

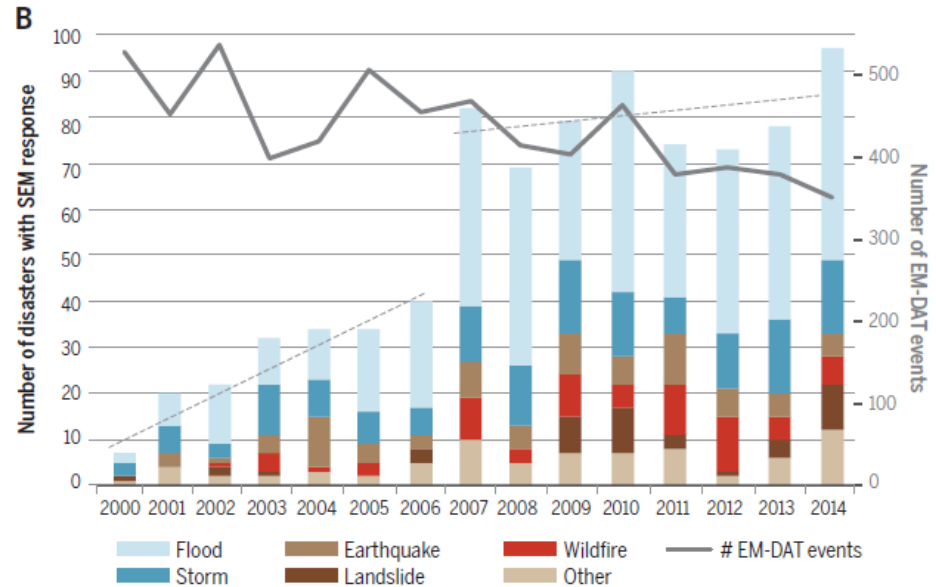
# What can users expect from the EMS Mapping during the emergency operations?

Copernicus Emergency Management Service



# EMS Mapping: what kind of disasters?

- The **availability of EO satellite systems** has increased the application of satellite data for global rapid assessment of disaster situations during the past 15 years
- Satellite based emergency mapping can provide concrete support in case of
  - ✓ **Hydrometeorological disasters** → including flood, storm, snow, wildfire, and drought events
  - ✓ **Geophysical disasters** → earthquake, volcano, and landslide events
  - ✓ **Biogenic events** → epidemic outbreaks and technical accidents.



\*Source: *Global trends in satellite-based emergency mapping*, AAVV, 2016



# Which type of maps and when?

## Rapid Mapping -RM

- **Reference maps:** baseline for generating post-emergency products
- **Delineation maps (with monitoring option)** outline the extent of the area affected by the event.
- **Grading maps** assessment of the impact caused by the disaster.
- **Activation Extent Map** atlas of the maps produced

## Risk and Recovery Mapping - RRM

- **Reference maps** comprehensive knowledge of the territory and exposed assets and population
- **Pre-disaster situation maps** up-to-date thematic information for contingencies on areas vulnerable to hazards
- **Post-disaster situation maps** for use beyond the immediate response phase, to assess recovery needs, long-term impact of the disaster event, progress in reconstruction efforts

### Service Level 1 (SL1)

- Reference maps: 9 h
- Delineation and Grading maps: 12 h Service

### Service Level 5 (SL5)

All map types typically in 5 working days

### Multilingual support

Translation of relevant cartographic elements of the maps in official EU languages



## Su [EMSR190] Norcia: Grading Map, Monitoring 1

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- 
- 
- 



*Published: 2016-10-31 11:48 (UTC)*

Product version: v2

Map scale: 1:12500

Status:

Production finished, quality approved

### Map Coverage Planner

### Available for downloads

- Raster products (maps), in different formats and resolution
- Zipped vector packages, shp, kml

### Downloadable items

**PDF:** 100 DPI 200 DPI 300 DPI

**JPEG:** 100 DPI 200 DPI 300 DPI

**TIFF:** 100 DPI 200 DPI 300 DPI

**Vector package:** ZIP





# How you can get the products?

## Copernicus EMS portal

<http://emergency.copernicus.eu/>

dedicated sftp site for the Authorized User

### RAPID MAPPING

- List of Activations
- Map of Activations
- GeoRSS Feed **115 readers**

### RISK AND RECOVERY

- List of Activations
- Map of Activations
- GeoRSS Feed **27 readers**

**COPERNICUS**  
Emergency Management Service

Home | What is Copernicus | EMS - Mapping | EMS - Early Warning System | News

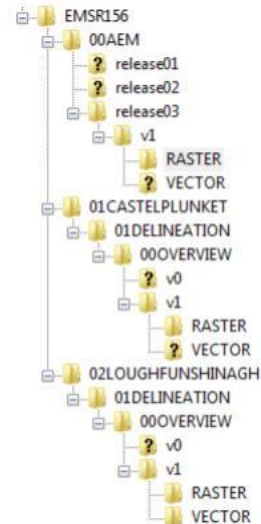
LATEST NEWS - 2016-10-13 | [EMSR188] Floods in Southern France

### Copernicus Emergency Management Service - Mapping

A service in support of European emergency response

Map above displays only latest Copernicus EMS - Mapping Activations. To see a Map of All Activations, go to section Map of Activations in Rapid Mapping or in Risk and Recovery Mapping sub-menus respectively.

Act. Code	Title	Event Date	Type	Country/Terr. Feed
EMSR190	Earthquake in Central Italy	2016-10-26	Earthquake	Italy
EMSR188	Floods in Southern France	2016-10-13	Flood	France
EMSR187	Floods in Romania	2016-10-12	Flood	Romania
EMSR186	Tropical Cyclone Matthew in Southeastern...	2016-10-06	Wind storm	United States
EMSR185	Tropical cyclone in Haiti	2016-10-03	Other	Haiti





## Data policy principles

- Under Copernicus Regulation (EU) No 377/2014 and Commission Delegated Regulation (EU) No 1159/2013, the information produced by the Copernicus Emergency Management Service shall be made available to the public on a **full, open and free of-charge** basis. However, under exceptional circumstances, dissemination restrictions may be imposed for security reasons or the protection of third party rights
- Public Authorities can access the **imagery** which are or were used during any of the Rapid Mapping and Risk & Recovery Mapping activations, upon registration and signature of the applicable Terms and Conditions.



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## How you can access data ?

The **Copernicus Space Component Data Access (CSC-DA) service** - financed by the EU and operated by ESA – grants National Public Authorities harmonized access to data that originates from a large fleet of Earth Observation missions, the Sentinels dedicated missions and over 40 European and international Contributing Missions.

Registration and License signature:

<https://spacedata.copernicus.eu/web/cscda/data-access/registration>



Select one or more datasets and Subscribe for data access

<https://spacedata.copernicus.eu/web/cscda/data-access/subscription-to-datasets>



Download Data via FTP or the dedicated Catalogue and Download Tool

<https://spacedata.copernicus.eu/web/cscda/data-access/discovery-and-download>



## What's needed

## What satellites can do

### Early warning

- Disaster anticipation



- Regular monitoring

### Crisis

- damage assessment
- support to logistics



- damage assessment
- support to logistics

### Post Crisis

- monitoring of recovery operations



- monitoring of recovery operations

### Floods

- visible water extent



- dynamic monitoring of flood extent
- affected infrastructures

### Fires

- visible burnt areas
- possible Hot Spots



- Burnt Scar Mapping
- very frequent Hot Spot service

### Earthquakes

- detailed damage assessment
- conditions of infrastructures



- building damage assessment
- status of critical infrastructures
- road conditions analysis

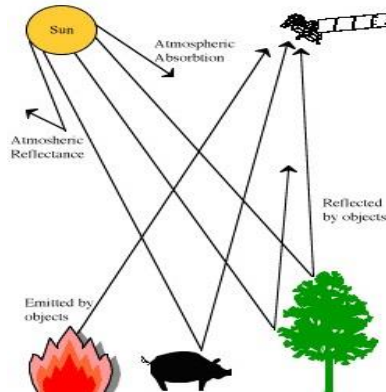




## Which data?

### Optical satellites

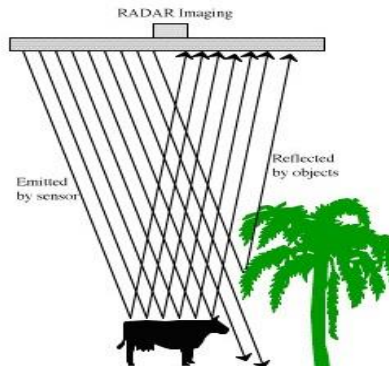
- they have a sensor on board that needs light to record the image and that cannot “see” through clouds



- ✓ Pass over any AOI **once a day at 10:00 ca LT** (the second pass is at 22:00 ca with no light)

### SAR satellites

- they have an active sensor on board that can acquire regardless cloud coverage



- ✓ They can exploit both day and night passes acquiring **twice a day at 07:00 ca**

In case of Flood event, the radar acquisitions allow to monitor the floodmask twice a day even with bad weather conditions



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# Satellite sensor vs disaster type



Fires



Earthquakes



Conflicts



Floods

**Optical** sensors are suitable to discriminate burnt forest areas as the vegetation has different behaviours in the NIR and SWIR spectral band according to the chlorophyll content

Comparing an **optical** image pair in order to identify damage indicators such as debris or roof discontinuity can be identified

**Pairs of SAR images** acquired in interferometric mode can be used for change detection analysis and to produce damage proxy maps (e.g. building destruction/construction)

**Optical** data allow to observe particular elements such as IDP camps, cross border checkpoints, etc. and, eventually, their evolution over time

**SAR** sensors acquire under every weather and light condition increasing the collection opportunities when typically the weather conditions are not good



# Scale and resolution

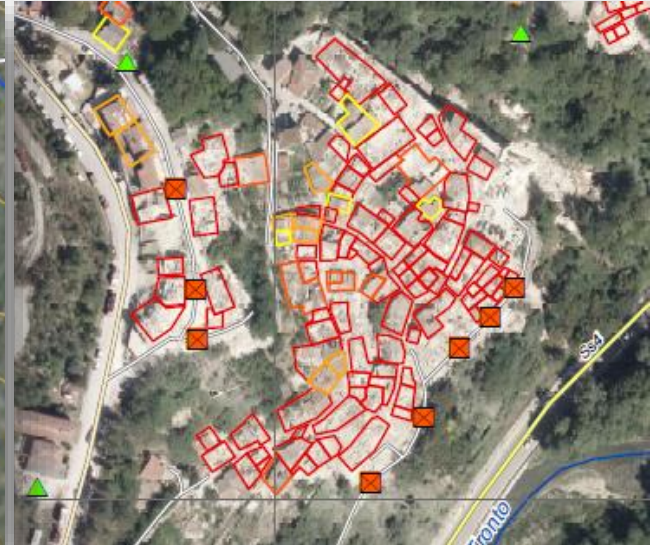
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Satellite data can achieve very detailed analysis thanks to resolution up to submeter, considering that higher is the resolution, smaller is the coverage

1:50.000

1:15.000

1:5.000



- Primary Road
- Built-up area
- ...

- Street network
- Building blocks
- ...

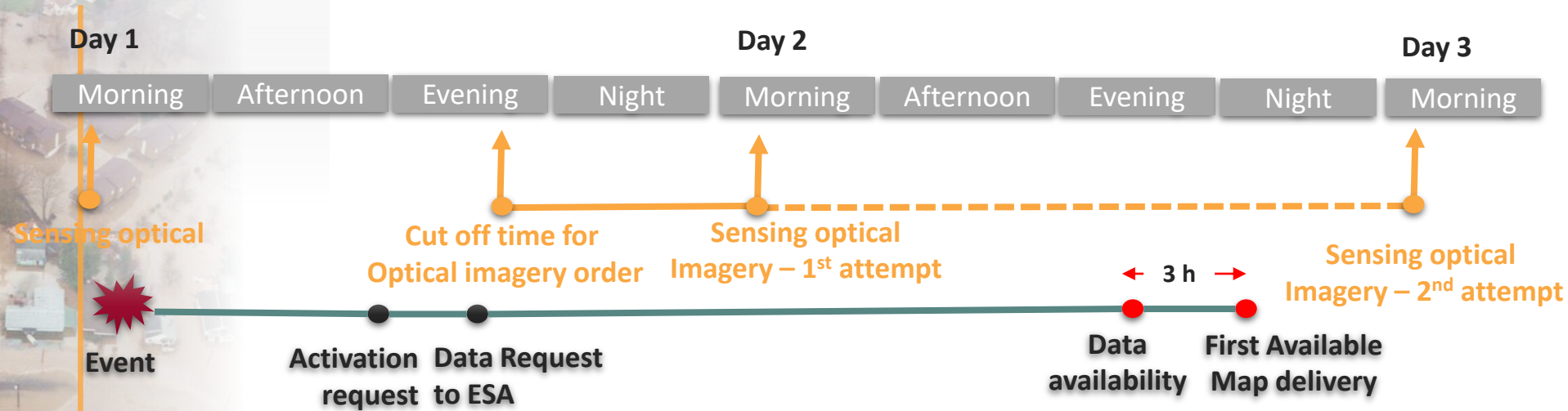
- Infrastructures
- Building footprint
- ...



# Time is critical!

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Typical scenario for events which require satellite **OPTICAL** acquisitions



## WHY TIME IS CRITICAL?

- The **delay** of the activation request can cause the loss of the first satellite opportunity over the relevant Areas of Interest **REQUIRED BY THE Authorized User**, due to the cut-off time for the satellite imagery order
- For optical imagery, typically the 2<sup>nd</sup> attempt is planned the day after of the 1<sup>st</sup> attempt or later





# Capabilities and limitations

## Emergency Management



- **world-wide** coverage
- **high** temporal coverage
- detailed as well as large area analysis possible
- remote sensing sensors detect wavelengths **beyond** the capabilities of the **human eye**
- observations **independent from cloud** coverage and sun illumination (radar-sensors)
- combination / **synergy of** different **sensors**
- can support **all phases of** the **crisis** and disaster cycle



- **limited availability** of satellite imagery within certain time frames/**response time** (new acquisitions) may affect the chances to detect damages on the ground (eg in case of flash floods)
- **weather constraints** for optical data (clouds, haze, etc.)
- spatial **resolution versus** large area **coverage**
- inherent **limitations of the SAR** analysis technique **in urban and forested areas**

more and **more data are coming up** thanks to satellite constellations, web/social media, crowd sources, ....