H SAF
Support to Operational Hydrology and Water Management

WMO RA VI Hydrological Forum

Oslo, 20 September 2016

H-SAF: from products to end users

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ITAF-COMet

H-SAF Project Manager

H-SAF Objectives

Satellite Application Facility in Support to Operational Hydrology and Water Management

- to **provide satellite-derived products** from existing and **future satellites** with sufficient time and space resolution to satisfy the needs of operational hydrology. Identified products:
  - precipitation (liquid, solid, rate, accumulated);
  - soil moisture (at large-scale, at local-scale, at surface, in the roots region);
  - snow parameters (detection, cover, melting conditions, water equivalent);
- to perform **independent validation** of the usefulness of the new products for fighting against floods, landslides, avalanches, and evaluating water resources

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The Consortium and Partners

ITALY
USAM-CNMCA
PROTEZIONE CIVILE
CNR -ISAC
UNIFE
TELESPAZIO

AUSTRIA
ZENTRAL ANSTALT FUR METEOROLOGIE UN GEODYNAMIC
TU WIEN

ECMWF
EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS

FINLAND
FINNISH METEOROLOGICAL INSTITUTE

POLAND
INSTITUTE OF METEOROLOGY AND WATER MANAGEMENT

TURKEY
TURKISH STATE METEOROLOGICAL SERVICE
MIDDLE EAST TECH. UNIV.
ISTANBUL TECH. UNIV.
ANADOLU UNIVERSITY
ONDOKUZ MAYIS UNIV.

BELGIUM
ROYAL METEOROLOGICAL INSTITUTE

BULGARIA
NATIONAL INSTITUTE OF METEOROLOGY AND HYDROLOGY

FRANCE
METEO-FRANCE

GERMANY
BUNDESANSTALT FUR GEWASSERKUNDE

HUNGARY
HUNGARIAN METEO SERVICE

SLOVAKIA
HYDRO-METEOROLOGICAL INSTITUTE

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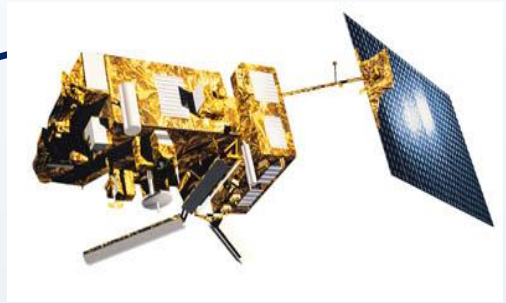
The Context: The SAF Concept

EUM Geostationary Systems

Data Acquisition and Control

Data Processing EUMETSAT HQ



EPS

Other Data Sources

Application Ground Segment

EUMETSAT Central Application Facility

Satellite Application Facilities (SAFs)

Central Processing

Distributed Processing and generation of specific products

USERS

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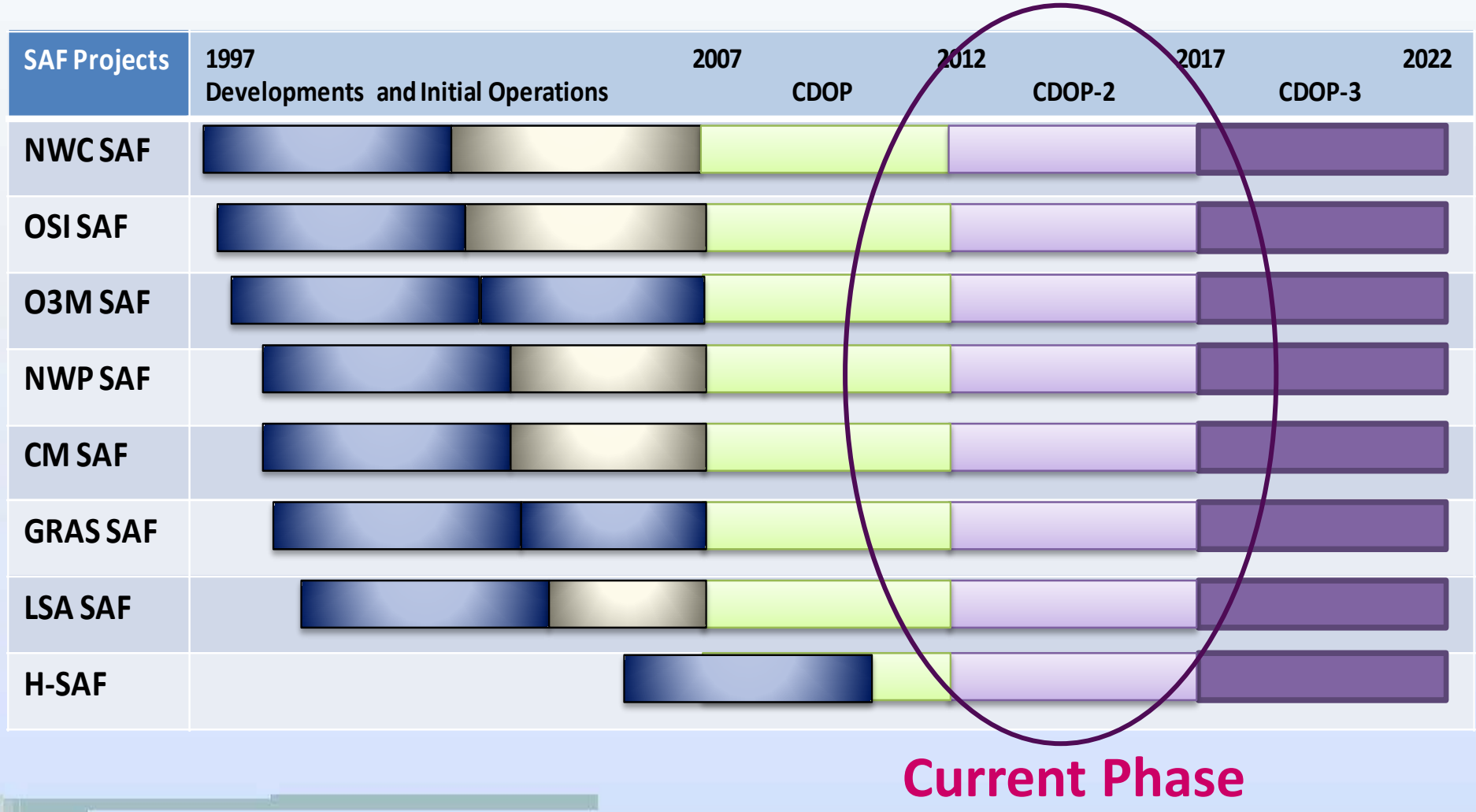
The Context: The SAF Schedule



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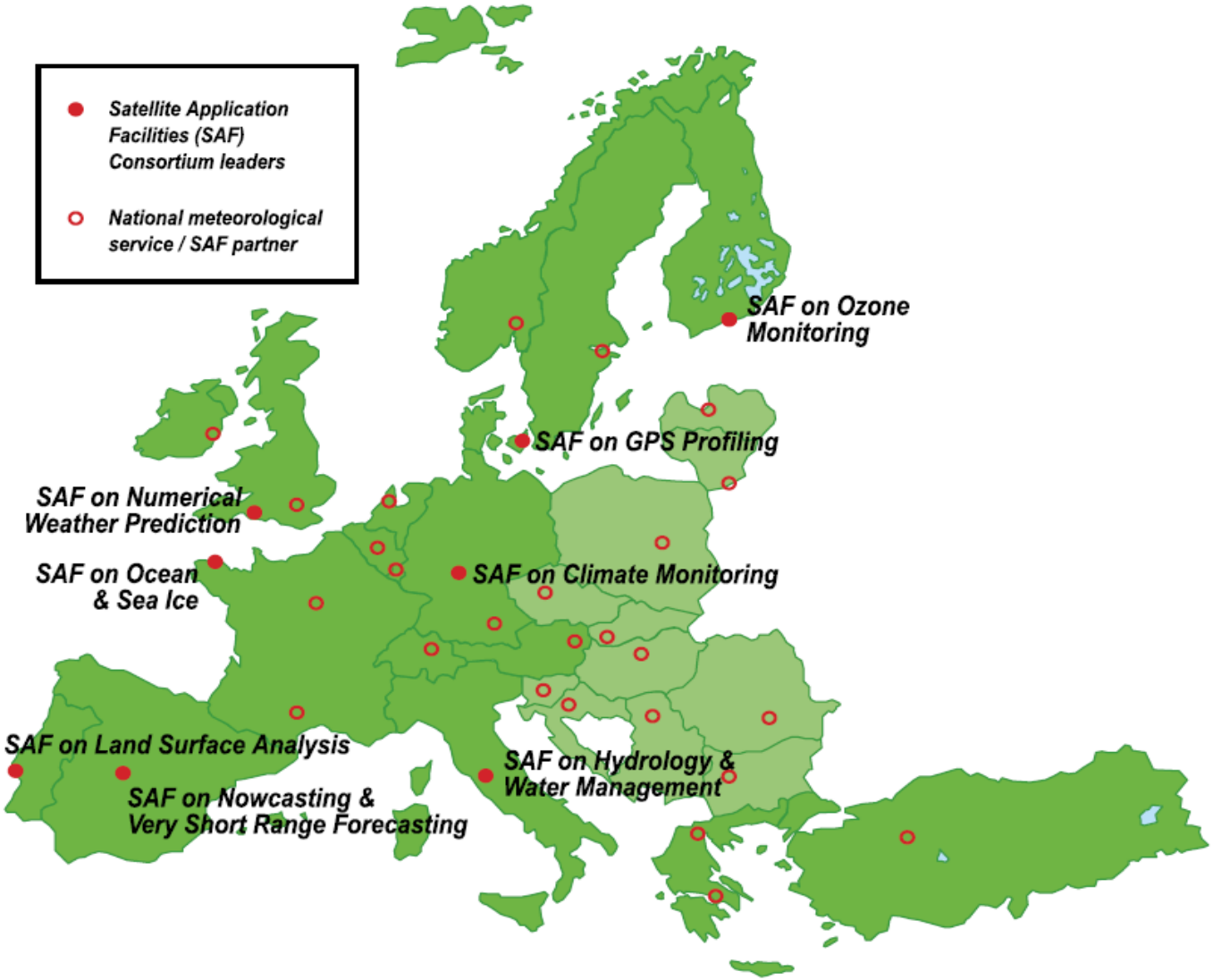
The Context: The SAF Network

SAF
The EUMETSAT Network of Satellite Application Facilities



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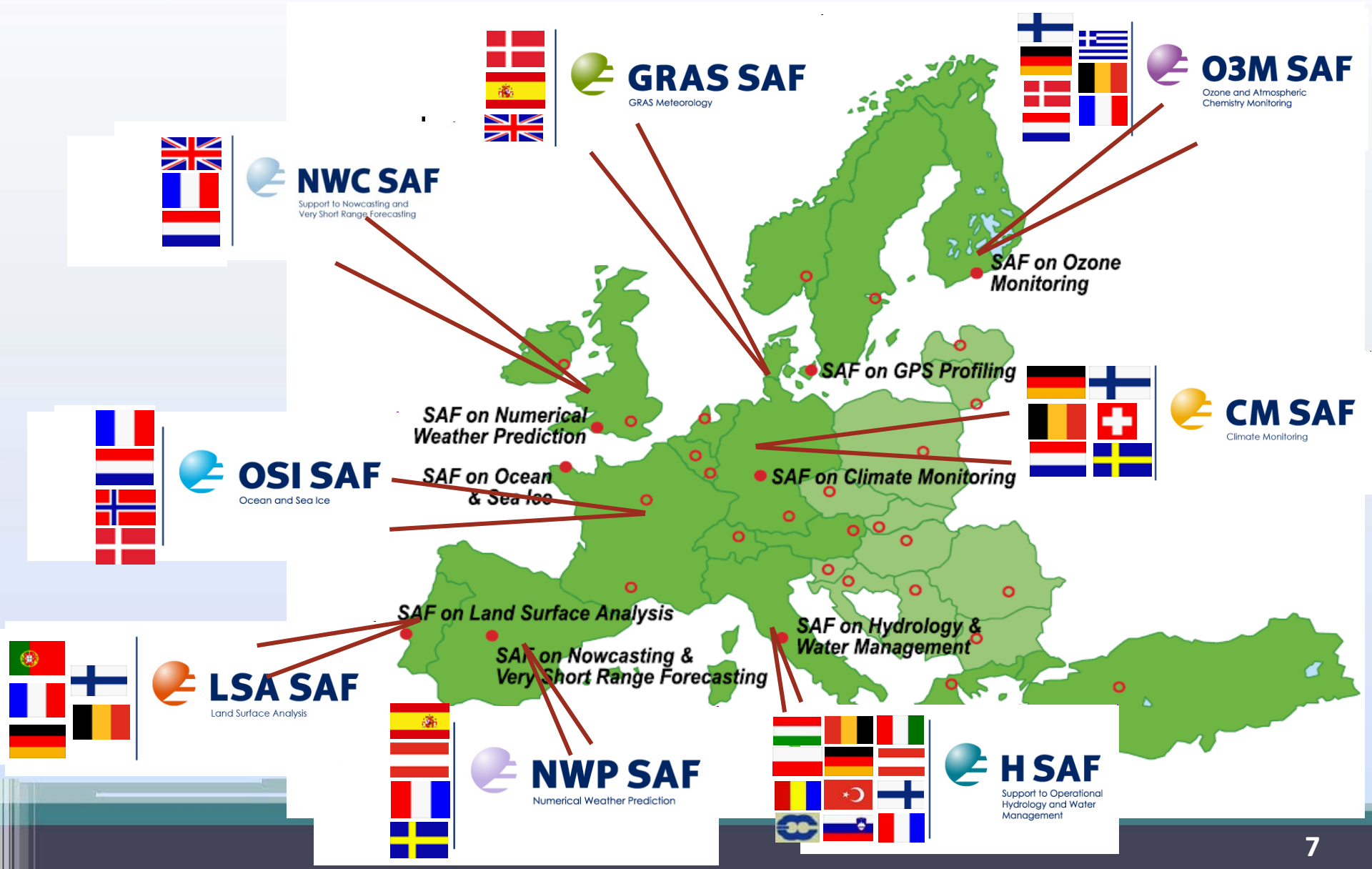
The Context: The SAF Network



H-SAF Operational Products

Precipitation Products

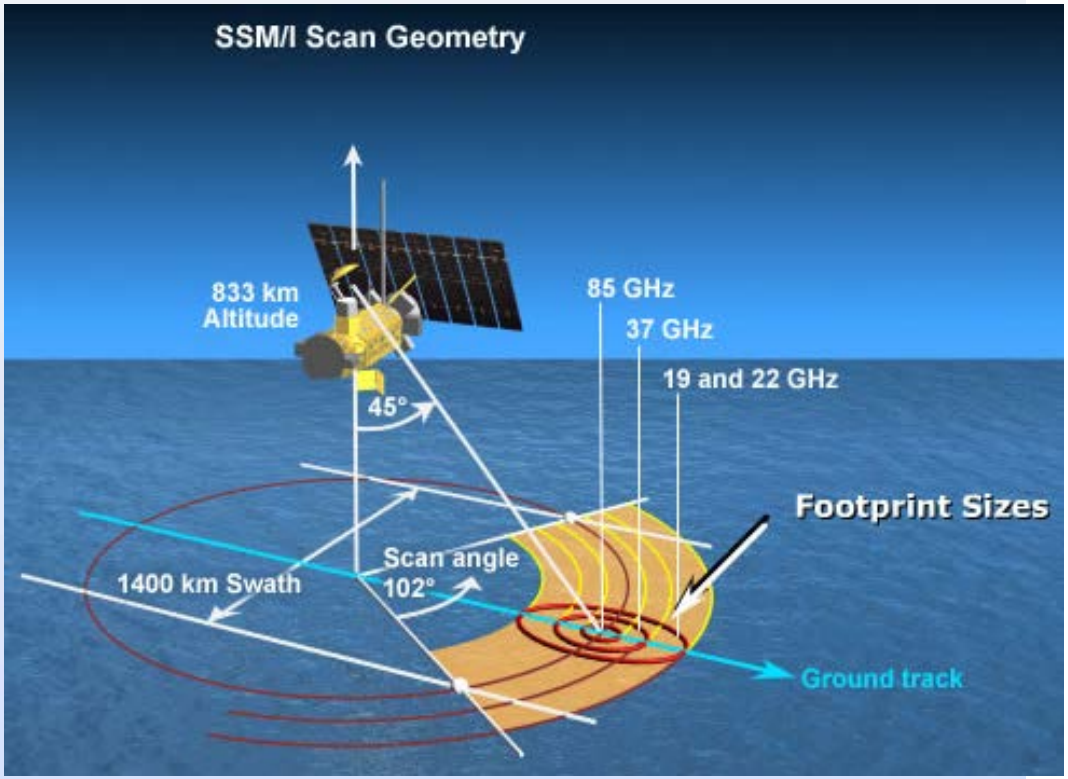
Precipitation products generation chains at COMet(Italy)

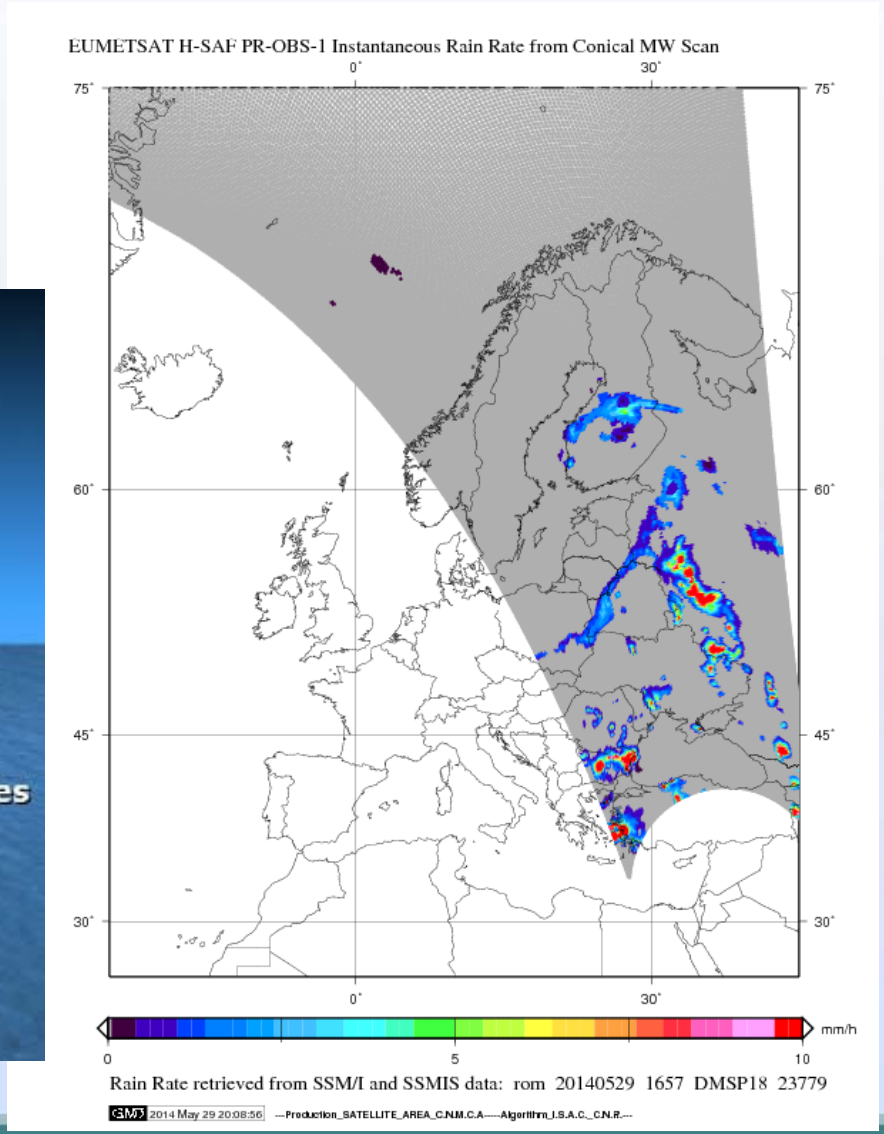
Identifier	Product Description	Algorithm	Resp. Inst.	Status
H01 PR-OBS-1	Precipitation rate at ground by MW conical scanners	**Bayesian CDRD**	**ISAC-CNR Rome**	**Operational**
H02 PR-OBS-2	Precipitation rate at ground by MW cross-track scanners	**Neural Network**	**ISAC-CNR Rome**	**Operational**
H03 PR-OBS-3	Precipitation rate at ground by GEO/IR supported by LEO/MW	**Blending**	**ISAC-CNR Bologna**	**Operational**
H04 PR-OBS-4	Precipitation rate at ground by LEO/MW supported by GEO/IR	**Morphing**	**ISAC-CNR Bologna**	**Operational (to be discontinued)**
H05 PR-OBS-5	Accumulated precipitation at ground by blended MW and IR	**Time integration**	**COMet**	**Operational**
H15 PR-OBS-6	Blended SEVIRI Convection area / LEO MW precipitation -	**Blending + NEFODINA**	**COMet**	**Pre-operational**

H-SAF Operational Products: examples

PR-OBS1 / H01

Precipitation from Microwave Conical scan satellite (SSMI/S)

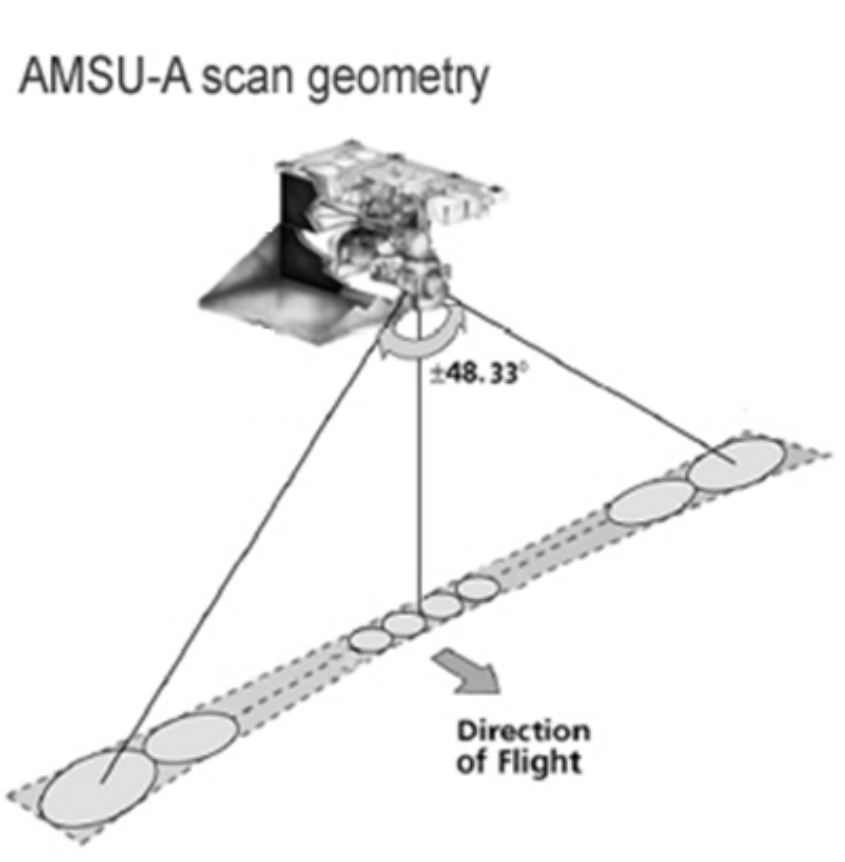


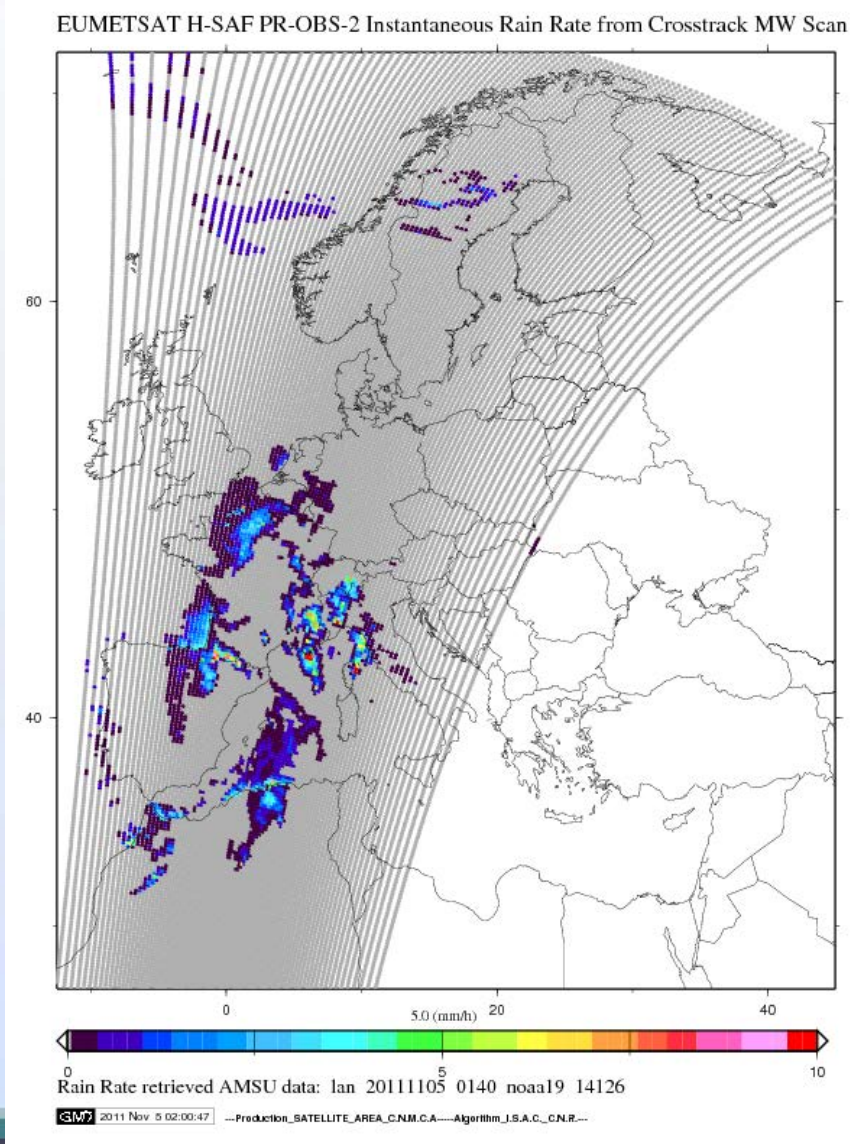


H-SAF Operational Products: examples

PR-OBS2 / H02

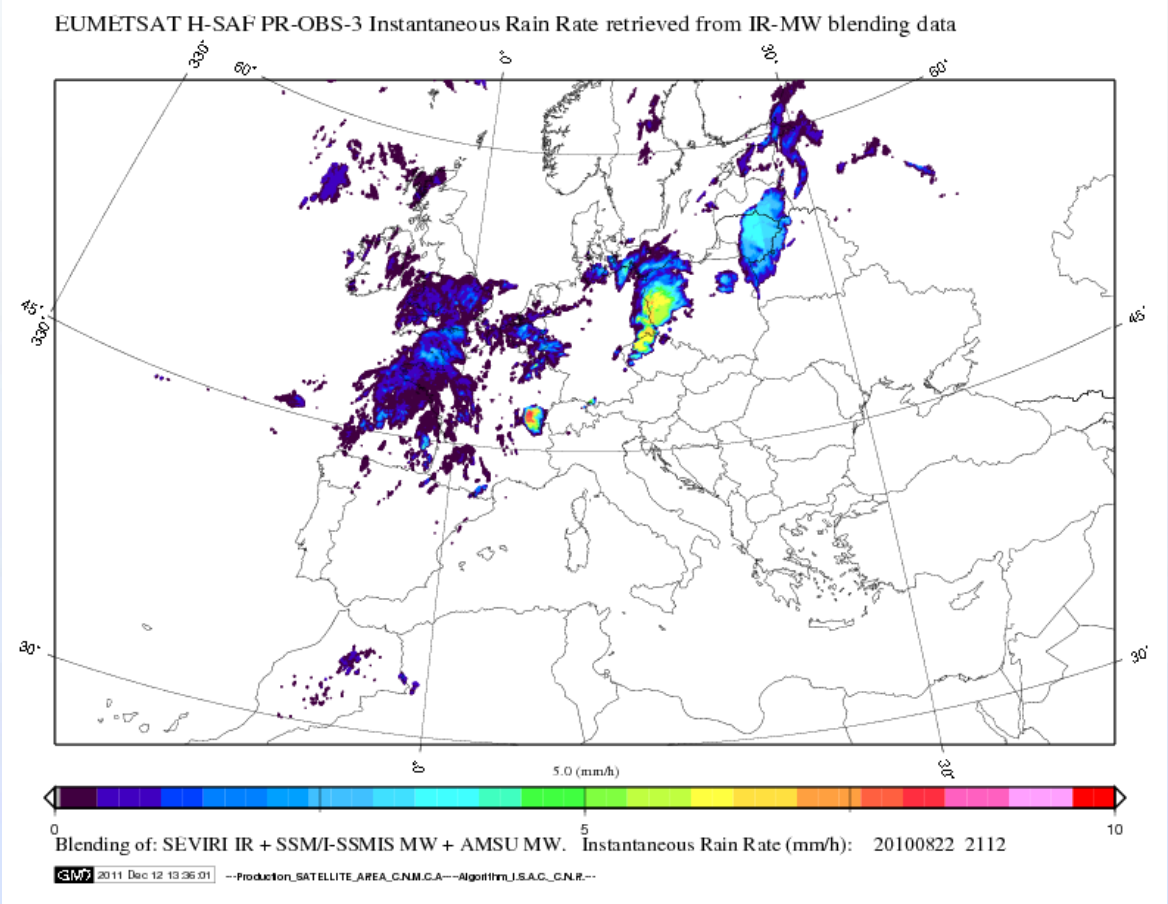
Precipitation from Microwave Cross scan satellite (AMSU/MHS)





H-SAF Operational Products: examples

PR-OBS3 / H03 Multi-platform algorithm: BLENDING Technique

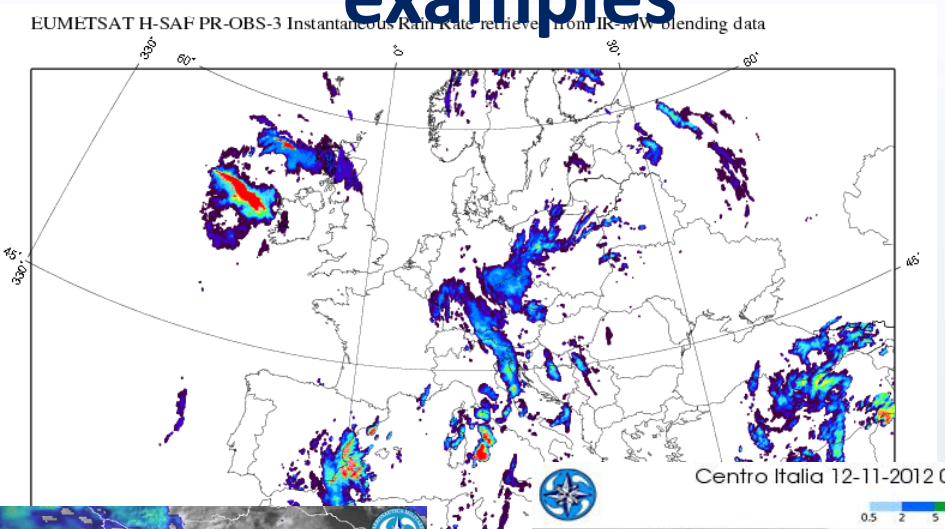


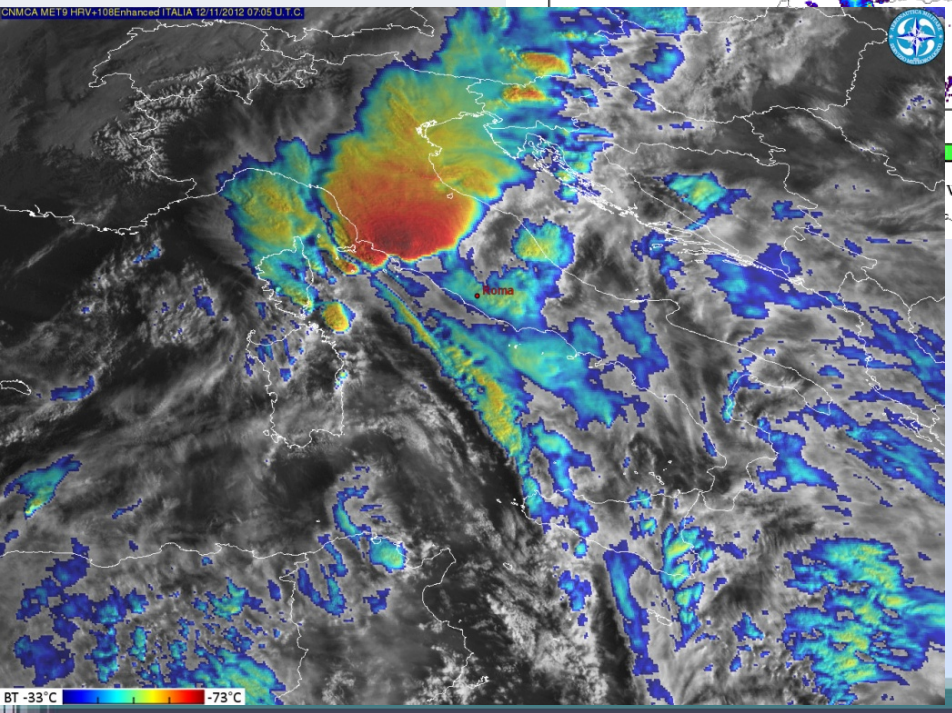
The "Rapid Update" tecnique allows to compute instantaneous rain intensities at the ground at the geostationary time-space scale (Turk et al. 2000, Torricella et al. 2007).

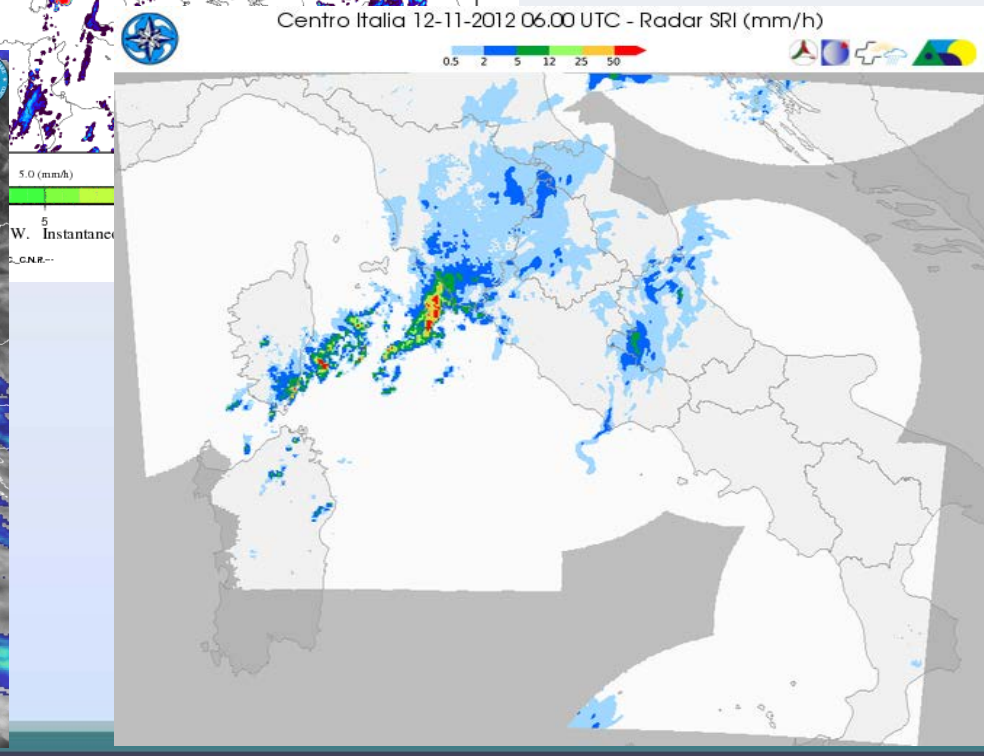
It is based on a blended MW-IR technique that correlates, by means of the statistical probability matching, brightness temperatures measured by the IR geostationary sensors and PMW-estimated precipitation rates at the ground.

H-SAF Operational Products: examples

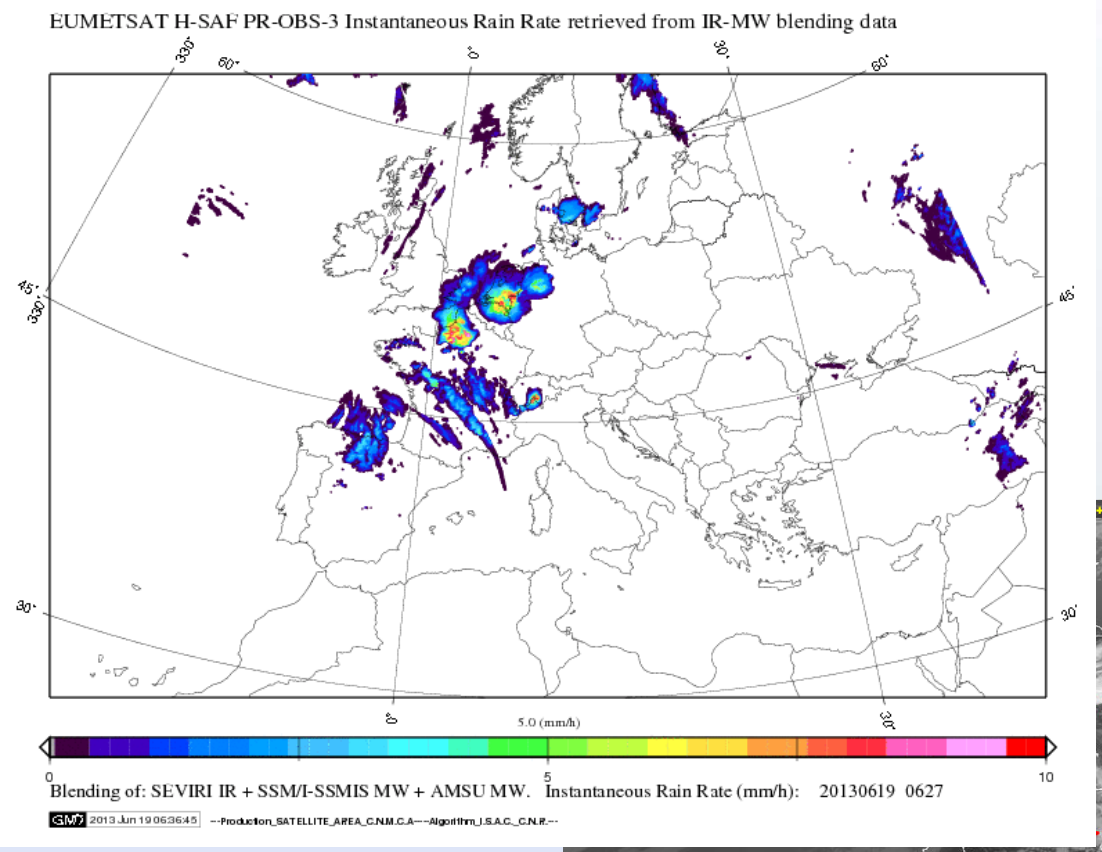
H03 Case study:
11-12 /11/ 2012
Grosseto (Italy)



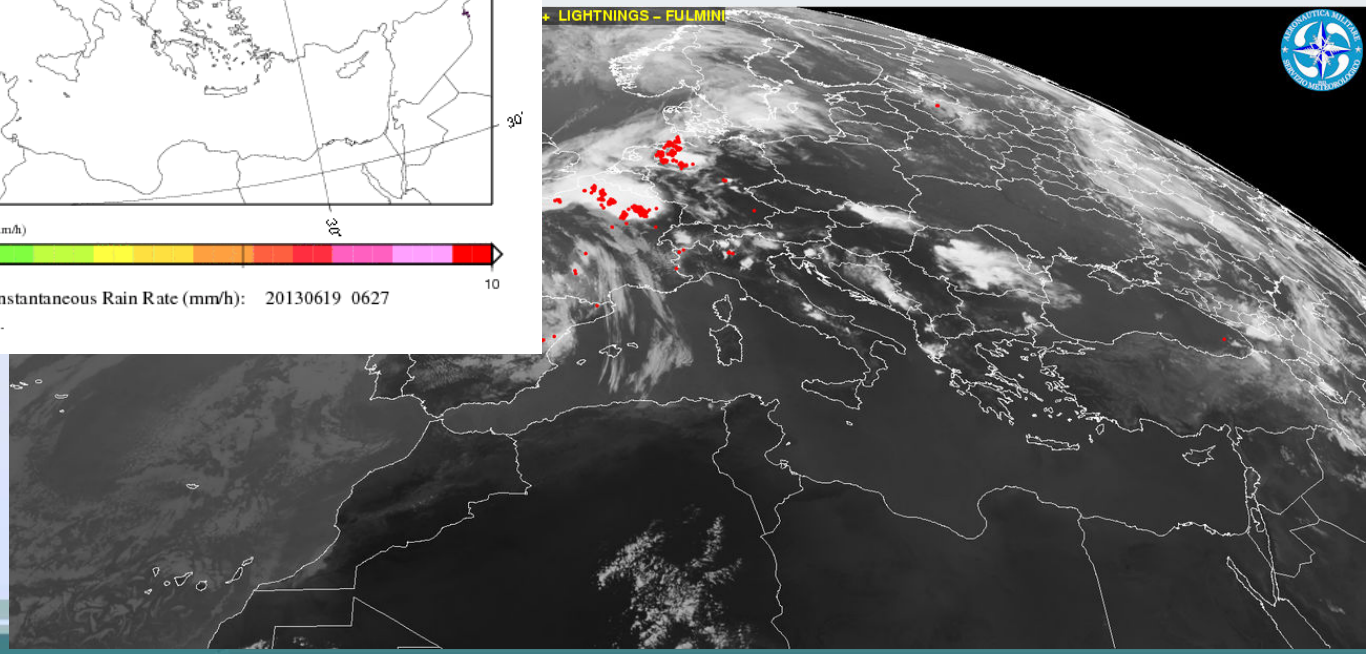




H-SAF Operational Products: examples

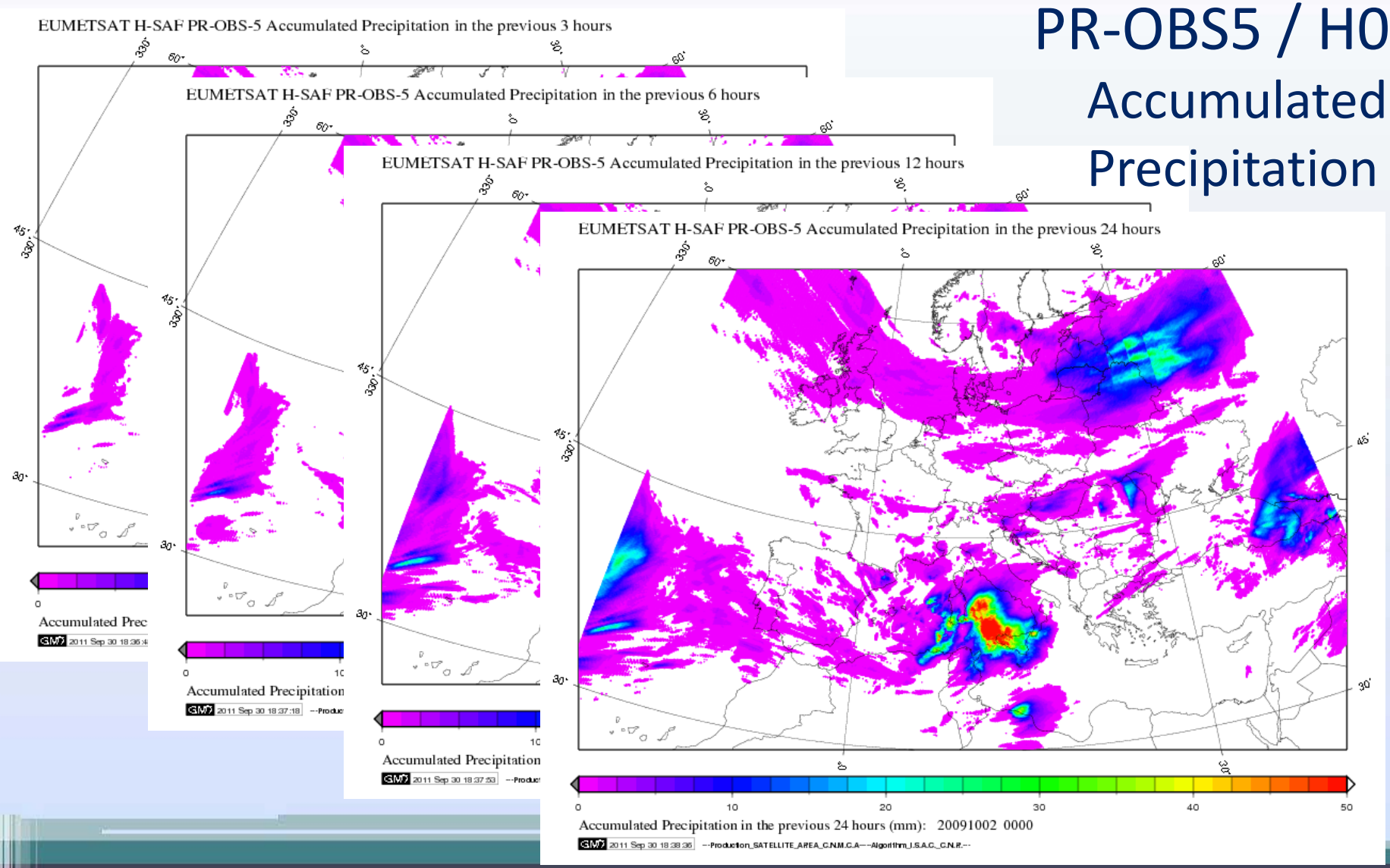


H03 Case study:
19 June 2013
Germany



H-SAF Operational Products: examples

PR-OBS5 / H05
Accumulated Precipitation



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Future improvements for precipitation products

Enlargement to Full Disc

- Algorithms to be assessed by 2016
- Expected Operations in 2017

MTG-based Products

- From FCI, LI
- Expected Operations in CDOP-3 (next phase)

New PMW based Products

- Algorithms to be assessed by 2016
- Expected Operations in CDOP-3 (next phase)

Higher temporal sampling

- Full exploitation of all overpasses of present and future satellites carrying cross-track and conically scanning PMW radiometers, which has now reached its optimal configuration with the **NASA/JAXA GPM** (number of satellites, GPM core satellite)

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H-SAF Operational Products

Soil Moisture Products

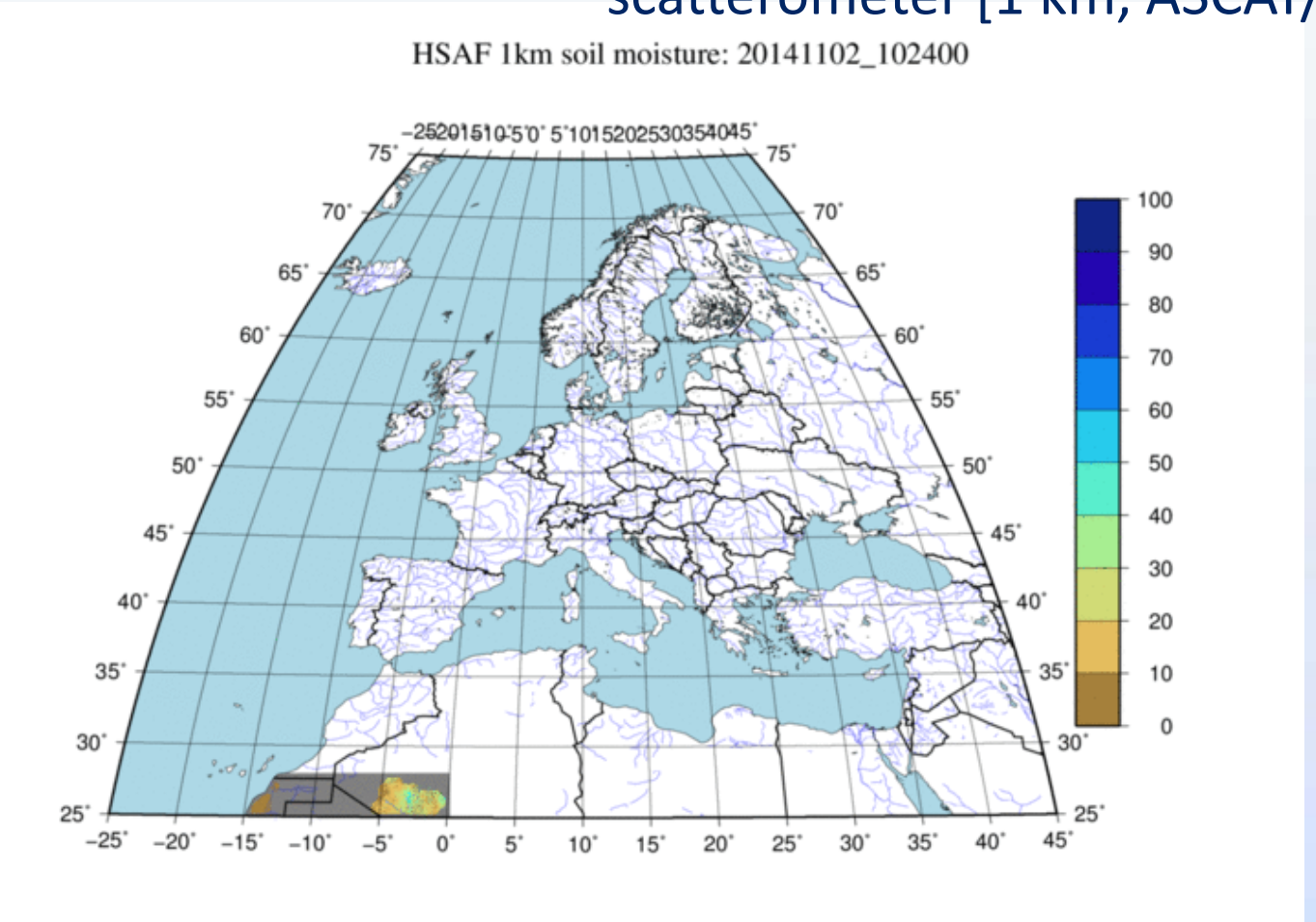
Soil moisture products generation chains at ZAMG (Austria)+ ECMWF (UK)

H08 SM-DIS-1	Small-scale surface soil moisture by radar scatterometer [1 km, ASCAT/SAR]	Pre-Operational
H16, H101, H102, H103 SM-OBS-3	Large-scale surface soil moisture by radar scatterometer (25 km, ASCAT)	Operational
H14 PR-OBS-2	Soil Moisture Profile Index in the roots region retrieved by surface wetness scatterometer assimilation method	Operational
H25 PR-OBS-2	ASCAT Large-scale surface soil moisture (25 Km) - Time Series	Released
H27 PR-OBS-3	Soil Wetness Index in the roots region by scatterometer assimilation in a NWP model - Time Series	Expected release Nov 2016

H-SAF Operational Products: examples

SM-DIS-1 / H08

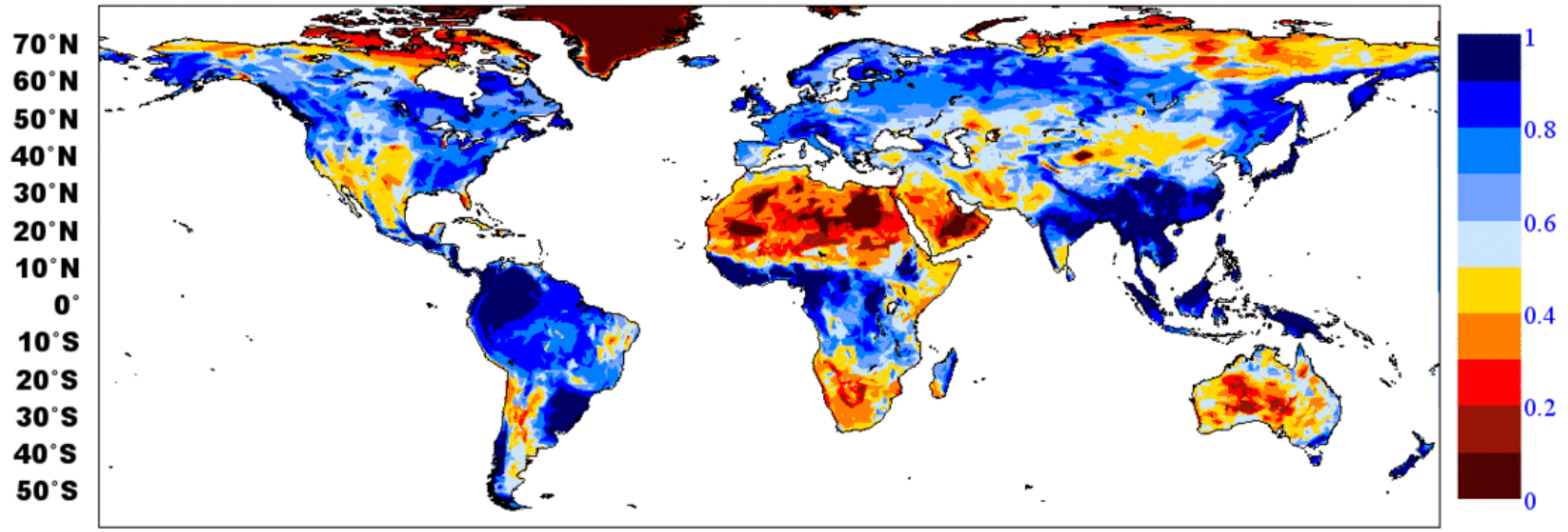
Small-scale surface soil moisture by radar scatterometer [1 km, ASCAT/SAR]



H-SAF Operational Products: examples

SM-DAS-2 / H14

Soil Moisture Profile Index in the roots region retrieved by surface wetness scatterometer assimilation method



Future improvements for Soil Moisture products

Transition to EPS-SG

- Full Transition to SCA (EPS-SG) for both surface and root region Soil Moisture Product is planned for next phase (CDOP-3)

H-SAF Operational Products

Snow Products

Snow products generation chains at FMI (Finland) and TSMS (Turkey)

H10 PR-OBS-1	Snow detection (snow mask) by VIS/IR radiometry	Operational
H11 PR-OBS-2	Snow status (dry/wet) by MW radiometry	Pre-Operational
H12 PR-OBS-3	Effective snow cover by VIS/IR radiometry	Operational
H13 PR-OBS-4	Snow water equivalent by MW radiometry	Pre-Operational

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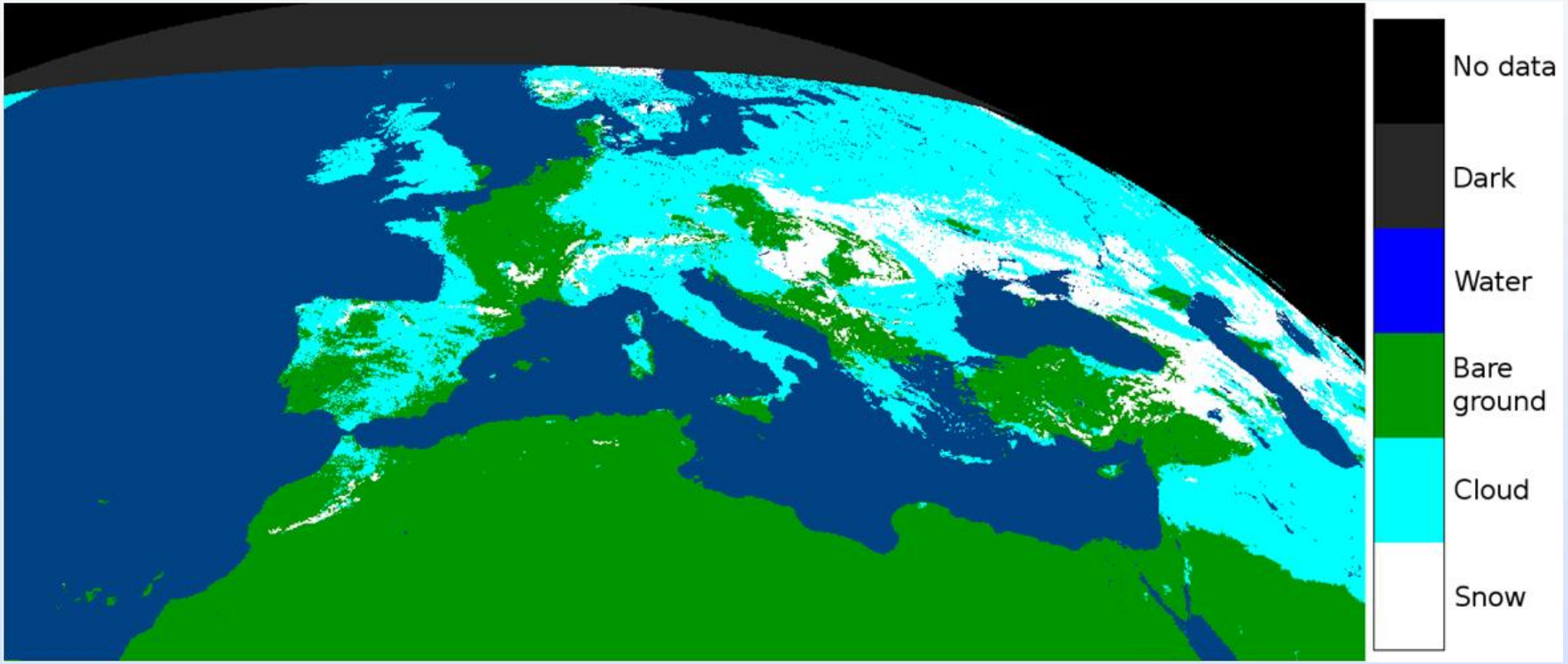
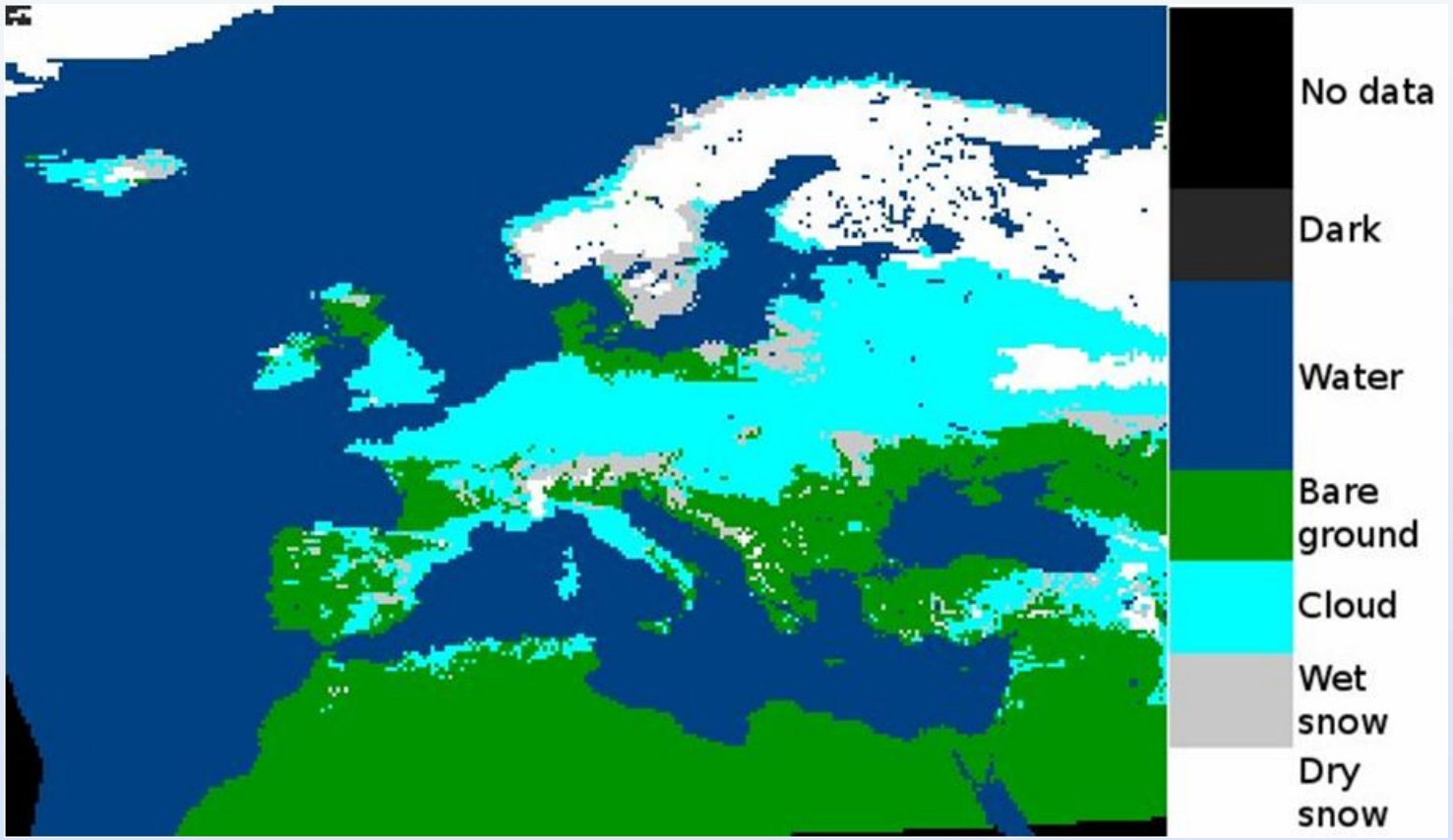
H-SAF Operational Products: examples

SN-OBS-1 / H10 Snow detection (snow mask) by VIS/IR



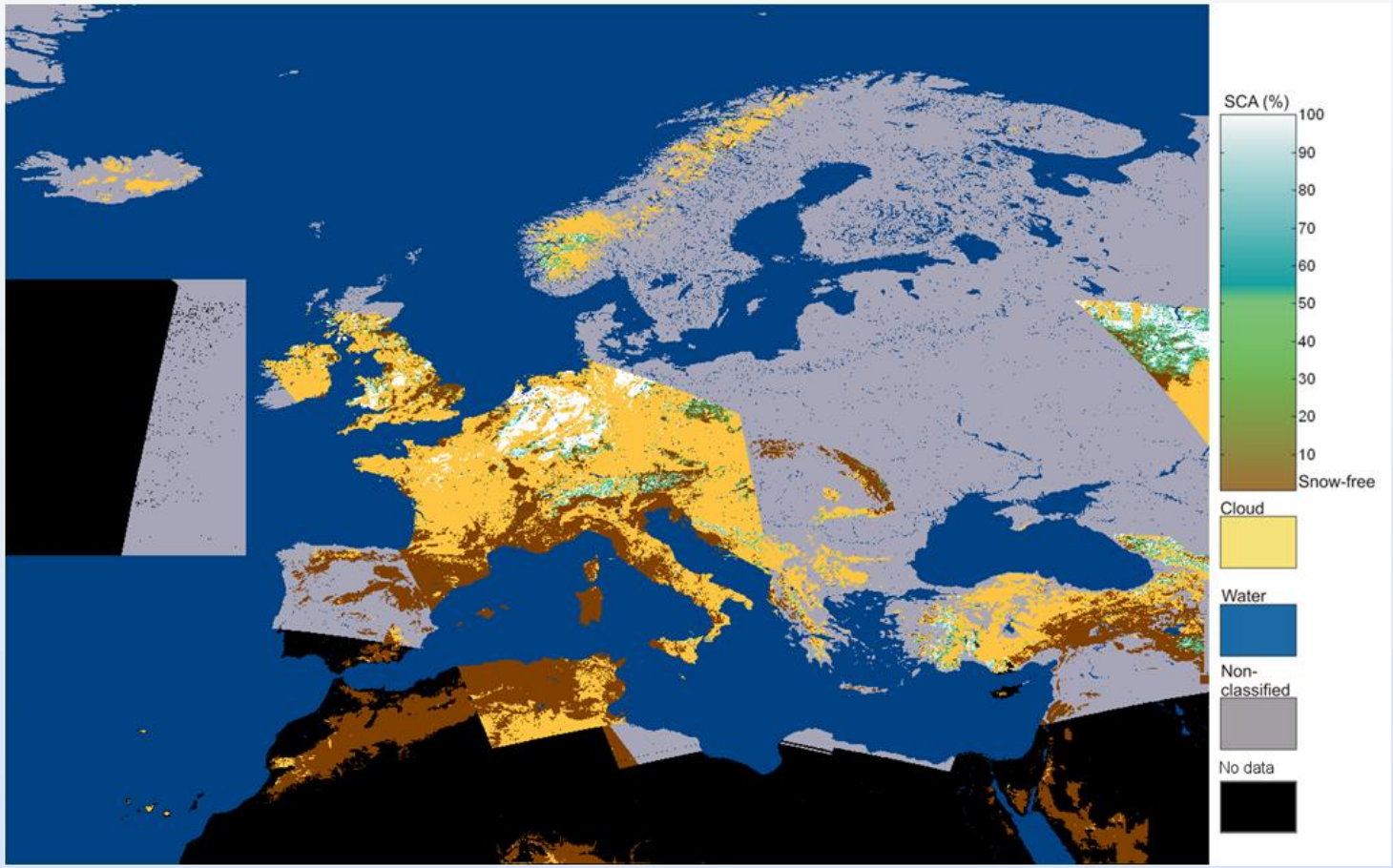
H-SAF Operational Products: examples

SN-OBS-2 / H11 Snow status (dry/wet) by MW



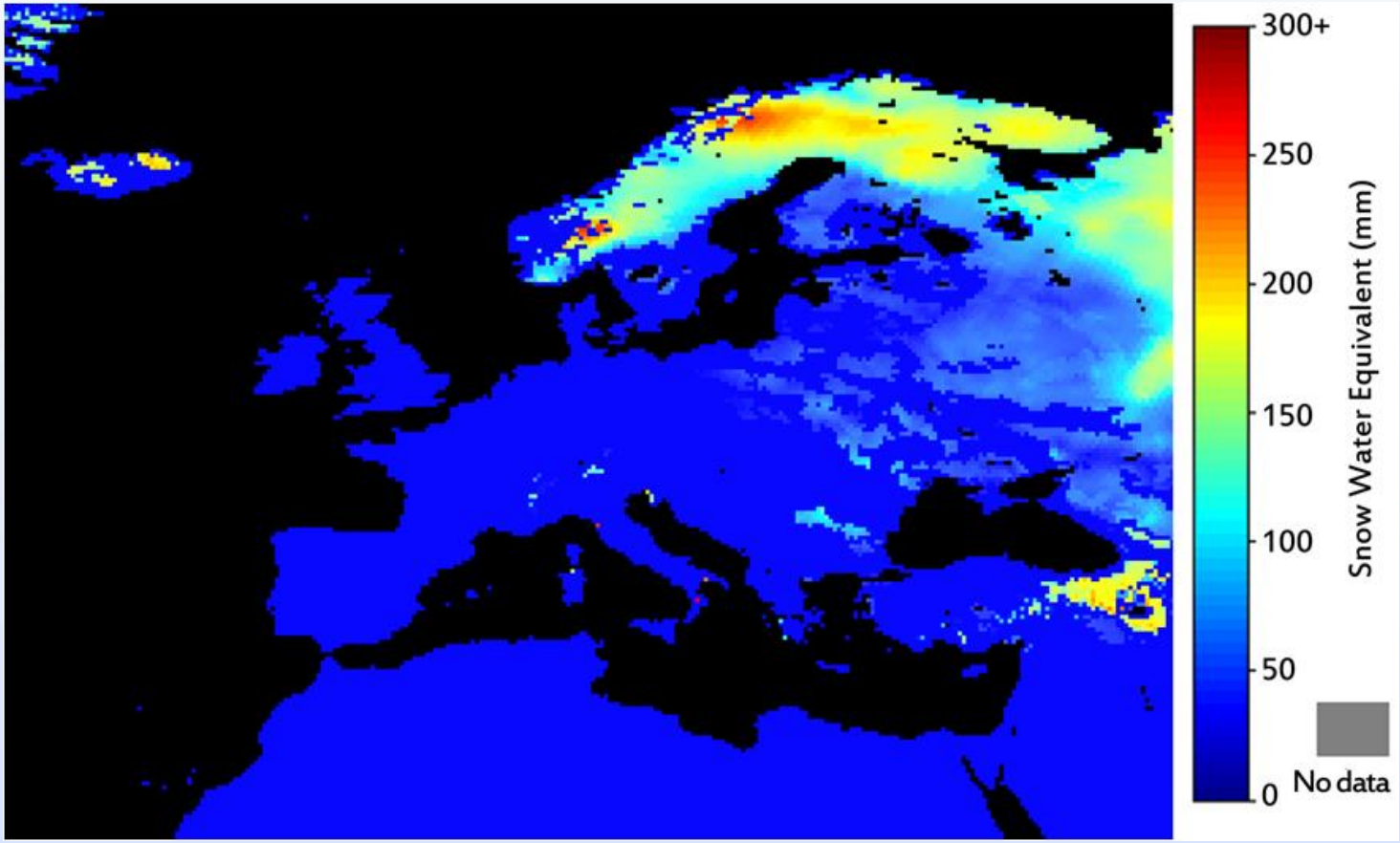
H-SAF Operational Products: examples

SN-OBS-3 / H12 Effective snow cover by VIS/IR



H-SAF Operational Products: examples

SN-OBS-4 / H13 Snow water equivalent by MW



Future improvements for Snow products

Transition to MSG

- Transition from SEVIRI to FCI planned on next phase (CDOP-3)

Hemispherical Products

- Provision of products with enlargement to northern hemisphere planned on next phase (CDOP-3)

Quality Monitoring and Hydrovalidation Programmes

- Quality Monitoring Programme provides a continuous assessment of the products quality and performances by evaluating **statistical scores** and case study analysis on the base of **comparison between satellite products and ground data;**

13 countries involved: Austria, Belgium, Bulgaria, ECMWF, Finland, France, Germany, Hungary, Italy, Poland, Romania, Slovakia, Turkey; coordinated by **DPC (Italy)**

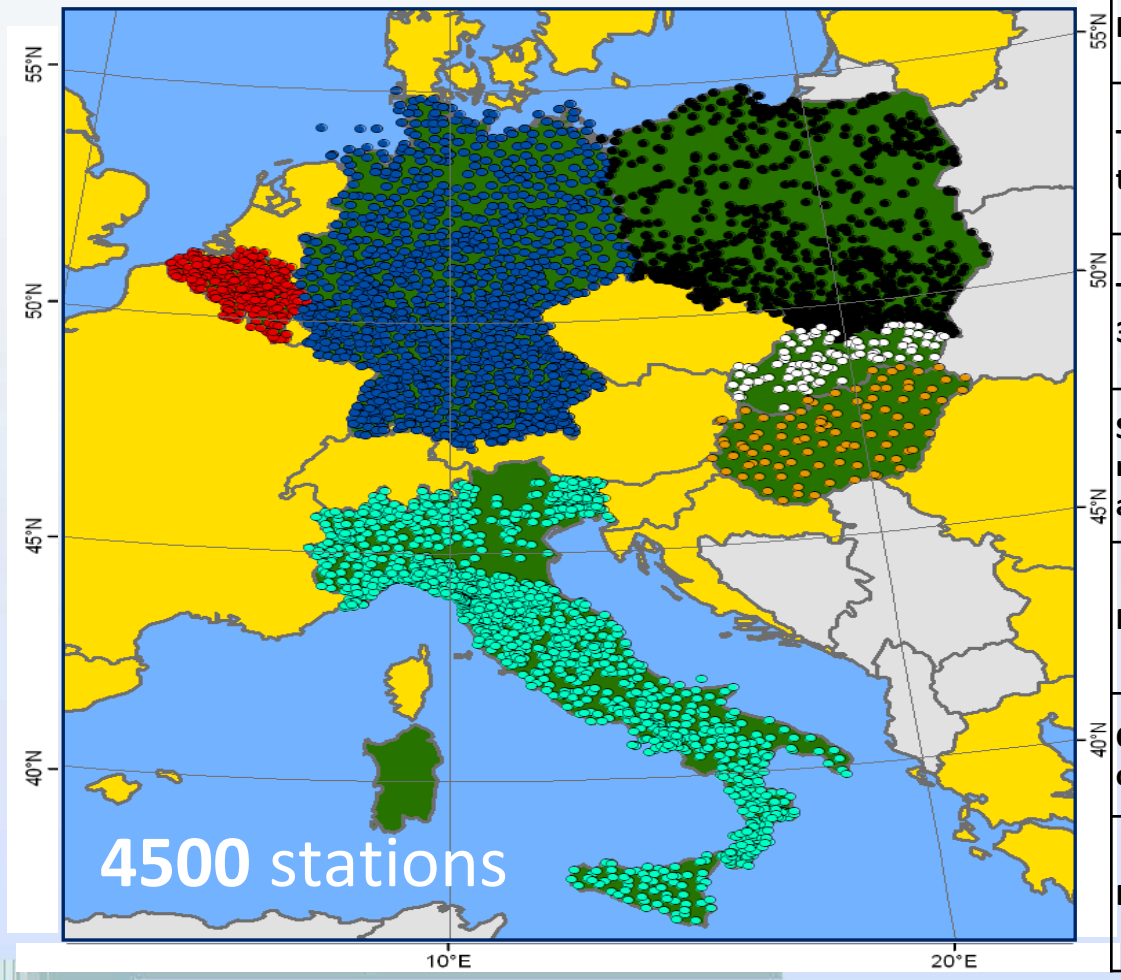
- Hydrovalidation Programme evaluates the impact with hydrological applications by **interfacing with hydrological models**, performed both through near real time and off-line impact studies

8 countries involved : Poland, Belgium, Bulgaria, Finland, Germany, Italy, Slovakia, Turkey; 21 test sites provided;

coordinated by **IMGW (Poland)**

Quality Monitoring Programme

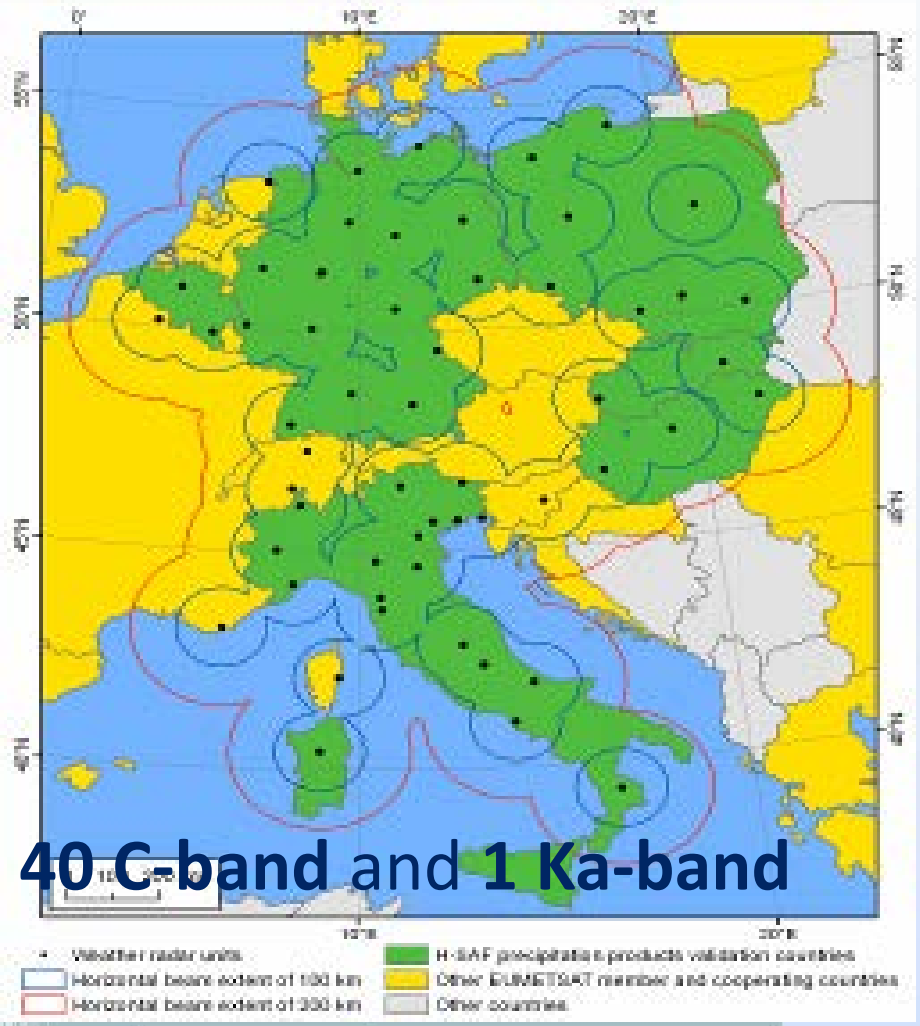
The Raingauge Network



Data Sources	Raingauges
Instrument characteristics	Telemetric and mechanic
Time domain (near real time/ case studies)	Near real time, case studies
Time resolution (15 min, 30 min)	10 – 30 min (telemetric), 3 – 24 h (mechanic)
Spatial distribution (whole national territory/ limited area)	Whole national territory
Number of station	~390 mechanic (RMI) + 12 telemetric (RMI) + 4160 telemetric (SETHY)
Operational/ for research only	Operational (RMI) + research (other networks)
Data quality check	Telemetric: automatically checked / mechanic: autom. + manually checked

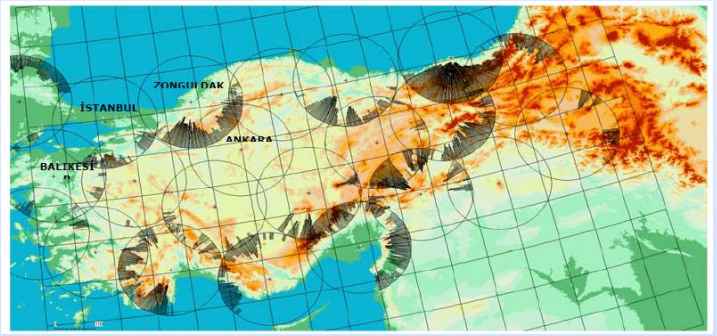
Quality Monitoring Programme

The Radar Network



40 C-band and **1 Ka-band**

Data Sources	Radars
Instrument characteristics	Beam width ~1°, max range ~150 Km, 250m, C-band, single polarization, Doppler polarimetric
Time domain	Near real time/ case studies
Time resolution	5 min, 15 min, 30 min, 1h, 24h
Spatial distribution	Whole national territory
Number of station	40 C-band +1 Ka-band



Central Services – Archiving and dissemination

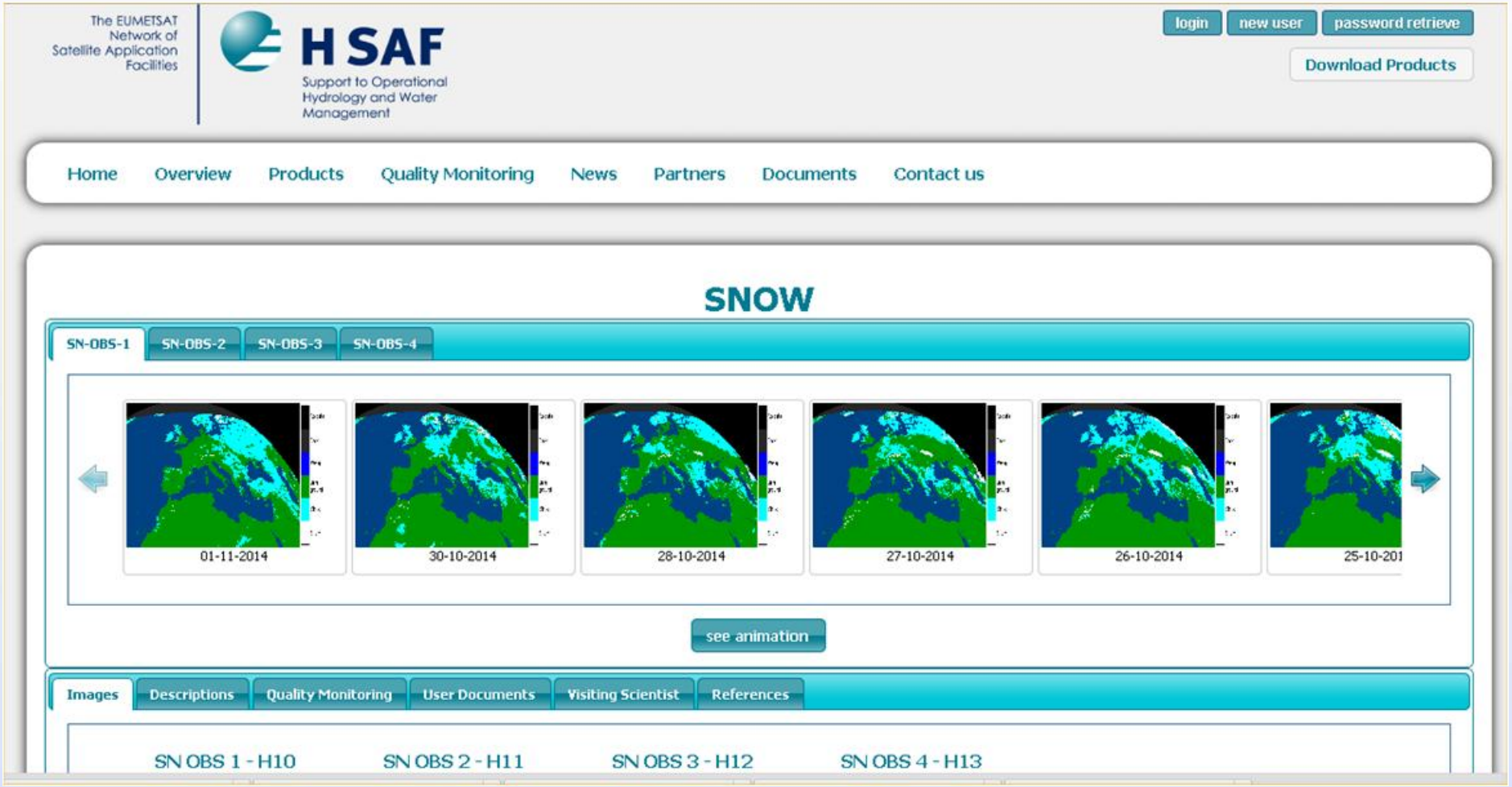
H-SAF Products are **centrally collected** by NRT ingestion from peripherals to Central Site at COMet.

Products are available as follows:

- **On-line archive**: Latest 60 days of production constantly available (24/7), by mean of ftp access for registered users.
- **Off-line archive** : Entire production since the beginning of H-SAF operations, made available on demand through an Order Management system in a temporary FTP area for a limited temporal window

Dissemination of products is performed by both **EUMETSAT Data Delivery Service (EUMETCast)** and **ftp dedicated server**

User Services – Website



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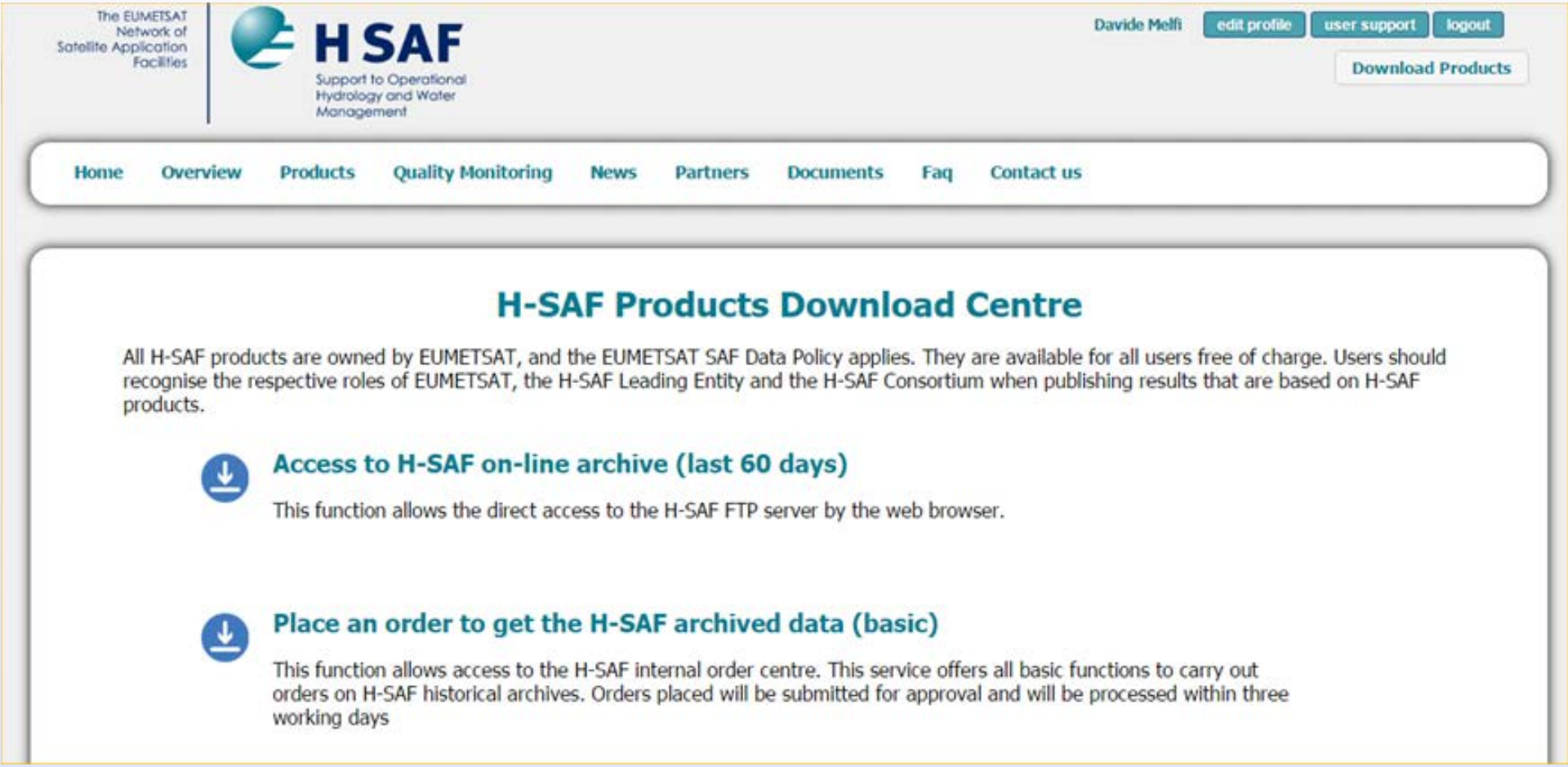
User Services – Website



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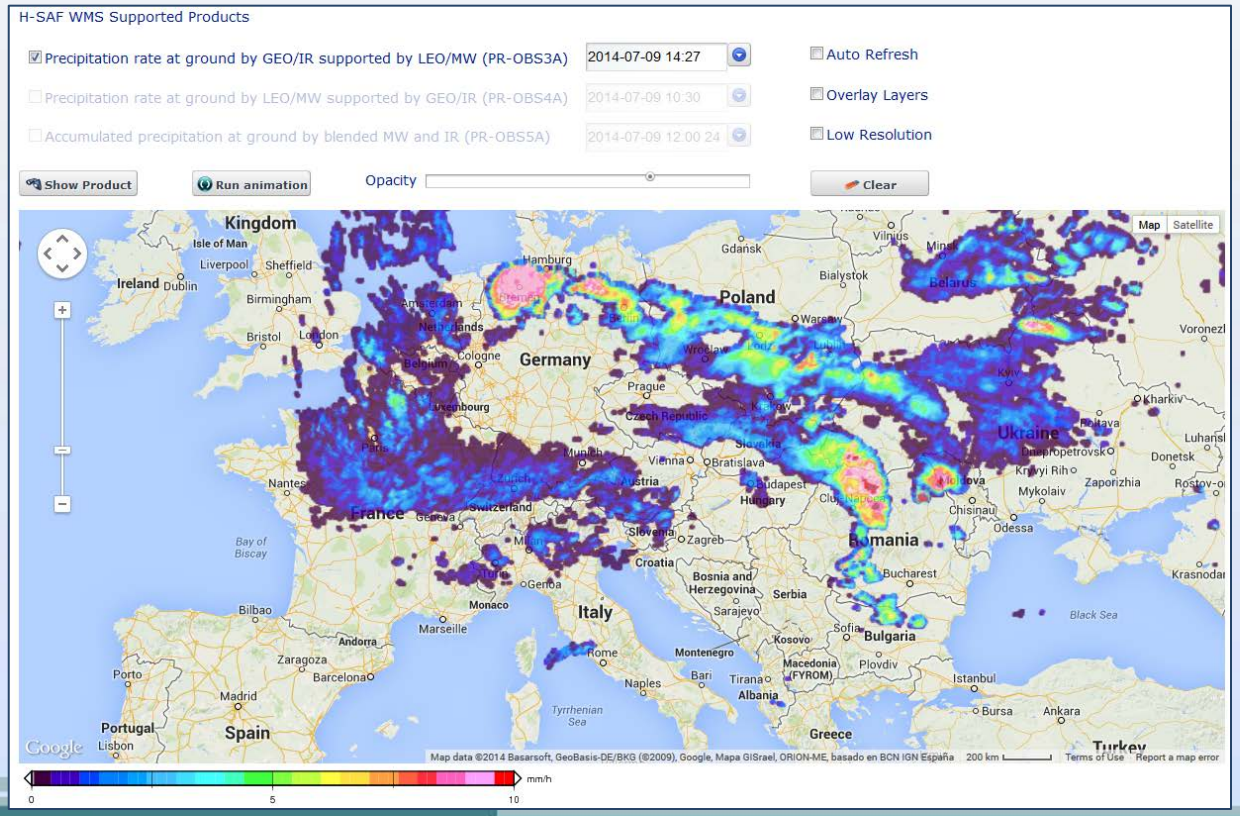
User Services – Map Tool

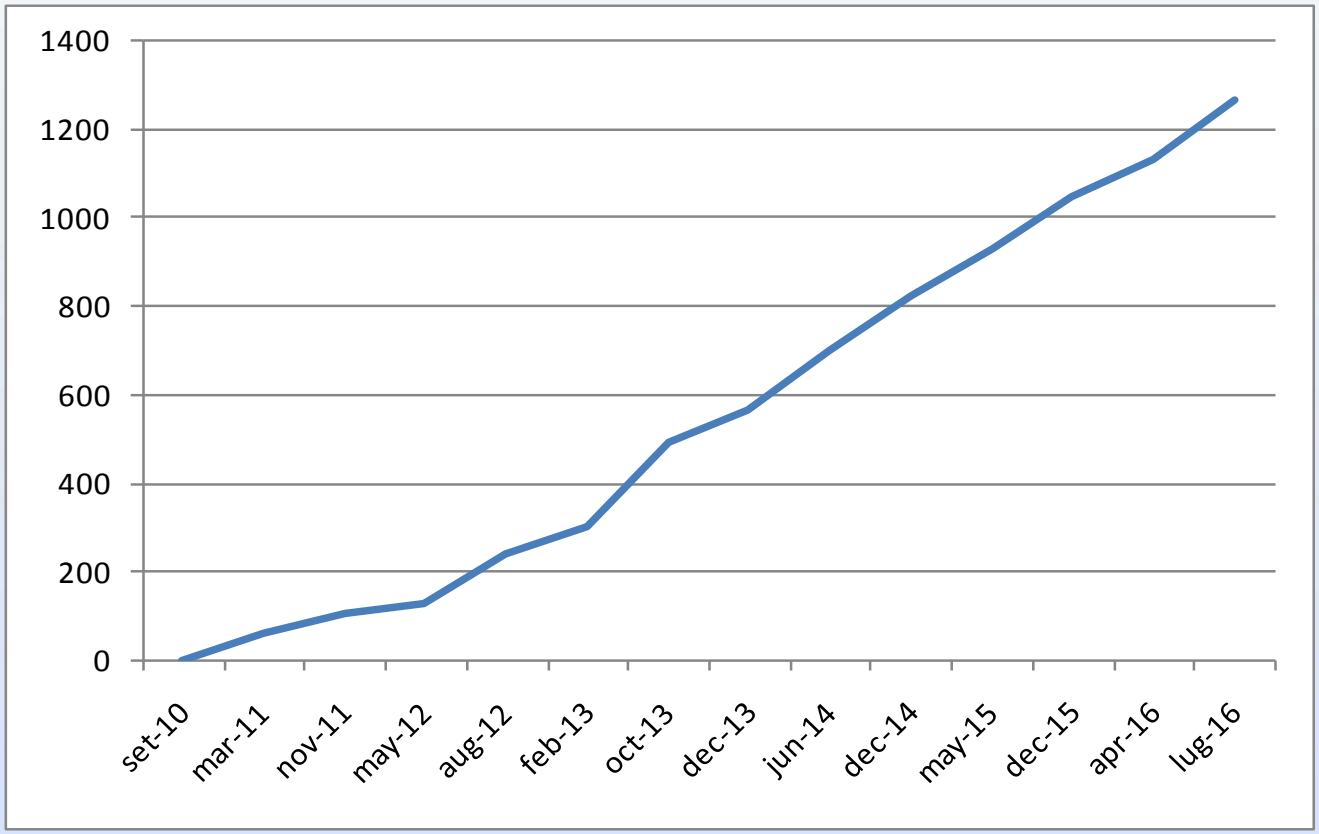
The **Map Tool** is a web application that provides an easy to use tool - you only need a web browser and a good internet connection - to display a set of precipitation products (H03, H05) on a **georeferenced map**.



Achievements and status of the Programme

Establishment of user community

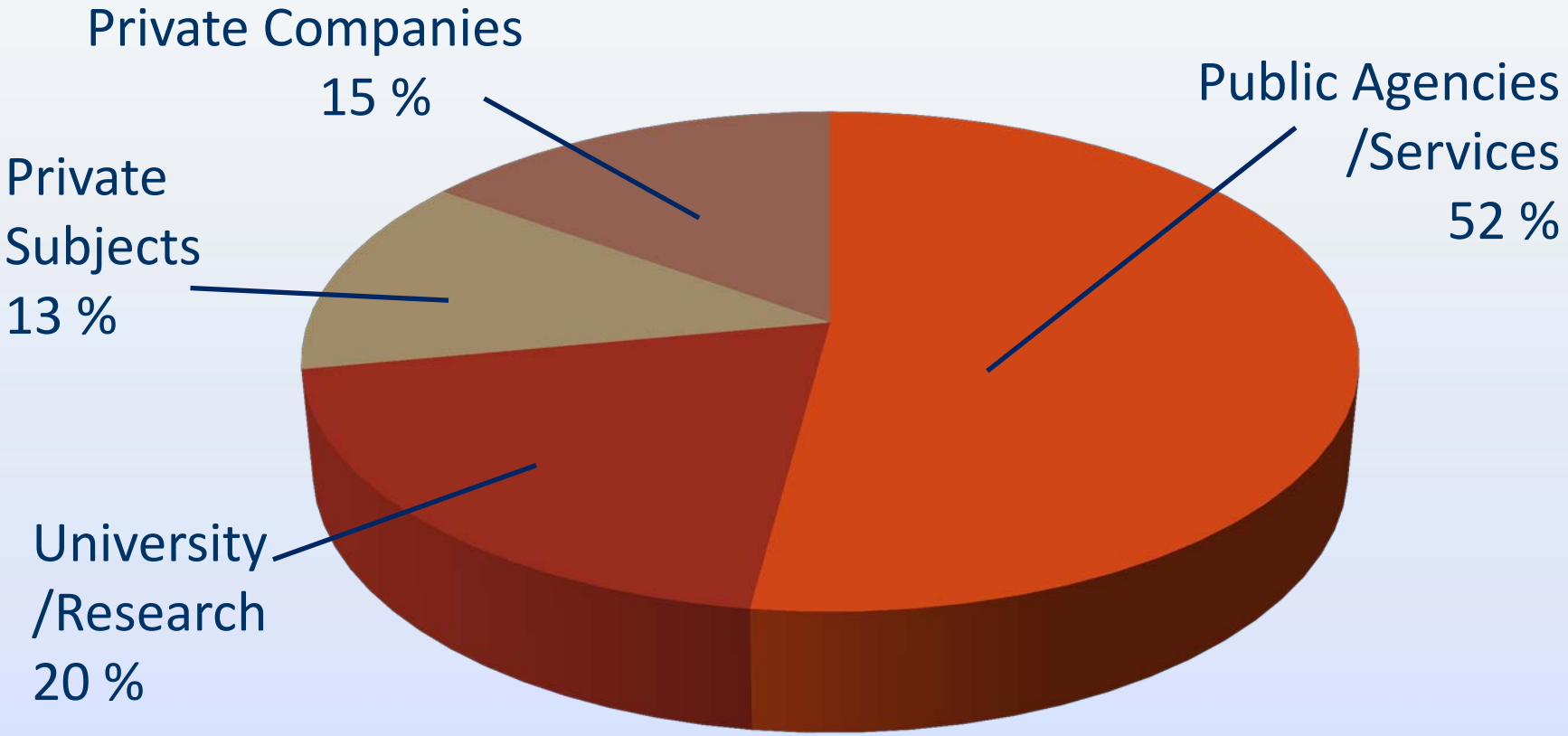
Trend in user registration:



Achievements and status of the Programme

Establishment of user community

categories of users:



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Thank you for your attention!

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