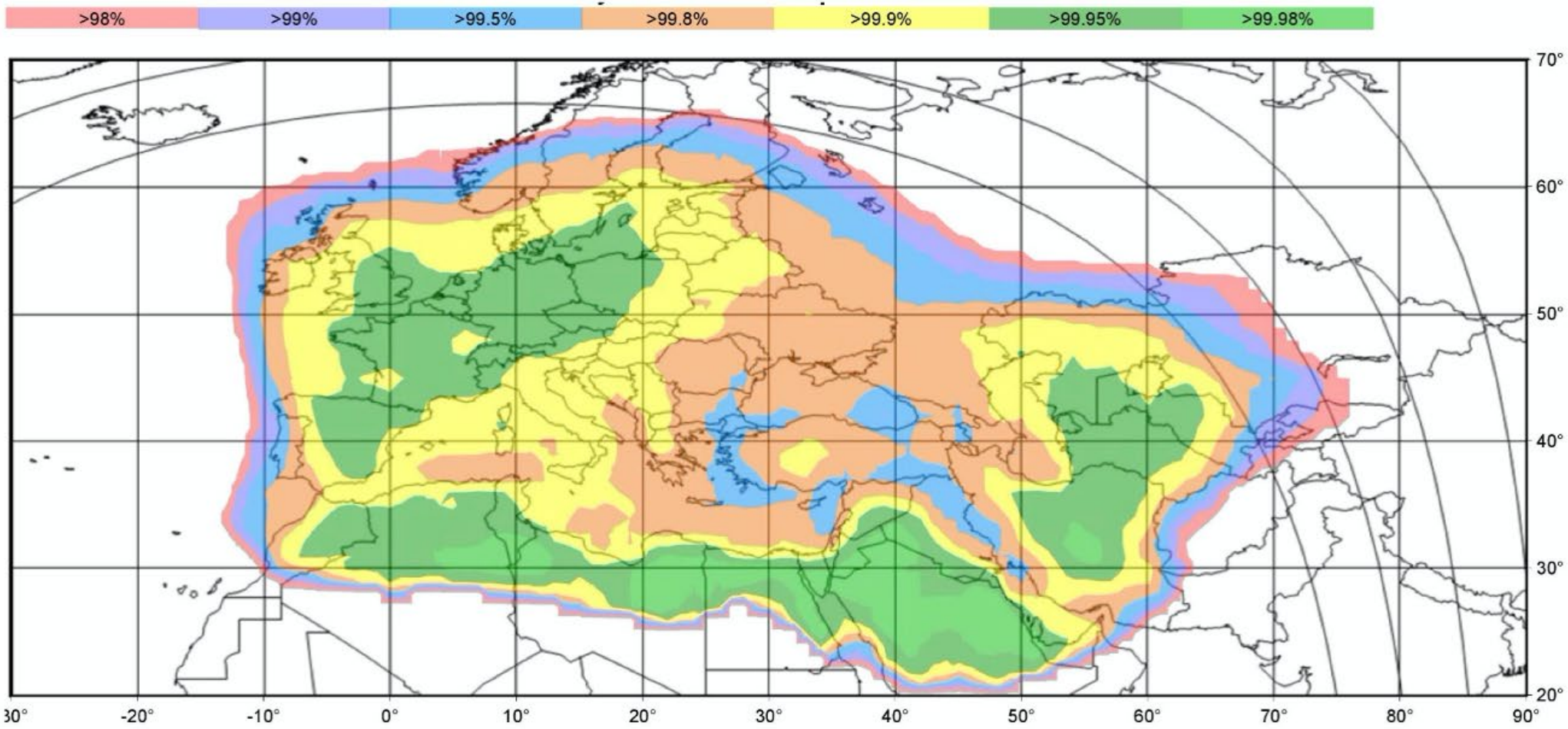
High Volume Service-2 (EMT2 transponder) – 1.2 meter antenna

EUMETCAST – HIGH VOLUME SERVICE

Eutelsat E10A (10°E); 16APSK2/3

for MTG

1.2m reception antenna rain fade availability
(G/T at 12.5 GHz = 20.5 dB/K)



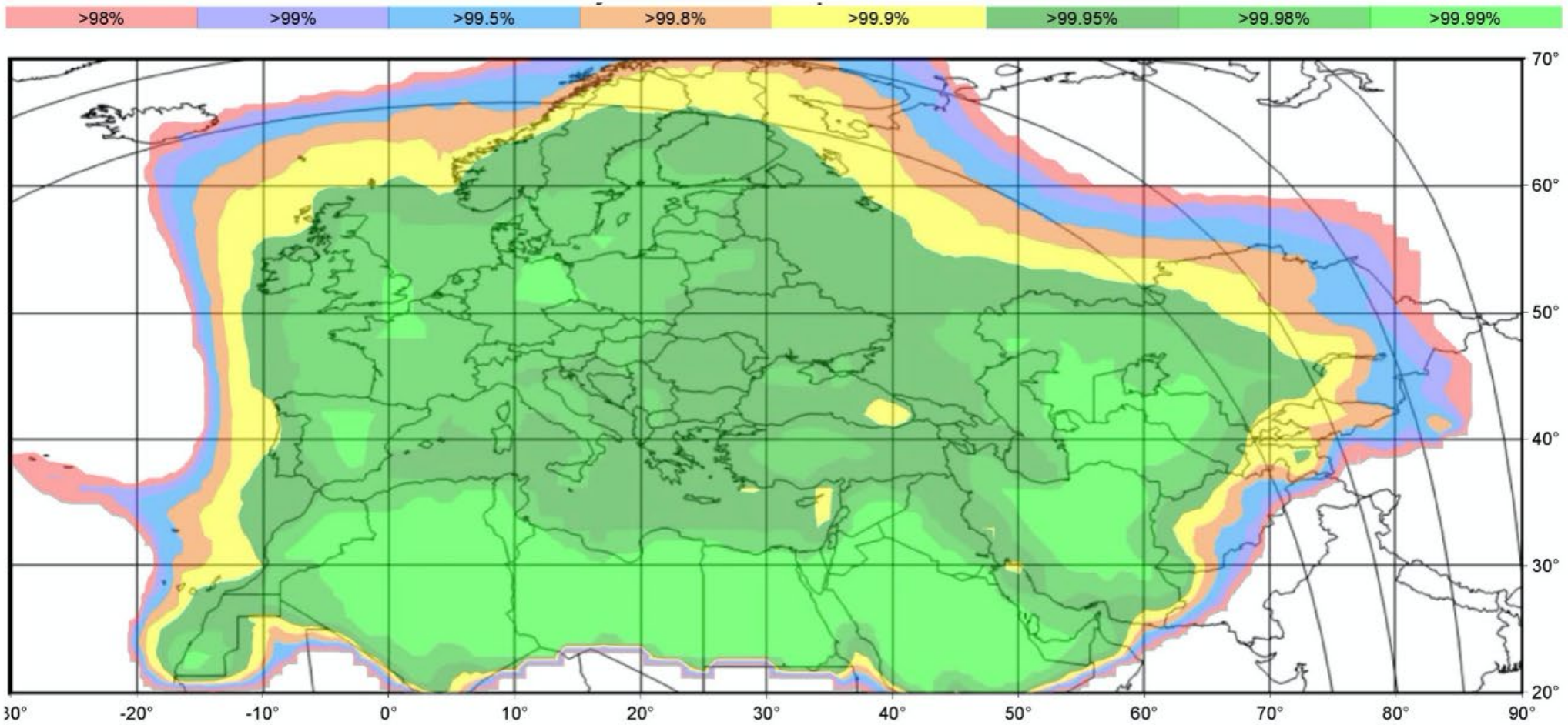
High Volume Service-2 (EMT3 transponder) – 1.8 meter antenna

EUMETCAST – HIGH VOLUME SERVICE

Eutelsat E10A (10°E); 16APSK2/3

for MTG

1.8m reception antenna rain fade availability
(G/T at 12.5 GHz = 23.5 dB/K)



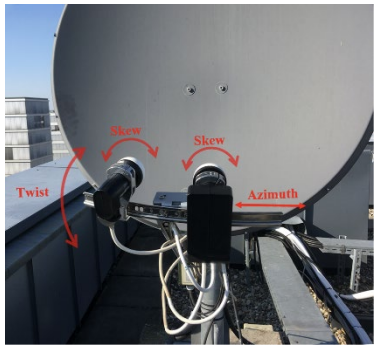
Antenna size

- Recommended antenna size will be different for different locations
- Rainfade availability maps provided in the EUMETCast Knowledge Base and EUM-TD-15 document can be used for deciding the antenna size for a target availability
- Small antennas (such as 0.9 meter) that is currently providing 99.98% to receive MSG data (Basic Service) may provide as low as 98% availability to receive MTG-I data (HVS-2)
- The data will mostly be lost during the critical adverse weather conditions (precipitation, strong wind, etc.) when it is urgently needed.
- Other possible non-perfections in the outdoors setup such as long cable distances between the antenna and receiver or antenna alignment may cause to even lower availability figures

Antenna types

Offset Antenna

- Mostly available in smaller sizes (< 1.8 meters)
- Possibility of using as dual feed (multiple LNBs)



Prime Focus (Parabolic) Antenna

- Mostly available in larger sizes (>1.8 meters)
- Not ideal for using as dual feed

LNB Type

- Transponders (WK10 and WK9) which will broadcast MSG (Basic Service) and MTG-I (HVS-2) data have different polarizations.
- This will require the use of Twin, Quad or Quattro LNBs.

Single LNB

Twin LNB
2 x Outputs

Quad LNB
4 x Outputs

Quattro LNB
4 x Outputs
(to be used with a multi switch and DiSEqC receiver)

Cabling and RF network elements

Cabling between the antenna and the receiver:

- For distance less than 20m. → standard 75 ohm Coaxial Cable Type-F RG 6/U or similar
- For longer distances up to 100m. → a low loss coax cable type 75 ohm RG-11

Amplifier:

- Using an amplifier to compensate cable losses will not achieve the same performance compared to using shorter or low loss cables.

Passive Signal Splitters:

- Use of splitters will introduce some power losses
- The splitter should have a "power pass-through" protection

Receivers

- Current list of verified DVB-S2 receiver devices will also support the reception of MTG data
- If the user has currently have a single receiver device with a single feed for receiving MSG data (BAS) then a second receiver will be needed for MTG-I data (HVS-2).
- If the receiver type is a LAN DVB router (such as Ayecka SR1 or Novra S300) then an additional network adapter on the reception PC/server will be needed.
- Or the data outputs of the LAN DVB routers can be connected to a dedicated Multicast LAN (or VLAN) where the reception PC/server is also connected to.
- The tests are on-going for the verification of some new receivers which are advertised to support multiple (2 and more) feeds.

EUMETCast Terrestrial Connectivity

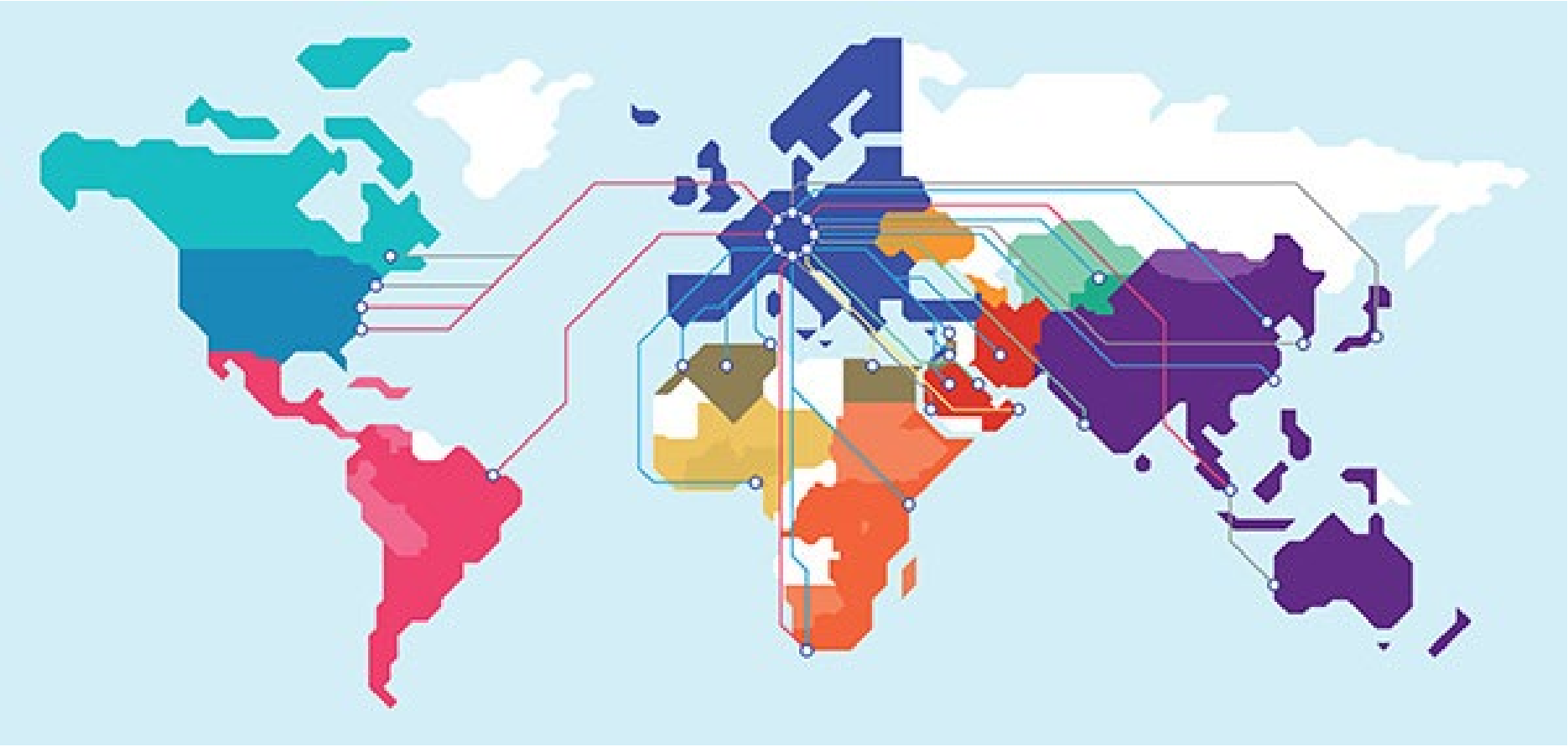
- EUMETCast Terrestrial provides all data on the EUMETCast Satellite and plus some other data that is not available in the EUMETCast Satellite.

- One example is MTG-FCI Full Disk Scanning Service High Resolution bands.

- EUMETCast Terrestrial is also important to be used as a backup to the EUMETCast Satellite service to in case of:
  - EUMETCast Satellite service interruptions
  - To compensate any data losses due to adverse weather in the vicinity of the antenna
  - To compensate any outdoor hardware failure

EUMETCast Terrestrial Connectivity

- Only thing you need to use EUMETCast Terrestrial is having a network connectivity with your National Research and Education Network (NREN) in your country.



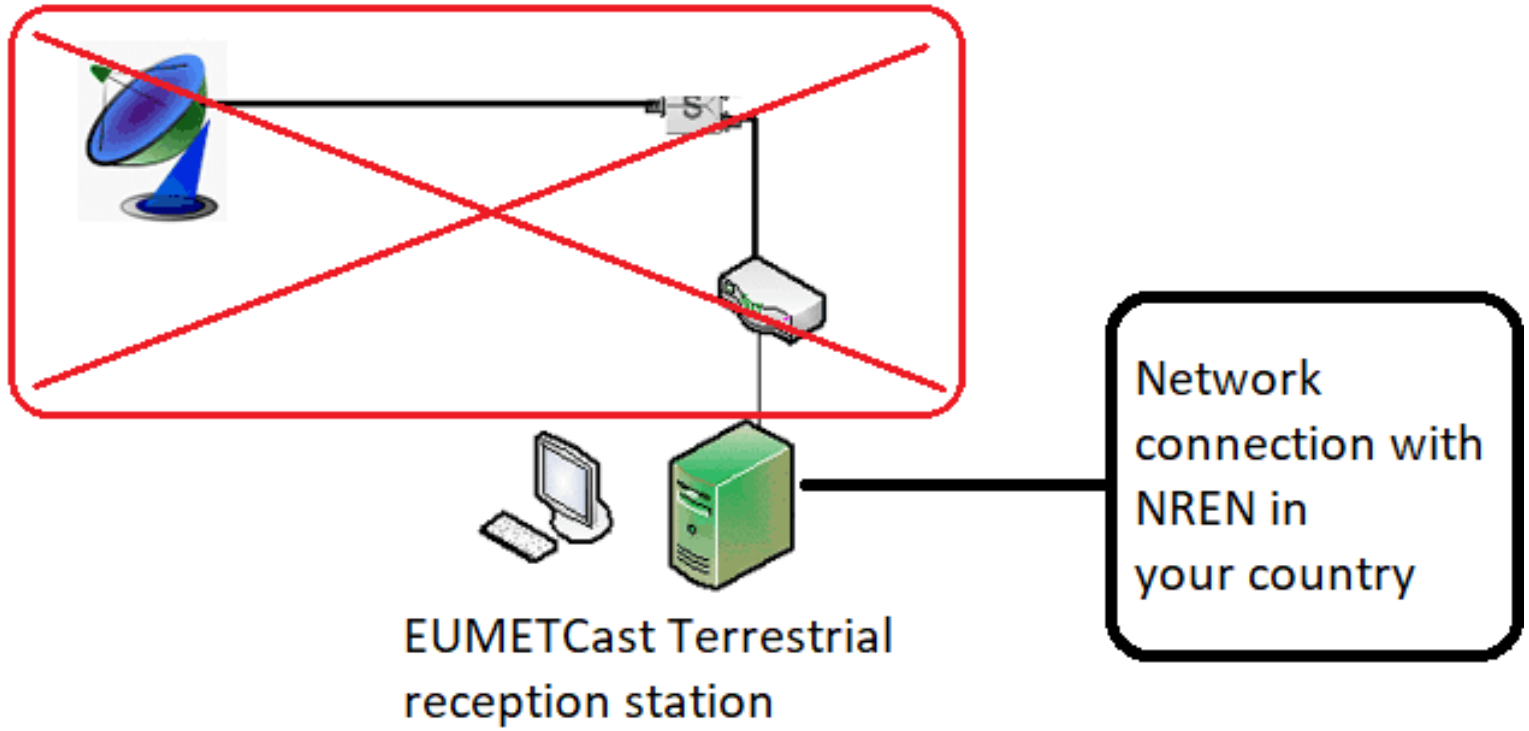
Please contact
your local NREN
for having information
about the connectivity.

(map.geant.org)

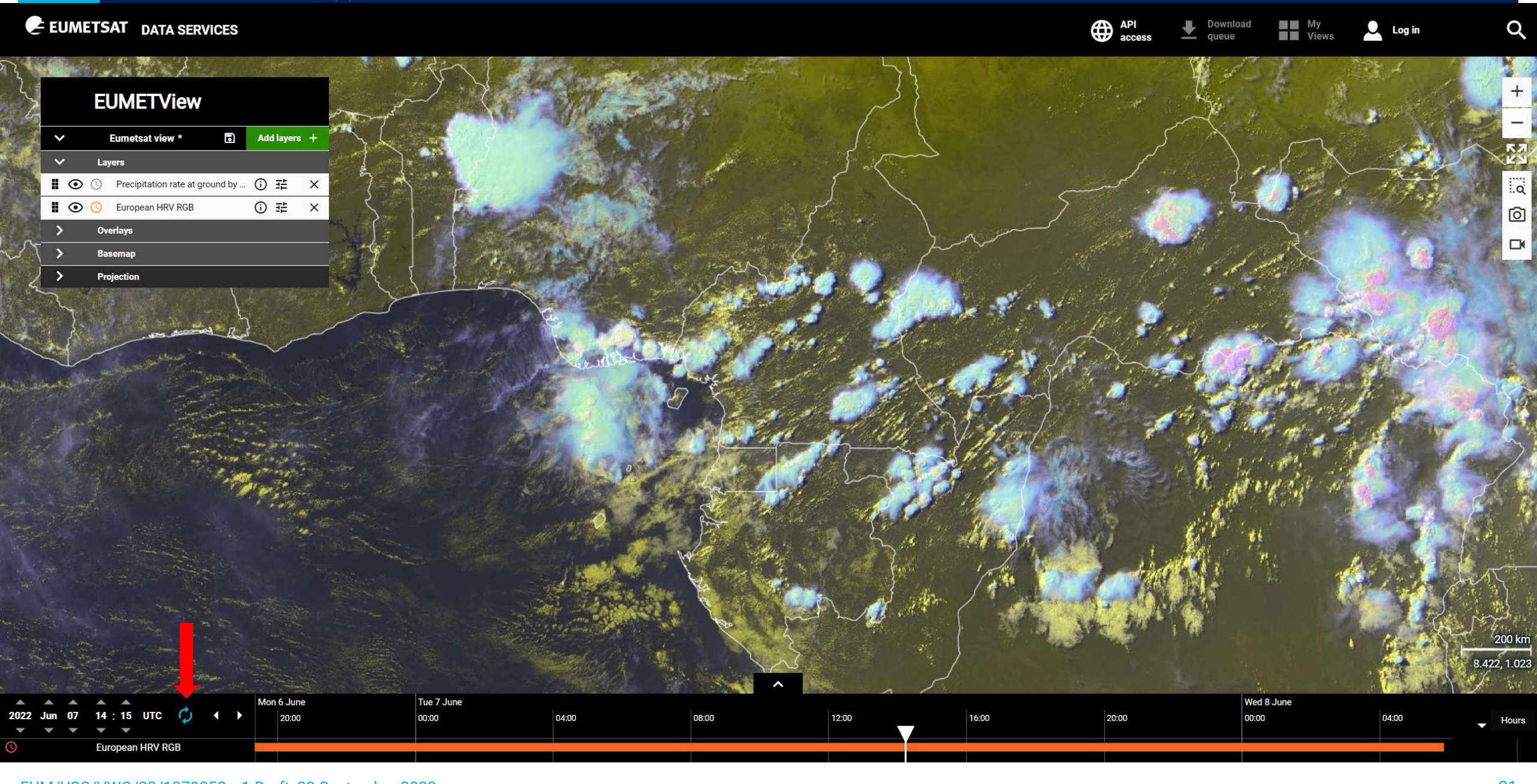
EUMETCast Terrestrial Connectivity

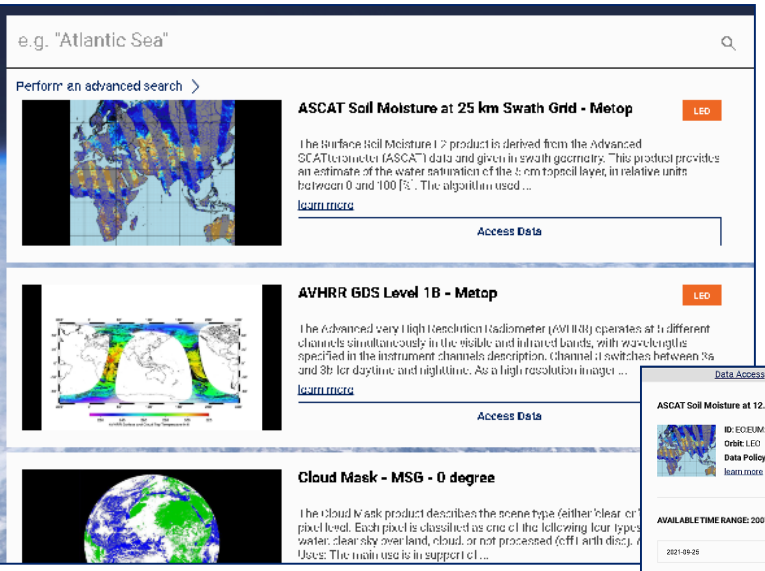
- EUMETCast Terrestrial is the expansion of the EUMETCast Satellite. It uses terrestrial lines instead of satellites to distribute the data.

- The reception station is using the same Tellicast client and EKU, without needing any antenna, receiver, etc. So the setup and maintenance is simpler.

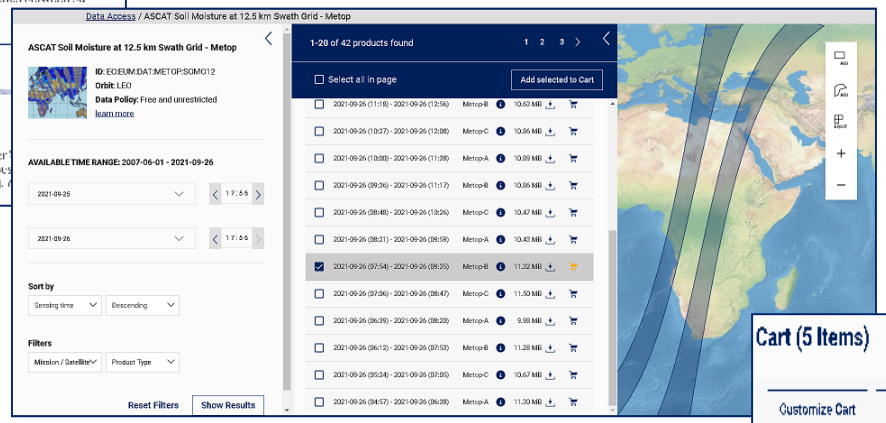


EUMETView


EUMETSAT DATA SERVICES
API access
Download queue
My Views
Log in
EUMETView
Eumetsat view *
Add layers
Layers
Precipitation rate at ground by ...
European HRV RGB
Overlays
Basemap
Projection
200 km
8.422, 1.023
2022 Jun 07 14 : 15 UTC
Mon 6 June
Tue 7 June
Wed 8 June
20:00
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00
Hours
European HRV RGB



Browse the catalogue of NRT, historic and CDR collections



Search data in a collection matching your date&time and ROI selection

Download the files

OR

Customize data by Data Tailor

Using the WebUI

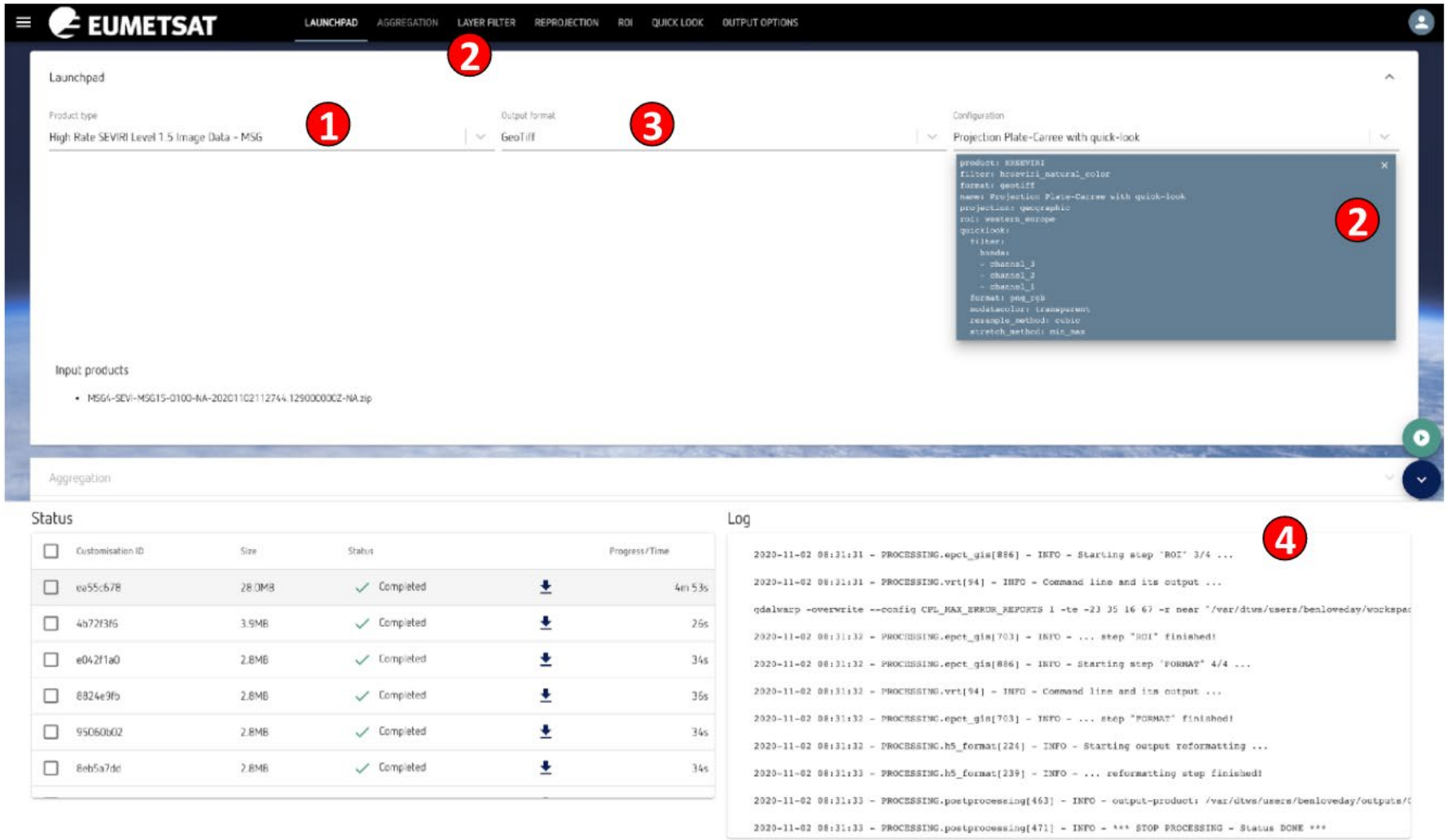
Available as standalone **and** online versions (interface with the Data Store)

1. > Supports a wide array of products (Data Store and local)

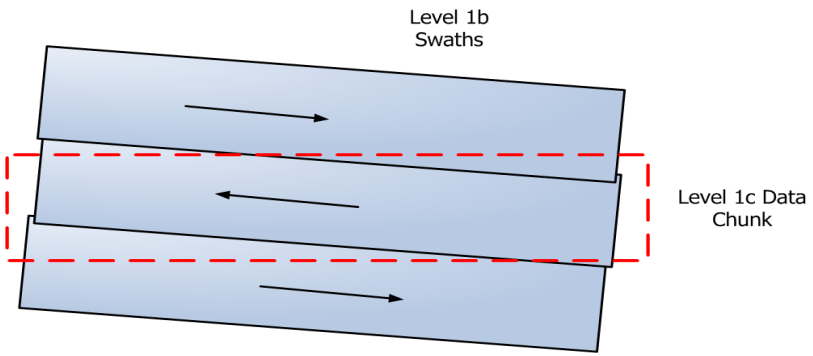
2. > Customisable processing chains; full save and recall.

3. > Customisable output formats

4. > Process queuing and logging information.



FCI Level-1 data – Repeat cycles and chunks



Chunk #
40
39
38
37
36
35
34
...
...
...
8
7
6
5
4
3
2
1

North

South

One FCI full disk repeat cycle consists of 40 body chunk files containing data and one trailer file. There are a total of 41 files.

There are 144 repeat cycles in one day (10 minutes each).

Body and trail chunk filenames

W_XX-EUMETSAT-Darmstadt,IMG+SAT,MTI1+FCI-1C-RRAD-FDHSI-FD--CHK-BODY---NC4E_C_EUMT_20170920120515_GTT_DEV_20170920120008_20170920120015_N_JLS_T_0073_0001.nc

W_XX-EUMETSAT-Darmstadt,IMG+SAT,MTI1+FCI-1C-RRAD-FDHSI-FD--CHK-BODY---NC4E_C_EUMT_20170920120527_GTT_DEV_20170920120009_20170920120027_N_JLS_T_0073_0002.nc

W_XX-EUMETSAT-Darmstadt,IMG+SAT,MTI1+FCI-1C-RRAD-FDHSI-FD--CHK-BODY---NC4E_C_EUMT_20170920120541_GTT_DEV_20170920120019_20170920120041_N_JLS_T_0073_0003.nc

Satellite Id	Instrument	Subtype & Coverage	Chunk type	Scan start time	Scan end time	Special compression	Repeat cycle in day	Chunk number	File format
MTG-I1 MTG-I2 …	FCI	FDHSI or HRFI FD or LAC4	Body/Trail	yyyyMMddhhmmss	yyyyMMddhhmmss	JLS – Lossless JPEG or blank	1 - 144	1 – 41	NetCDF

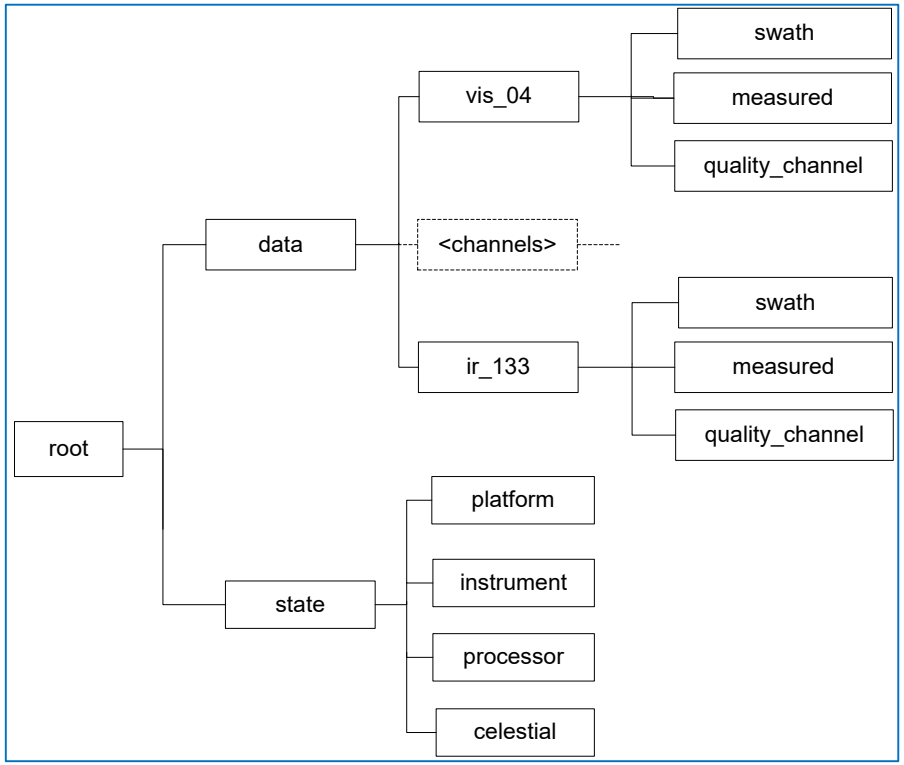
W_XX-EUMETSAT-Darmstadt,IMG+SAT,MTI1+FCI-1C-RRAD-FDHSI-FD--CHK-TRAIL---NC4E_C_EUMT_20170920121422_GTT_DEV_20170920120008_20170920120922_N_JLS_T_0073_0041.nc

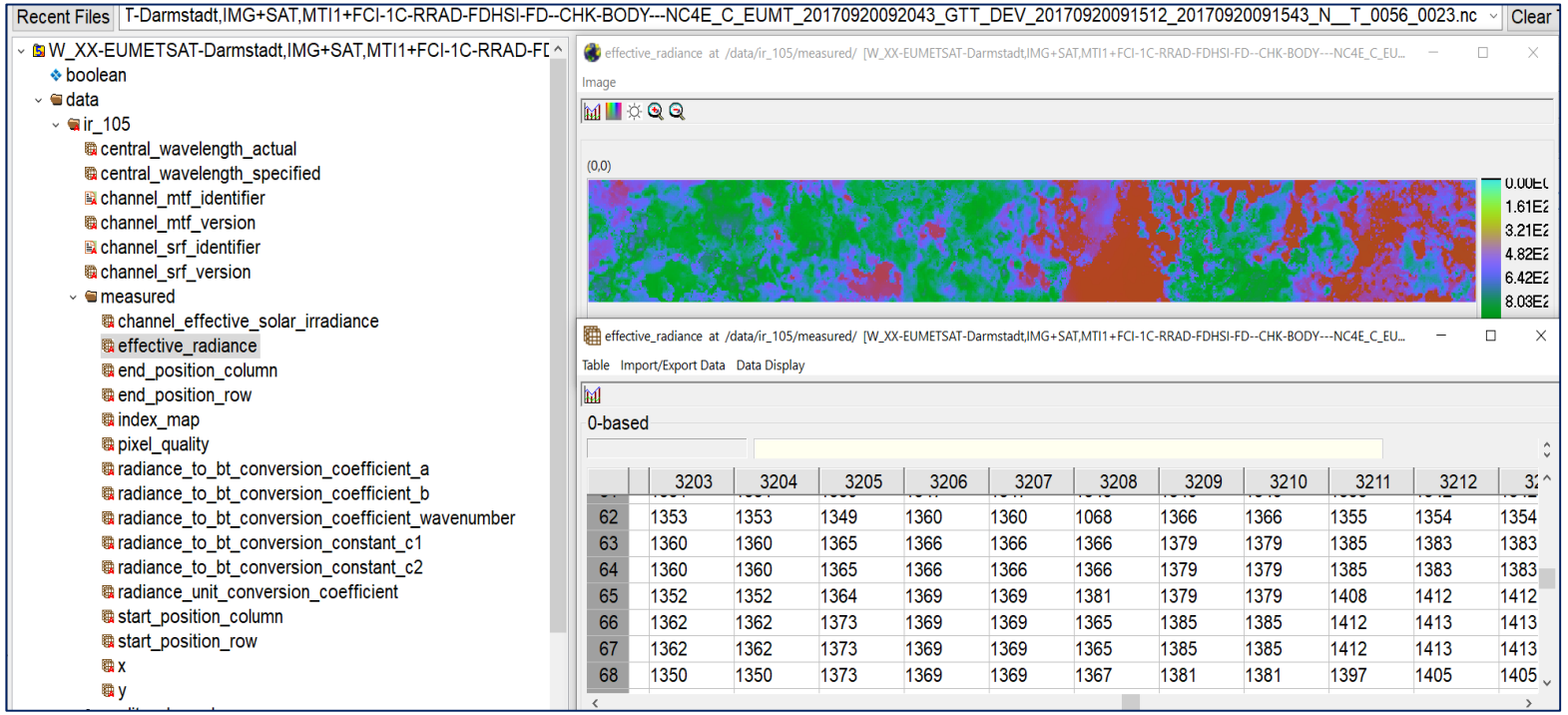
FCI Level-1 data – Fileformat

The FCI L1c datasets are netCDF-4 files and use the enhanced data model. In addition, they utilise the Hierarchical Data Format version 5 (HDF5) as the storage layer and so can also be read as HDF-5 files.

The current Climate and Forecast Conventions (CF 1.7) are applicable to version 3 of the netCDF data model. As such, the FCI L1c datasets cannot conform terms of the conventions although they do try to follow the spirit of the conventions as far as possible.

FCI Level-1 data – Fileformat





One body chunk contains data for all 16 bands

Group and dataset hierarchy in the FCI level-1c files (HDF® VIEW)

FCI Level-1 data – Compression

If the special_compression field in the filename is set to “JLS”, then the effective_radiance, index_map and pixel_quality variables in the dataset have been compressed using the CharLS algorithm, a fast lossless JPEG compression.

The user is required to download and install the HDF-5 dynamically loaded filter for CharLS decompression (noting that the netCDF-4 datasets use HDF-5 as their storage layer).

Access to installation instruction can be found at MTG FCI L1 Product User Guide (https://www.eumetsat.int/media/45923)

FCI Level-1 data – Compression

Updated installation instructions to be used for decompression of the compressed FCI level-1c data are available at

https://gitlab.eumetsat.int/open-source/data-tailor-plugins/fcidecomp/-/tree/2.0.1/

The current version includes:

- Conda based installations on Windows and Linux
- From source installations for some Linux distros (Ubuntu and RockyOS)

FCI Level-1 data – Data volumes (TD-360 test data)

The data volumes below are the approximate values based on the spectrally representative TD-360 test data, for 16 channels (NR) for full disk scans.

Approximately the same amount of space will also be needed to store 4 channels (HR) in High Resolution for full disk scans.

- Total volume for one repeat cycle (around noontime when the file sizes are max) (only NR)
  Compressed : 338 MB
  Uncompressed : 5.8 GB

- Total volume for one day (only NR)
  Compressed : 35 GB
  Uncompressed : 842 GB

FCI Level-1 data – Radiance data

- Conversion from counts to radiance (mW.m-2.sr-1.(cm-1)-1)

  radiance = (counts * scale_factor) + add_offset

- Conversion from radiance to effective radiance (W.m-2.sr-1.µm-1)

  radiance_eff = radiance * conversion_coeff (coefficient is provided in the chunk file)

- Conversion from effective radiance to Brightness Temperature (IR channels) (K)

$$T_{eff} = \frac{c_2 \cdot \nu_c}{a \cdot \ln\left(1 + \frac{c_1 \cdot \nu_c^{\,3}}{\overline{L_\nu}}\right)} - \frac{b}{a}$$

- Conversion from effective radiance to Reflectance (Visible and NIR channels) (%)

$$r_{\lambda_i} = \frac{\pi \cdot R_{\lambda_i} \cdot d^2(t)}{I_{\lambda_i} \cdot \cos(\theta(t,x))}$$

Conclusions

- In order to access MTG Data via EUMETCast Satellite, some changes may be needed in the outdoors and indoors equipment.
- EUMETCast Terrestrial is free from any of those changes and also important for accessing some extra MTG data
- Online Data Services will complement the options for accessing the MTG-I data
- Data handling aspects (file format, compression, data volume, etc.) of MTG FCI are much different than the MSG SEVIRI
- Please contact with EUMETSAT Helpdesk (ops@eumetsat.int) for any questions.

Thank you!

Questions are welcome.