# BEYOND, The European EO Center of Excellence in N. Africa, Middle East, Balkans (BAMENA)

*Building a Centre of Excellence for*
*EO-based monitoring of Natural Disasters*

*www.beyond-eocenter.eu*

*Funded under FP7-REGPOT-2012-2013-1*
*Activity: 4.1 Unlocking and developing the research potential of research entities established in the EU's Convergence regions and Outermost regions*

**Funding:** 2.3 MEuros EC Contribution

**Additional funding** from Structural Funds ~270KEuros

Project funded by the EUROPEAN UNION

# BEYOND, The European EO Center of Excellence in BAMENA


**BEYOND** gathers information about the Earth's **physical, chemical and biological systems**. It monitors and assess the status of, and changes in, the natural environment and the built environment

- **BEYOND** sets up innovative solutions for EO, allowing to a multitude of monitoring networks (space borne and in-situ) available over the region to operate in a complementary, unified, and coordinated manner
- **BEYOND** builds innovative research and skills capacity in the domain of EO through scientific exchange with European and regional partnering organisations
- **BEYOND** transforms the observations to added value products ready for down-streaming to specific societal needs in the domain of environmental monitoring and Natural Disasters
- **BEYOND** delivers online observations and higher level EO products and services to stakeholders, and international scientific and End User communities

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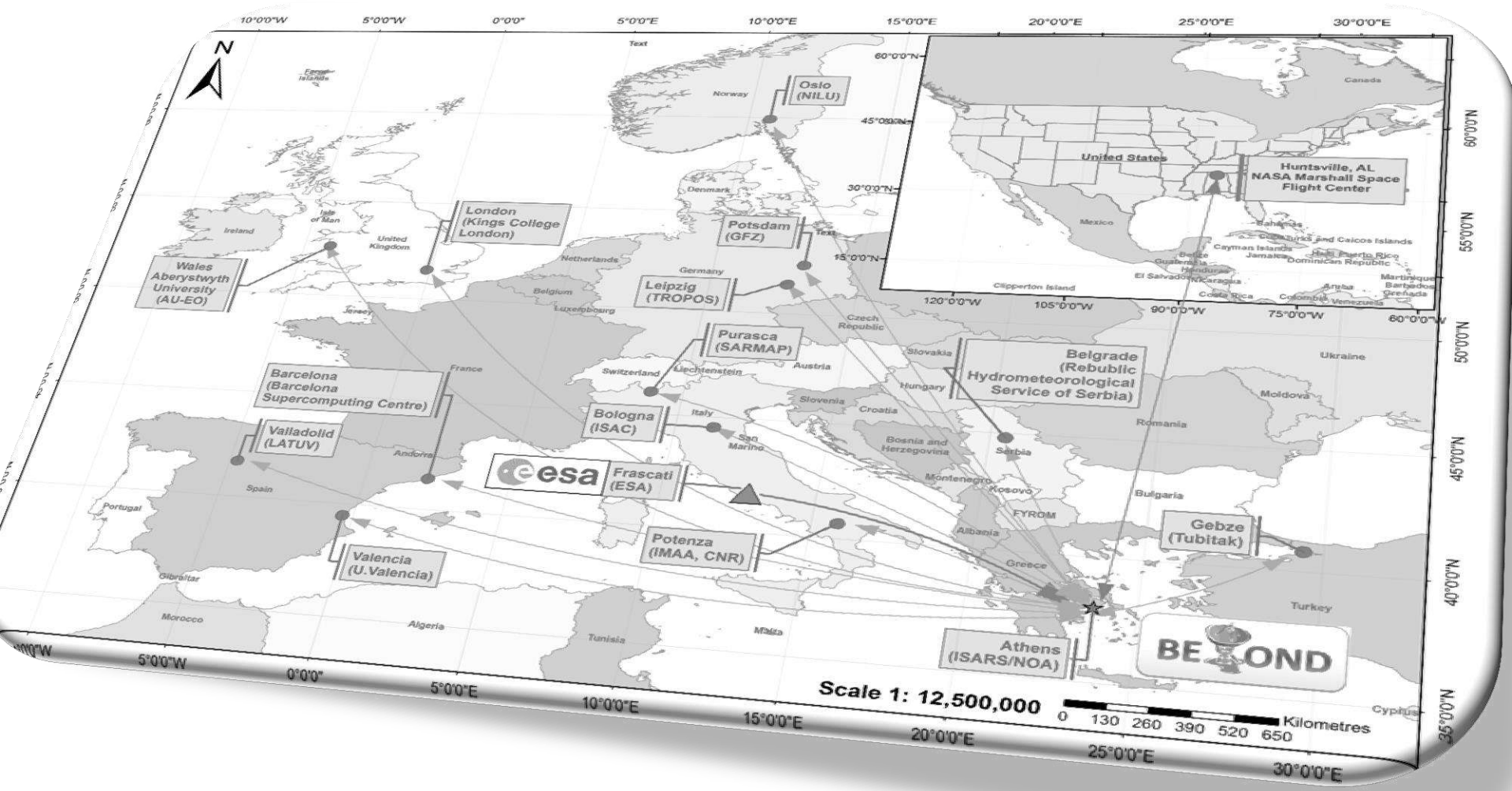


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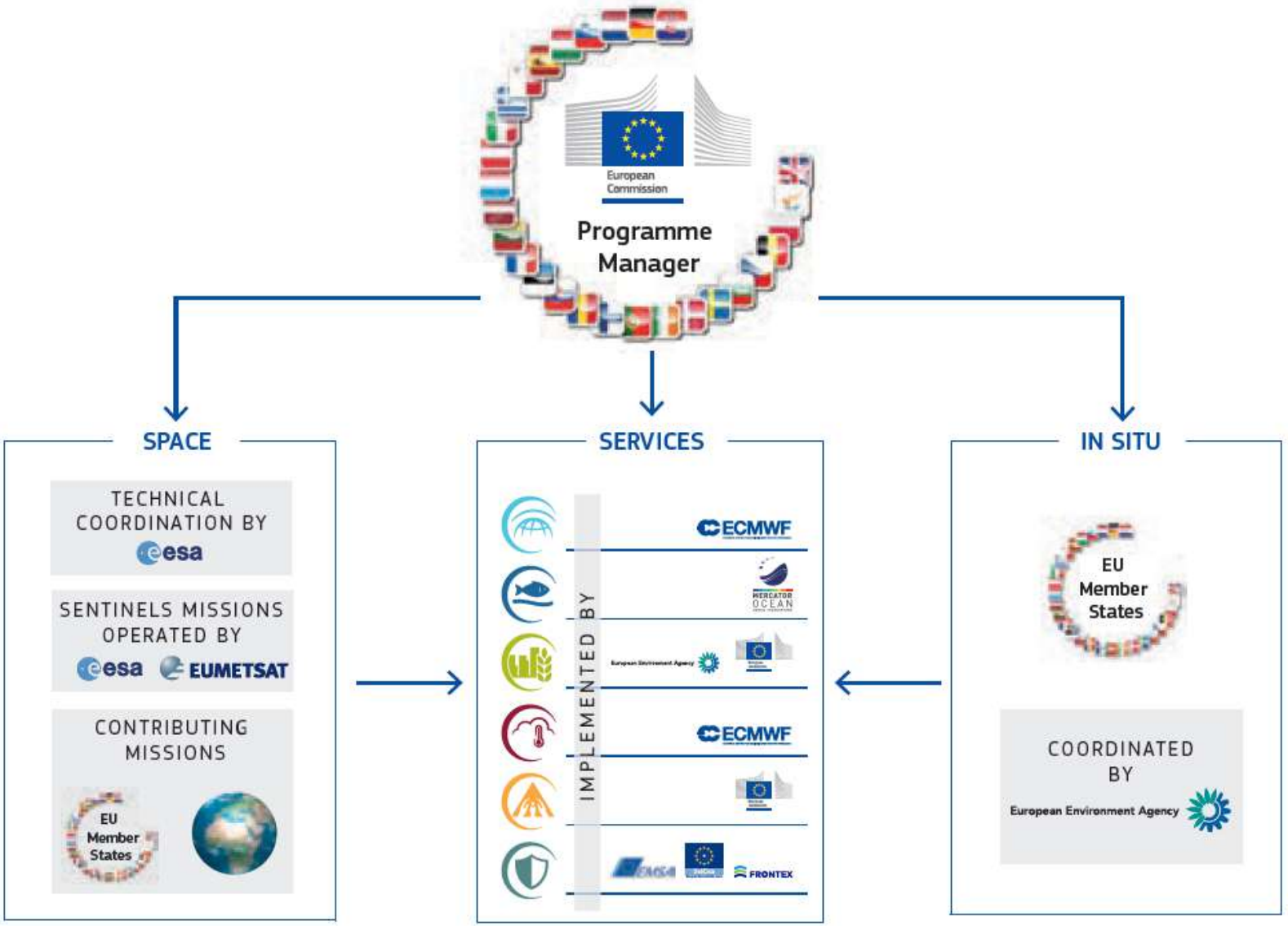
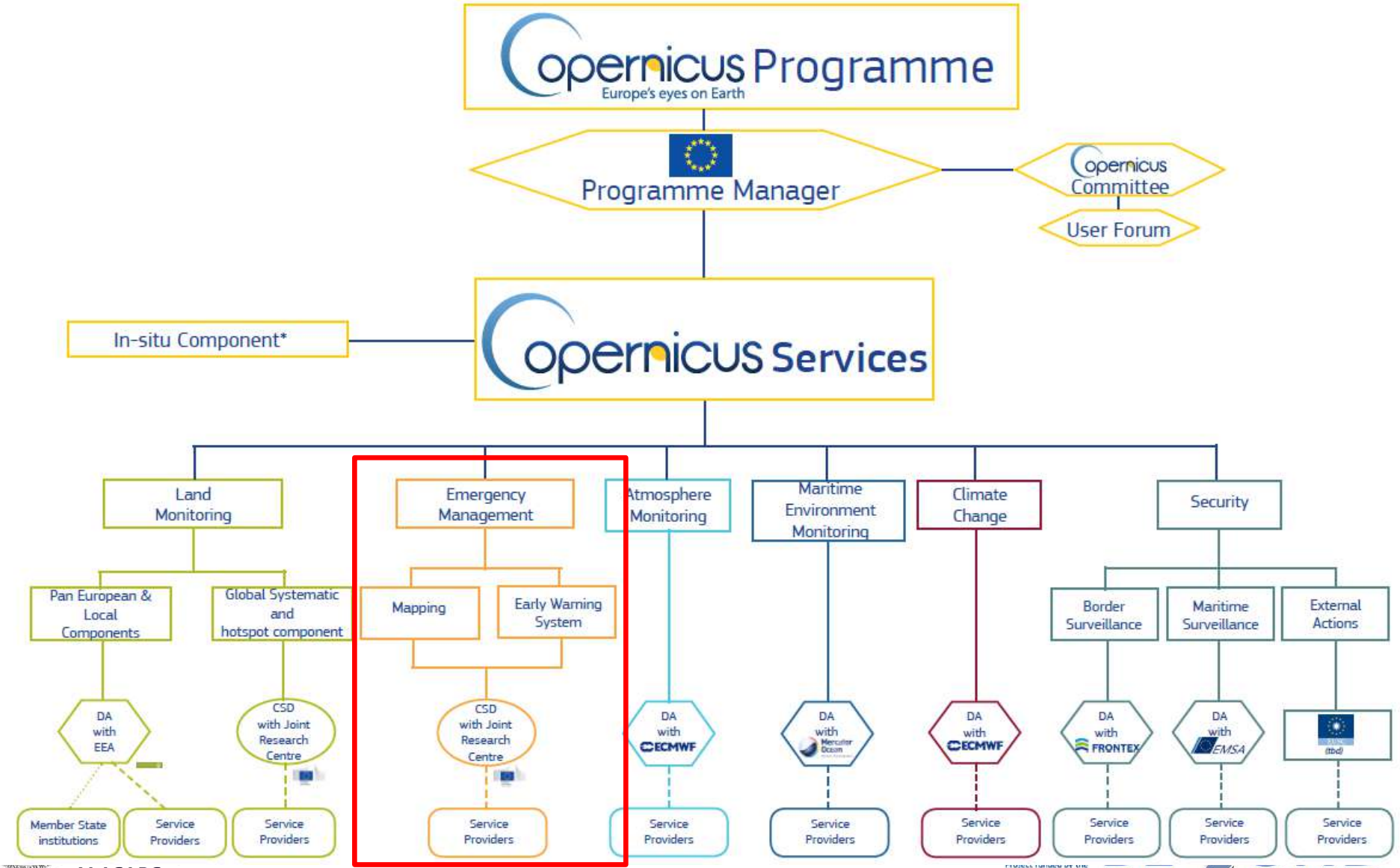
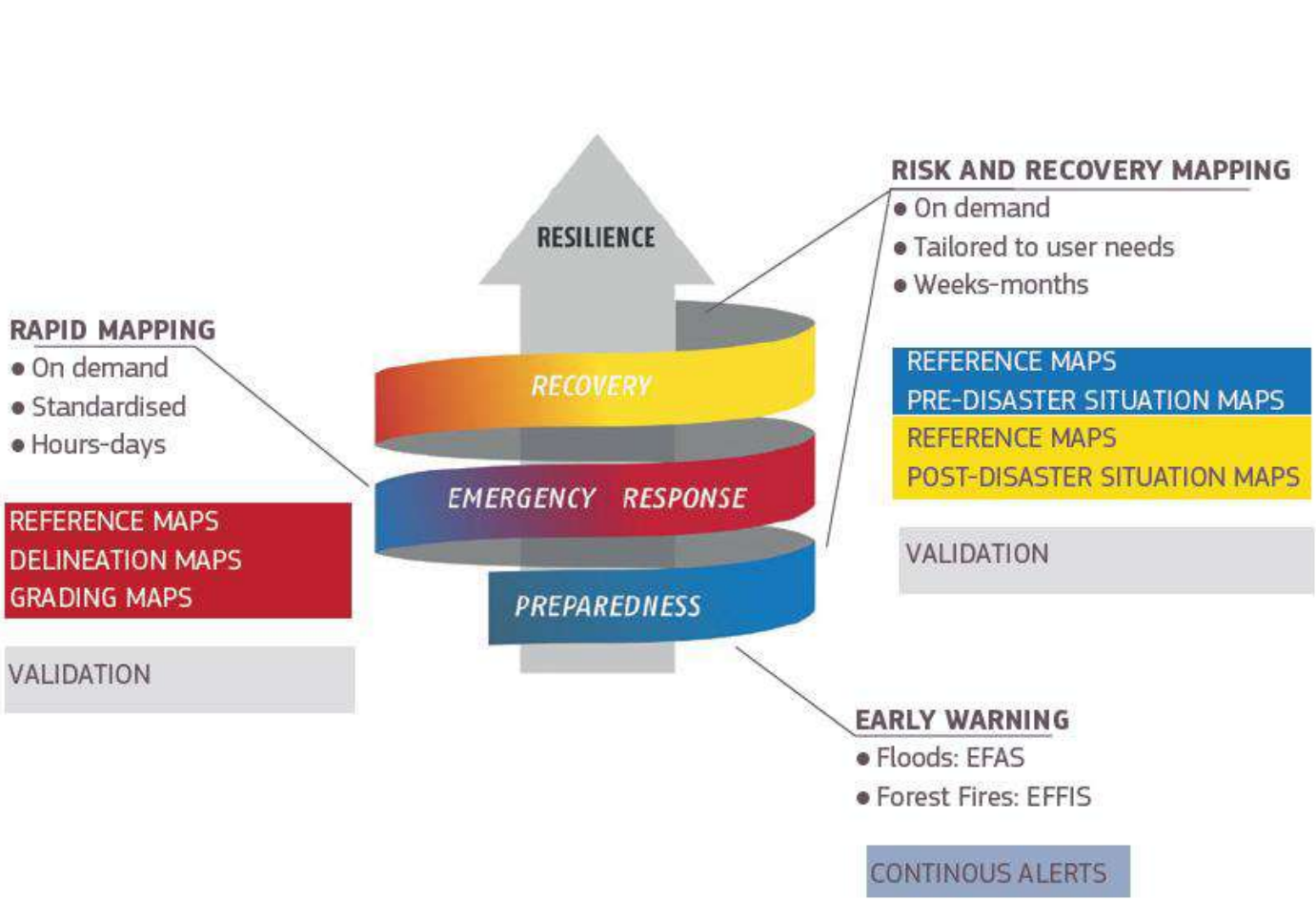
# **What is Copernicus?** An overview



# **Copernicus EMS** BEYOND's involvement



# **Copernicus EMS** The three pillars




**Disaster types**

- Flood
- Fire
- Storm
- Volcanic eruption
- Landslide
- Earthquake
- Industrial accident
- Other

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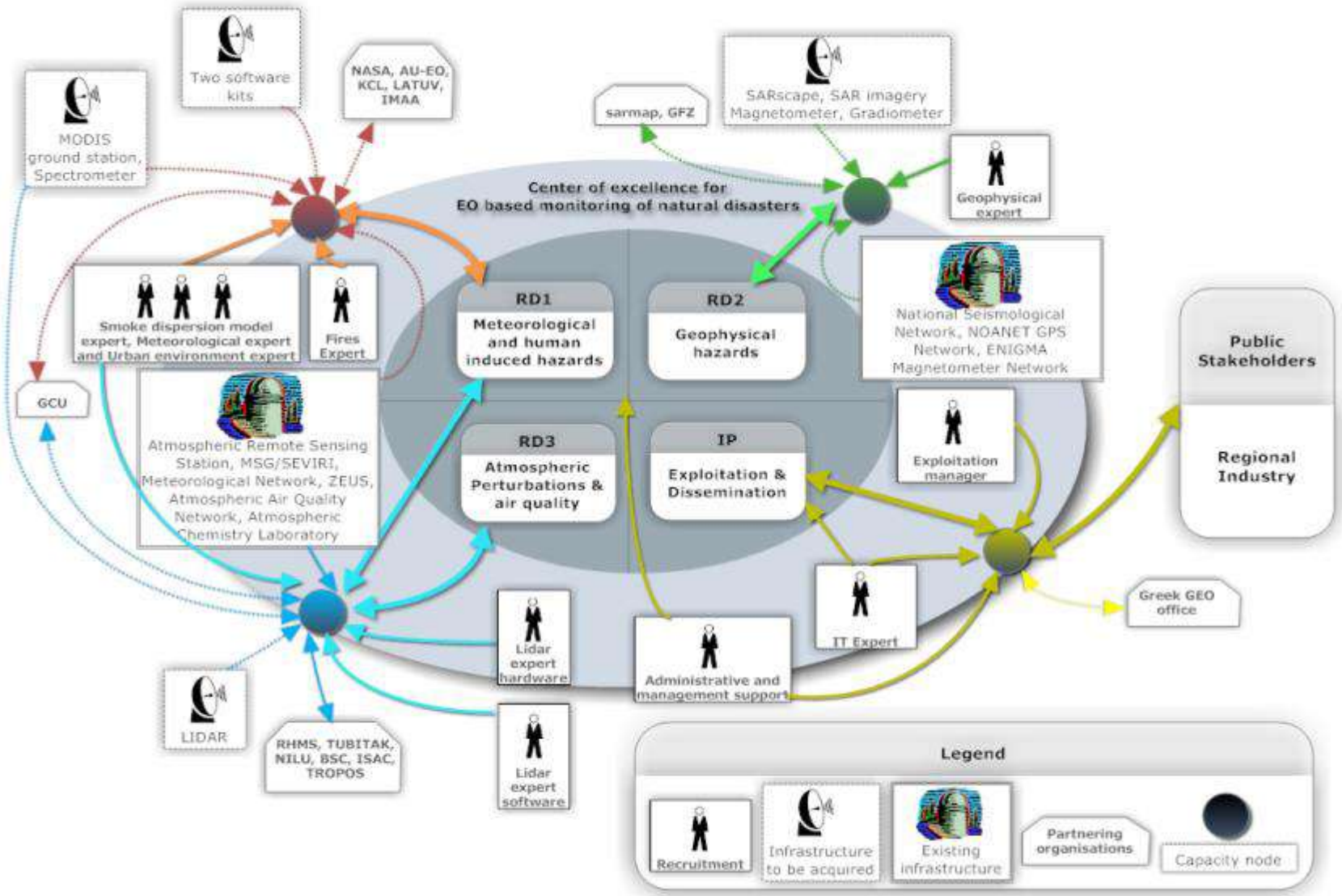


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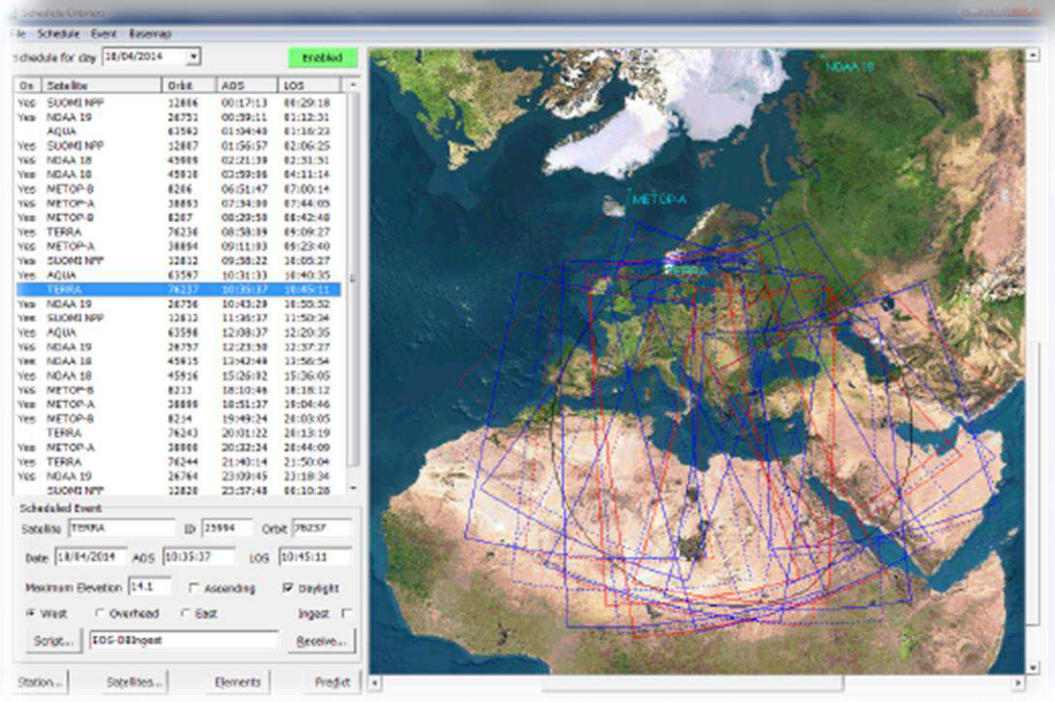
**Operate a Region-wide X-/L- band multi-mission station:**

**EOS Aqua and Terra, SUOMI NPP, JPSS, NOAA, Met Op, FengYun)**

**part of the DB network**

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Operate two **MSG acquisition stations of DVB-S & DVB-S2 systems**

Exploit high throughput provided with the new EUMETCast Europe service, based on using the EUTELSAT 10A

part of EUMETSAT's network




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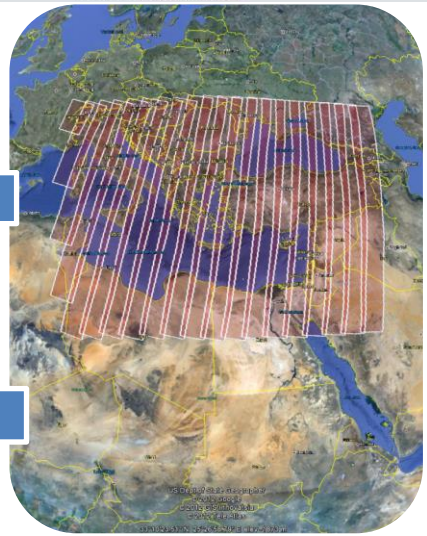
Sentinel-1

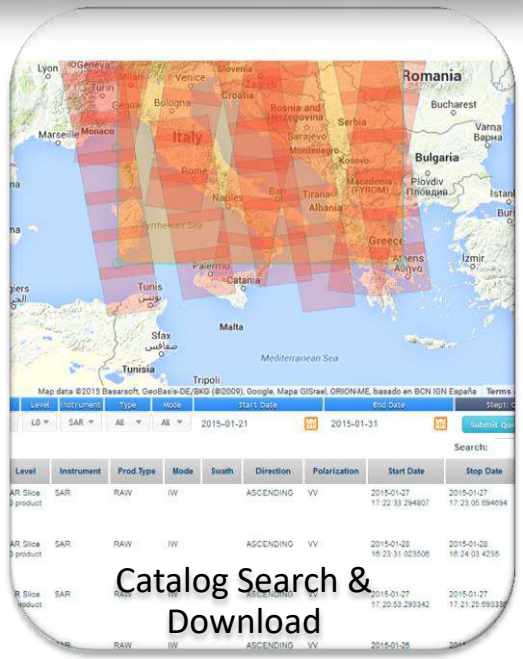


Sentinel-3

Sentinel-2

Sentinel-5p

**Operate the 1st Collaborative Ground Segment (Hellenic Sentinel Data Hub- Mirror Site), allowing near real time acquisition of S-1, S-2, S3, and future S5P satellite missions**




**http://Sentinels.space.noa.gr**

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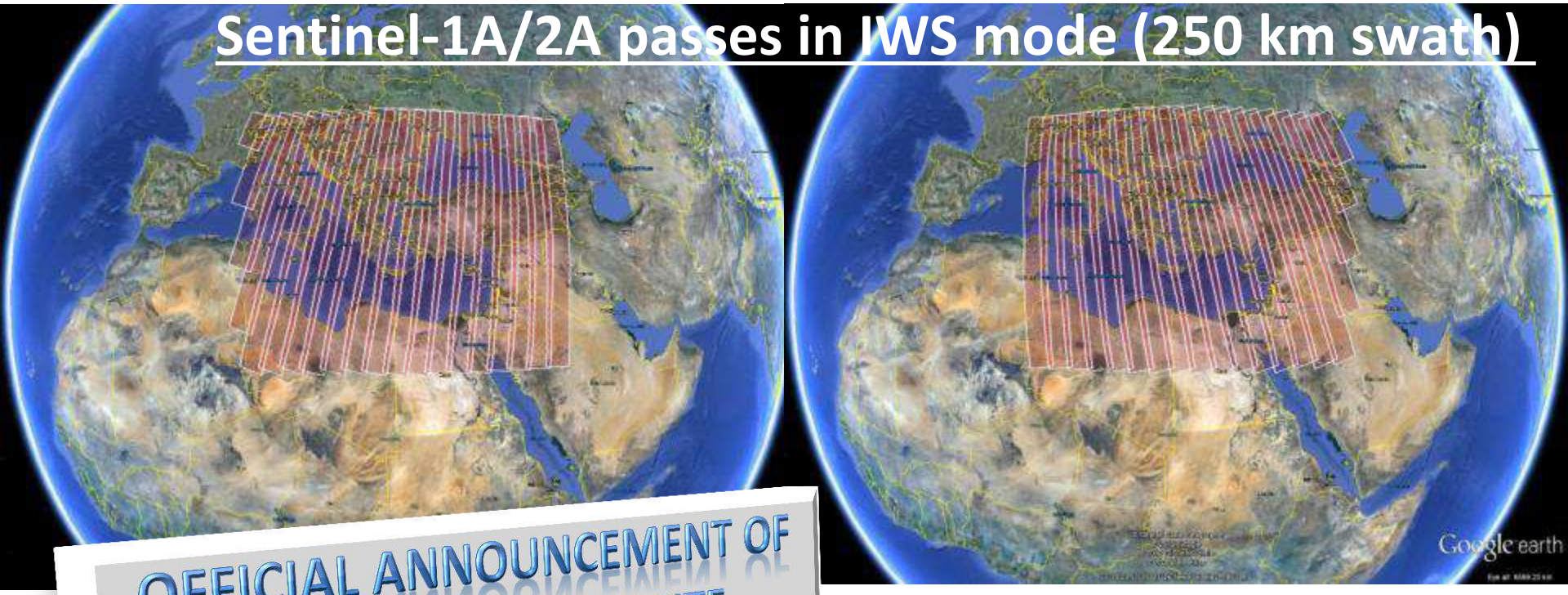
## Sentinel-1A/2A passes in IWS mode (250 km swath)




**OFFICIAL ANNOUNCEMENT OF HELLENIC MIRROR SITE ATHENS SPACE EXPO: 28 MARCH – 5 APRIL**

**HTTP://SENTINELS.SPACE.NOA.GR**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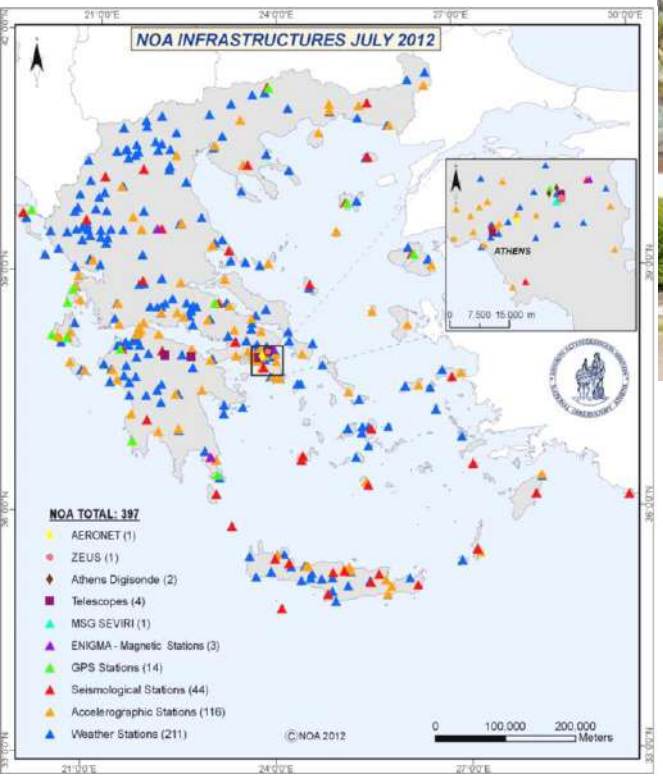
**Map of the deployed in-situ monitoring networks (meteo, GPS, geomagnetic, air, seismological)**




**Operate Ground Lidar Stations, part of the ACTRIS Research Infrastructure**


**EARLINET Lidar Network**



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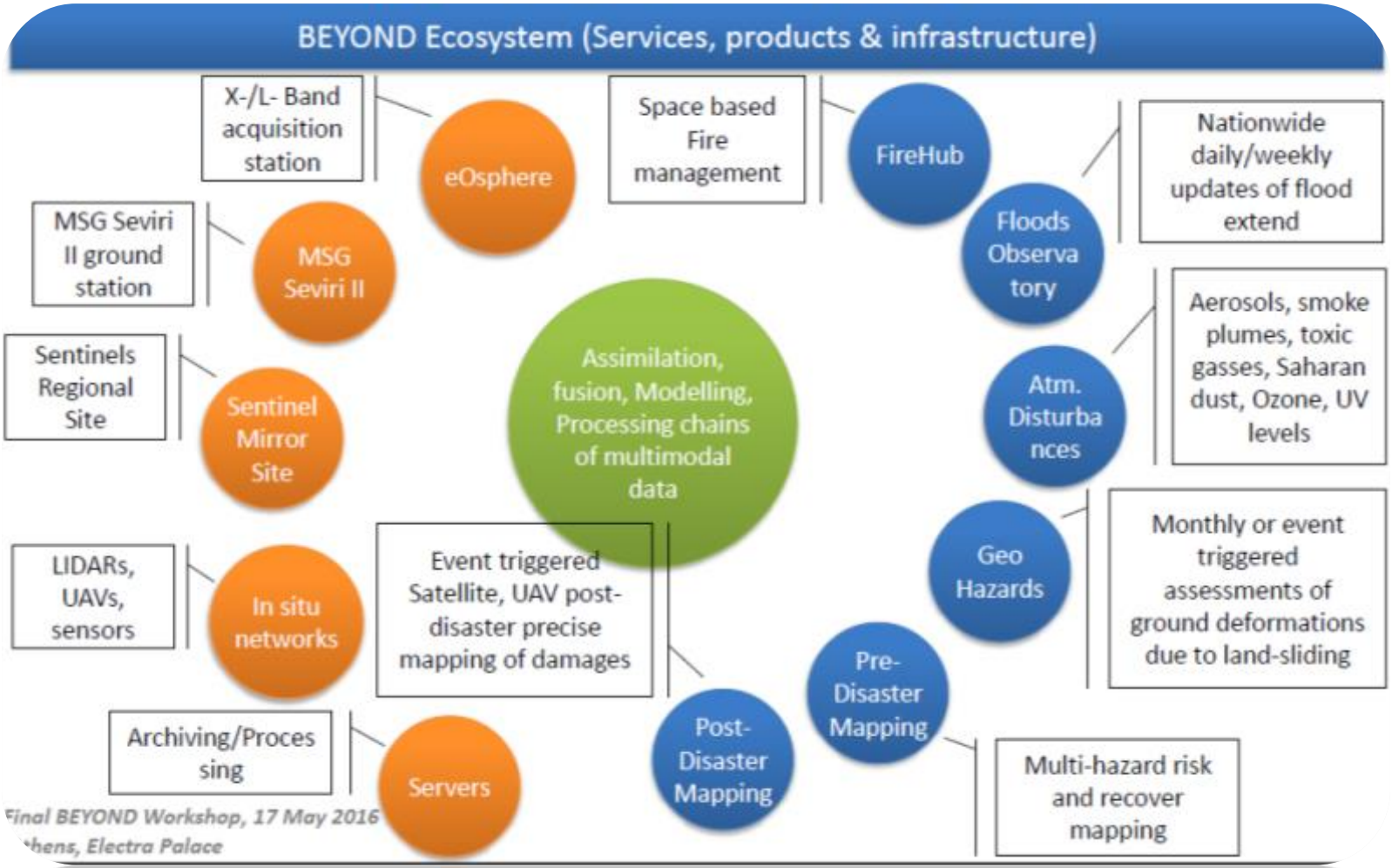


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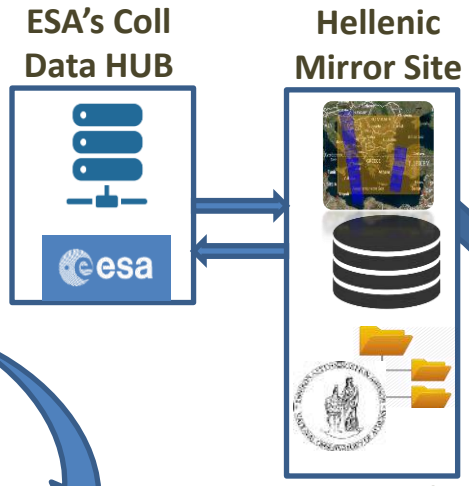



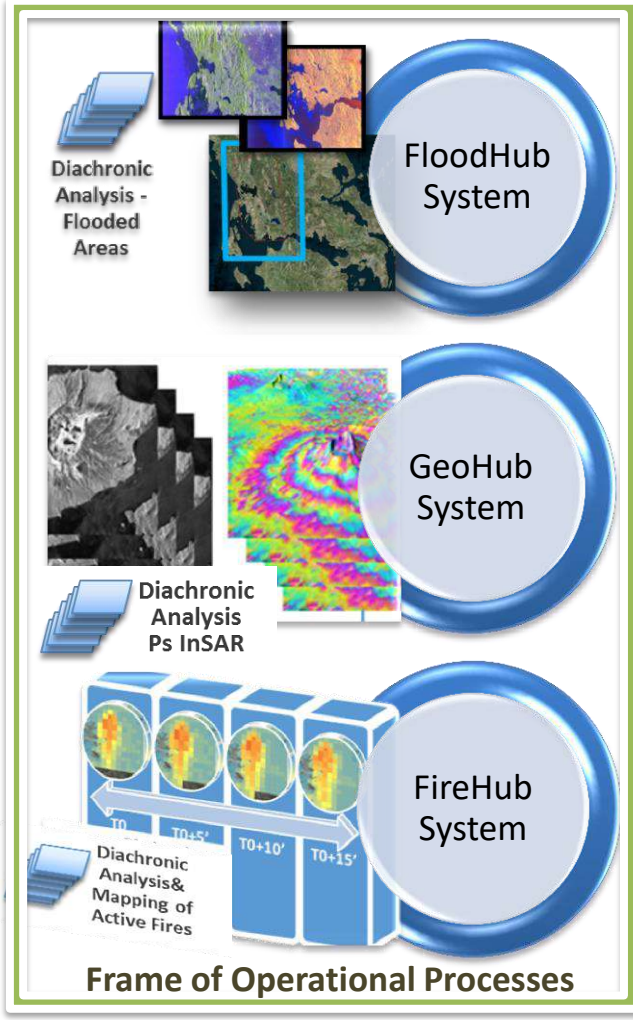


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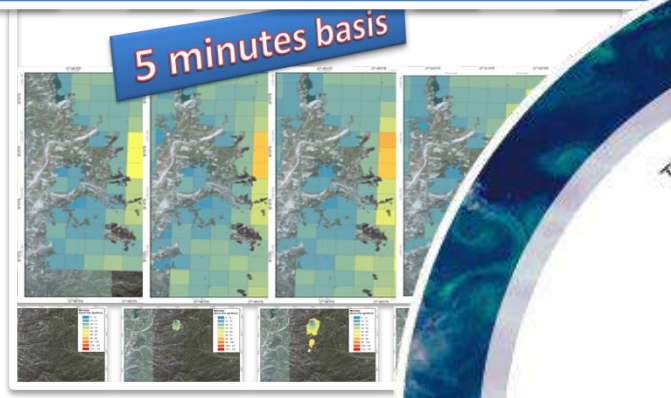
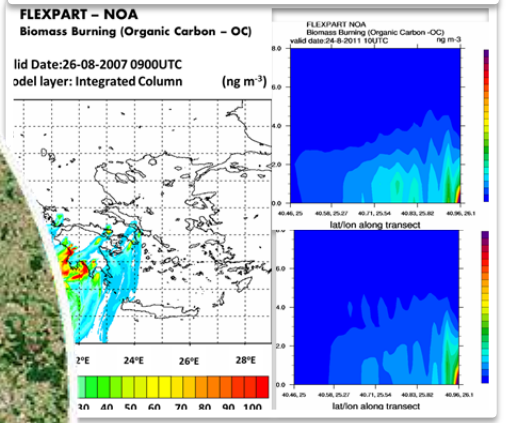
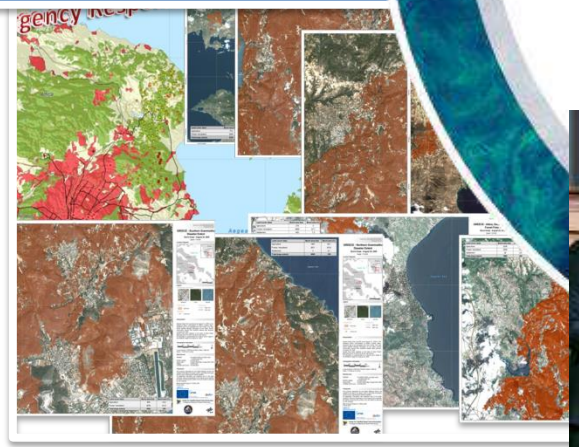
**Active Fire Mapping: 5 ‘ - 500 m - 24/7**



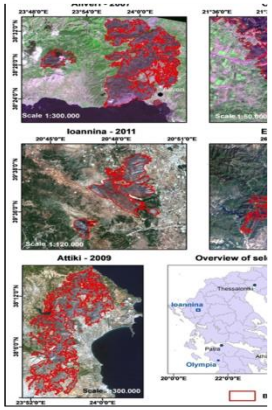

**Hourly Fire Smoke dispersion**




**Burnt Area Mapping: daily/weekly/sea**



**urnt Area Mapping**


The Earth Monitoring Competition

Copernicus masters

WINNER

BEST SERVICE CHALLENGE

2014

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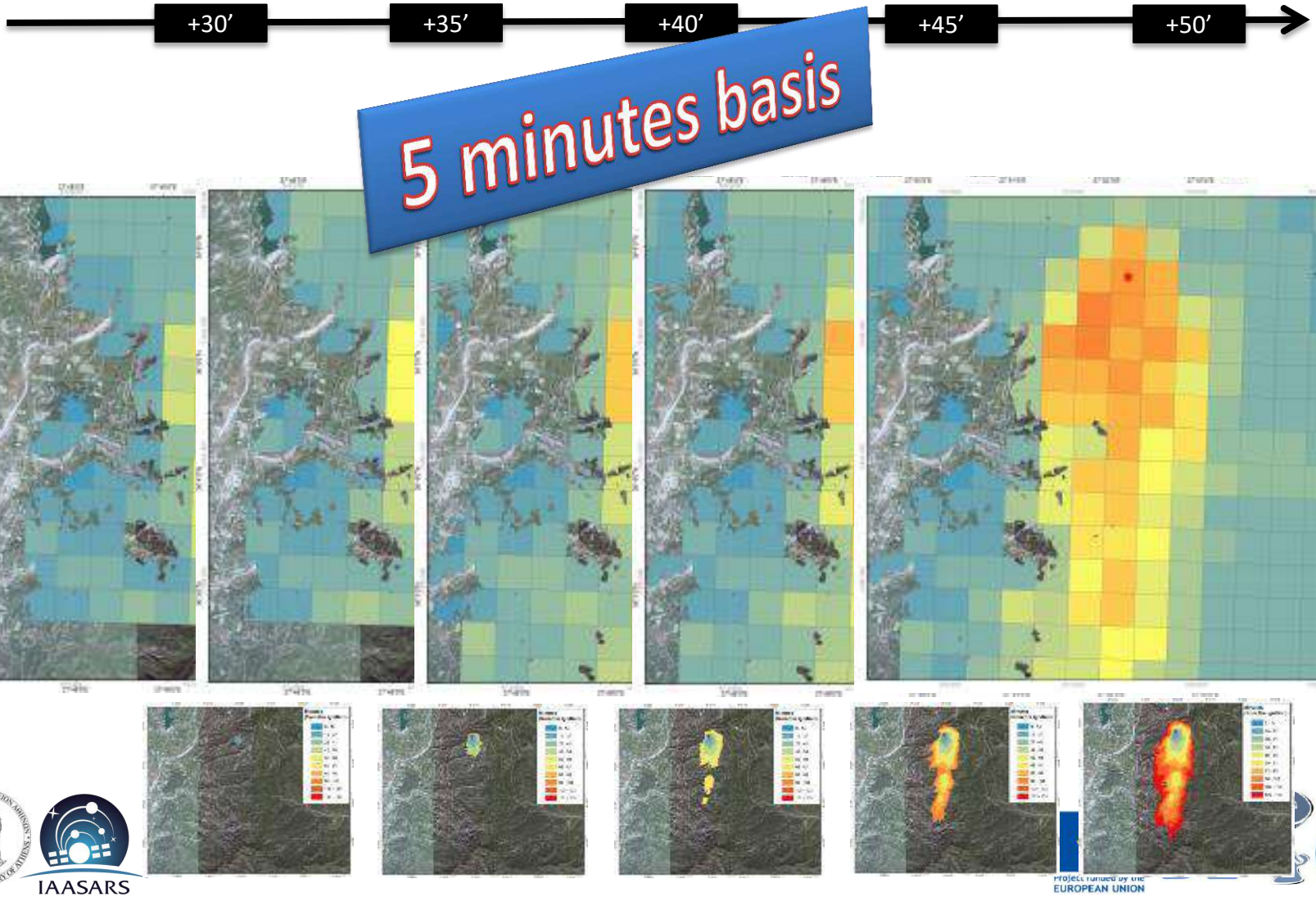
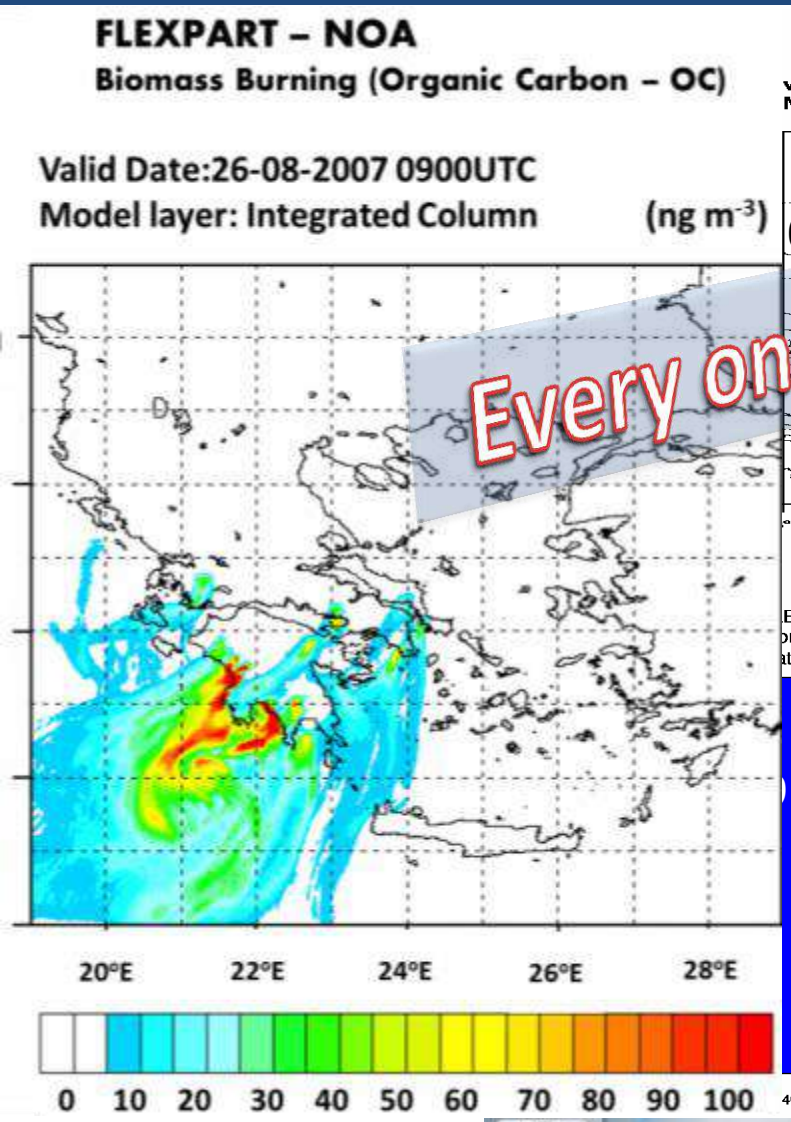
## Regional Real Time Fire Monitoring - NOA's MSG SEVIRI Station

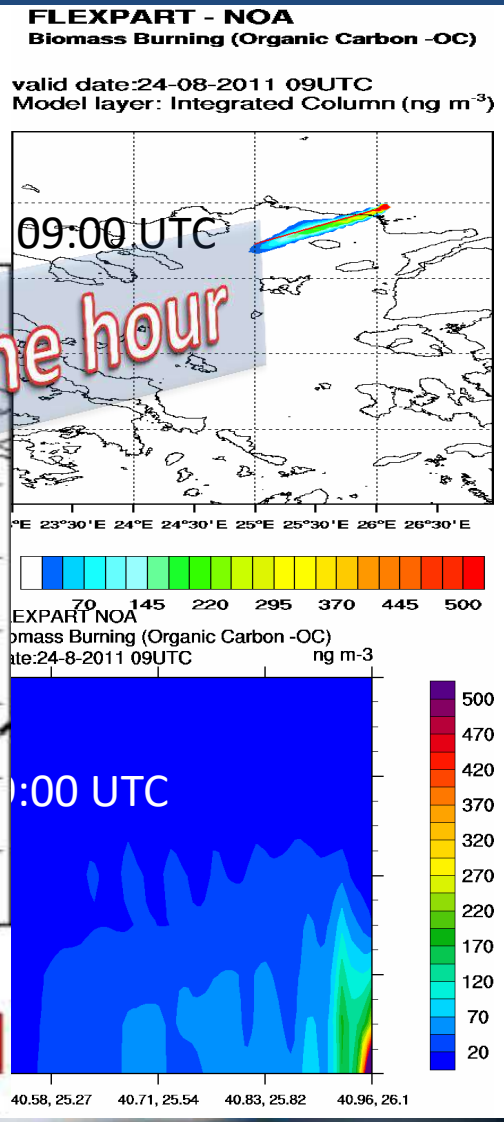
# BEYOND, The European EO Center of Excellence in BAMENA

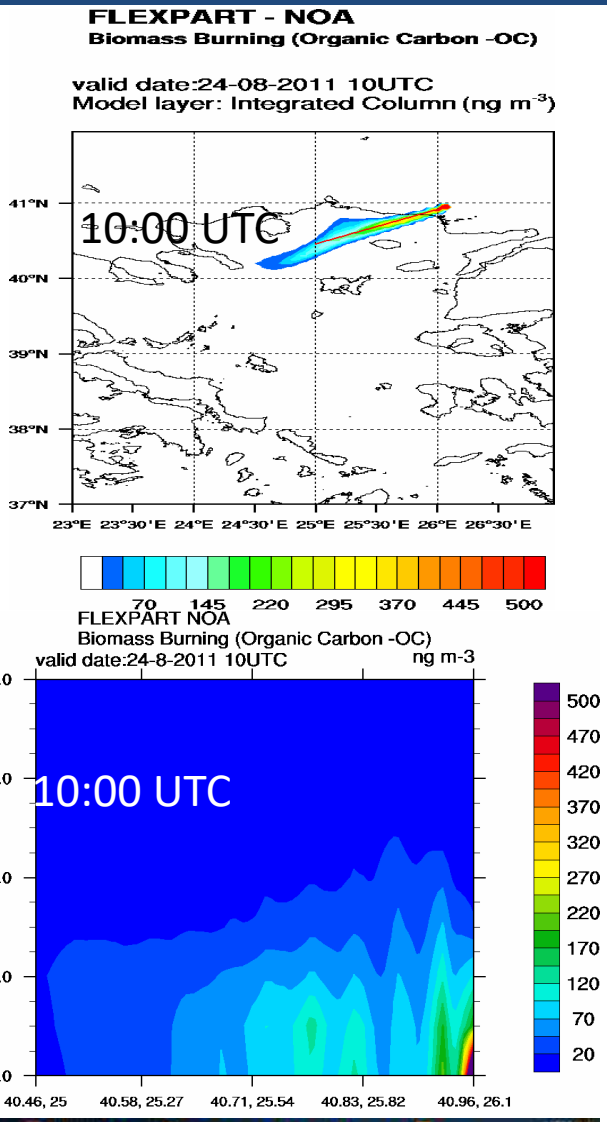
## Results @ 150 minutes after fire ignition



# BEYOND, The European EO Center of Excellence in BAMENA




Every one hour

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BEYOND FireHub

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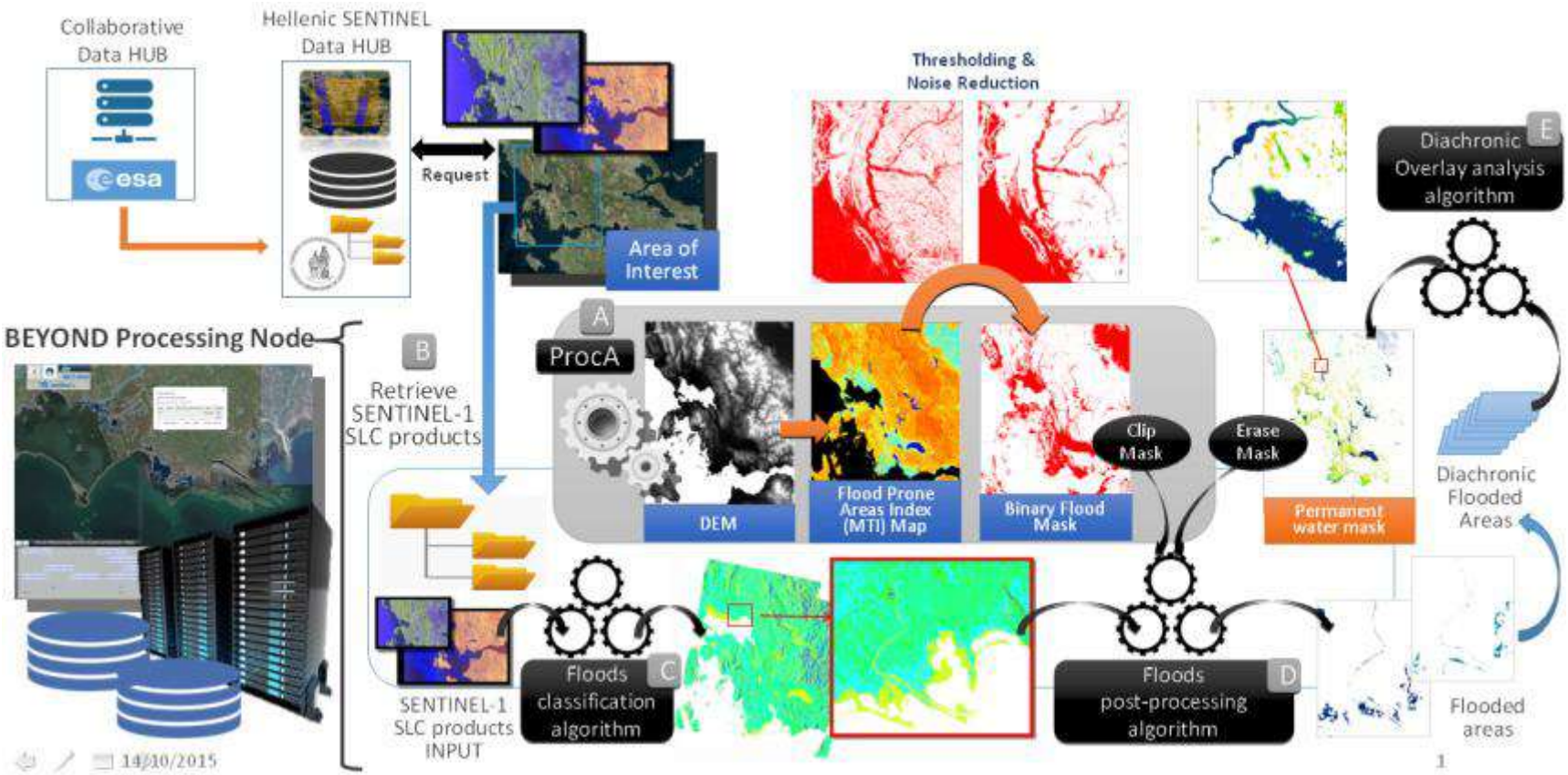
## FloodHub: BEYOND's Floods Monitoring Service Architecture

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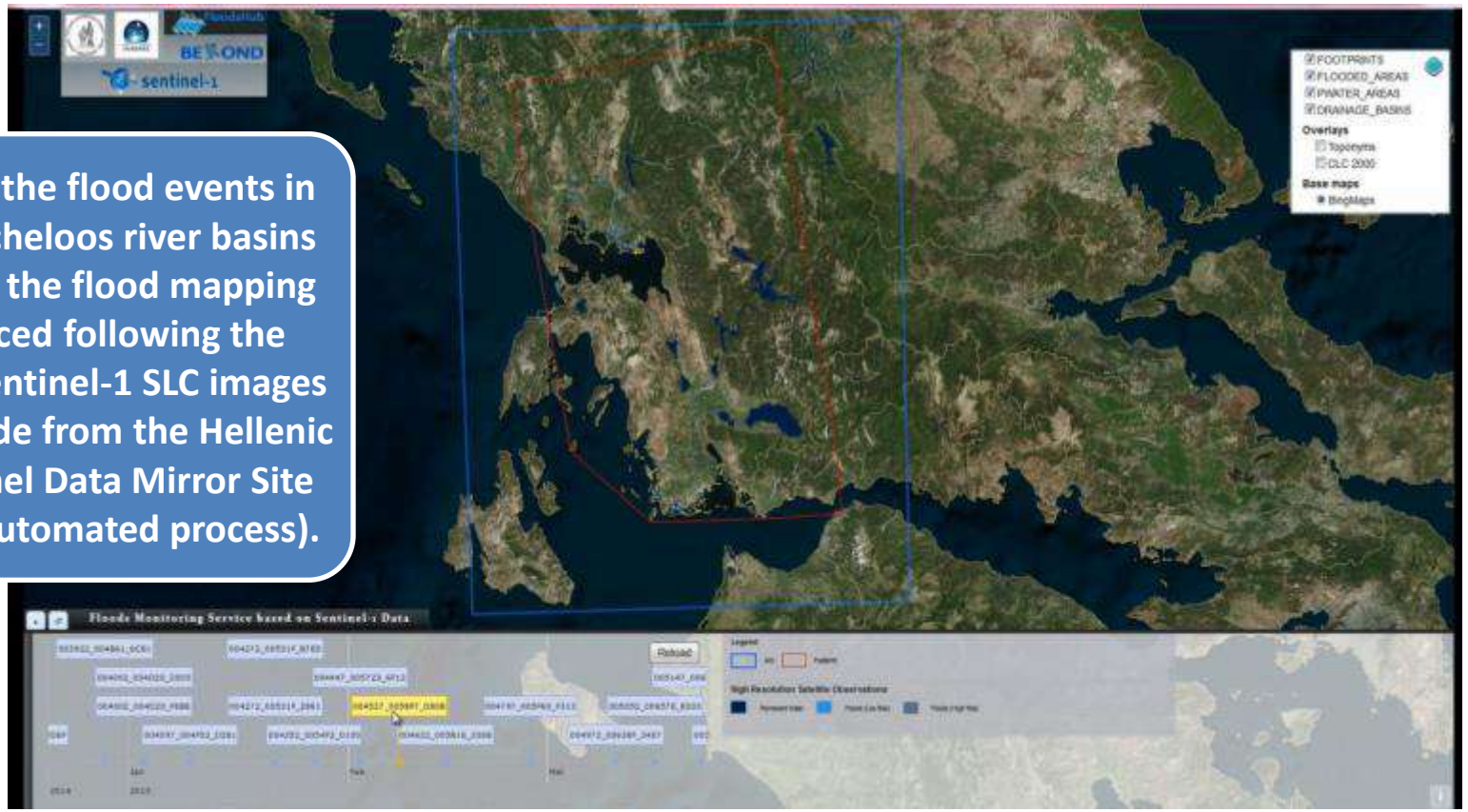
## FloodHub: BEYOND's Floods Monitoring Service — Overview

We monitor all the flood events in Arachthos & Acheloos river basins and we publish the flood mapping results produced following the processing of Sentinel-1 SLC images of IW swath mode from the Hellenic National Sentinel Data Mirror Site (the first fully automated process).

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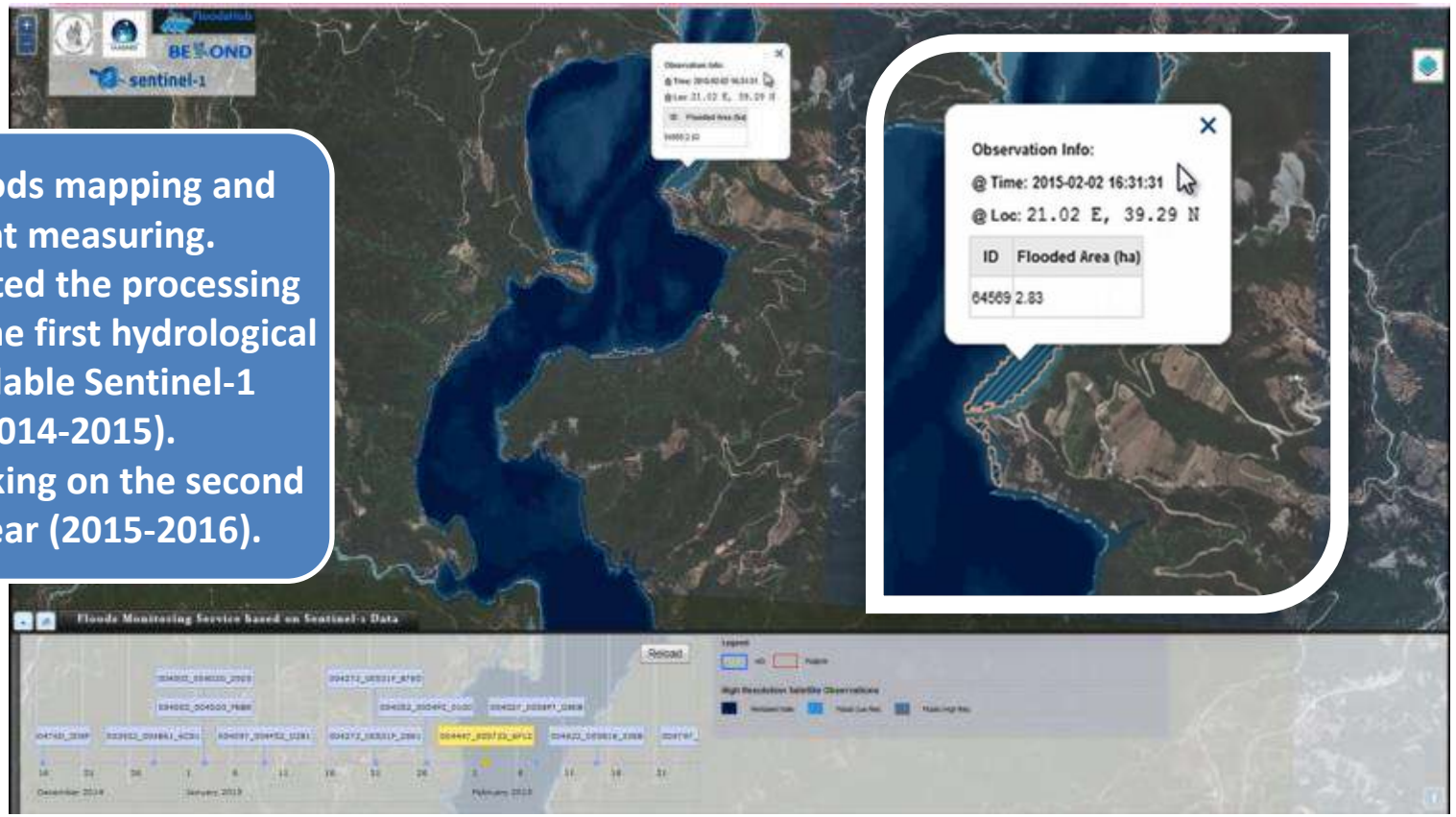
## FloodHub: BEYOND's Floods Monitoring Service — Detail

We provide floods mapping and floods extent measuring.
We have completed the processing and analysis for the first hydrological year with available Sentinel-1 images (2014-2015).
We are now working on the second hydrological year (2015-2016).

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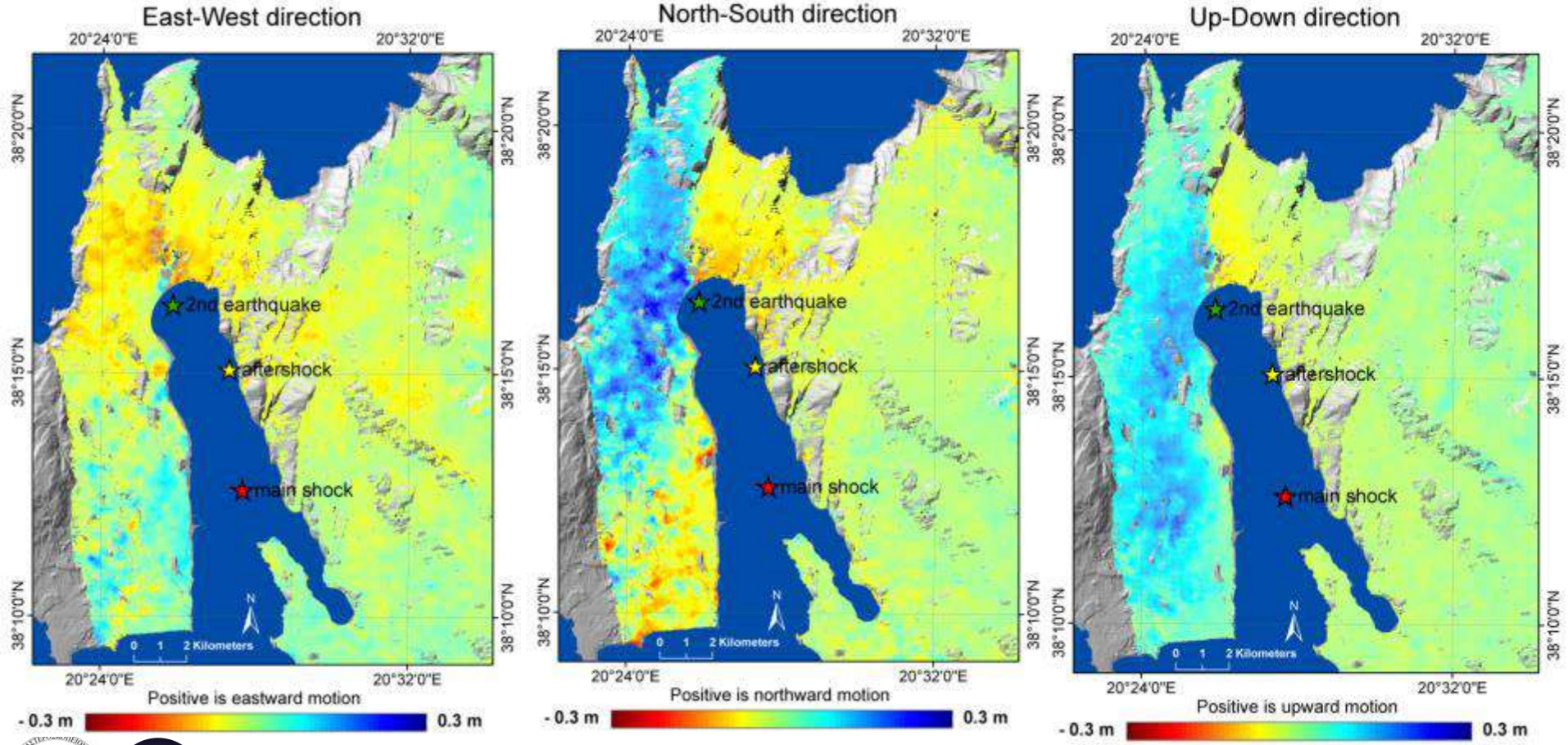
# Earthquakes – Cephalonia case

- 3D crustal deformation from TerraSAR-X & COSMO-SkyMed data
- Inversion to estimate fault parameters




Merryman Boncori et al., SRL 2015

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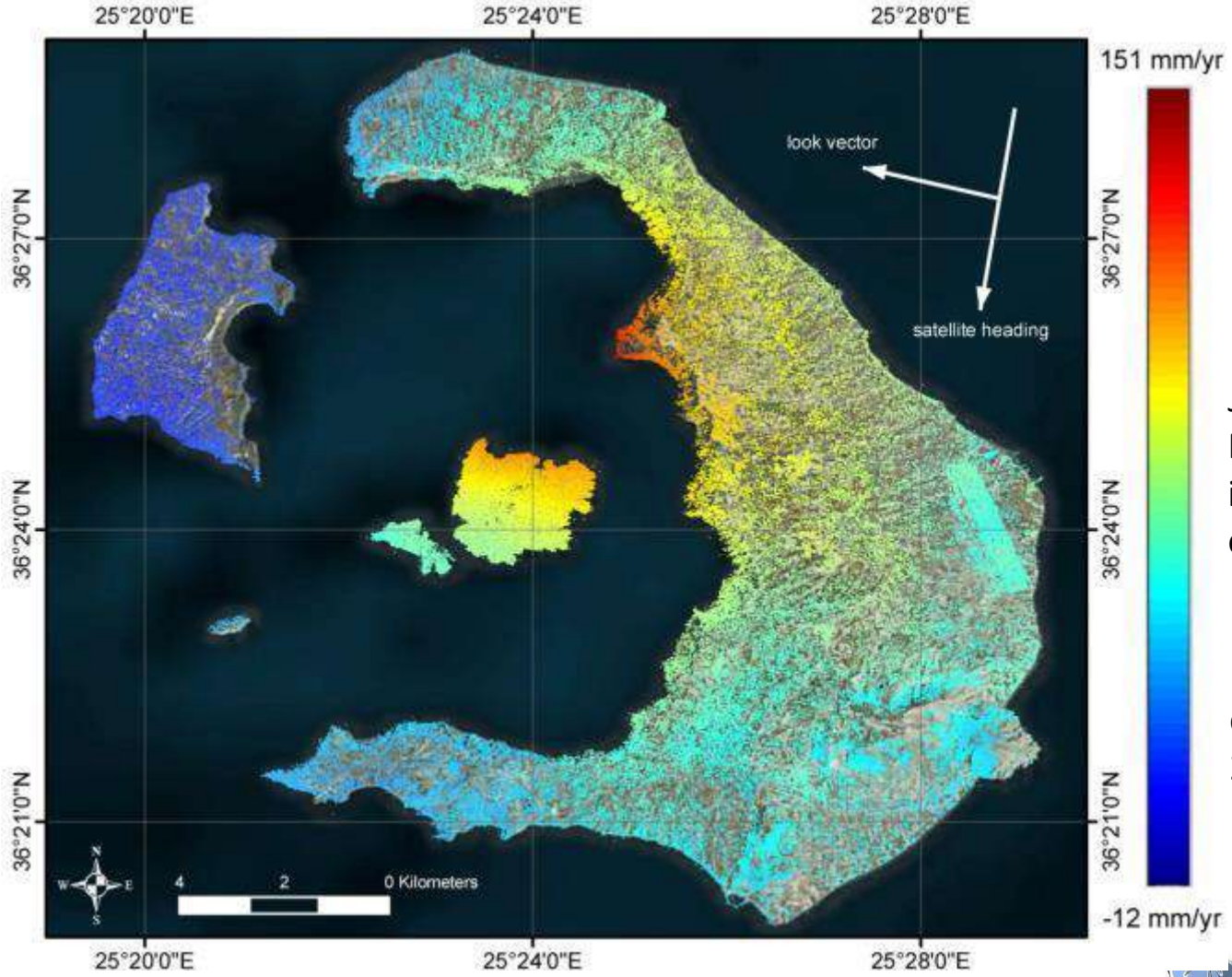
# Volcanoes – Santorini case

**Data**
- NSN
- NOANET
- ENIGMA
- In-situ

**Services**
- Geodesy
- Modeling
- Hazard Ass.
- Large Proc.

**Applications**
- Tectonics
- Volcanoes
- Landslides
- Subsidence




Jan. 2011 – Mar. 2012 inflation episode

Papoutsis et al., GRL 2013

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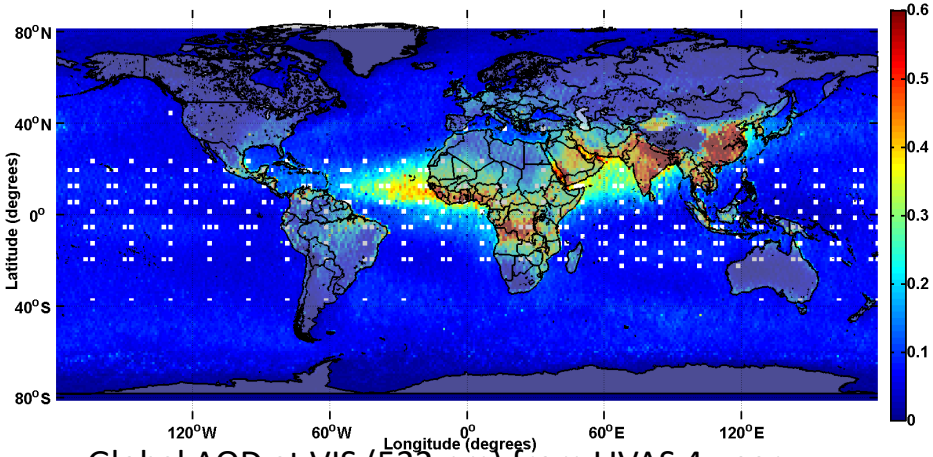
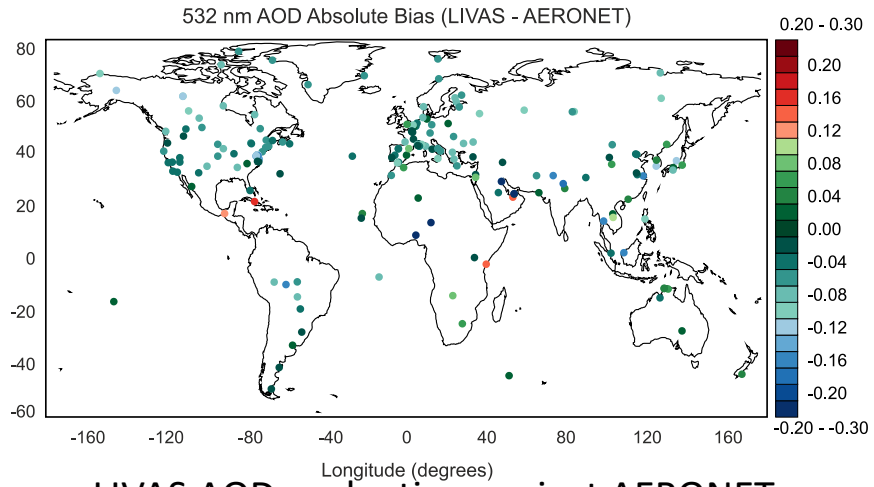
**Global 3D climatology of aerosols and clouds**
**LIVAS portal under BEYOND (1x1 degree resolution)**




Global AOD at VIS (532 nm) from LIVAS 4-year averages of CALIPSO observations




LIVAS AOD evaluation against AERONET

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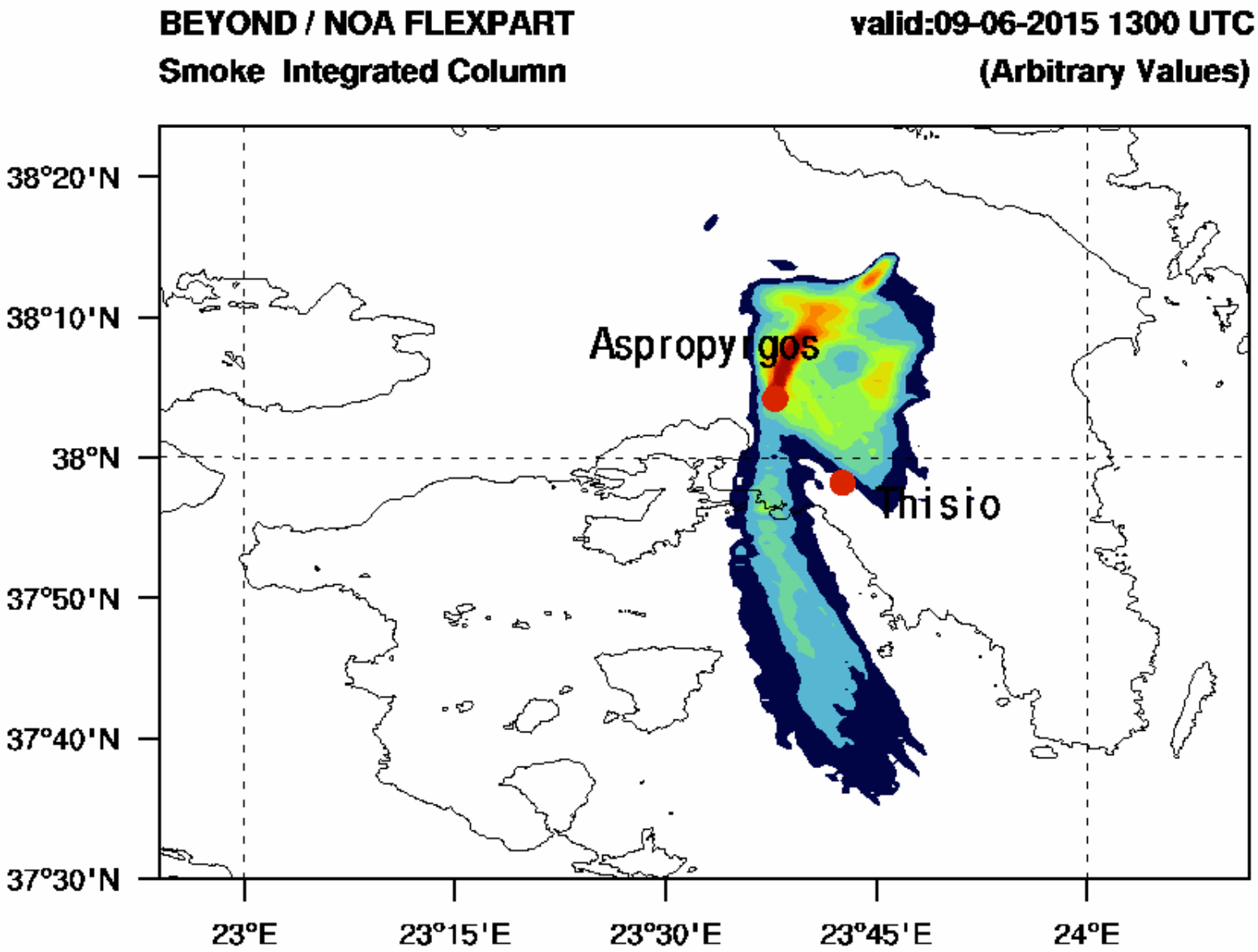
BEYOND / NOA FLEXPART
Smoke Integrated Column
valid:09-06-2015 1300 UTC
(Arbitrary Values)
38°20'N
38°10'N
38°N
37°50'N
37°40'N
37°30'N
23°E
23°15'E
23°30'E
23°45'E
24°E
Aspropyrgos
Thisio

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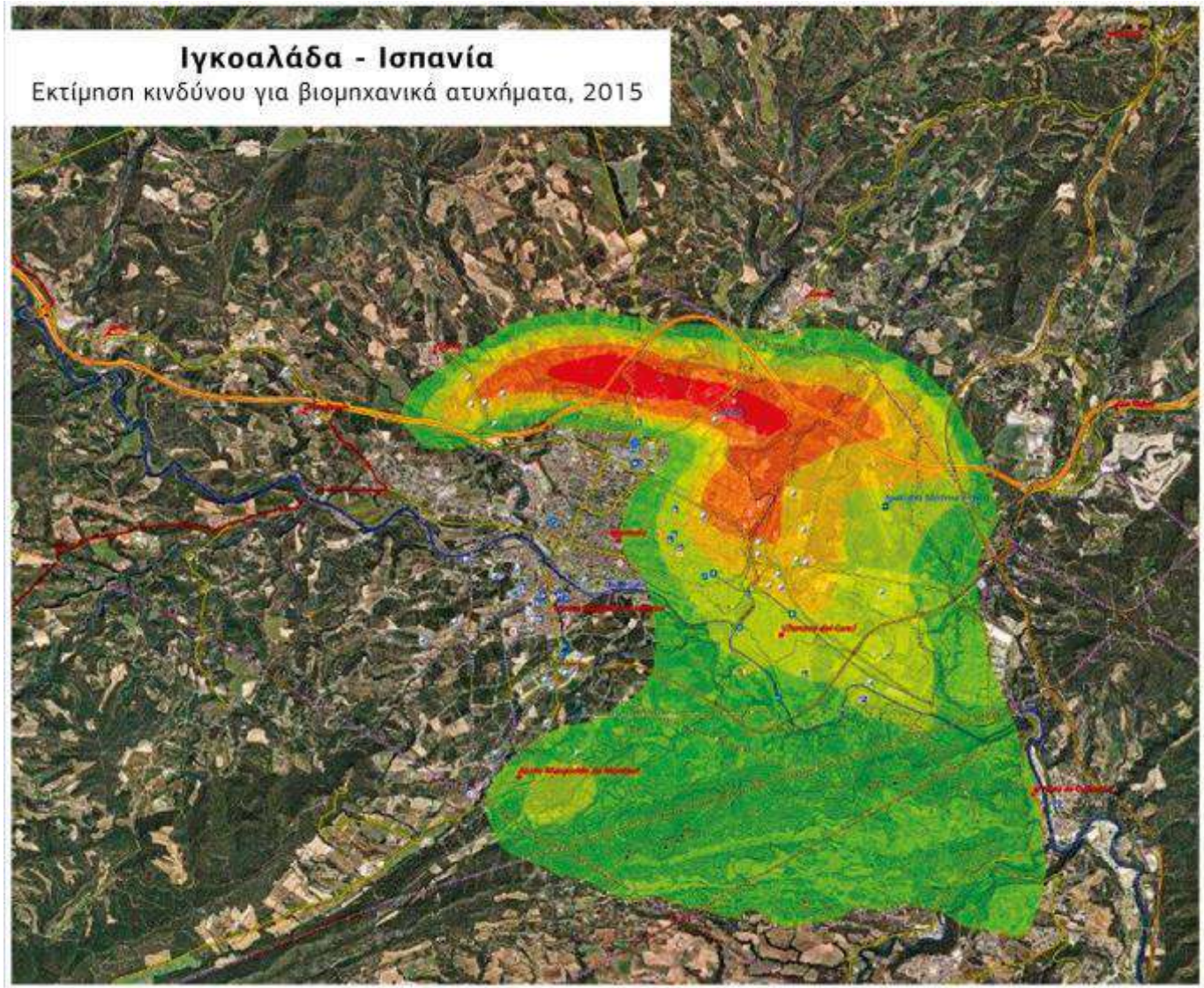
**Copernicus EMS Risk & Recovery Activations**

Catalonia, Spain
EMSN026

Toxic cloud after an industrial accident

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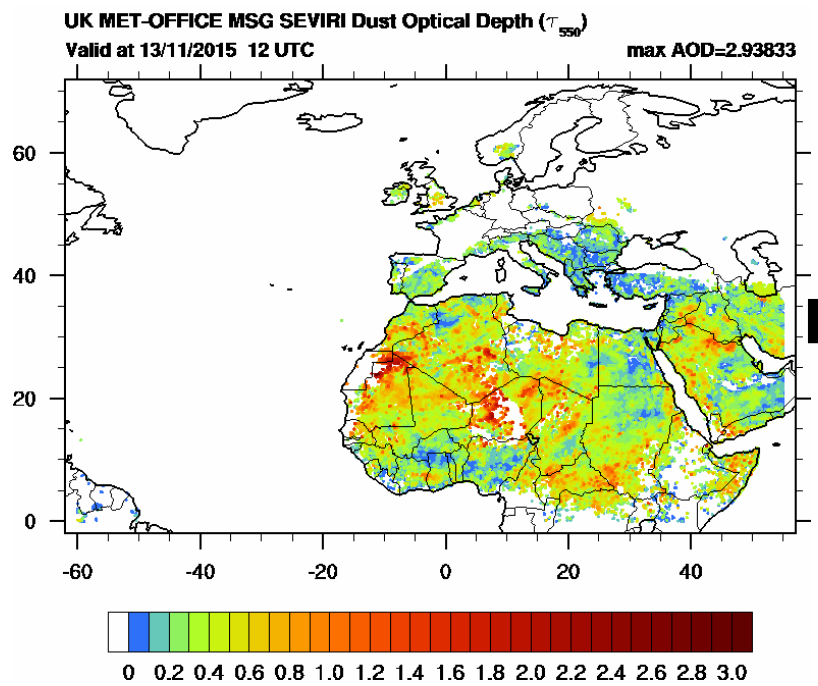
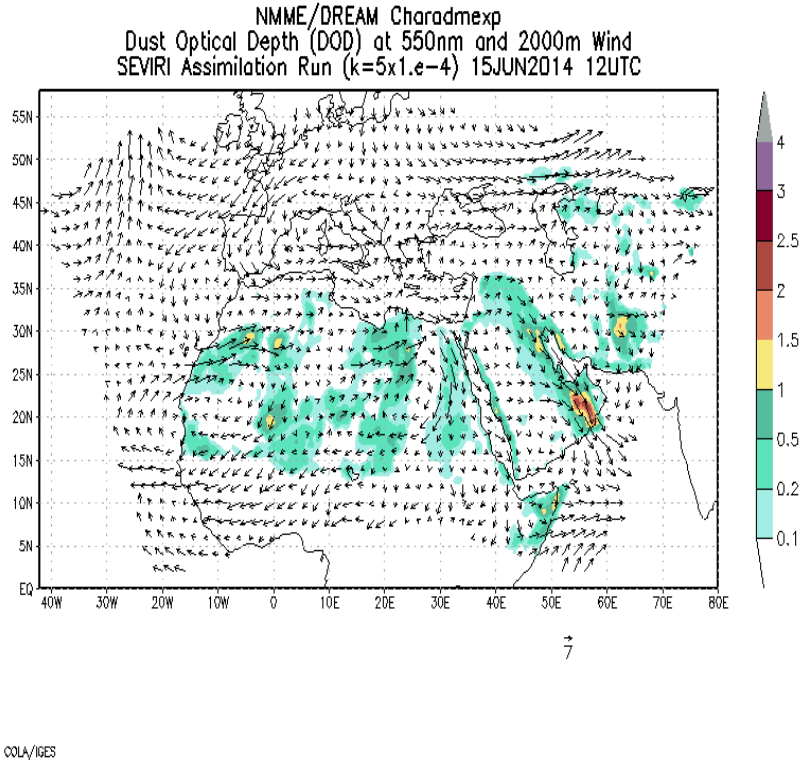



**Dust initial field assimilation**




U.K. Met Office MSG dust optical thickness

NMME-DREAM model with dust assimilation

Solomos et al., 2016, COMECAP

European Center of Excellence for EO Disaster Management

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DisasterHub

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## UAV Assisted Loss Recording

**Cephalonia Earthquake**
**Feb 2014**


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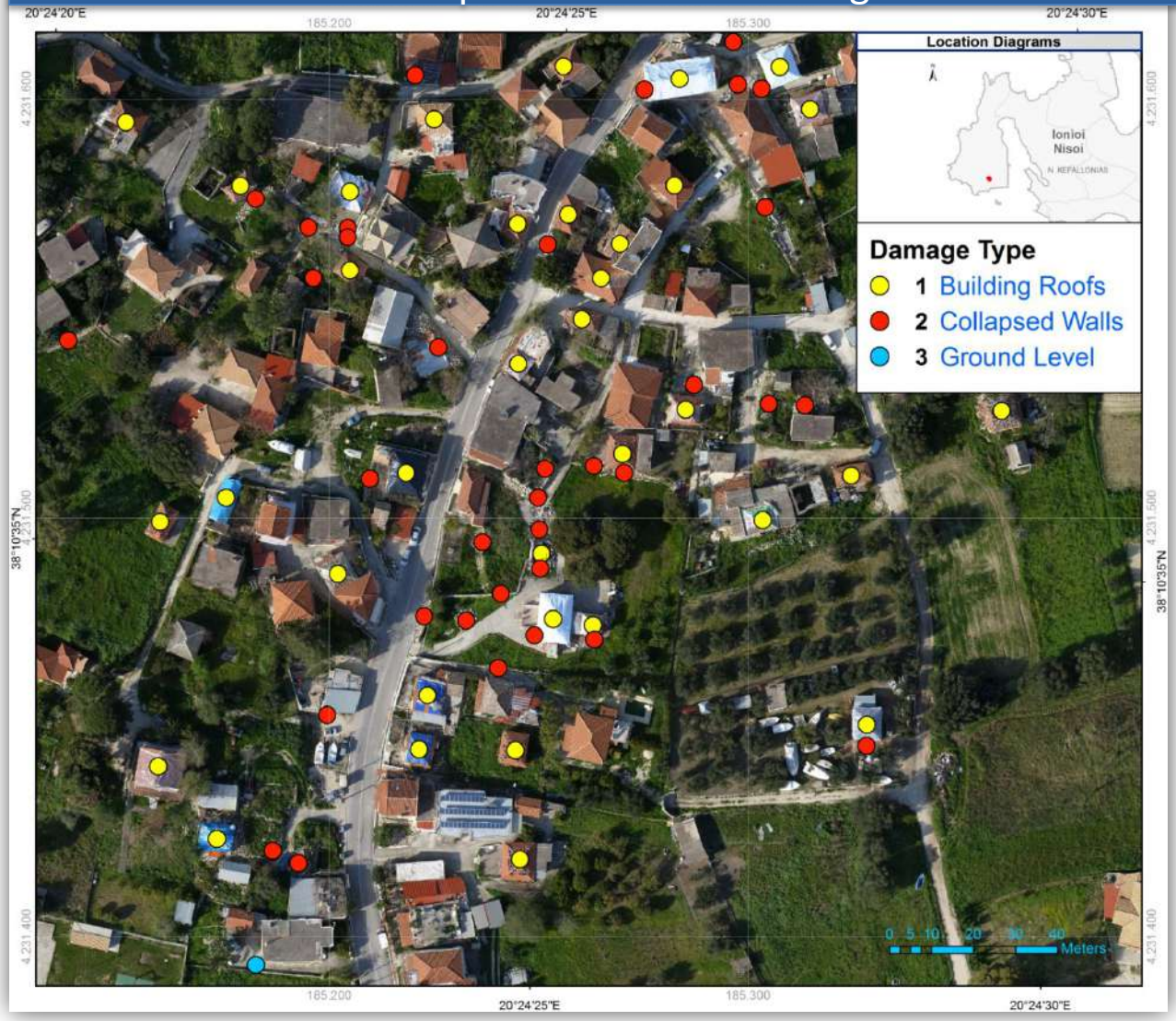
## Cephalonia Island – Village of Mantzavinata

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**Activation**

Thasos, Greece

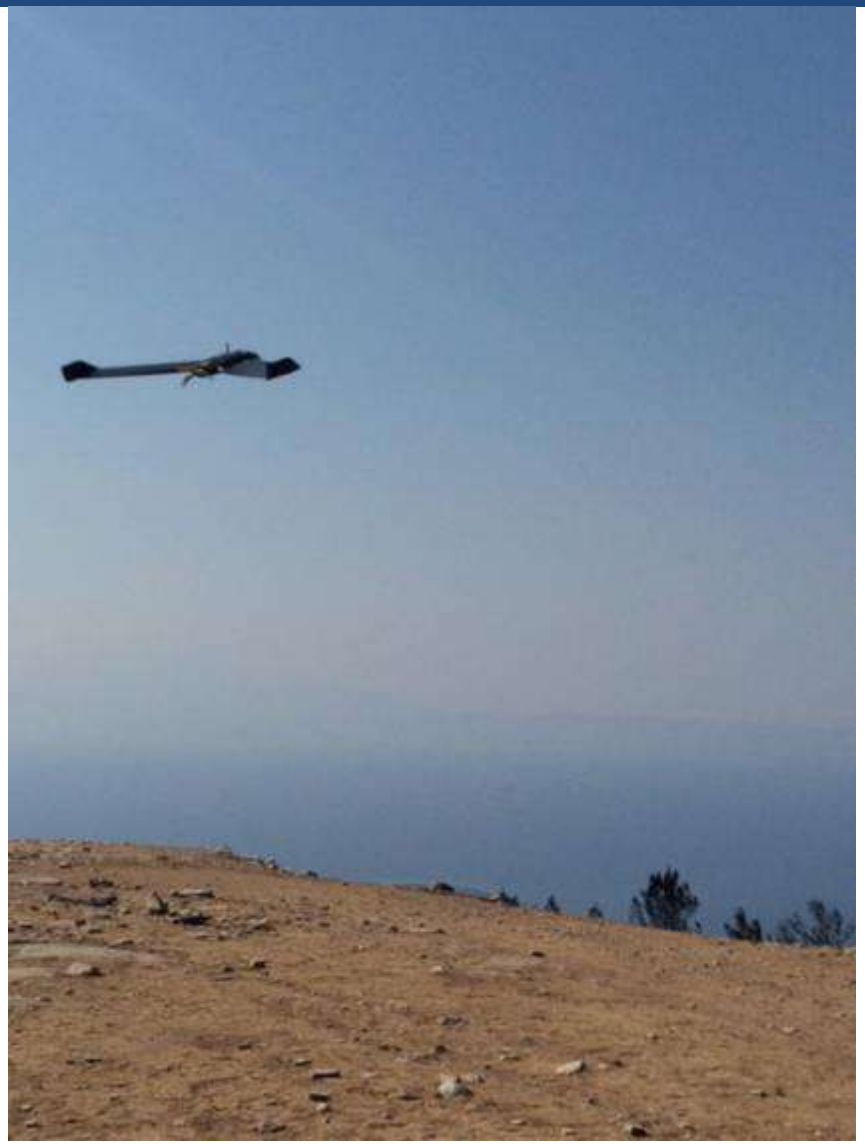
Fire

# BEYOND, The European EO Center of Excellence in BAMENA

**Activation**

Thasos, Greece

Fire



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**Activation**

Thasos, Greece

Fire

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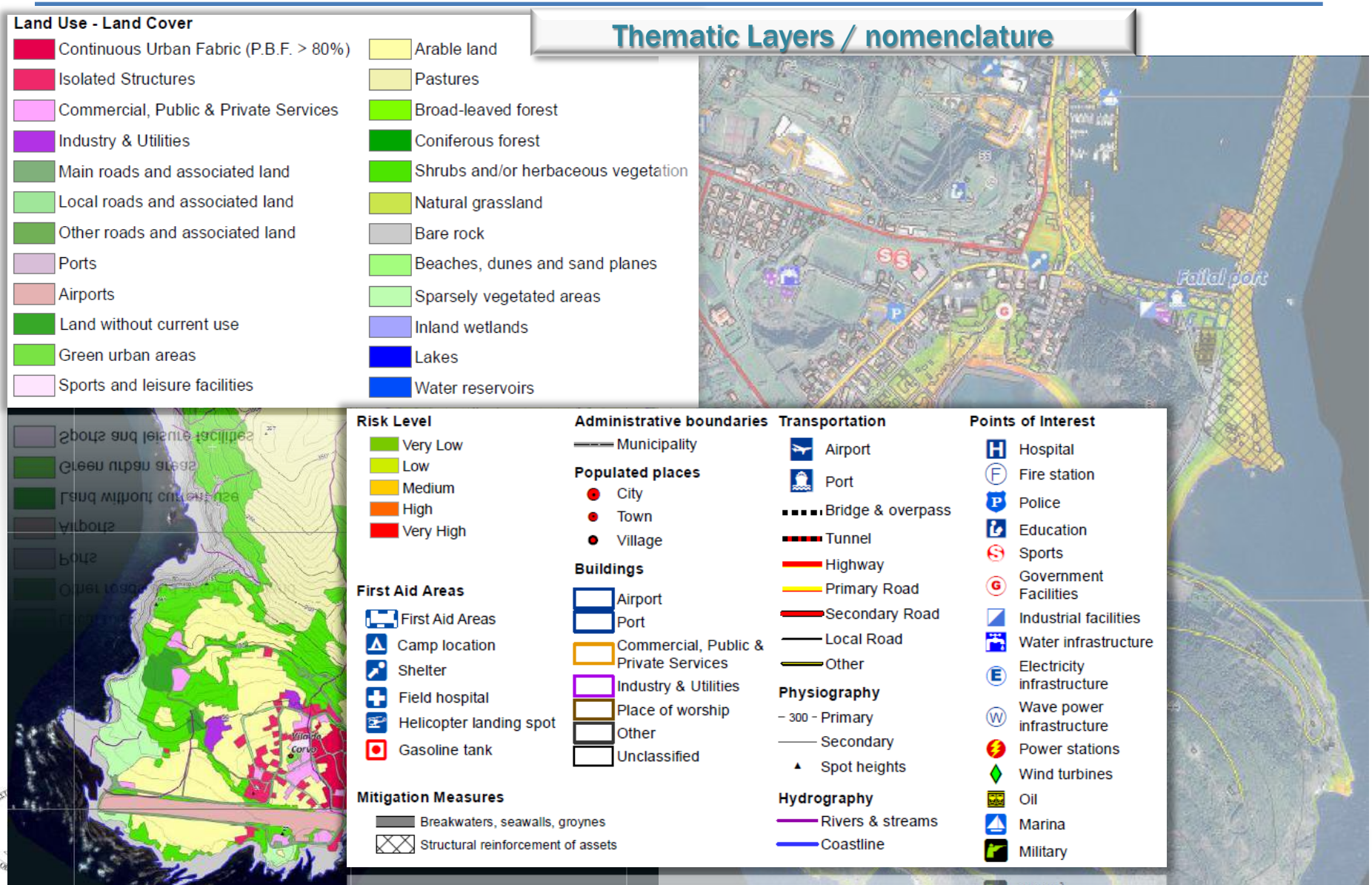
# **Azores activation** Reference mapping



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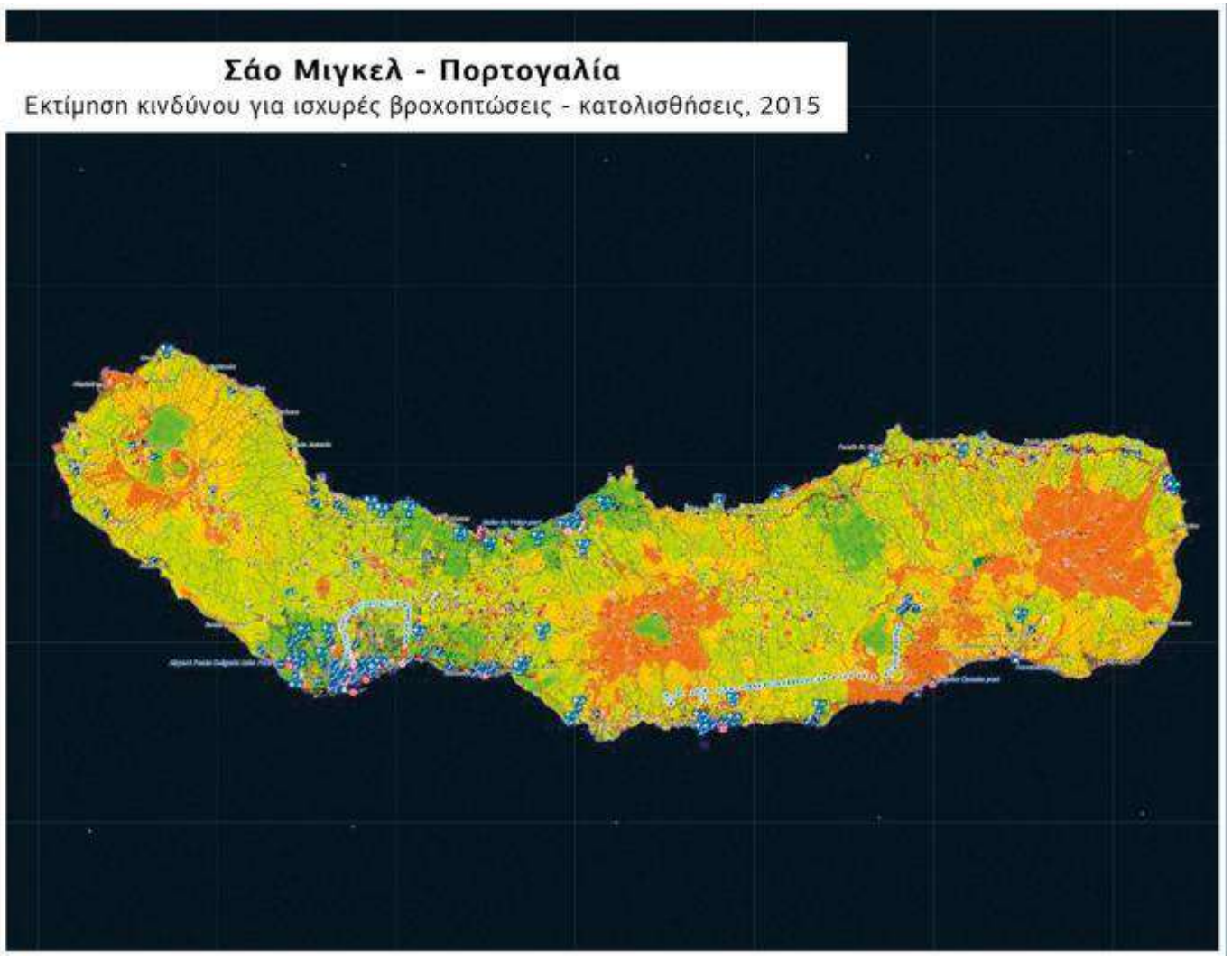
**Copernicus EMS Risk & Recovery Activations**

Azores islands, Portugal
EMSN018

Multiple natural hazards:

- Seismic
- Flash Flood
- Tsunami & Storm Surges
- Landslide & Erosion
- Lava Flow
- Coastal Erosion

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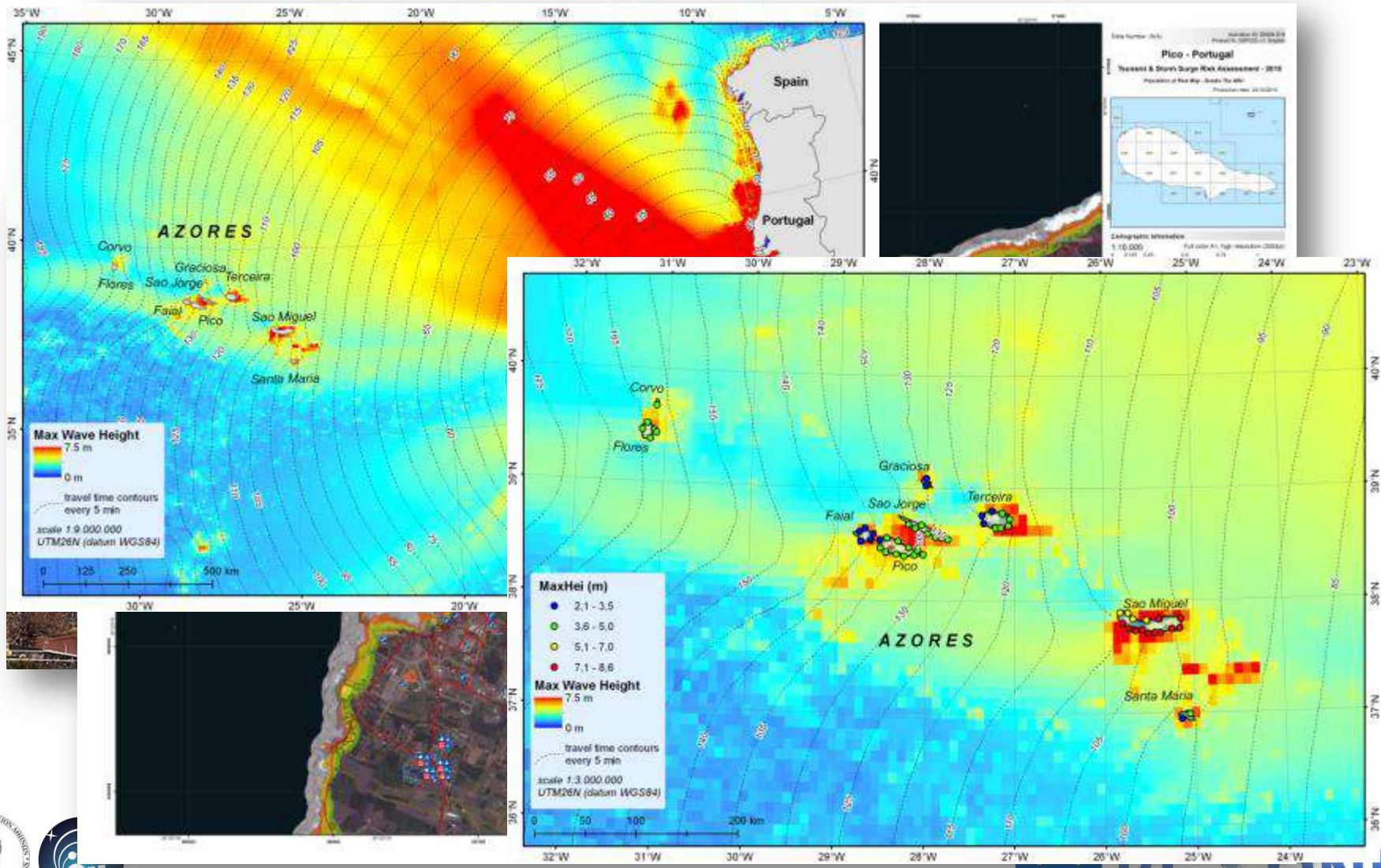
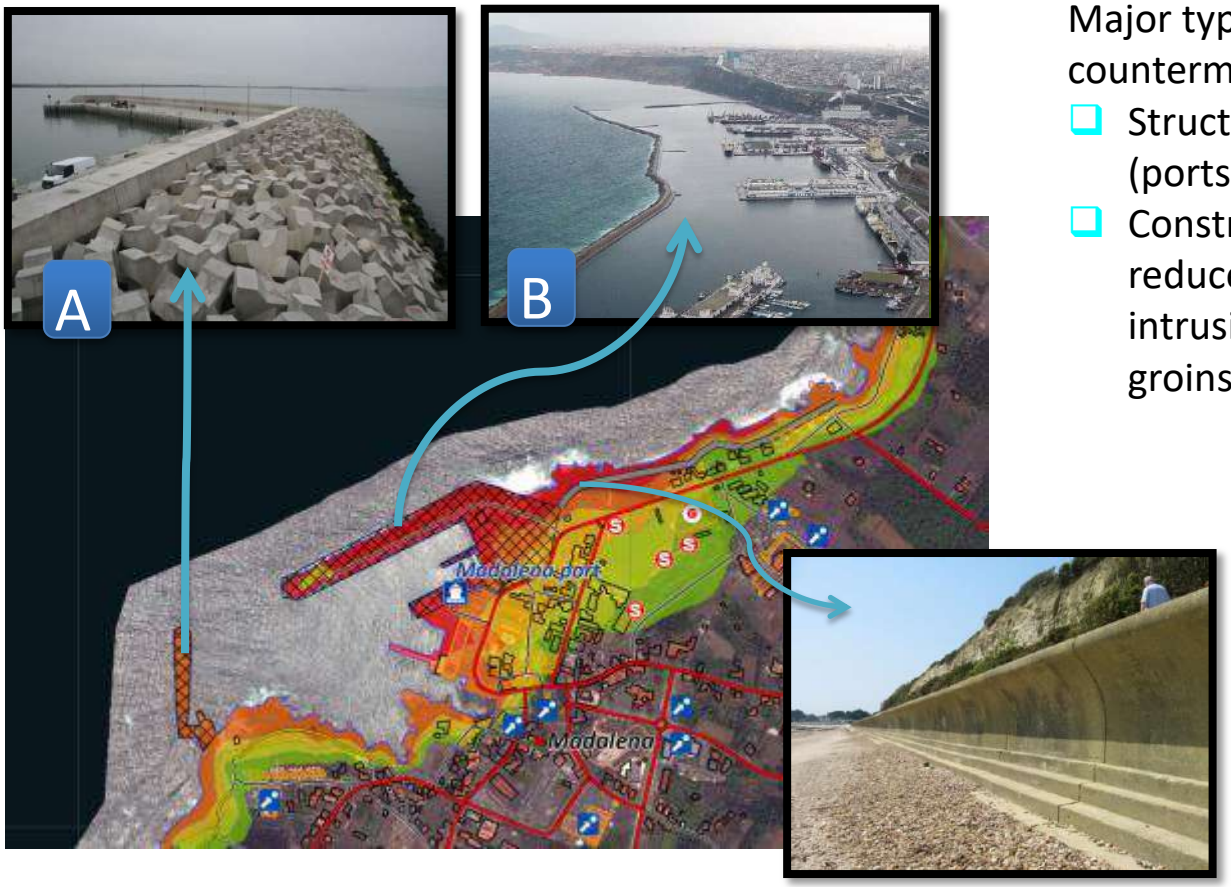
## Azores activation

Tsunami



## Azores activation

Tsunami




Major types of structural countermeasures:

- Structural reinforcement of assets (ports & other on-land facilities) [A]
- Construction of defences in order to reduce tsunami & storm surges intrusion (Breakwaters, seawalls, groins, quays, dykes / levees) [B]

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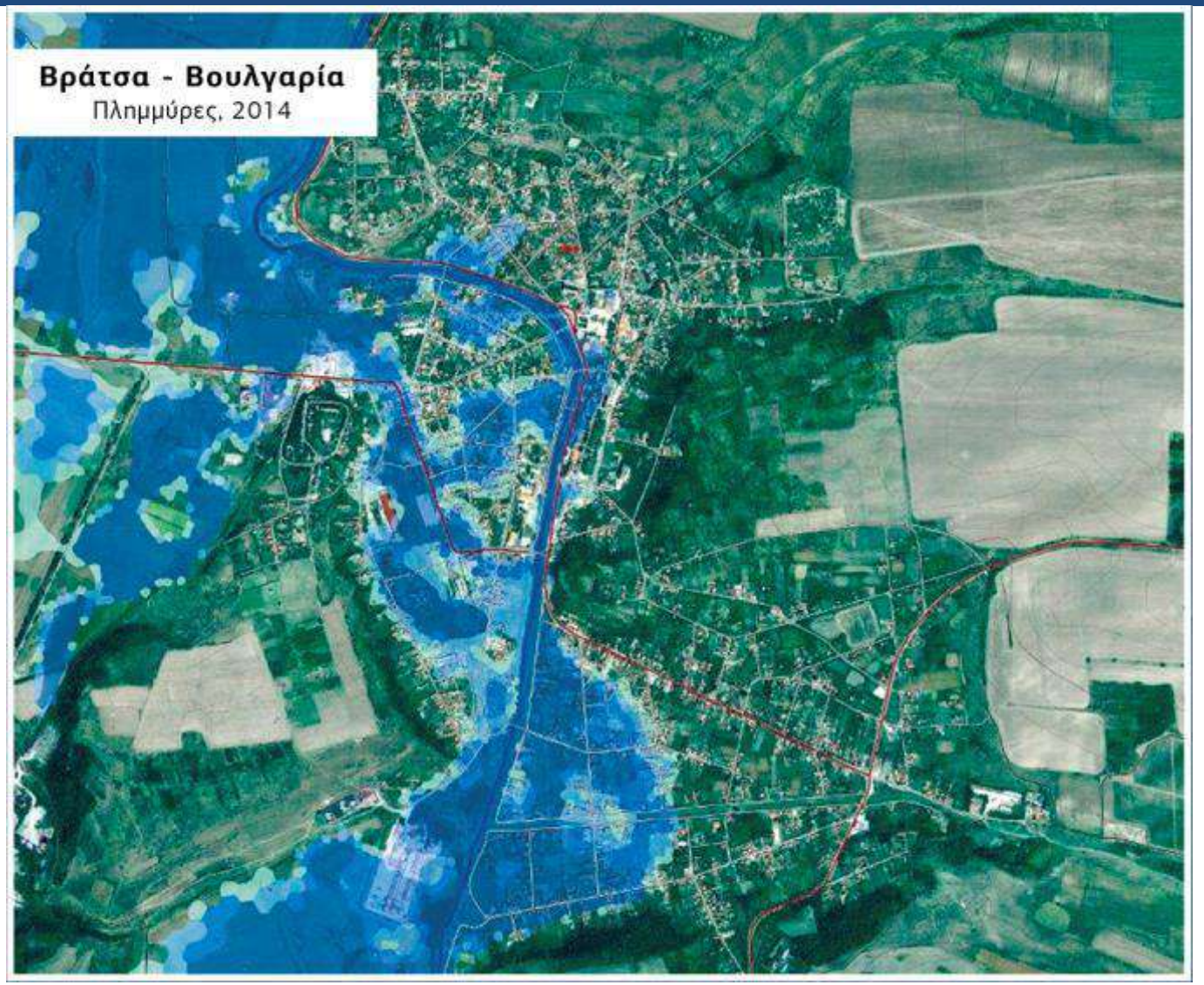
**Copernicus EMS Risk & Recovery Activations**

Bulgaria
EMSN022

Flood

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BEYOND

Coordinating and integRating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East and Balkans and Developing Links with GEO related intiatives toward GEOSS

# GEO-CRADLE:

## Fostering regional cooperation and roadmap for GEO and Copernicus implementation in N. Africa, Middle East, and the Balkans

*Funded under H2020 - Climate action, environment, resource efficiency and raw materials*
*ACTIVITY: Developing Comprehensive and Sustained Global Environmental Observation and Information Systems*
*CALL IDENTIFIER: H2020 SC5-18b-2015 Integrating North African, Middle East and Balkan Earth Observation capacities in GEOSS*
***Project GA number: 690133***
***Total Budget: 2,910,800.00 €***

IAASARS

GROUP ON EARTH OBSERVATIONS

Coordinating and integRating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East and Balkans and Developing Links with GEO related intiatives toward GEOSS

# GEO-CRADLE

… is a unique EU funded Coordination Action running at regional level,
… is looking at the N. Africa, Middle East, and the Balkan territories;

It seeks to identify common needs, create synergies, and integrate capacities,

Fosters the regional cooperation and integration of monitoring capabilities and networks, and scientific skills

Proposes/sets up large scale regional initiatives based on the Earth Observation (space based and in-situ) for addressing societal priorities in different thematic aspects such as Adaptation to Climate Change, Access to Raw Materials, better exploitation of the renewable Energy resources, and Food Security

## Objectives

- **Promote** the uptake of EO services and data in response to regional needs
- **Support** the effective integration of existing Earth Observation Capacities in the region
- **Facilitate** the engagement of the complete ecosystem of EO stakeholders in the region
- **Enhance** the participation in and contribution to the implementation of **GEOSS** and **Copernicus** in **North Africa**, **Middle East** and the **Balkans**

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# Thematic Areas

***Adaptation to Climate Change (ACC)***

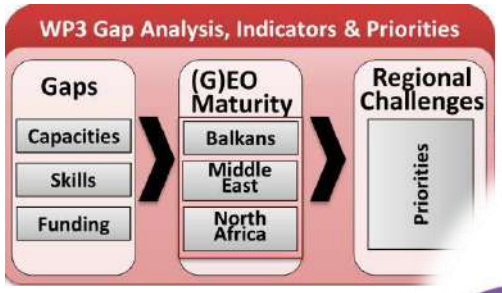
***Improved Food Security – Water Extremes Management (IFS)***

***Access to Raw Materials (ARM)***

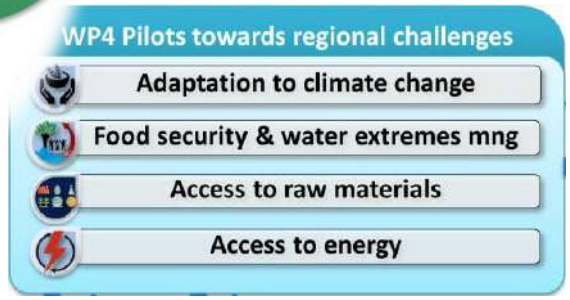
***Access to Energy (SENSE)***

Coordinating and integRating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East and Balkans and Developing Links with GEO related intiatives toward GEOSS

# The Project Pillars






Visit:
http://195.251.203.238/surveygeocradle/index.php/inventories/capacities/gc-survey1

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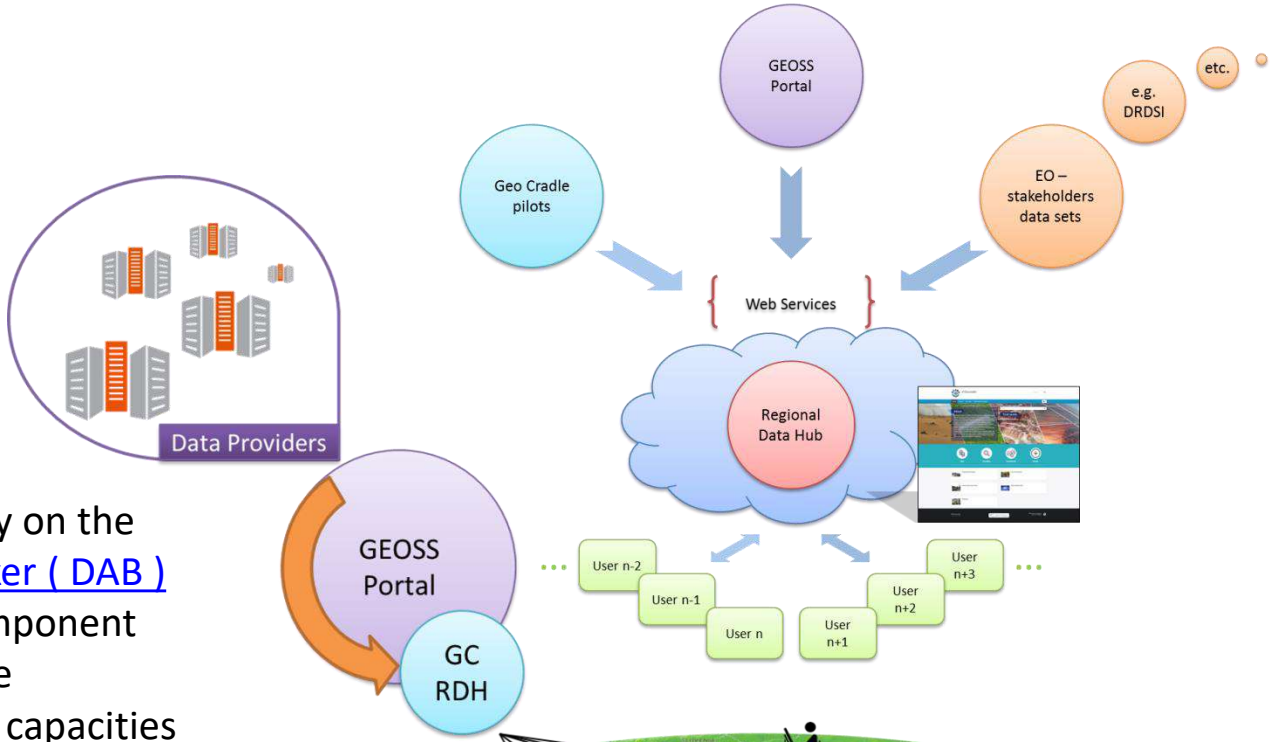
# Regional Data Hub – Connection with GEOSS & Regional Portals

- GEO CRADLE Regional Data Hub (GC-RDH) is going to provide its users with a transparent discovery and access mechanism of the GEOSS portal's resources, and other regional portals!




- This mechanism will heavily rely on the GEO Discovery and Access Broker ( DAB ) APIs which is a middleware component in charge of interconnecting the heterogeneous and distributed capacities contributing to GEOSS; part of the GEOSS Common Infrastructure (GCI) since November 2011.

# Roadmap for future Implementation of GEOSS

**Guides** the implementation of GEOSS and the uptake of Copernicus in the RoI

**Assesses** the readiness and maturity of each country in the RoI

**Lays out** the actions for the long-term response to major regional challenges in the RoI

**Paves** the ground for a potential regional large initiative

Coordinating and integRating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East and Balkans and Developing Links with GEO related intiatives toward GEOSS

BEYOND

thank you!

## For more information

http://www.beyond-eocenter.eu

http://geocradle.eu/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