

H SAF project: satellite derived products for the monitoring of precipitation, soil moisture and snow cover.

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H SAF Deputy Project Manager

Civil Protection Department, Italy,

Satellite Application Facilities



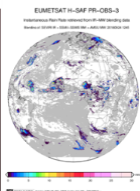
Satellite Application Facilities (SAFs) are dedicated centers of excellence for processing satellite data. They form an integral part of the distributed **EUMETSAT** Application Ground Segment.

SAF in Support to Operational Hydrology and Water Management

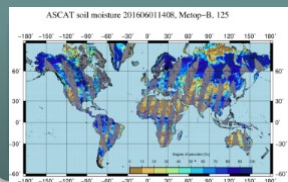
NEAR REAL
TIME

Eumetcast,
H SAF ftp

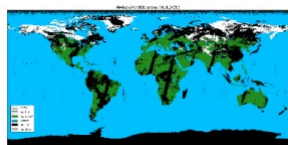
Data Cube



precipitation
rate and accumulated



soil moisture
surface and root mean zone



snow
cover, melting conditions,
water equivalent

Hydrological
applications

Water management

Agriculture

Climate

Natural hazard
assessment



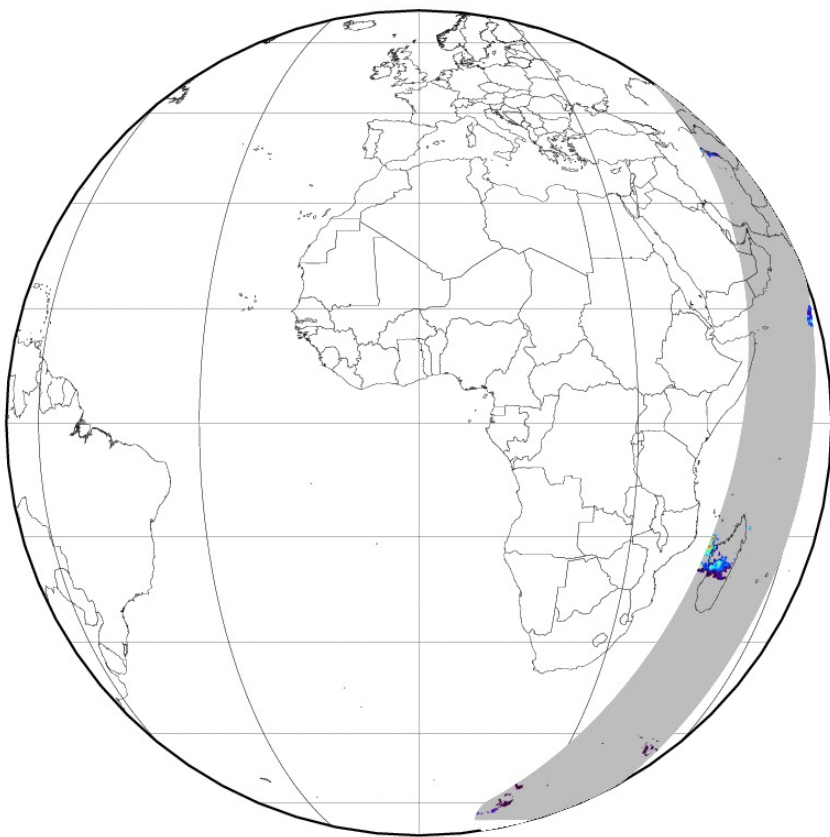
EUMETSAT

H SAF Precipitation Products: MW precipitation products

EUMETSAT H-SAF P-IN-SSMIS

Instantaneous Rain Rate from Conical MW Scan

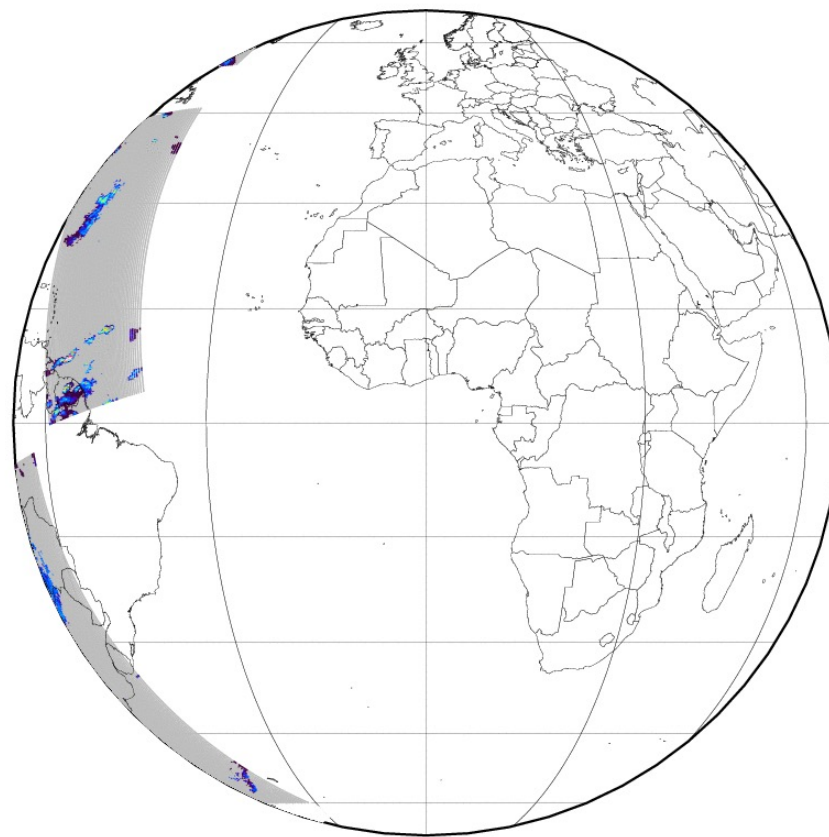
Rain Rate retrieved from SSM/I and SSMIS data: 20190622 0000 DMSP16 808E



EUMETSAT H-SAF P-IN-MHS

Instantaneous Rain Rate from Crosstrack MW Scan

Rain Rate from Crosstrack MW Scan: 20190622 0046 METOPB 35068



Features

Strips of
~1400Km
swath

More than 6
passes/daily
over Europe

~30Km

150 minutes
from
observing
time

EUMETCast

BUFR

Main features

Strips of
~2250Km
swath

More than 6
passes/daily
over Europe

16x16 – 26x52
km2

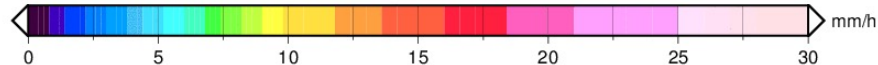
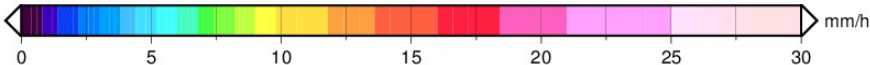
30 minutes from
observing time

EUMETCast

BUFR



Snow Ev





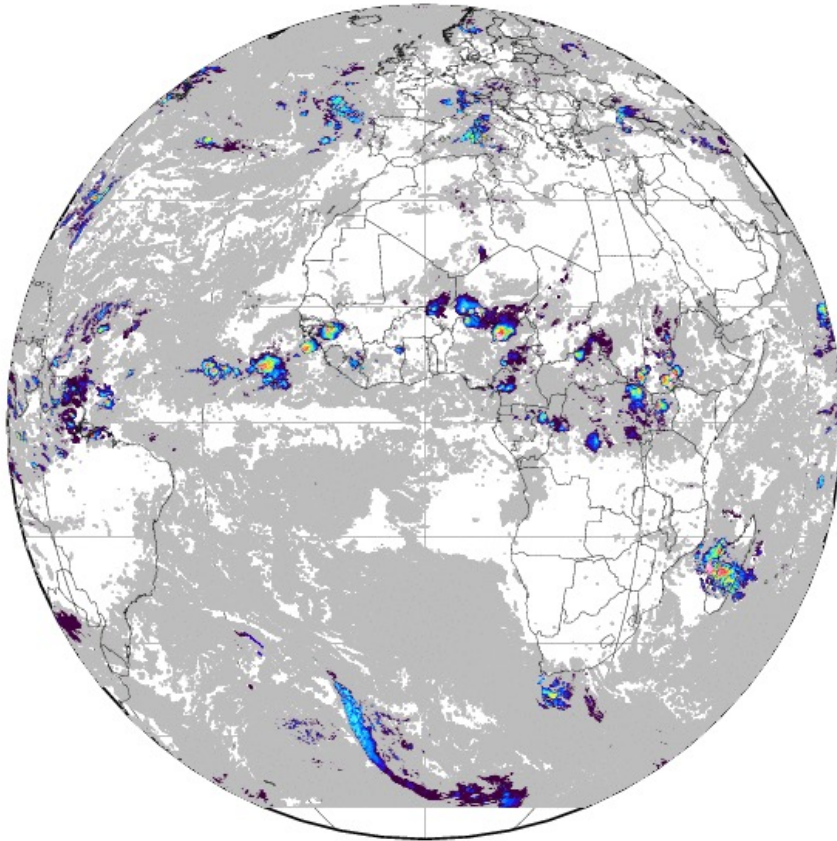
EUMETSAT

H SAF Precipitation Products: MW + IR precipitation products

EUMETSAT H-SAF P-IN-SEVIRI

Instantaneous Rain Rate retrieved from IR-MW blending data

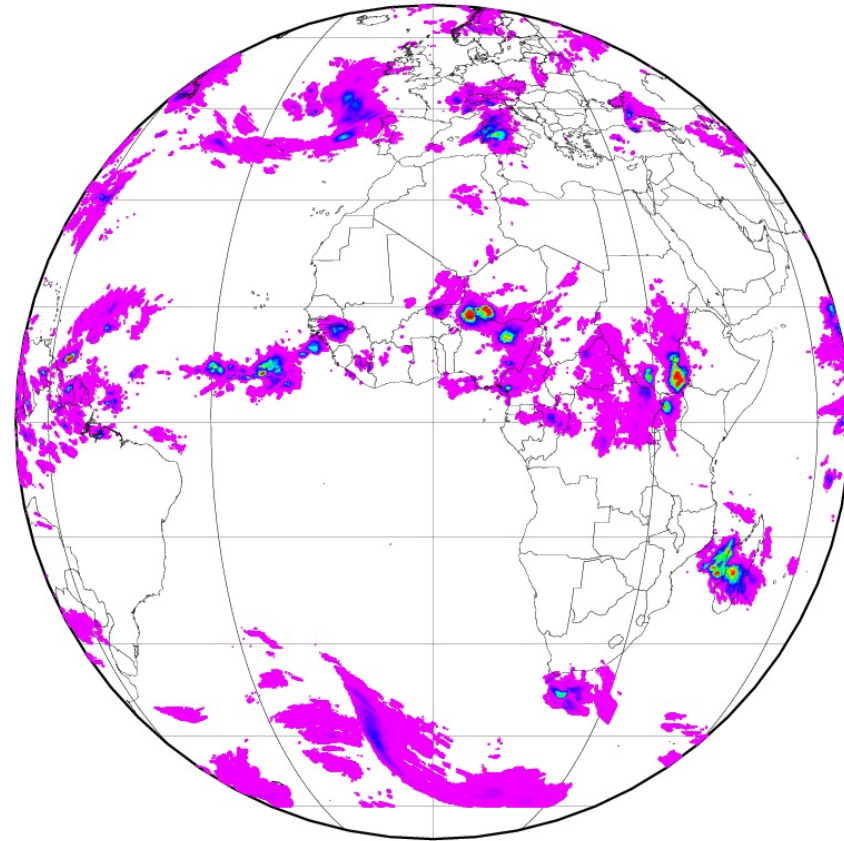
Blending of: SEVIRI IR + SSM/I-SSMIS MW + AMSU MW: 20190622 0000



EUMETSAT H-SAF P-AC-SEVIRI

Accumulated Precipitation in the previous 3 hours

Blending of: SEVIRI IR + SSM/I-SSMIS MW + AMSU MW: 20190622 0300



Main features

MSG Full-disk area

Every 15 min

3 Km s.s.p.
~8 km over Europe

Within 15 minutes

EUMETCast

GRIB-2

3 Km s.s.p.
~8 km over Europe

Within 15 minutes after every 3h

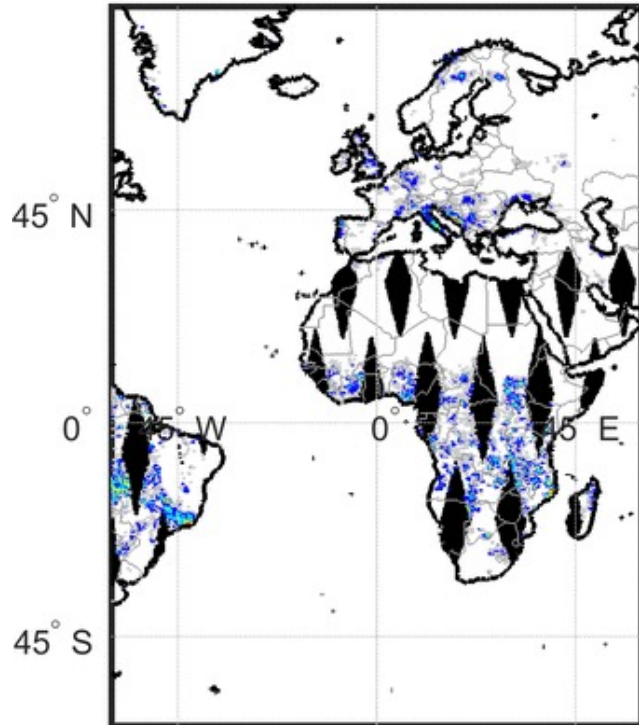
EUMETCast

GRIB-2

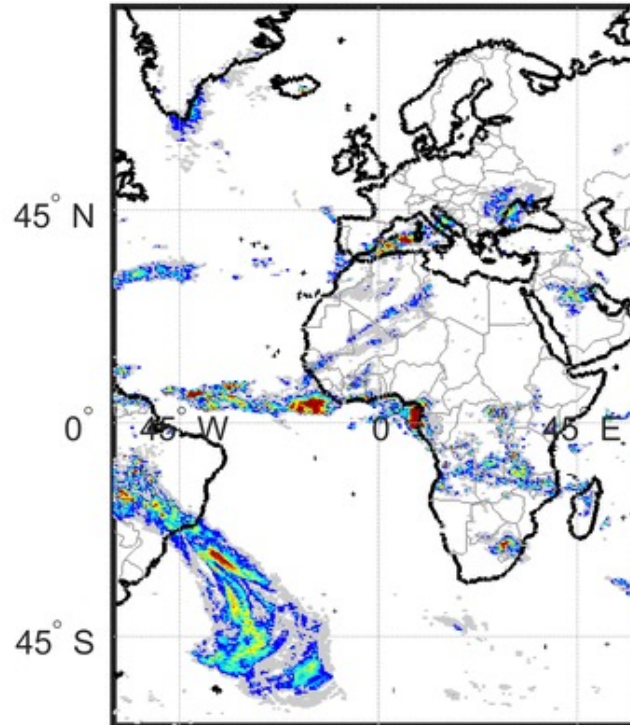
Snow E



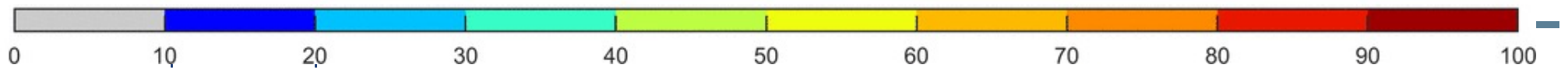
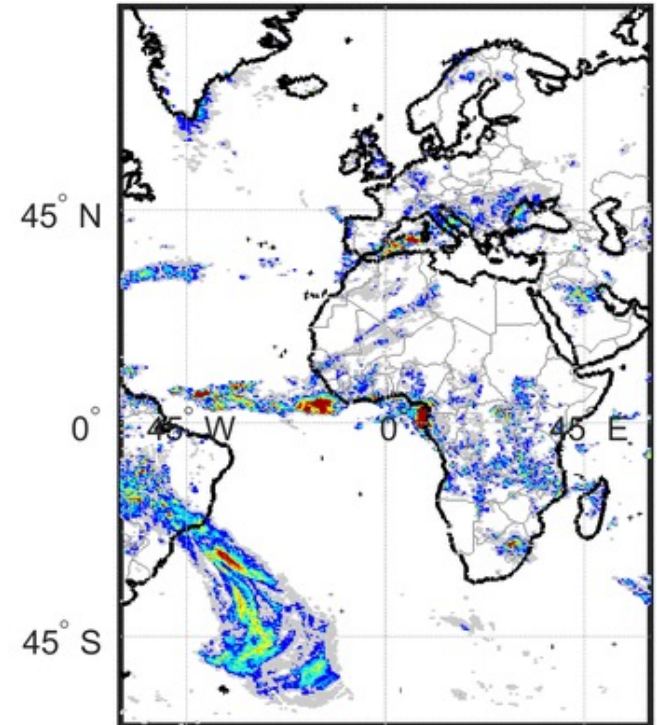
SM2RAIN Real Time Rainfall - 2018-Nov-19



H23 Rainfall - 2018-Nov-19



H64 Rainfall - 2018-Nov-19



Case studies in Italy, Liguria 5 terre: 25 October and 4 November

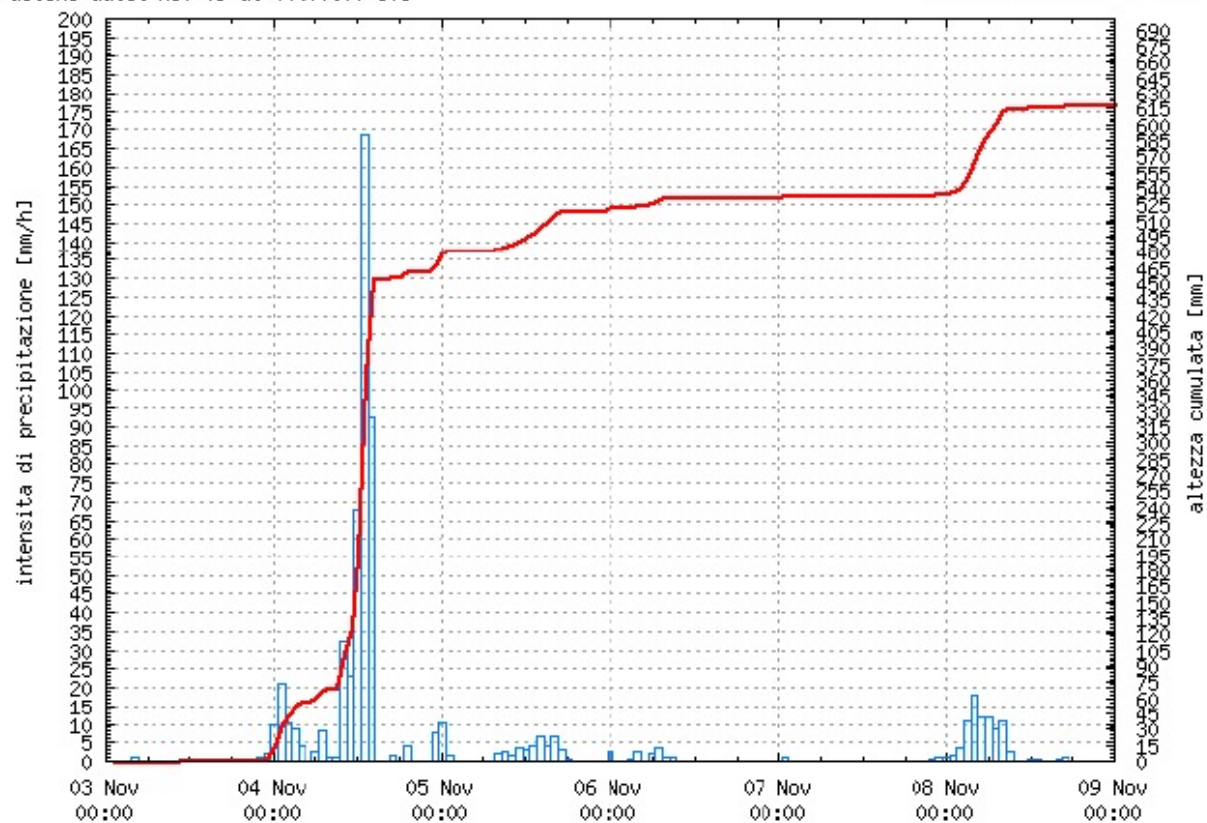


Rain gauge: more than 160 mm in 1 h, more than 500 mm in 24 h

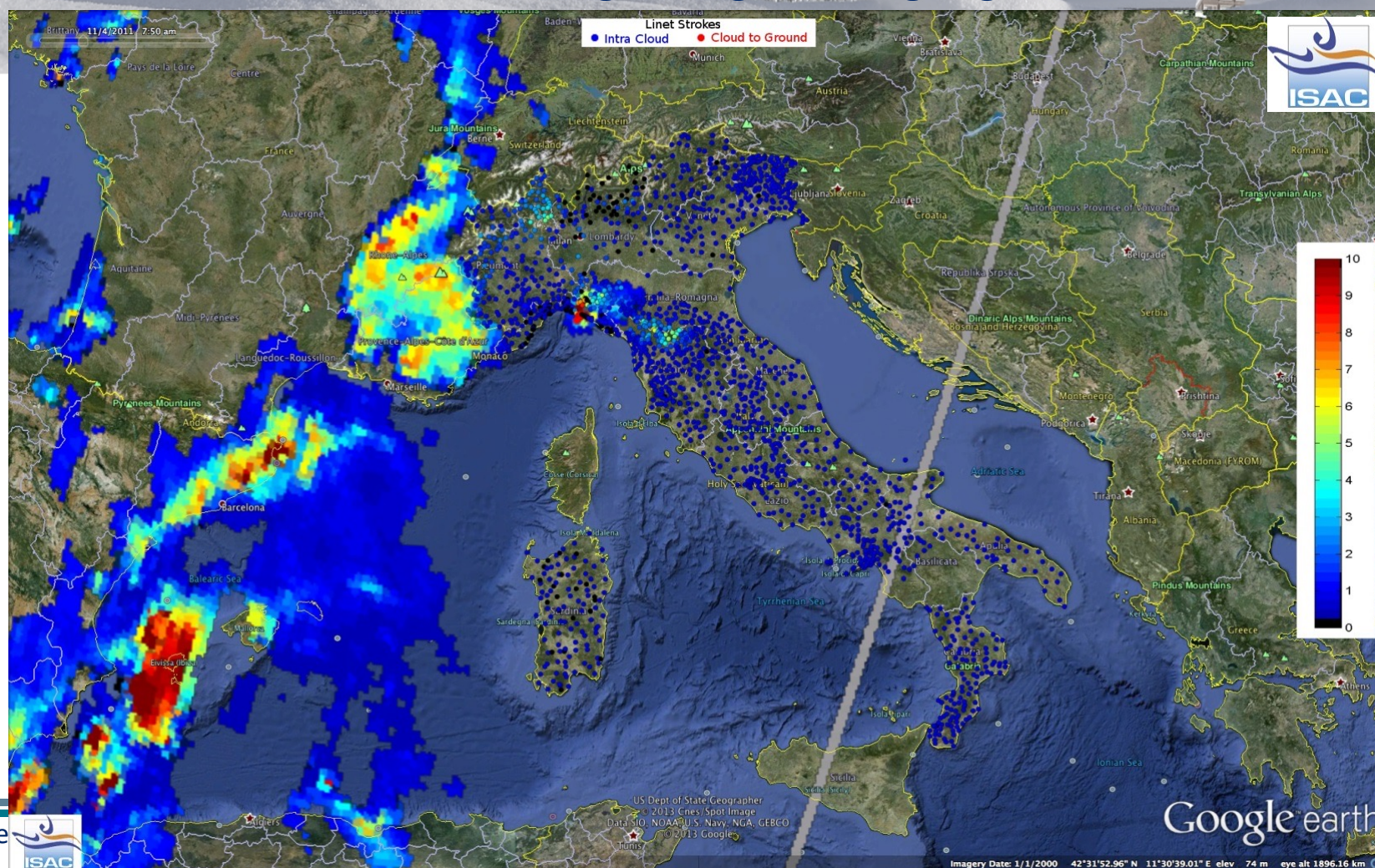
grafico del: Nov-11 at 11:22:17 UTC
ultimo dato: Nov-09 at 00:00:00 UTC

Vicomarasso

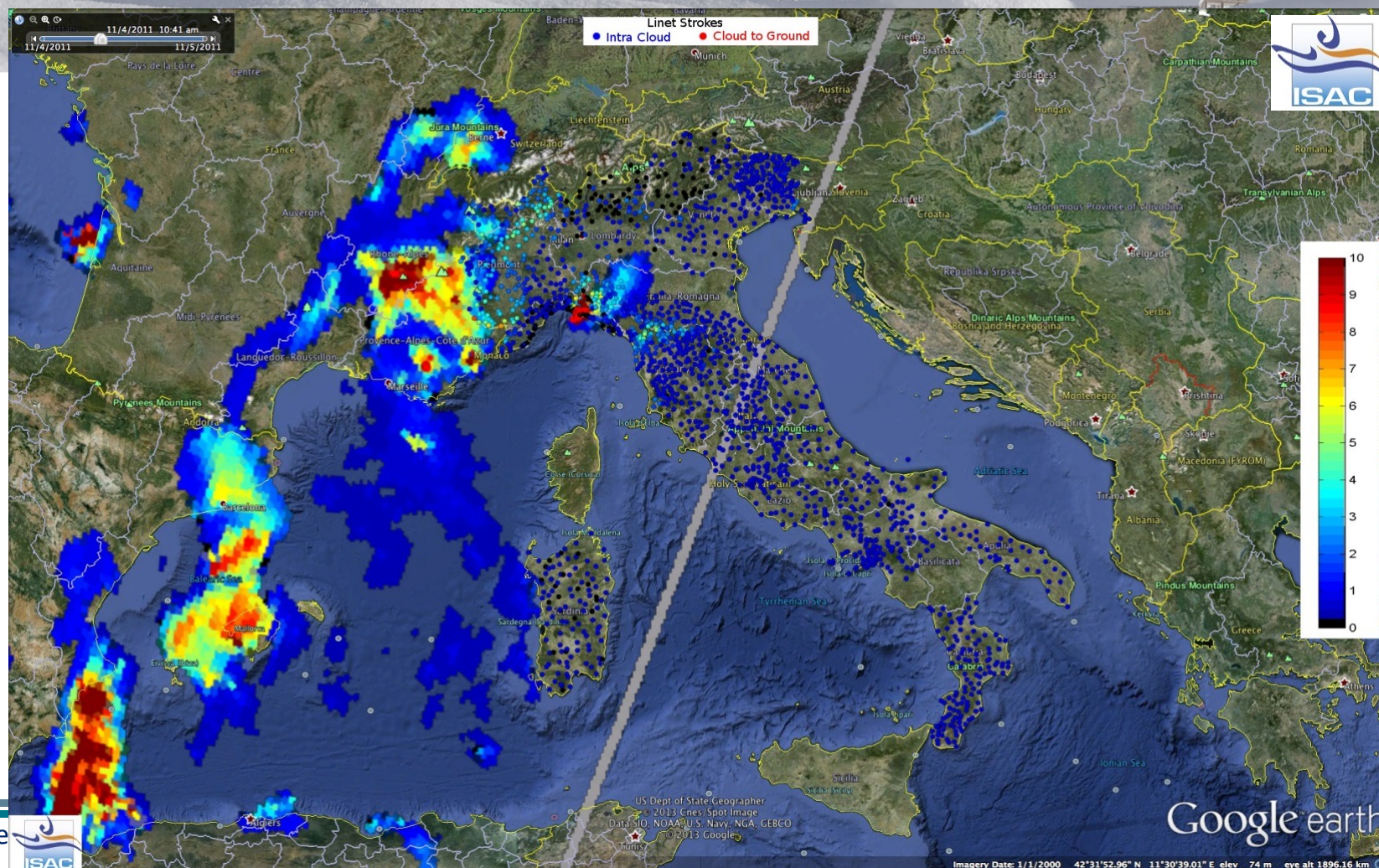
ARPAL CFMI-PC



H-SAF PR-OBS-1 + Radar + Lightning + Rain gauges – time 05:50 UTC

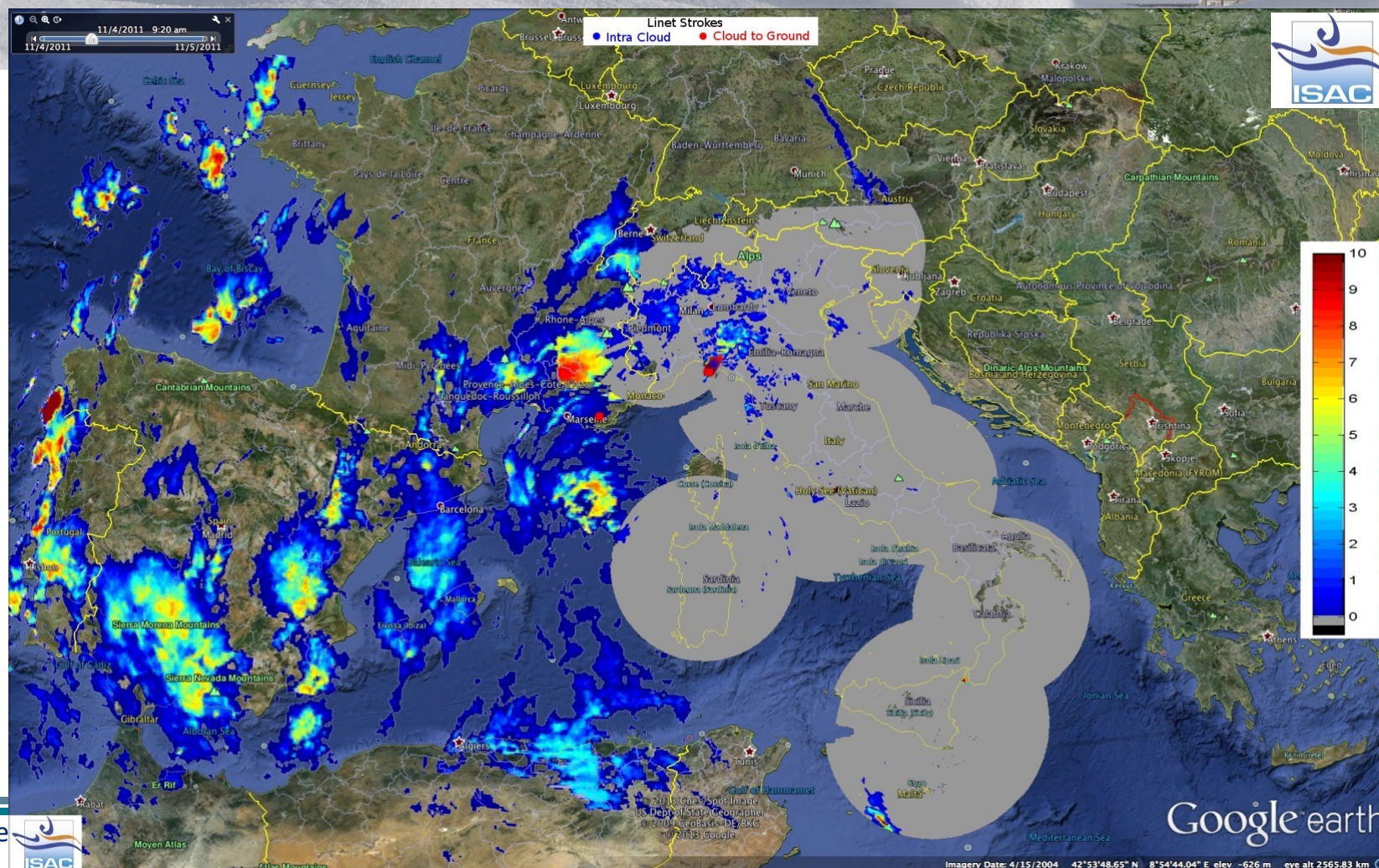


H-SAF PR-OBS-1 + Radar + Lightning + Rain gauges – time 08:50 UTC





H-SAF PR-OBS-3 + Radar + Lightning – time 07:20 UTC



Strategy and foreseen improvements

New PMW based Products

Introduction of Modules for snowfall and and light rainfall

New PMW and SM2RAIN prod

Daily precipitation based on H SAF EPS-SG SCA soil-moisture product and MW products

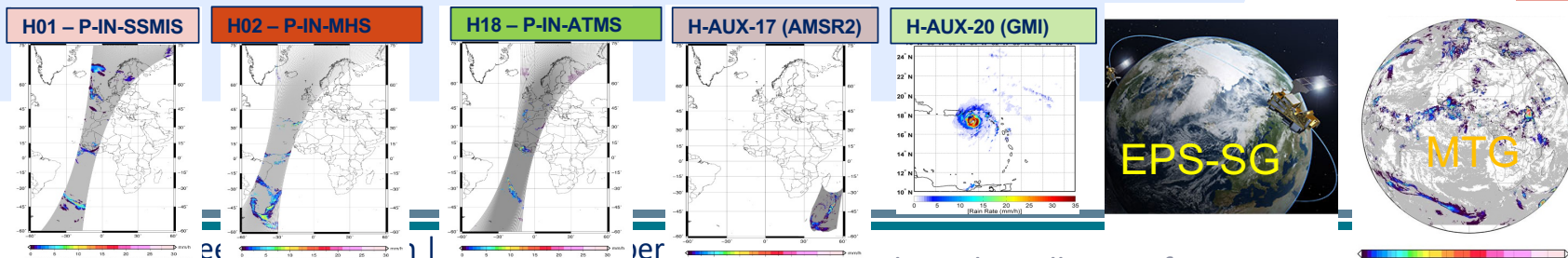
New MW and IR based Products

MTG (FCI and LI)

NRT

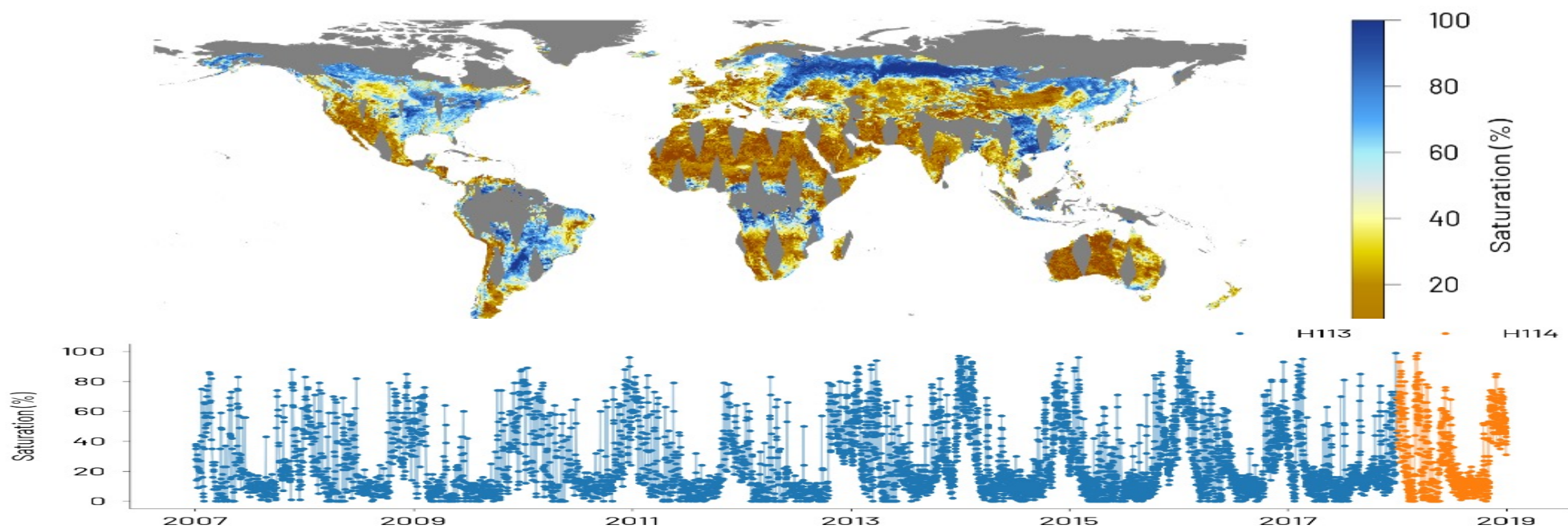
LATE RUN
Gage adjusted

DATA RECORD



logical Satellite Conference 2021

SURFACE SOIL MOISTURE (SSM)

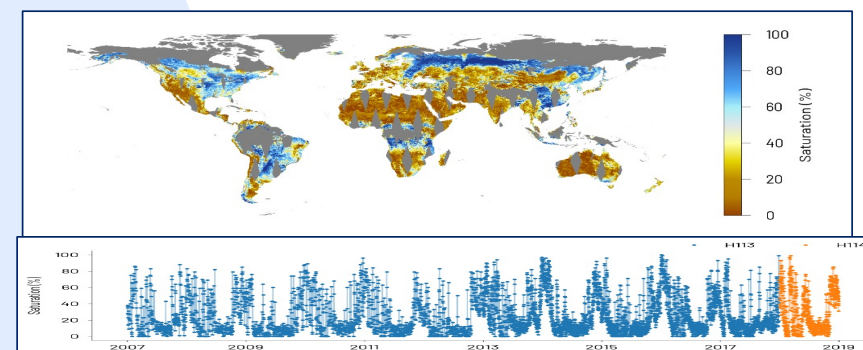


- ASCAT **Climate Data Record** SSM released every year in time series format, from 2007
- ASCA Thematic Climate Data Records

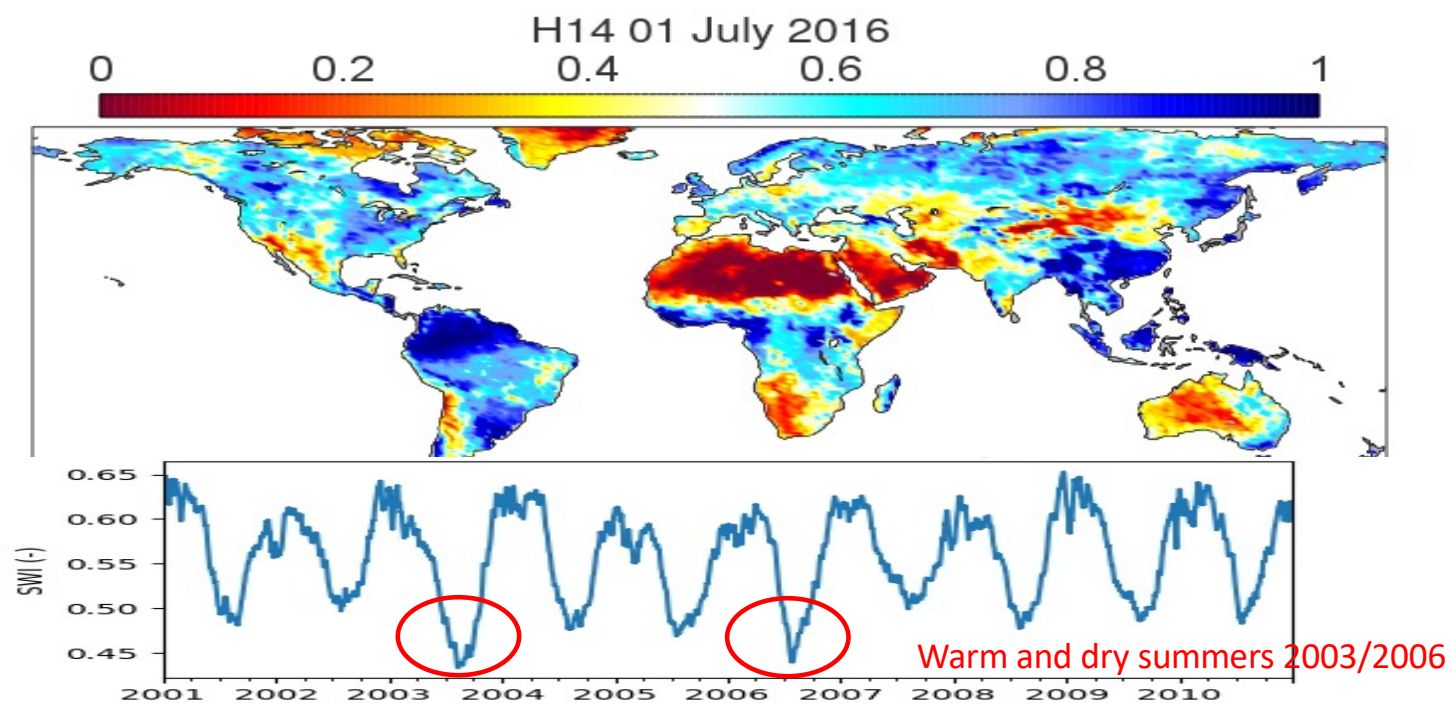


all global, daily products

- NRT products: SCA DIS SSM NRT 0.5 km , SCA SSM NRT 6.25 km , SCA SSM NRT 12.5 km, ASCAT SSM NRT 25 Km
- DATA RECORD: long-term SSM climate data record starting from 1992



ROOT MEAN ZONE SOIL MOISTURE(RSM)



- Global H27 CDR product from 1992 are produced at 16 km resolution.

H SAF Soil Moisture products in CDOP 4

Root Zone Soil Moisture

Strategy and foreseen improvements



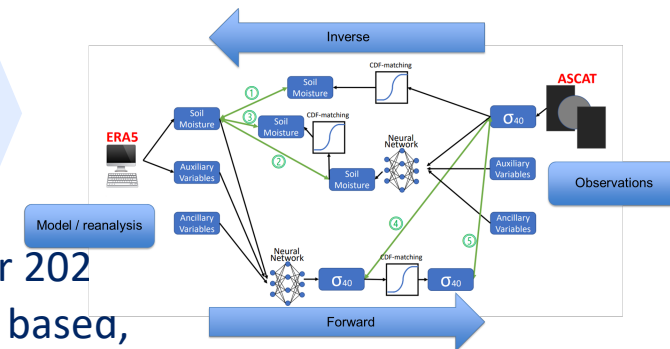
All global, 10 Km resolution, daily products

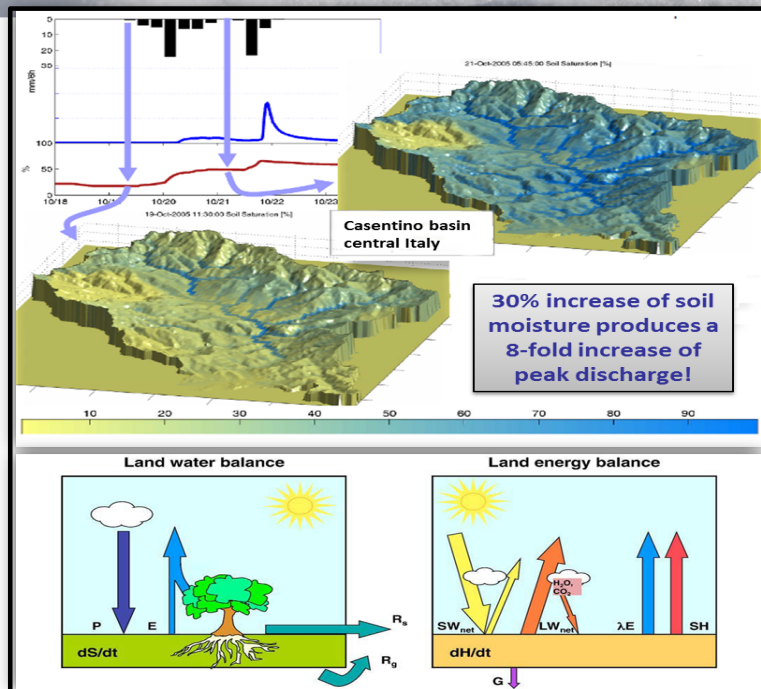
➤ NRT:

- Metop ASCAT RZSM (oper 2021),
- Metop-SG SCA RZSM (oper 2025),
- Metop-SG SCA RZSM neural network-based (oper 2025)

➤ DATA RECORD:

- ERS/SCAT and Metop/ASCAT product, 1992-2021, (oper 2019)
- ERS/SCAT, Metop/ASCAT, 1992-2026 (oper 2023, 2024),
- ERS/SCAT, Metop/ASCAT and Metop-SG/SCA product, 1992-2026 (oper 2025)
- ERS/SCAT, Metop/ASCAT and Metop-SG/SCA product, neural network based, 1992-2026 (oper 2026)





DROUGHT



PRECIPITATION



FLOODS



LANDSLIDES

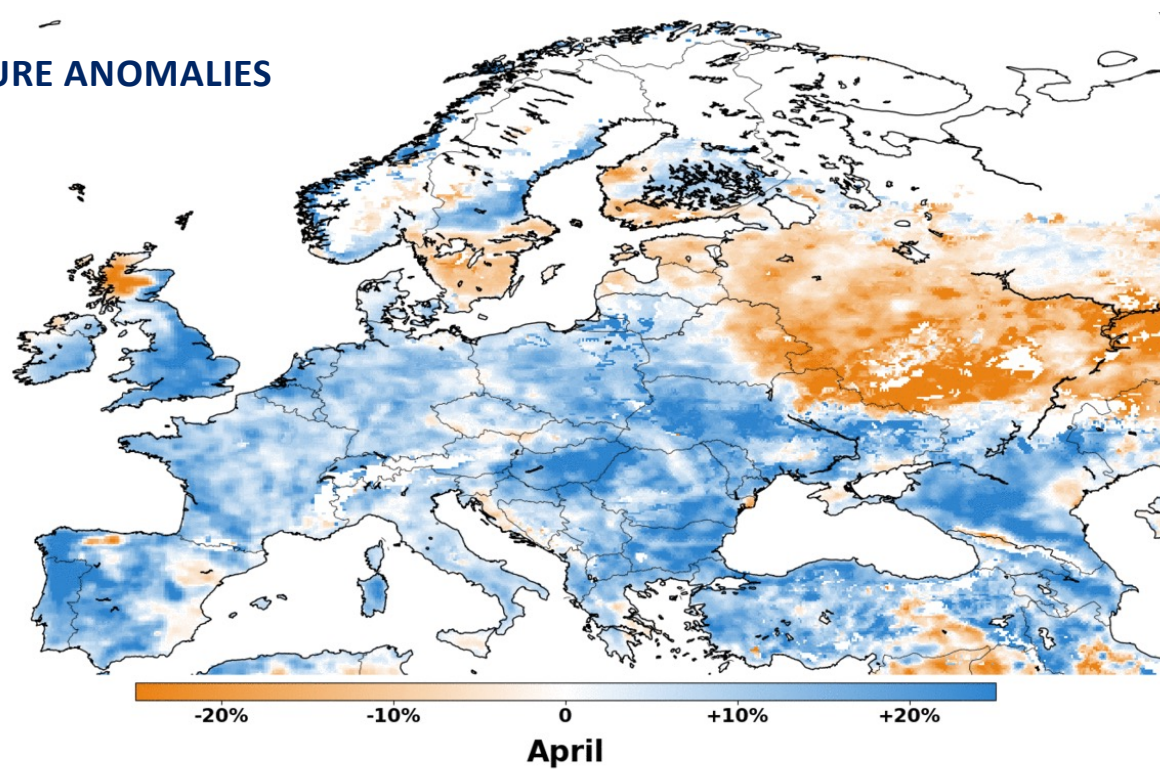


NUMERICAL WEATHER
PREDICTION

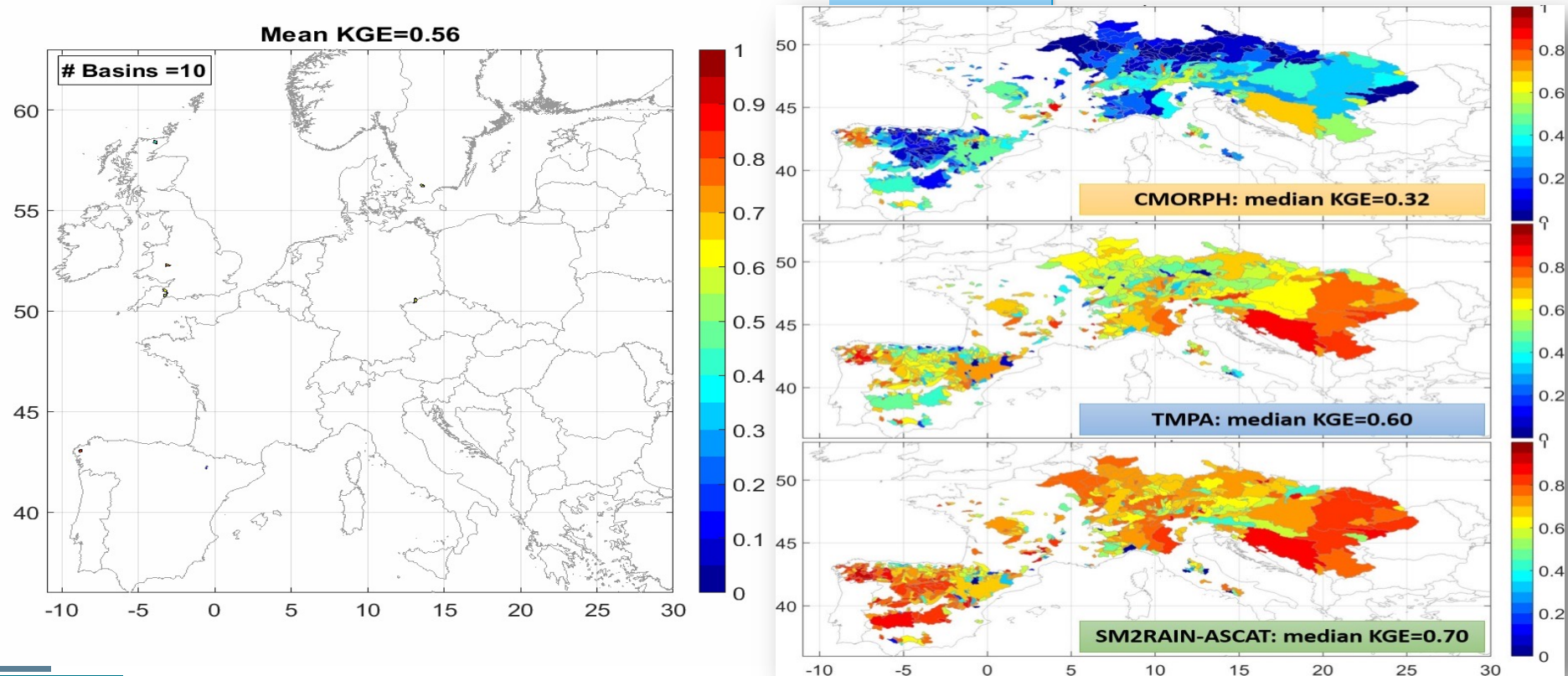


CROP PRODUCTION

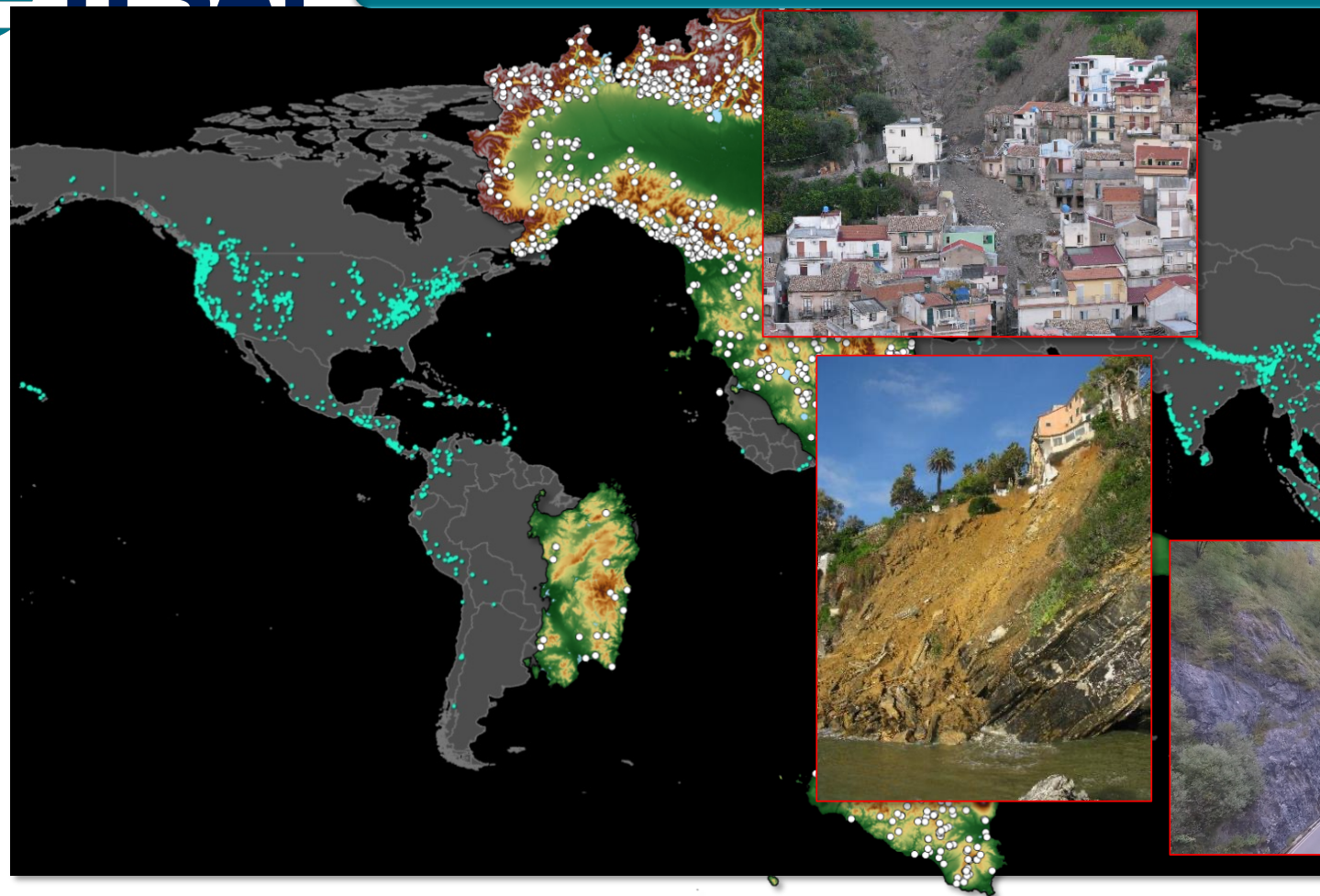
DROUGHT: SOIL MOISTURE ANOMALIES



Simulation of floods over 600 basins in Europe through SM2RAIN precipitation



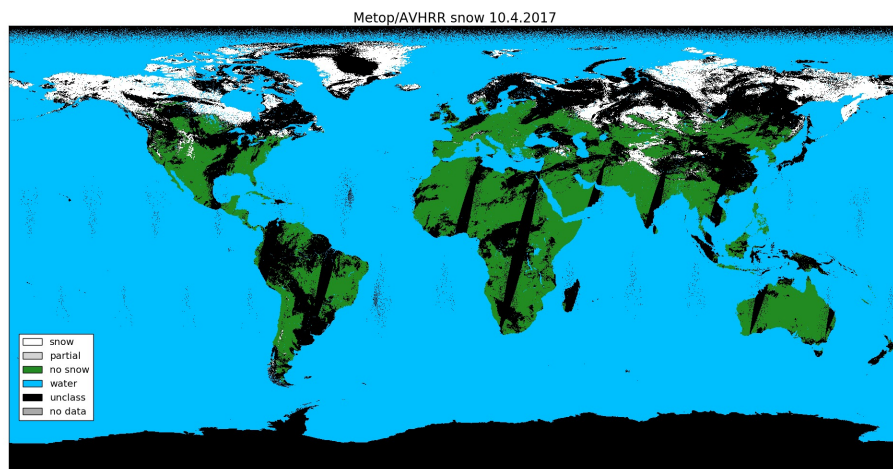
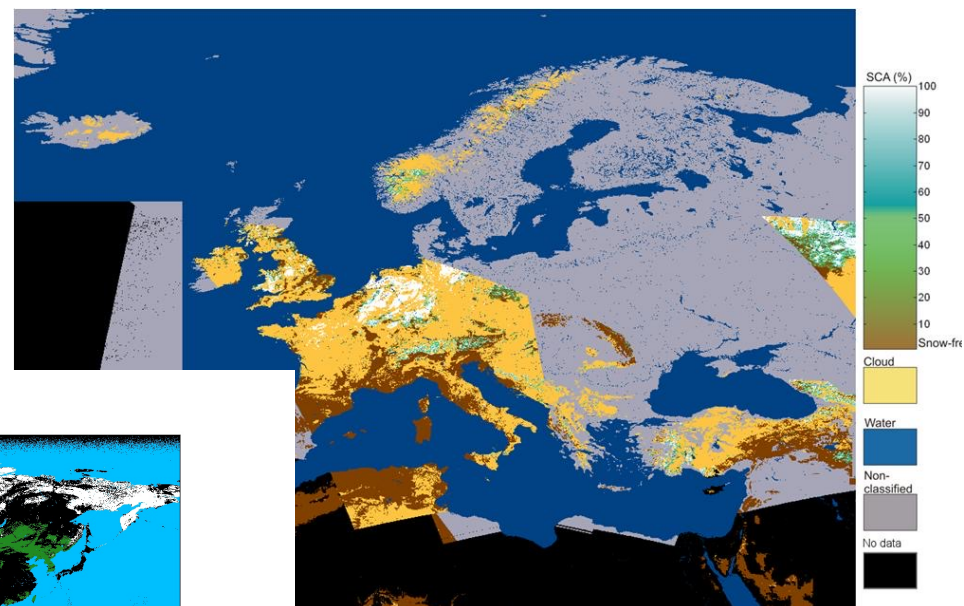
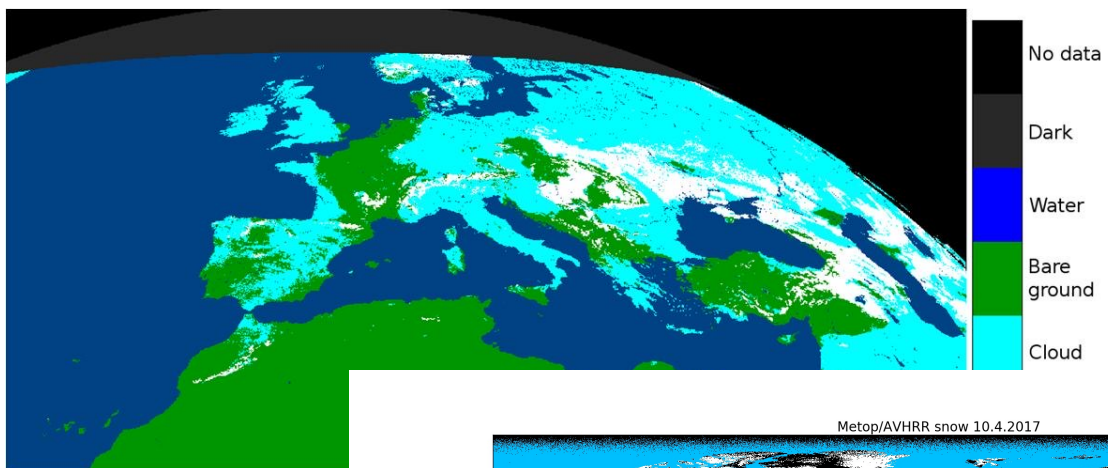
SM2RAIN for Landslide - Europe



Catalogue listing
2238
rainfall-induced
landslides
between
2007 and 2017

Brunetti et al. (2018 RSE)

H SAF Snow products



Product Validation Program: Quality Control

- **to monitor the progress in product quality** as further development evaluating statistical scores and case study analysis on the base of comparison between satellite products and ground data;
- **to provide validation service to end-users** publishing on the H SAF webpage the statistical scores evaluated and the case studies analysed;
- **To investigate the H SAF product impact in end-user applications** for emergency management, precipitation event alerts, street monitoring, water balance evaluation, etc.

**Product
quality
assessment**

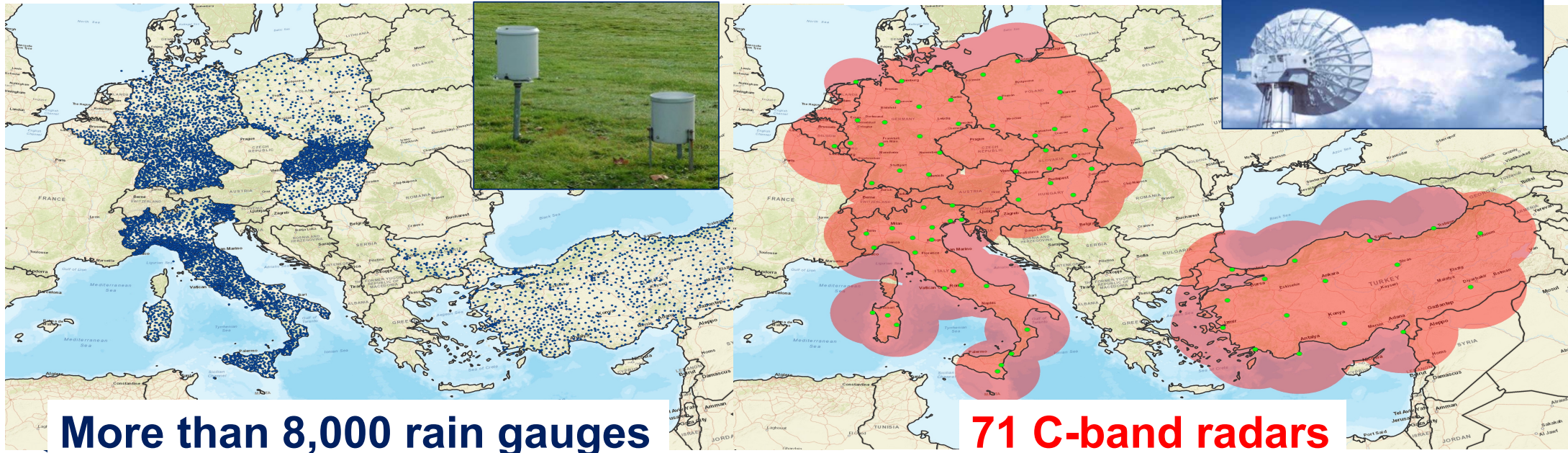
**User
Promotion**

Hydrologists, meteorologists, and precipitation, snow and soil moisture ground data experts, coming from experts from the National Meteorological and Hydrological Institutes of **Austria (ZAMG)**, **Belgium (IRM)**, **Bulgaria (NIMH)**, **Finland (FMI)**, **France (Meteo France)**, **Germany (BfG)**, **Hungary (OMSZ)**, **Italy (ITAF MET, DPC, UniBo, CNR-IRPI, CIMA)**, **Poland (IMWM)**, **Slovakia (SHMU)**, and **Turkey (ITU, METU, AU)**. ECMWF takes also part of the PVG.

Country	Institutes
Belgium	IRM
Bulgaria	NIMH
Germany	BfG
Hungary	OMSZ
Italy	DPC, UniBo
Poland	IMWM
Slovakia	SHMU
Turkey	ITU, METU, TSMS

Precipitation Product Validation Group

The *Precipitation Product Validation Group (PPVG)* is composed of experts from the National Meteorological and Hydrological Institutes of **8 European countries** under the coordination of the Italian Civil Protection Department. The PPVG uses both **rain gauge** and **radar** data for validation of precipitation products.



The Hydrologic Validation Programme

The purpose is to **assess** the benefits of the novel HSAF satellite-derived data on practical hydrological applications and to **improve** products and their usability in operational hydrology

- Product **quality assessment** and their continuous monitoring by product validation (evaluation) with the usage of hydrological rainfall-runoff models,
- Research into possibility of **HSAF products application in operational hydrology**
- **Training activities**, stimulating the use of satellite products in hydrology and water management

Product quality
assessment

Usability of
products and
its
improvement

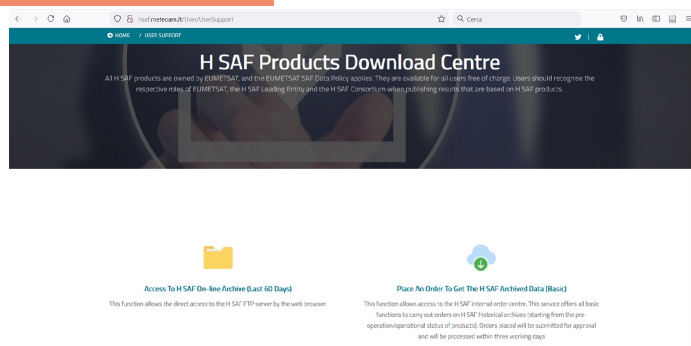
Promotion of
products

SAF on Support to Operational Hydrology and Water Management

- **Provide *operational* high quality level 2/3 products and develop *new satellite-derived products* to satisfy the *needs of operational hydrology*;**
 - ***identified products:***
 - precipitation (rate, accumulated);
 - soil moisture (at large-scale, at local-scale, at surface, in the roots region);
 - snow parameters (detection, cover, melting conditions, water equivalent);
- ***independent validation;***
- ***All the products have a certified Accuracy by the work of 11 countries***

How to download data

<http://hsaf.meteoam.it>

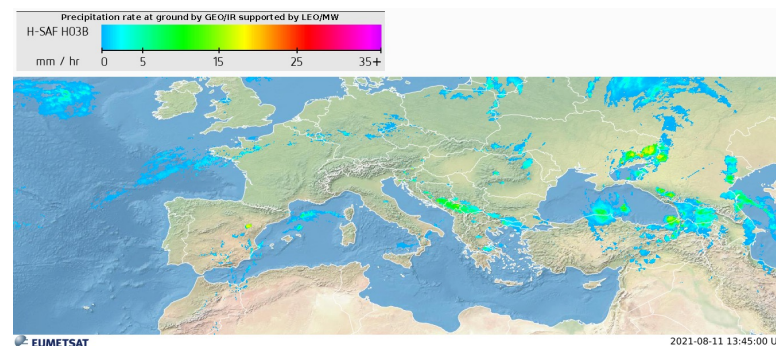


<http://hsaf.meteoam.it/User/UserSupport>

1. Registration on the H SAF website.
2. Select product.
3. Select period and area of interest.
4. In few days you'll get an email to download the data.

EUMETCAST

<https://view.eumetsat.int/productviewer?v=default>



Devastating floods in western Europe

10-17 July 2021

Region

Germany, Belgium, The Netherlands, Luxembourg, France, Switzerland

Satellites

Meteosat-11, Metop

Instruments

SEVIRI, ASCAT

Channels/Products

Airmass, Infrared, Absolute Topography, NWC SAF Precipitating Clouds, H SAF Soil Wetness Index

WEB PAGE

<http://hsaf.meteoam.it/>

Thanks for your attention !

Contact :silvia.puca@protezionecivile.it