
European Commission
What can users expect from the EMS Mapping during the emergency operations?
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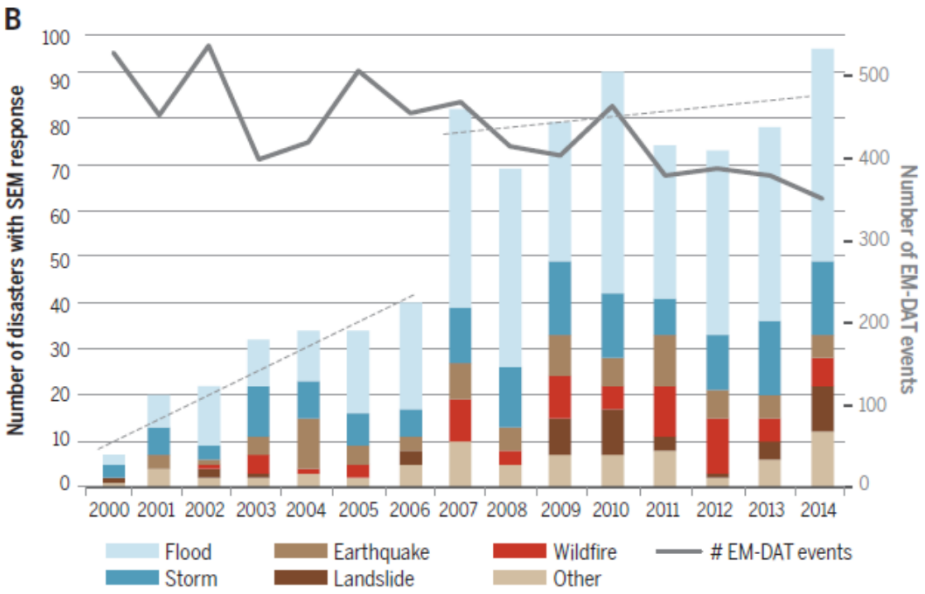
EMS Mapping: what kind of disasters?

- 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

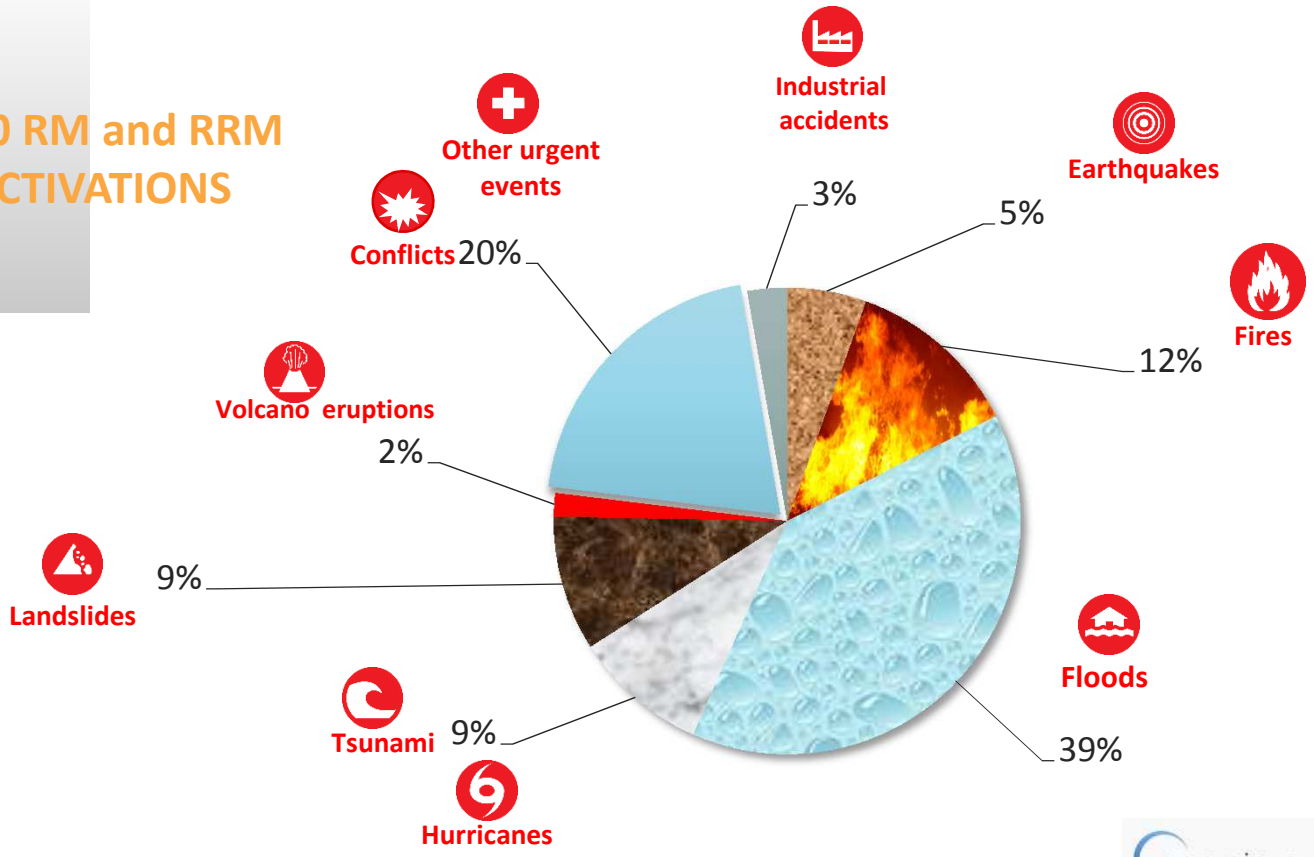
- Satellite based emergency mapping can provide concrete support in case of
  - ✓ **Hydrometeorological disasters** → including flood, storm, snow, wildfire, and drought events
  - ✓ **Geophysical disasters** → earthquake, volcano, and landslide events
  - ✓ **Biogenic events** → epidemic outbreaks and technical accidents.



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

Copernicus 2012 - 2016

+220 RM and RRM ACTIVATIONS



Emergency Management

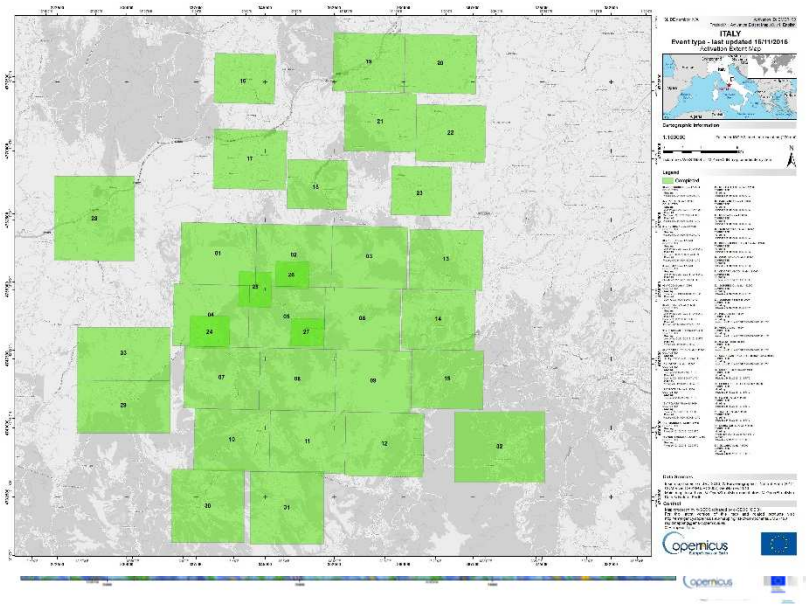
Which type of maps and when?

Rapid Mapping -RM

- **Reference maps** prior to the disaster event, for comparative purpose as a baseline for generating post-emergency products.
- **Delineation maps (with monitoring option)** outline the extent of the area affected by the event.
- **Grading maps** provide an 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 that can help for contingencies on areas vulnerable to hazards, aiming to minimise loss of life and damage
- **Post-disaster situation maps** up-to-date thematic information for use beyond the immediate response phase, such as assessing recovery needs, mapping the long-term impact of the disaster event, and monitoring progress in reconstruction efforts



Multilingual support is available, translate relevant cartographic elements of the maps in official EU languages

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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.

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 harmonised 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
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Download Data via FTP or the dedicated Catalogue and Download Tool
https://spacedata.copernicus.eu/web/cscda/data-access/discovery-and-download

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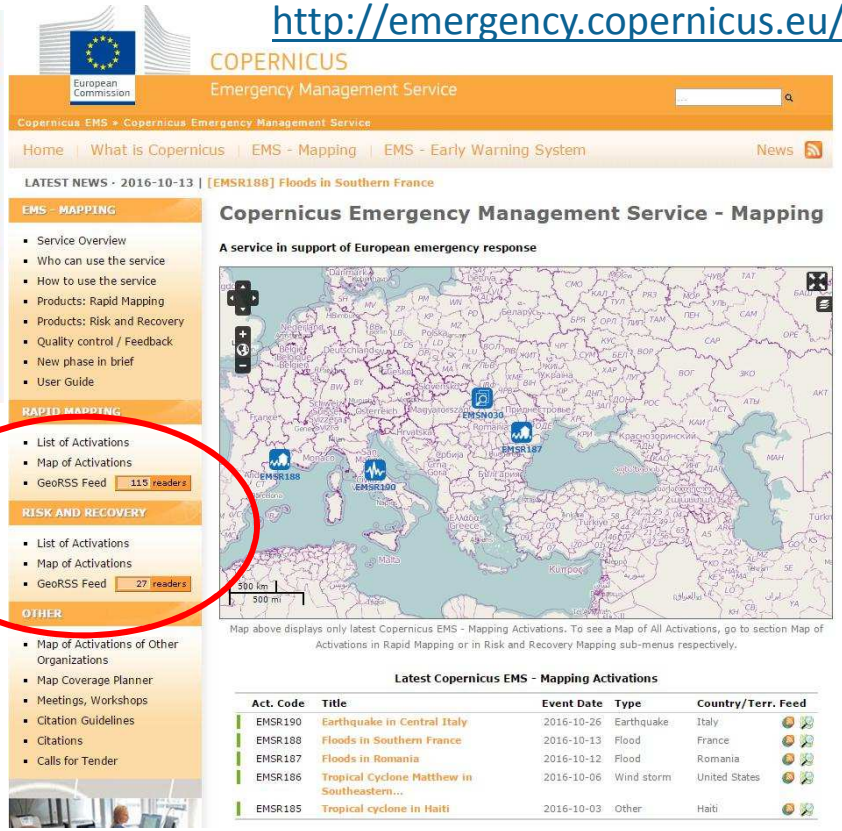
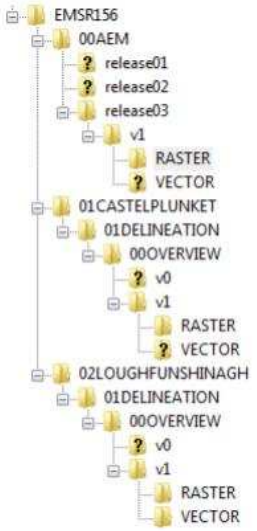
How you can get the products?

Copernicus EMS portal

http://emergency.copernicus.eu/



dedicated sftp site for the Authorized User



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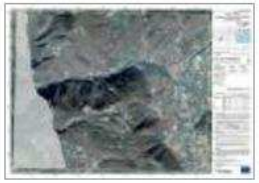
What you can get concretely?

Rapid Mapping -RM

[EMSR190] Norcia: Grading Map, Monitoring 1



Published: 2016-10-31 11:48 (UTC)
Product version: v2
Map scale: 1:12500
Status:
Production finished, quality approved

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		

Available for downloads

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

Supporting tools

- Email alerts about new activations for the Authorized User
- GeoRSS feeds for activations alerts and Map Delivery alerts
- Map of Activations of EMS and Other Organizations (Mechanisms)
- Map Coverage Planner

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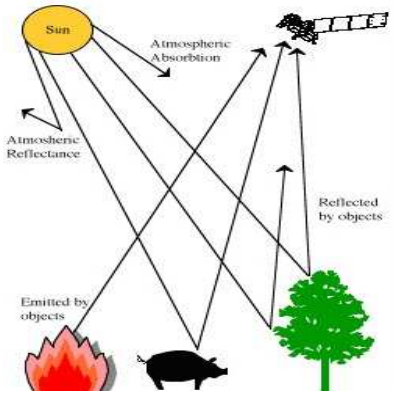
Phase of emergency and disaster types

	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

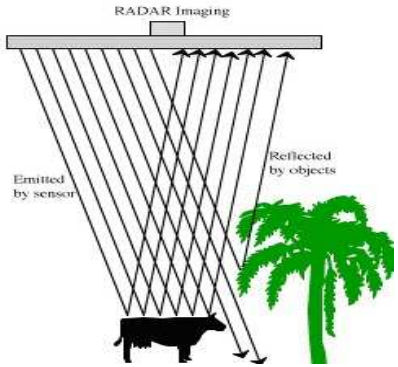
- they have a sensor on board that needs light to record the image and that cannot “see” through clouds



✓ 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

Optical sensor 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

Earthquakes

Comparing a co-seismic **optical** image pair in order to identify damage indicators such as debris or roof discontinuity

Conflicts

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

Floods

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

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Scale and resolution

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

- Primary Road
- Built-up area
- …

1:15.000

- Street network
- Building blocks
- …

1:5.000

- Infrastructures
- Building footprint
- …

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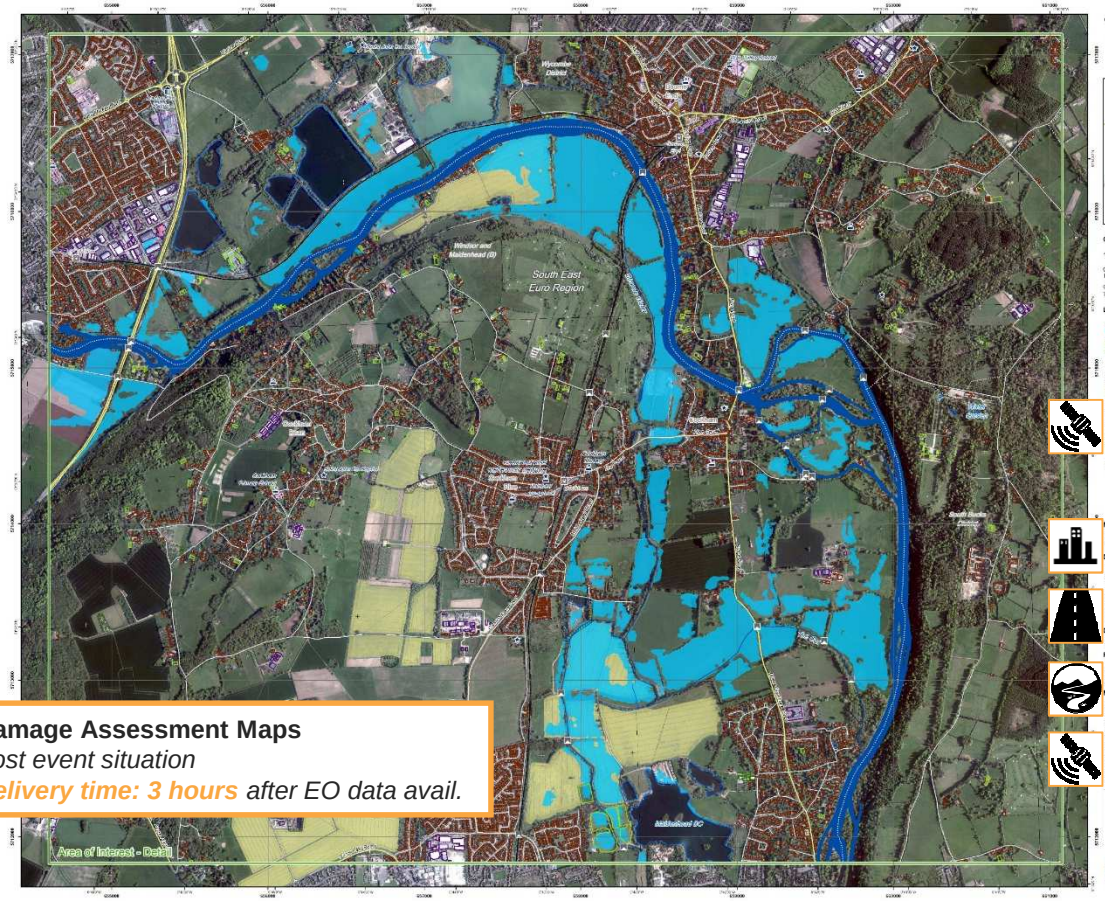
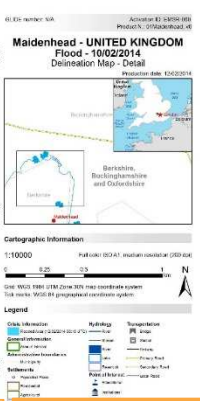
Copernicus EMS Rapid Mapping

Emergency Management





Damage Assessment Maps
Post event situation
Delivery time: 3 hours *after EO data avail.*

- **Disaster extent**
- **Settlements**
- **Transportation**
- **Hydrology**
- **Archive image**

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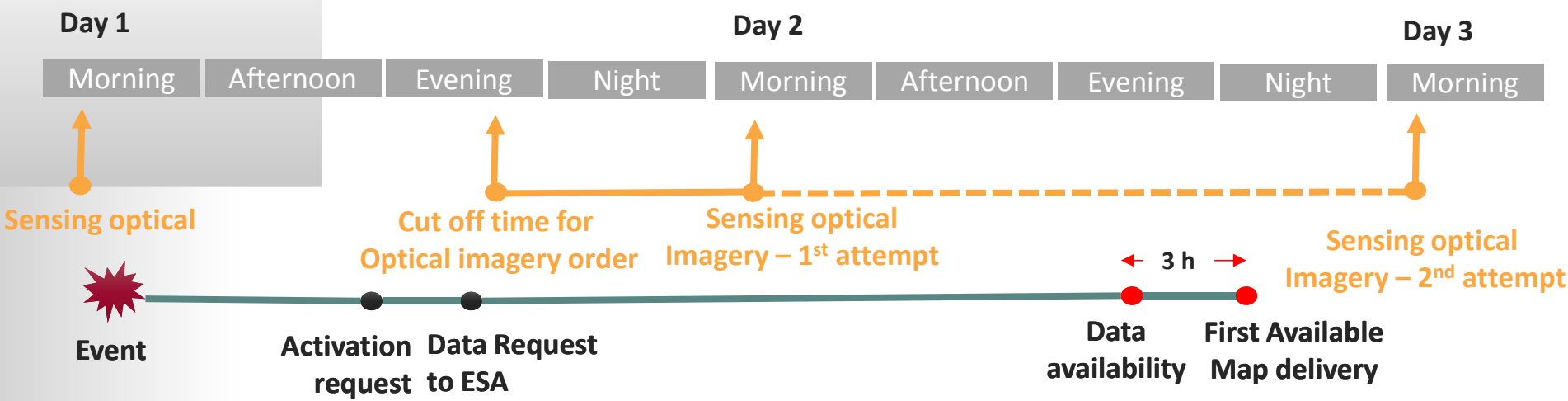
Time is critical!

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



WHY TIME IS CRITICAL?

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

Capabilities and limitations

- **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)
- **weather constraints** for optical data (clouds, haze, etc.)
- spatial **resolution versus** large area **coverage**

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