Civil protection and natural disasters

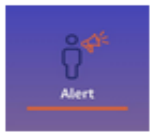
Union Civil Protection Mechanism (UCPM)

1. Anticipate

To improve risk assessment, anticipation, and disaster risk management planning. The complexity and interdependency of risks the EU faces makes it important to identify vulnerabilities in critical sectors, and anticipate hazards and threats.

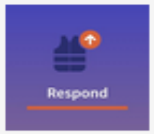
2. Prepare

To increase risk awareness and preparedness of the population to reduce the impact of disasters.



3. Alert

To enhance early warning. This ensures that warning messages across the national, regional and local levels reach the right people on time.



4. Respond

To enhance the EU Civil Protection Mechanism response capacity. Through this, the EU can provide more help to fill critical gaps and avoid further deterioration of the situation when the capacity of a country is overwhelmed.

5. Secure

To ensure a robust civil protection system. Civil protection systems must remain operational 24/7, during and after disasters, when they are most needed. Further actions include updating business continuity plans and procedures and ensuring coordination and information sharing across sectors, including with critical infrastructure providers.

2023	COM/2023/61 final	COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS European Union Disaster Resilience Goals: Acting together to deal with future emergencies

Highlights on key policy aspects supported by Copernicus

Early warning

- **Global Disaster Alert and Coordination System**
- **European Flood Awareness System** and **Global Flood Awareness System**
- **European Forest Fire Information System** and **Global Wildfire Information System**
- **European and Global Drought Observatories**

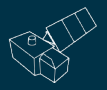
Tracking disasters from space

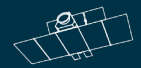
- **Rapid Mapping**
- **Risk and Recovery Mapping**

Key Copernicus supporting elements

Emergency Management

Land Monitoring Service





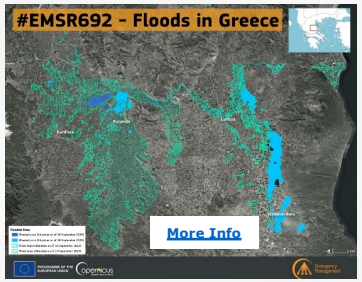
Copernicus Emergency Management Service

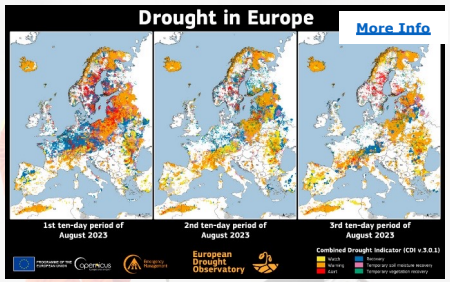
The operational service providing actionable information for the management of different types of disasters

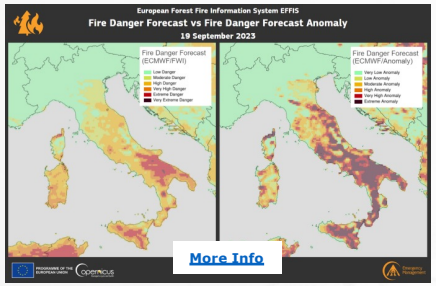
On-demand mapping: Rapid Mapping, Risk & Recovery Mapping

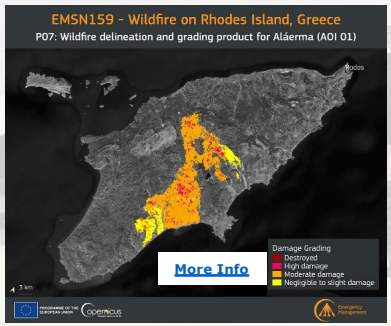
Early warning and monitoring: Floods, Fires, Droughts

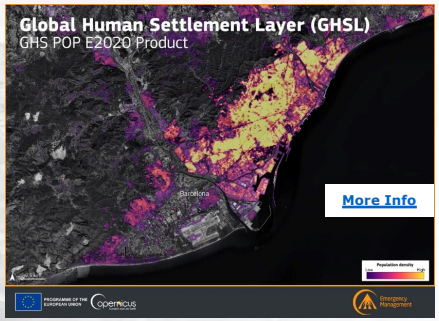
Exposure Mapping: Population, Built-up areas





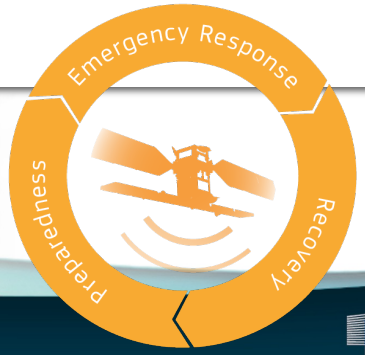






Explainer

- CEMS provides **timely and accurate geospatial information** (using satellite data in combination with models and in situ observations).
- CEMS is managed by the **Joint Research Center** of the European Commission in close coordination with DG DEFIS and DG ECHO.
- CEMS is a fully operational service (i.e. 24/7/365) and addresses **all phases of the disaster management cycle!**
- Know more AT THIS LINK



PROGRAMME OF THE EUROPEAN UNION · Copernicus · co-funded with esa

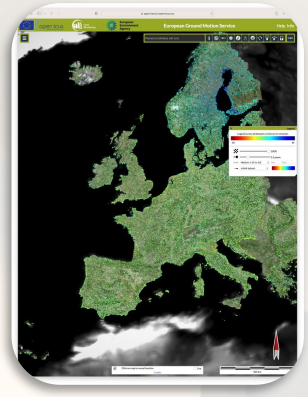
Copernicus Land Monitoring Service

To provide timely environmental information on land cover and land use

European Environment Agency

European Commission

European Ground Motion Service
Yearly updates since 2017



EU-Hydro

In situ

Urban Atlas
2006-12-18-21

High Resolution Layer Imperviousness
2006-09-12-15-18-21

Inland bodies Water Level

Explainer

- **Stability of ground for construction and infrastructure, high precision monitoring of land subsidence and lateral movements**

  CLMS offer - the *European Ground Motion Service* provides yearly updates on slow ground movements since 2017 with mm vertical accuracy. It is a unique product worldwide.

- **EU-Hydro** is the reference database including the hydrography network and coastline within Europe. Within the next update, to be initiated in 2024, it will include protective structures, to support better coastal planning.

- **Need to coordinate various data measurements on the ground**

  CLMS offer - *cross-cutting coordination of in situ data for Copernicus services;* We support the Copernicus services by preparing licensing agreements with Meteorological and Hydrological Agencies or maintaining a catalogue of geospatial data.

- **Reliable and uniform reference data sets to support civil protection and disaster response**

  CLMS offer - our products – river networks (*EU Hydro),* built up areas (*Urban Atlas, Imperviousness*)

- **Informing about water levels and water bodies extend variation**

  CLMS offer - Water level information and water bodies extend support hydrological services, as well as drought or flood alert systems

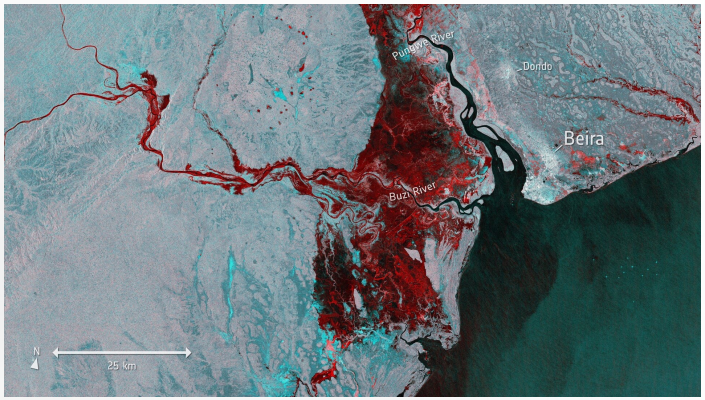
- *Know more* ➔ https://land.copernicus.eu/en, https://insitu.copernicus.eu/

- Contact point : https://land.copernicus.eu/en/contact-service-helpdesk, https://insitu.copernicus.eu/contact

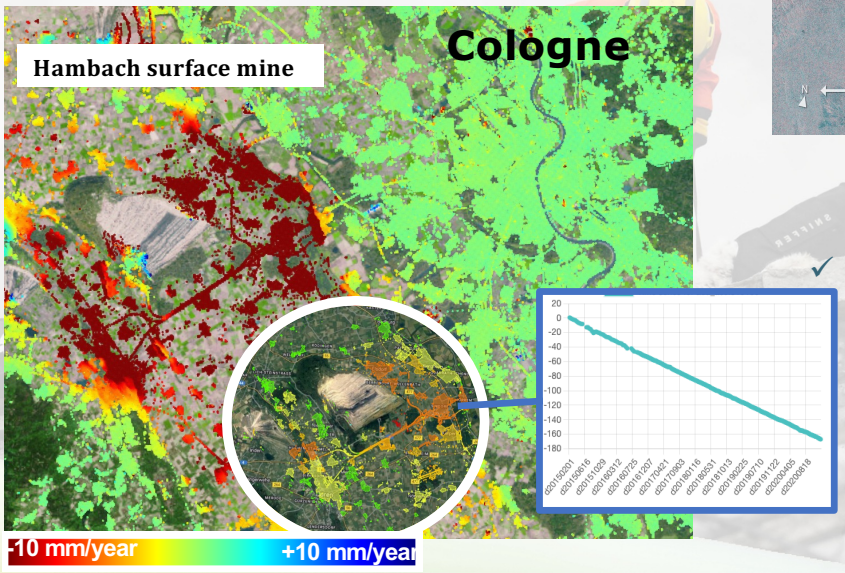
Sentinel-1

All weather, night-and-day measurements of terrain deformations and flood extents

✓ Flooded areas can be easily identified with Sentinel-1 radar which enables users quickly to map the extent of the areas covered by waters.



Extent of floods in Mozambic, June 2019 (source)



✓ Interferometric measurements show movements in the land, with millimetre-level accuracy. They enable the assessment of risks such as landslides and subsidence, and threats to infrastructure such as roads and pipelines.

Explainer

- Sentinel-1 interferometric mode* enables an operational global all-weather day-and-night monitoring of terrain deformations over cities and built-up infrastructure in Europe and hotspots globally with millimetre level accuracy
- Sentinel-1 observation scenario and its unprecedented revisit over Europe allow to measure urban areas, infrastructures several times per month since 2015.
- Sentinel-1 allows to map flooded areas clearly even through rain, clouds and darkness.
- Sentinel-1C needs to be launched soon following Sentinel-1B unavailability
- Long-term continuity will be ensured through Next Generation Sentinels
- Know more AT THIS LINK

Interferometry is a technique that allows to detect motions of the ground and of overlying infrastructure with millimetre-level accuracy.

Sentinel-2

Providing quick, large-area maps for disaster monitoring

- ✓ High spatial resolution up to 10m allows to derive precise maps of the forest fires and to assess the extent of burnt areas.
- ✓ The frequency of the observations also allows to monitor the situation along time (in clear sky conditions)

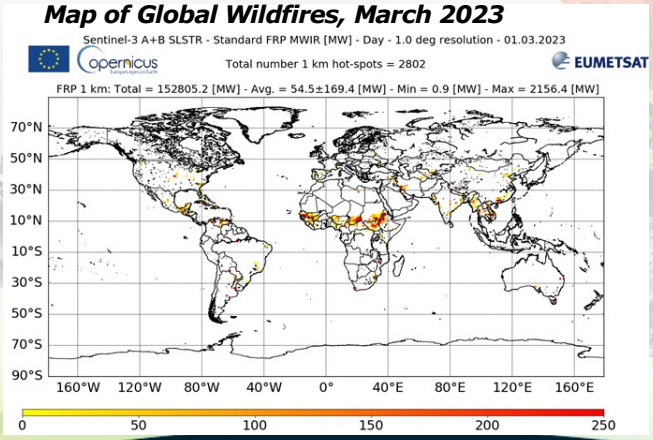
S2 image of a fire over Odemira in the Alentejo region in southern Portugal on 7 August 2023. (See at LINK)

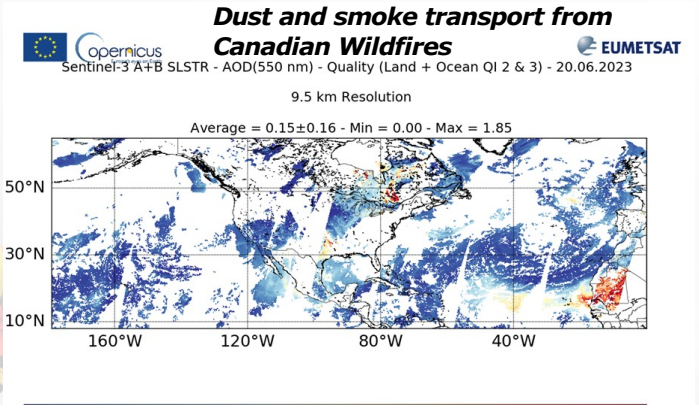
Explainer

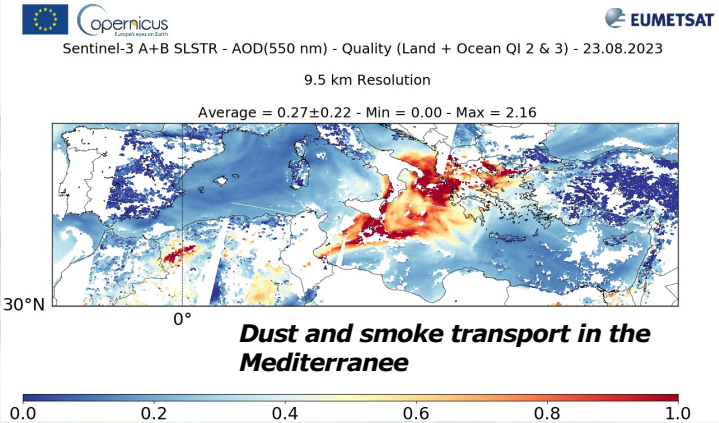
- Sentinel-2 supports post-event assessment and monitoring for a range of different types of disasters, from forest fires to floods and earthquakes.
- Sentinel-2's frequent coverage (every 3-5 days in Europe) means data is almost always available, except when prevented by cloud coverage, to pinpoint areas that need further investigation and on-the-spot support.
- Sentinel-2 short-wave infrared bands enable the intensity of the fire at a certain location to be determined.
- Long-term continuity will be ensured through Next Generation Sentinels
- Know more AT THIS LINK

Sentinel-3 (fires and dust)

Detection of Wild fires and smoke plumes movements







Explainer

- Sentinel-3 SLSTR and OLCI data and downstream products derived from it provide information on Aerosols and Fire Radiative Power
- Detection and monitoring of wildfires and smoke/dust plume transport
- Data most suitable for event scale – fast availability, high spatial resolution. Also contributes to downstream products (forecast models, derived ocean currents etc).

Case study examples:

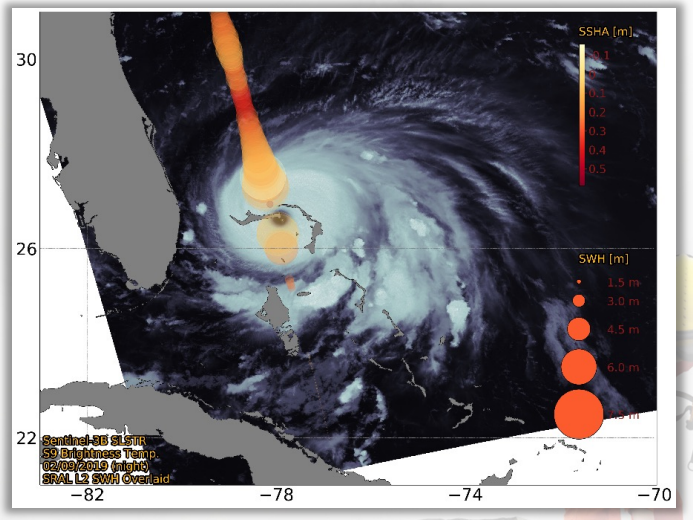
- https://www.eumetsat.int/devastating-fires-parts-mediterranean-during-unprecedented-heatwave
- https://www.eumetsat.int/canadian-wildfire-monitoring-over-atlantic-and-europe

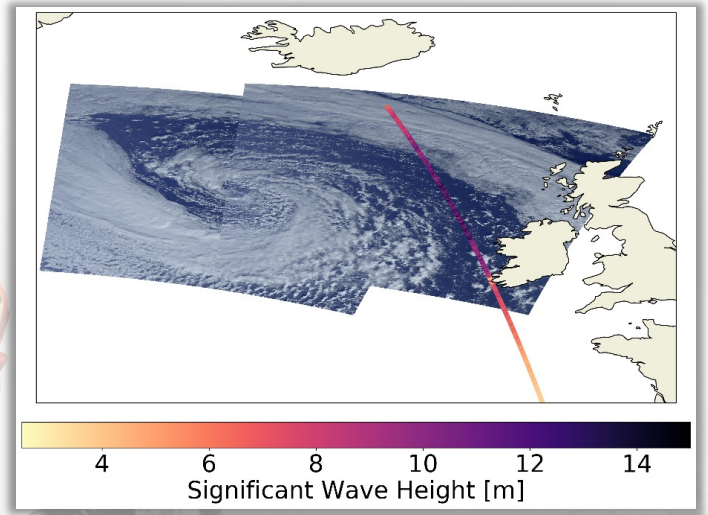
Know more AT THIS LINK

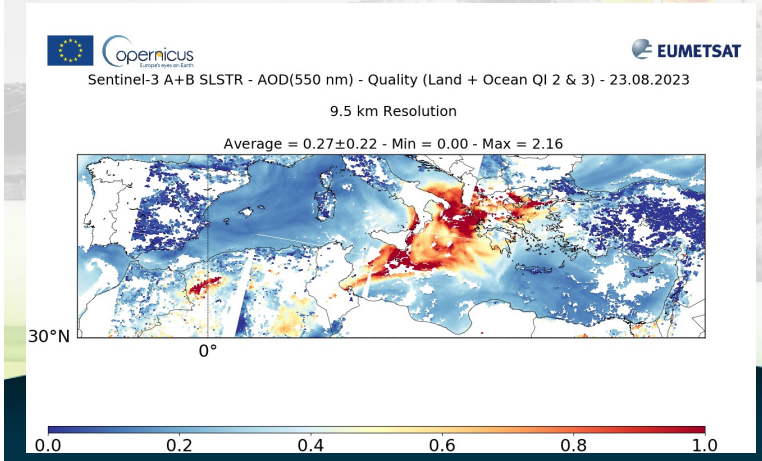
Sentinel-3 & 6

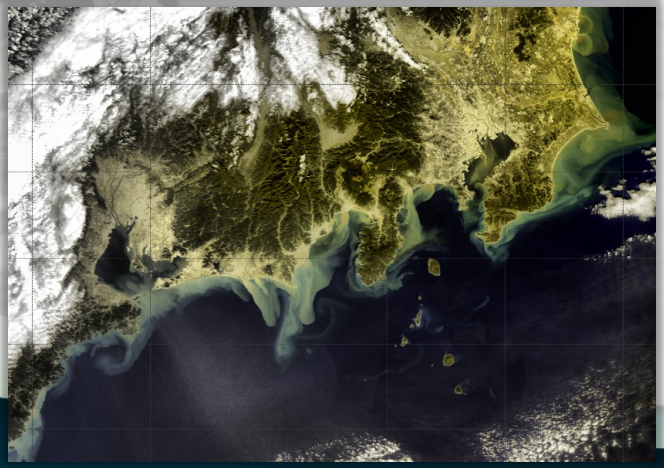
Important contributions to wildfire and extreme events monitoring

EUMETSAT









Explainer

- **Altimetry data** – provides sea surface height, significant wave height, and wind speed measurements.
  - **Utility for nowcasting, forecasting, and towards other metocean related variable derivation.**
- Optical data can also show impacts e.g. of sediment outflows and flooding/coastal damage.
- Detection and monitoring of wildfires and smoke/dust plume transport
- Data most suitable for event scale – fast availability, high spatial resolution. Also contributes to downstream products (forecast models, derived ocean currents etc).

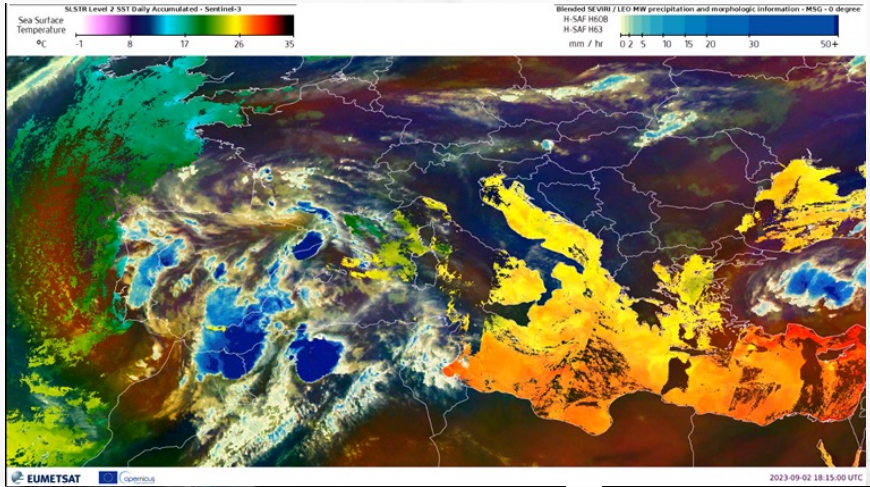
Case study examples:

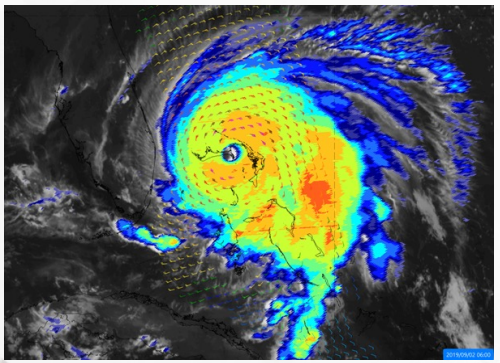
- https://www.eumetsat.int/multiple-perspectives-hurricane-dorian
- https://www.eumetsat.int/monitoring-tropical-cyclones-pacific-ocean-2013-2019
- https://www.eumetsat.int/tracking-tropical-cyclone-impacts-using-altimetry
- https://www.eumetsat.int/devastating-fires-parts-mediterranean-during-unprecedented-heatwave
- https://www.eumetsat.int/canadian-wildfires-monitoring-over-atlantic-and-europe

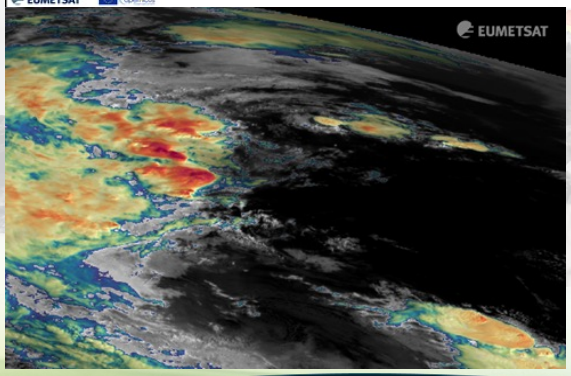
Copernicus Contributing Missions: Meteo

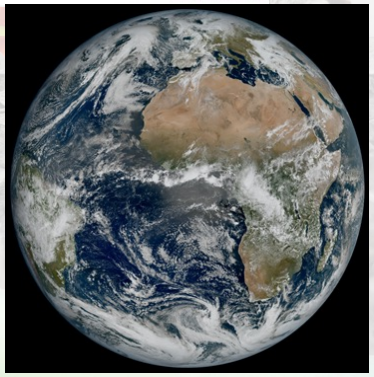
EUMETSAT

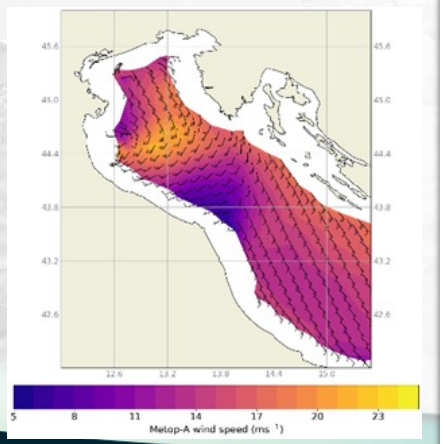
The essential assets to predict and warn from impending high impact weather









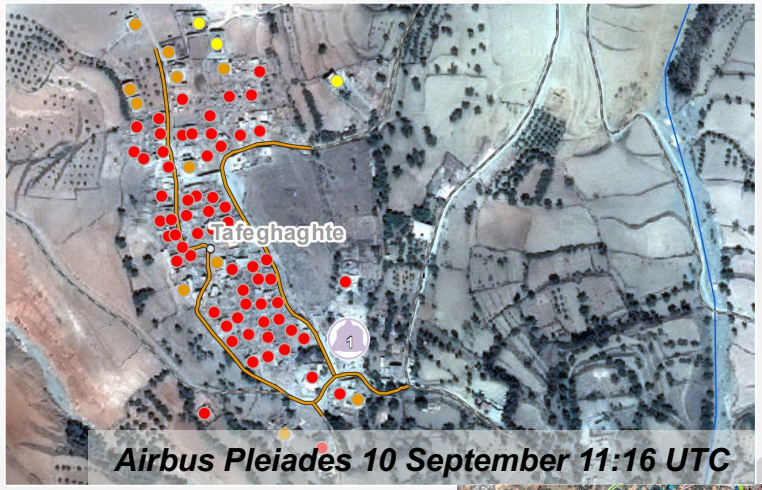


Explainer

- EUMETSAT operates the key European Programmes in support of operational weather forecasting, namely the Meteosat and Metop fleet of satellites, as Copernicus Contributing Missions.
- **Combined usage** of daily Sentinel 3 Sea Surface Temperature data with 15-Minute Meteosat data, allow close monitoring of high impact weather situations, such as the high-intensity rainfalls situations fueled by elevated Sea Surface temperatures around the Mediterranean (top left) in Sep. 2023.
- All forms of convective **storms** are monitored closely from their early stages of formation to better provide Nowcasting services (bottom left)
- **Tropical cyclones** are monitored from their earliest stages of development around the globe including in EU Member State's overseas territories (top right).

Copernicus Contributing Missions

The essential assets to scrutinize the street-level impacts of natural disasters



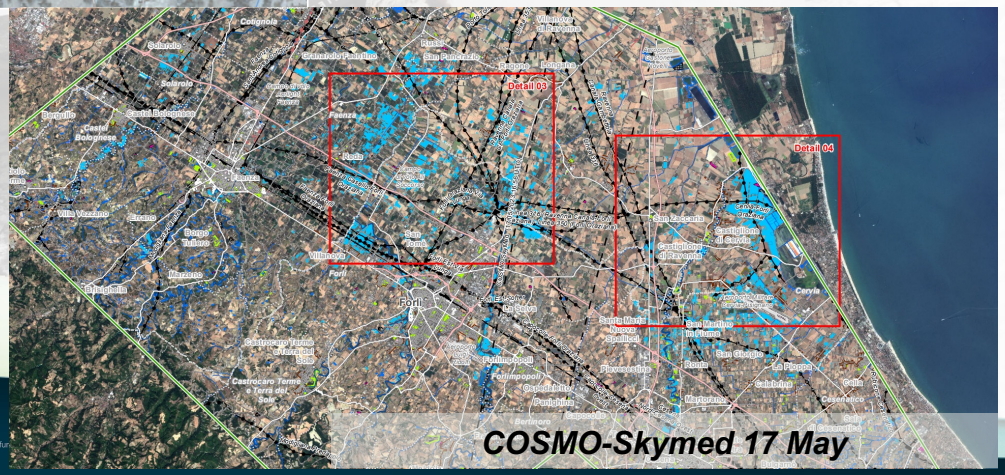
Airbus Pleiades 10 September 11:16 UTC

Earthquake in Morocco

- 8 Sept. at 22:11 UTC
- 9 Sept. morning
  → activation EMSR695 (large area)
- 10 Sept. morning
  → first VHR data:
  - Planet SkySat at 08:18 UTC
  - Airbus Pleiades at 11:16 UTC
  - Maxar Worlview-3 at 11:24 UTC
- 12 Sept. morning
  → analyses maps produced

Activation EMSR664

Flood in Italy



COSMO-Skymed 17 May

Explainer

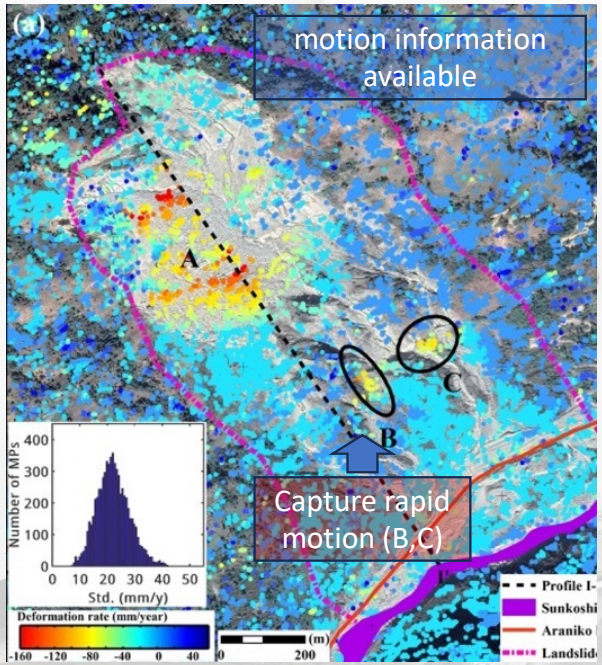
- CCMs are tasked upon request from the CEMS to cover the disaster area, multiplying opportunities for **rapid data acquisition** in complement to the Sentinels. This is essential for ensuring **a timely response** and for **monitoring dynamic situations** as disasters unfold (e.g. for floods, wildfires, etc.).
- CCMs provide **very high spatial resolution** (e.g., Pleiades NEO 30cm multispectral data), which enables the detection of small-scale changes before and after a disaster. This is important to scrutinize threats to infrastructure or rapidly changing natural landscapes.
- Efforts are on-going **to increase the number of suppliers (esp. European ones)** to improve the immediacy of the response.
- Know more AT THIS LINK

ROSE-L - Radar Observation System for Europe in L-band

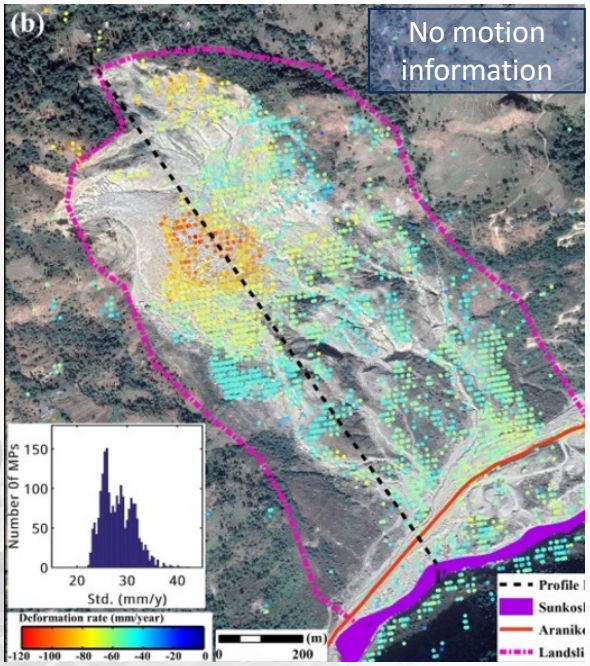
New surface motion information in previously inaccessible areas

Planned

L-band (e.g. ROSE-L simulation)



C-band (e.g. Sentinel-1)



Sunkoshi landslide 2017-2019

~10 mm/year

Explainer

- ROSE-L will be only operational source of surface motion information in extensive vegetated and snow covered areas which are inaccessible to C-band SAR missions such as Sentinel-1
- ROSE-L will extend the measurement of Sentinel-1 based terrain deformation information over urban areas and infrastructures to vegetated and snow covered areas currently inaccessible
- ROSE-L only operational source of information in areas of fast-moving surfaces e.g. due to rapid subsidence events, degrading infrastructure and active land slides
- Long-term continuity and ROSE-L missions guarantees that civil protection and natural disasters needs can be addressed.
- Know more AT THIS LINK

Interferometry is a technique that allows to detect motions of the ground and of overlying infrastructure with millimetre-level accuracy

Copernicus4regions User Stories

Selected user testimonials from European public authorities

The approach is filling a significant knowledge-gap on the pluvial floods' mechanism, analysis and risk-reducing measures' planning - an important contribution to the FRMP[1] update."

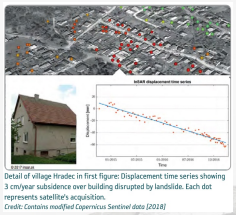
Rumeliya Petrova, Danube Region BD

[1]Flood Risk Management Plan of the Danube river basin (LINK)

Sentinel-2 data shows not only the flooded area, but the area where the water was accumulated – thus allowing precise risk reduction measures on watershed level to be implemented.

Sentinel 1 data has transformed the way we monitor groundwater flooding in Ireland. It provides a practical method to monitor a complex problem."

Koen Verbruggen, Geological Survey Ireland *(LINK)*



Detail of village Hradec in first figure: Displacement time series showing 3 cm/year subsidence over building disrupted by landslide. Each dot represents satellite's acquisition.
Credit: Contains modified Copernicus Sentinel data [2018]

Thanks to Sentinel-1 we can monitor landslides threatening citizens' homes more reliably and with unprecedented detail."

Dr. Pavel Liscak, Slovakia State Geological Institute *(LINK)*

The satellite data planning changes the way to prepare, plan and respond to an emergency, optimizing risk analysis and rescue operation efficiency."

Italian National Fire Corps (LINK)

The application of this method will greatly accelerate the fire extinguishing time and facilitate the movement of firefighters within the affected area."

Fire Department of the Split-Dalmatia county (LINK)

User quotes from NEREUS/ESA/EC 2018

Question Time!

BACK TO POLICY AREAS

BACK TO MEETING AGENDA