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 €

Haris KONTOES, Research Director, National Observatory of Athens,
Project Coordinator

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 and enhancing the societal resilience in the thematic areas of 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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The Thematic Priorities of GEO-CRADLE are linked with the SDGs

Adaptation to Climate Change (ACC)

Improved Food Security – Water Extremes Management (IFS)

Access to Raw Materials (ARM)

Access to Energy (SENSE)

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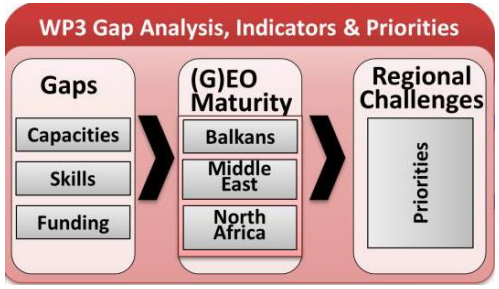
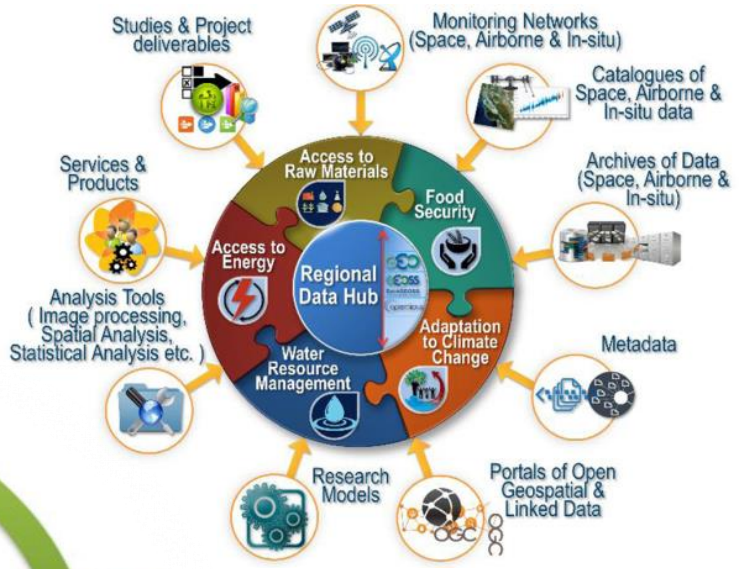
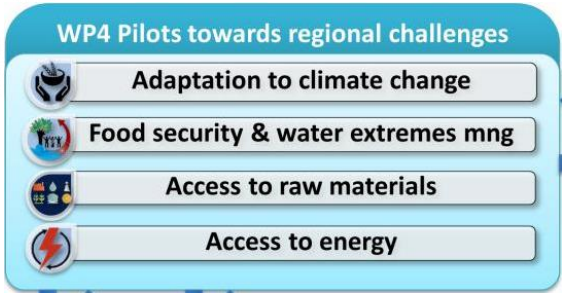
The Project Pillars







17 PARTNERSHIPS FOR THE GOALS

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

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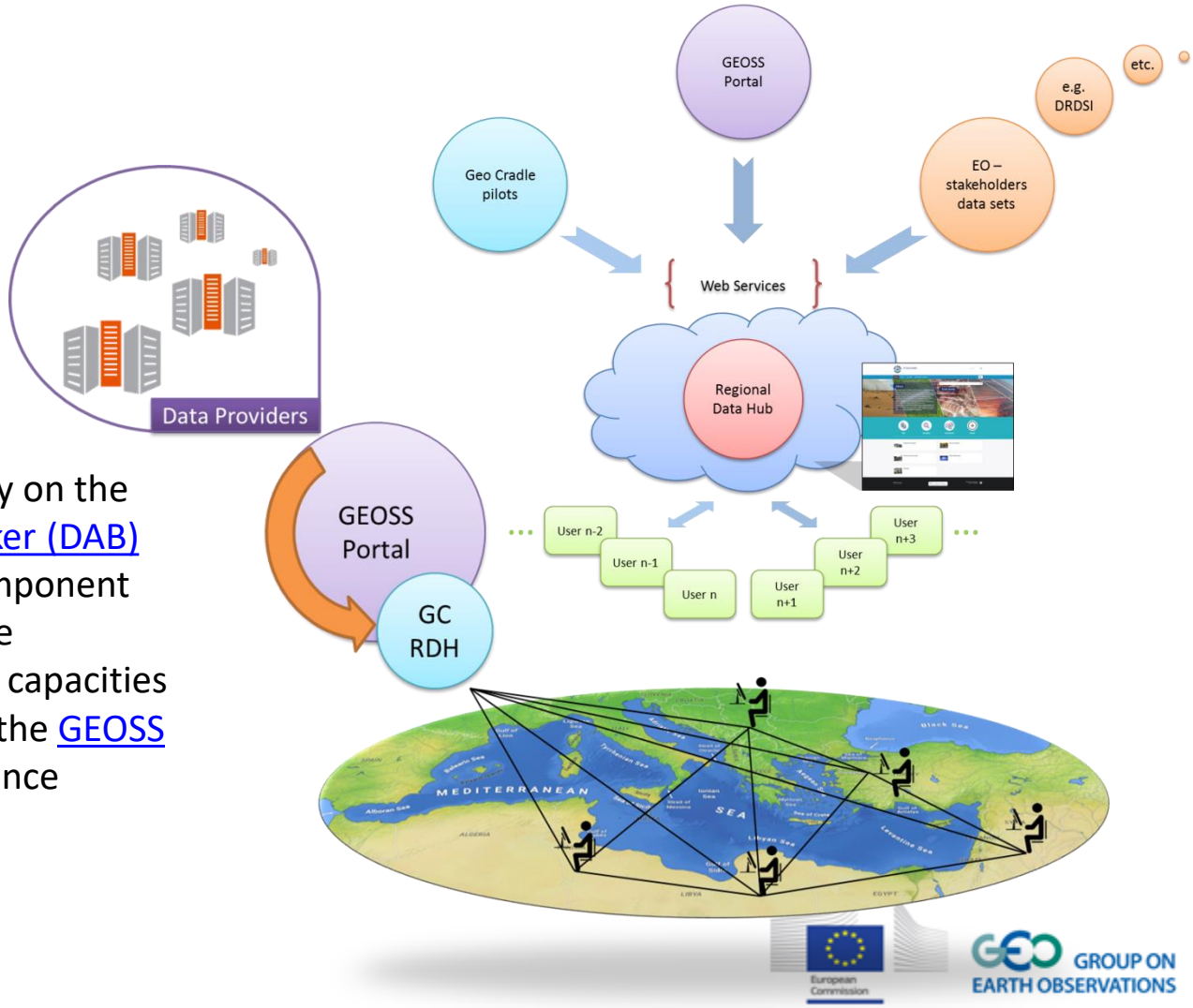
Regional Data Hub – Connection with GEOSS & Regional Portals

- 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.



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

Roadmap for future Implementation of GEOSS and Copernicus

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

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

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BEYOND

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

Dr Haris KONTOES
Research Director of IAASARS/NOA
Project Coordinator

Funding: 2.3 MEuros EC Contribution
Additional funding from Structural Funds ~270KEuros

Project funded by the EUROPEAN UNION

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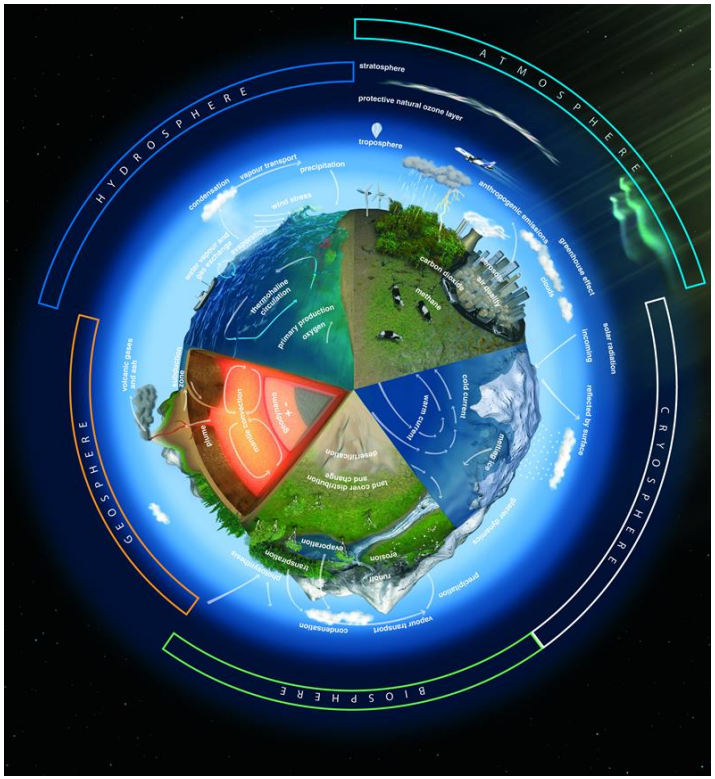
BEYOND, The European EO Center of Excellence in BAMENA



- **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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BEYOND IS LINKED WITH SDGs FRAMEWORK

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 through its active involvement in EU funded programs (e.g. Copernicus EMS) is playing a central role in achieving SDGs and is linked with specific targets as:

- Develops and implements, in line with the Sendai Framework for Disaster Risk Reduction, **holistic disaster risk management at all levels**
- **Suggests mitigation and adaptation measures to climate change**
- **Enhances the resilience of societies to disasters** (extreme weather disastrous events (fires, floods, surge storms), atmospheric episodes (toxic clouds, dust storms), geo-hazards (earthquakes, landslides, sol erosion, tsunamis, volcanoes)
- **Protects the human welfare and health**
- **Anticipates the protection of food** against soil erosion, and extreme events such as flooding and drought
- **Increases the sustainability of the urban environment**, and reduces the vulnerability of the built up areas to atmosphere episodes and geo-hazards

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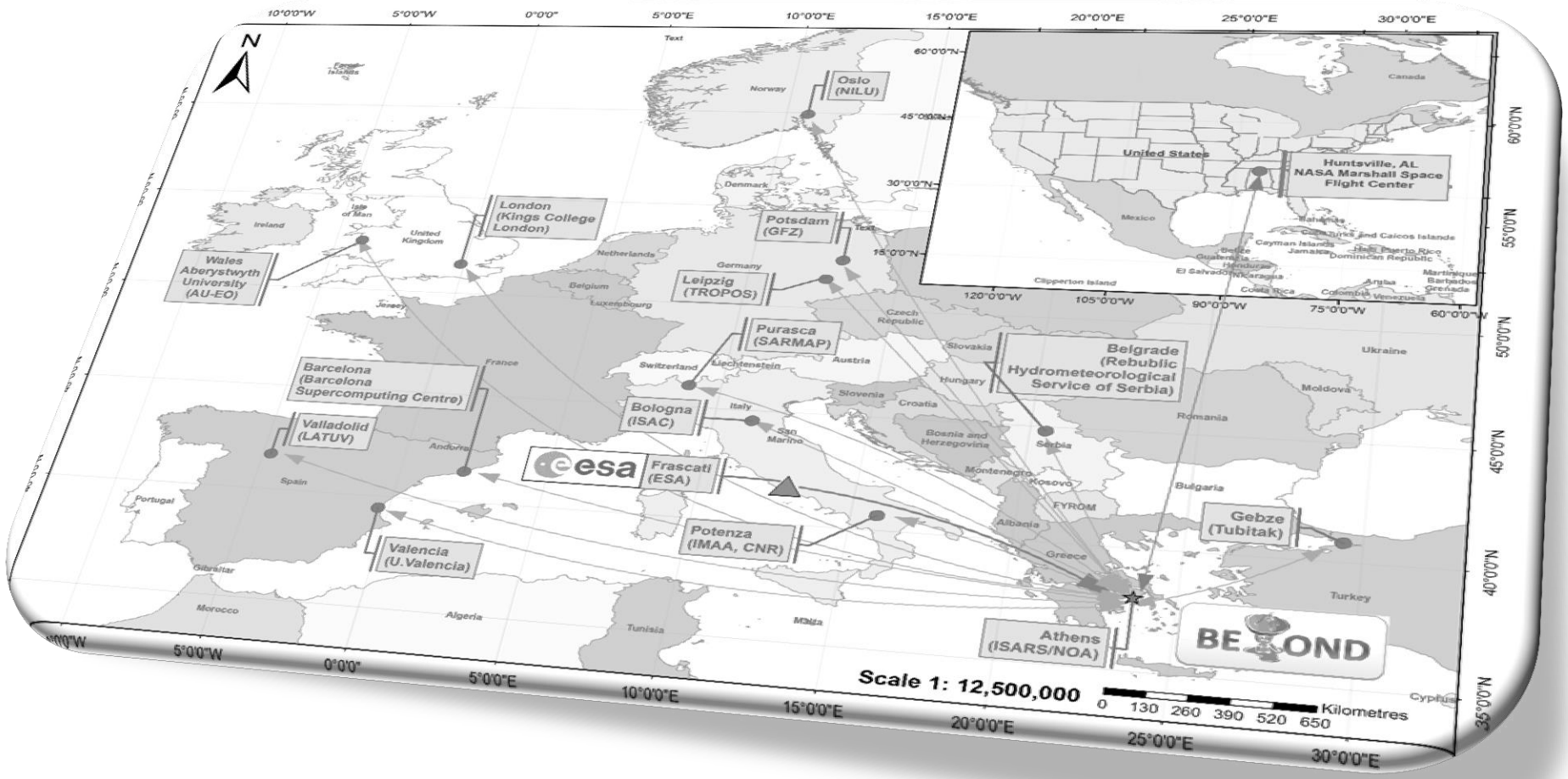

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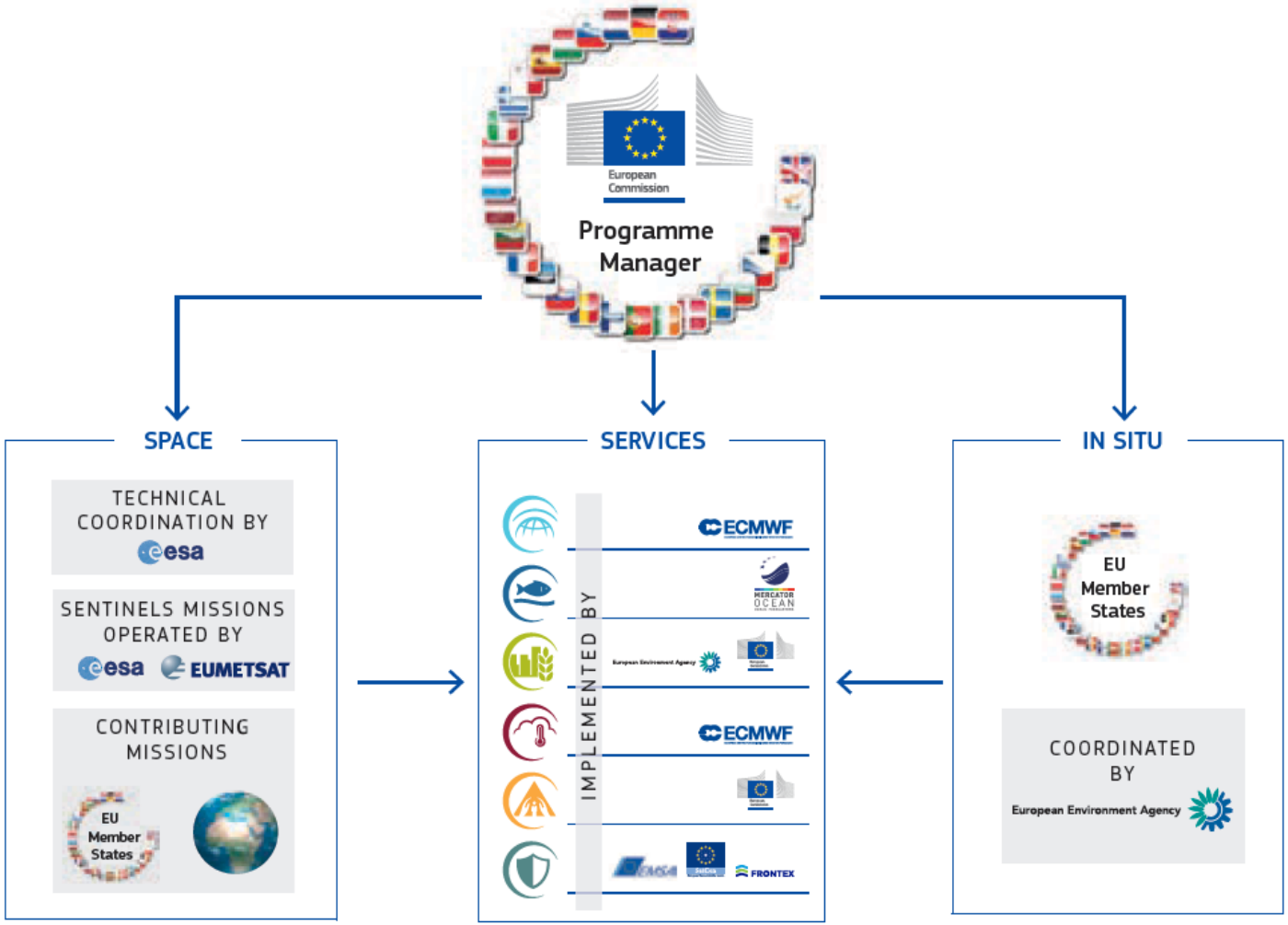
BEYOND

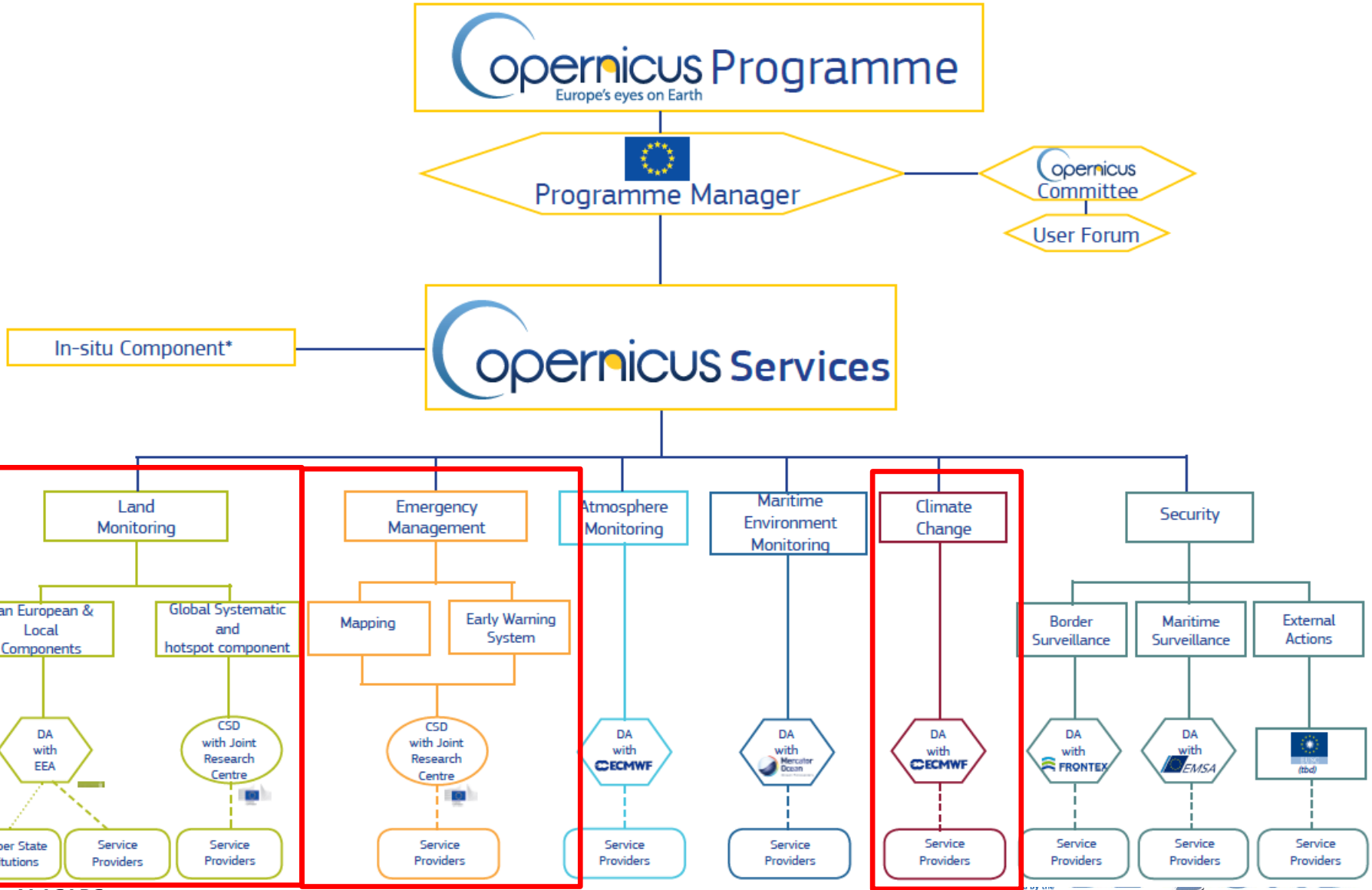
What is Copernicus? An overview

- A complex set of systems which collect data from multiple sources: earth observation satellites and *in situ* sensors
- Six thematic areas: land, marine, atmosphere, climate change, emergency management and security
- Main users of Copernicus services are **policy makers & public authorities**
- **Free and open access** on Copernicus data & products => commercial applications
- Coordinated and managed by the European Commission
    - ESA -> development of the observation infrastructure
    - EAA -> in situ component

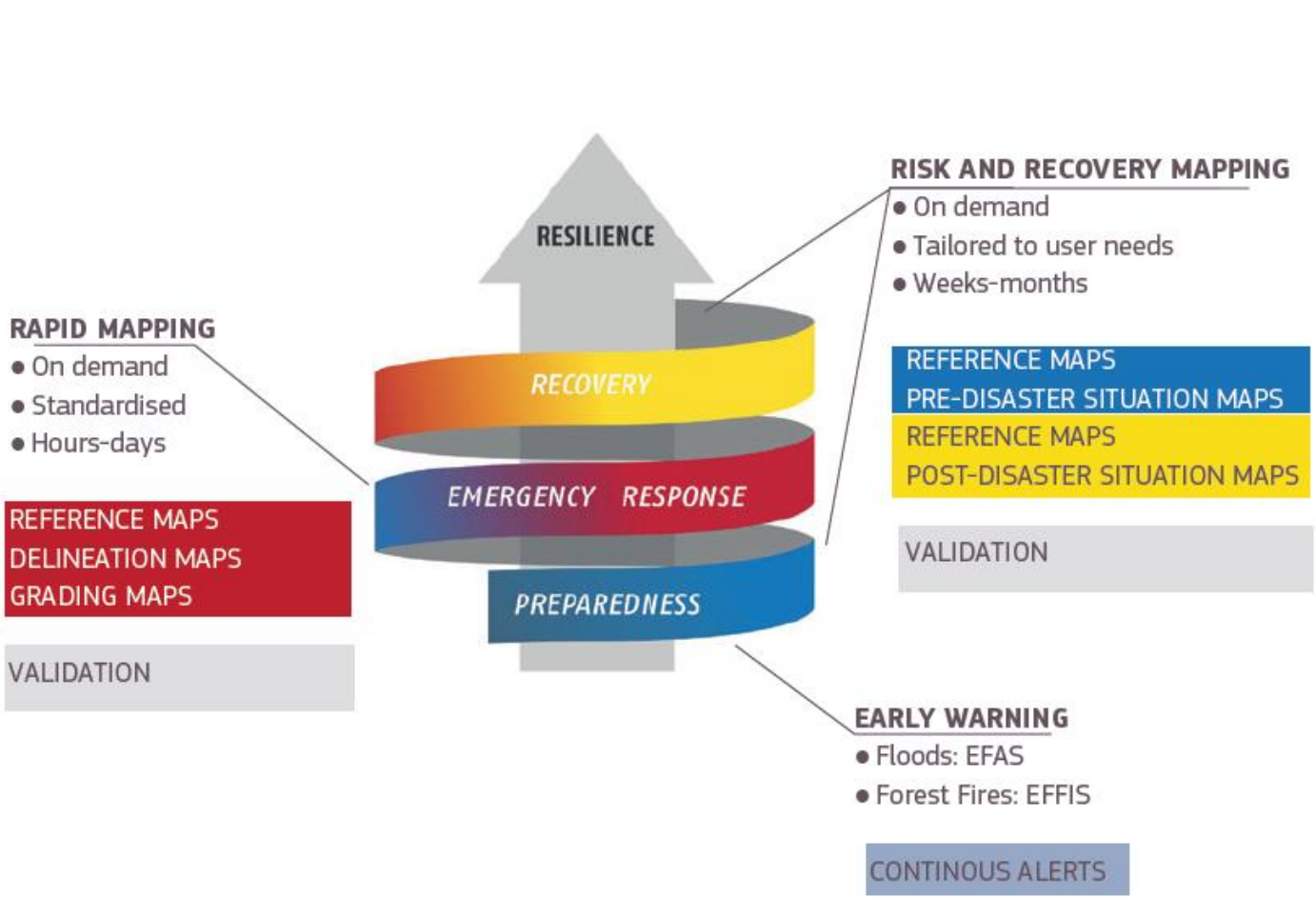
What is Copernicus? An overview



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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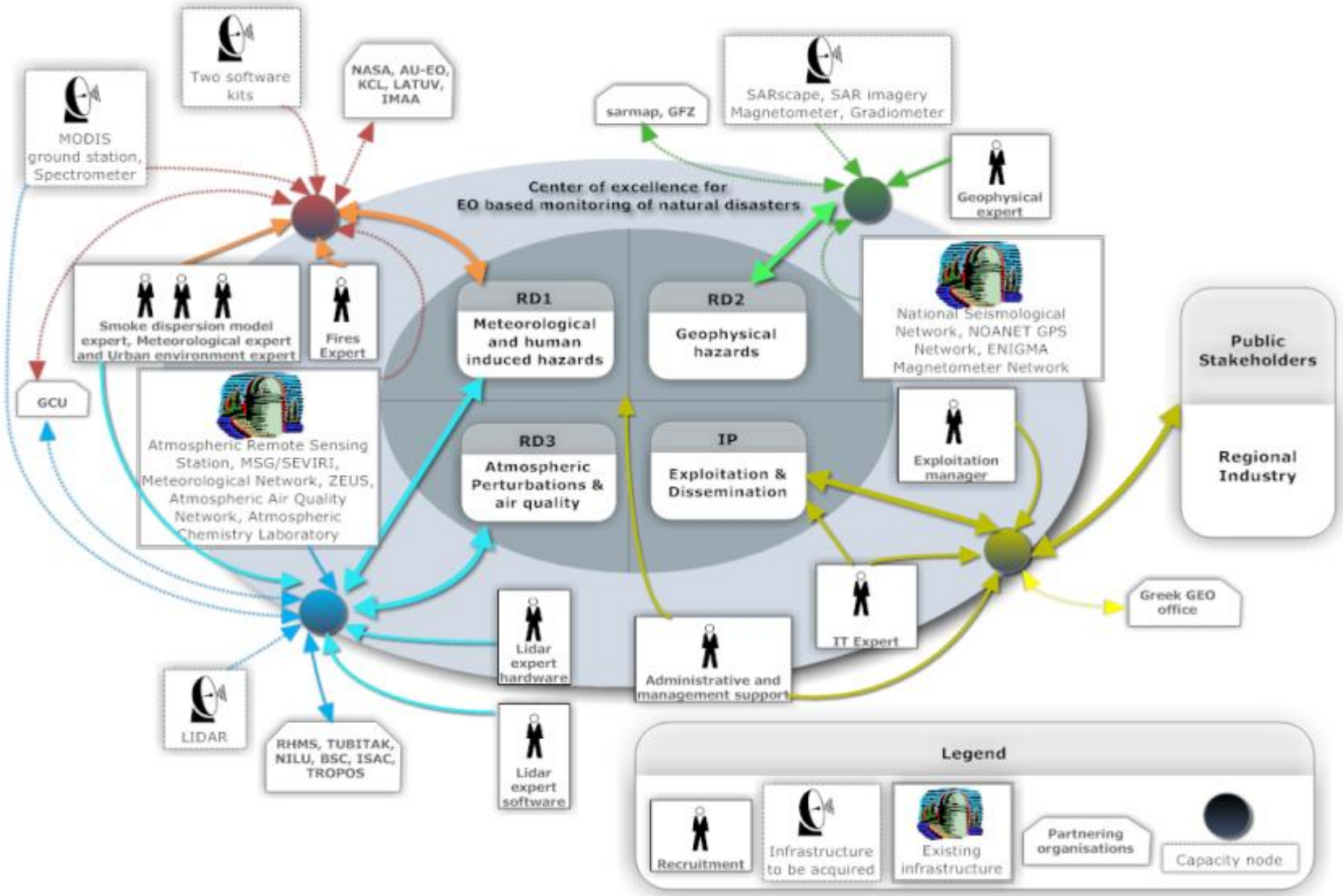

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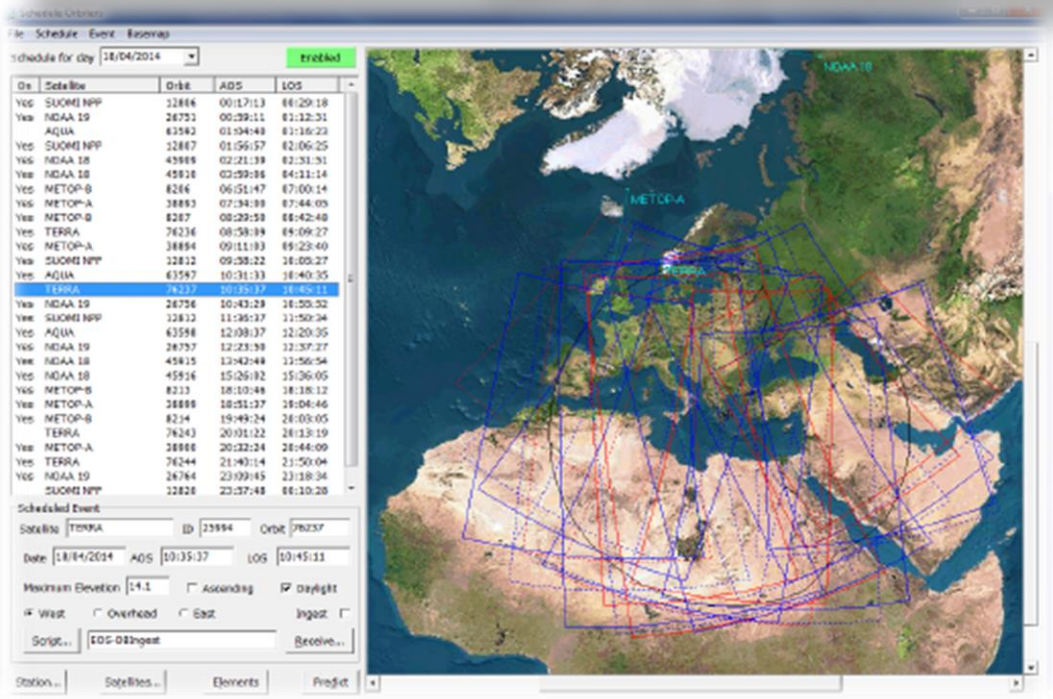
Operate a Region-wide X-/L- band multi-mission station:

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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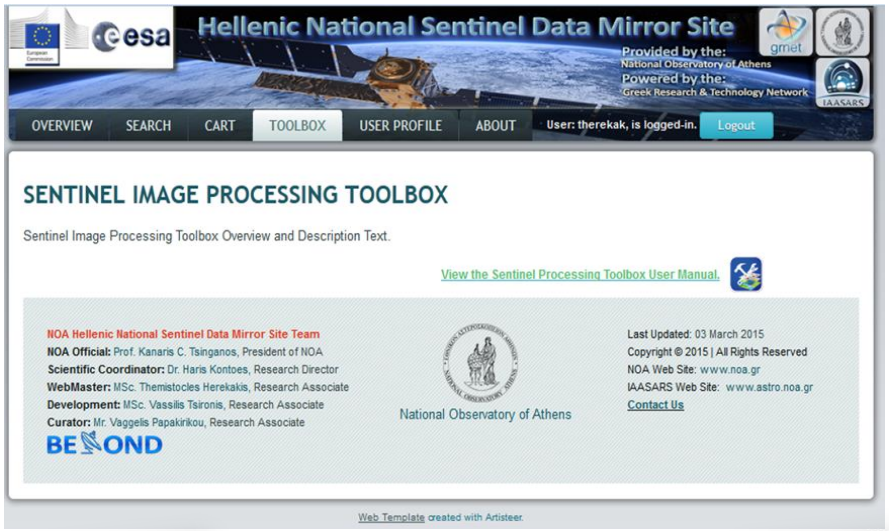
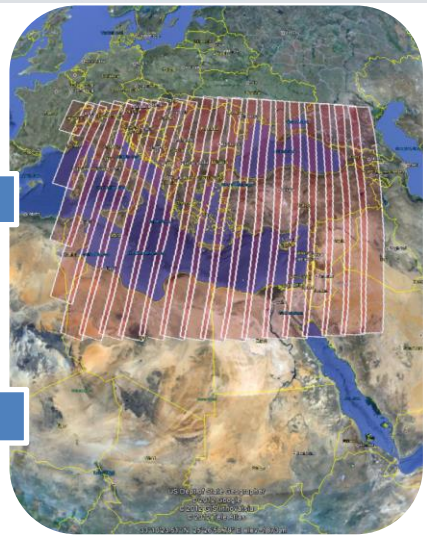


Operate the 1st Collaborative Ground Segment (Hellenic Sentinel Data Hub- Mirror Site), allowing near real time acquisition of S-1, S-2, S3, and future S5P satellite missions

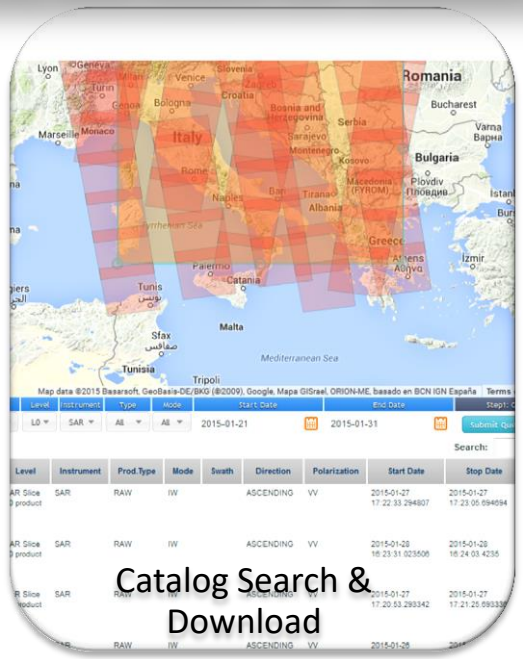
Sentinel-1

Sentinel-2



Sentinel-3

Sentinel-5p



http://Sentinels.space.noa.gr

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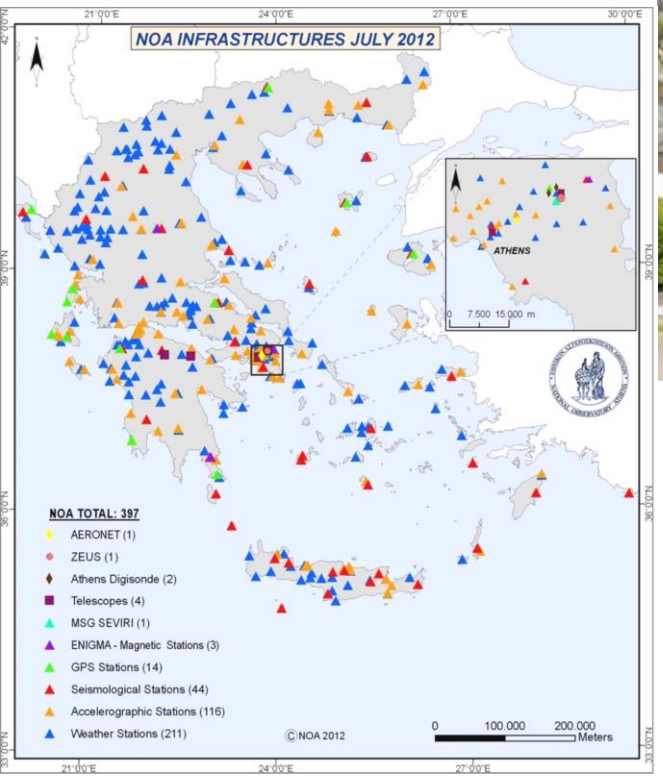
Map of the deployed in-situ monitoring networks (meteo, GPS, geomagnetic, air, seismological)



Operate Ground Lidar Stations, part of the ACTRIS Research Infrastructure

EARLINET Lidar Network

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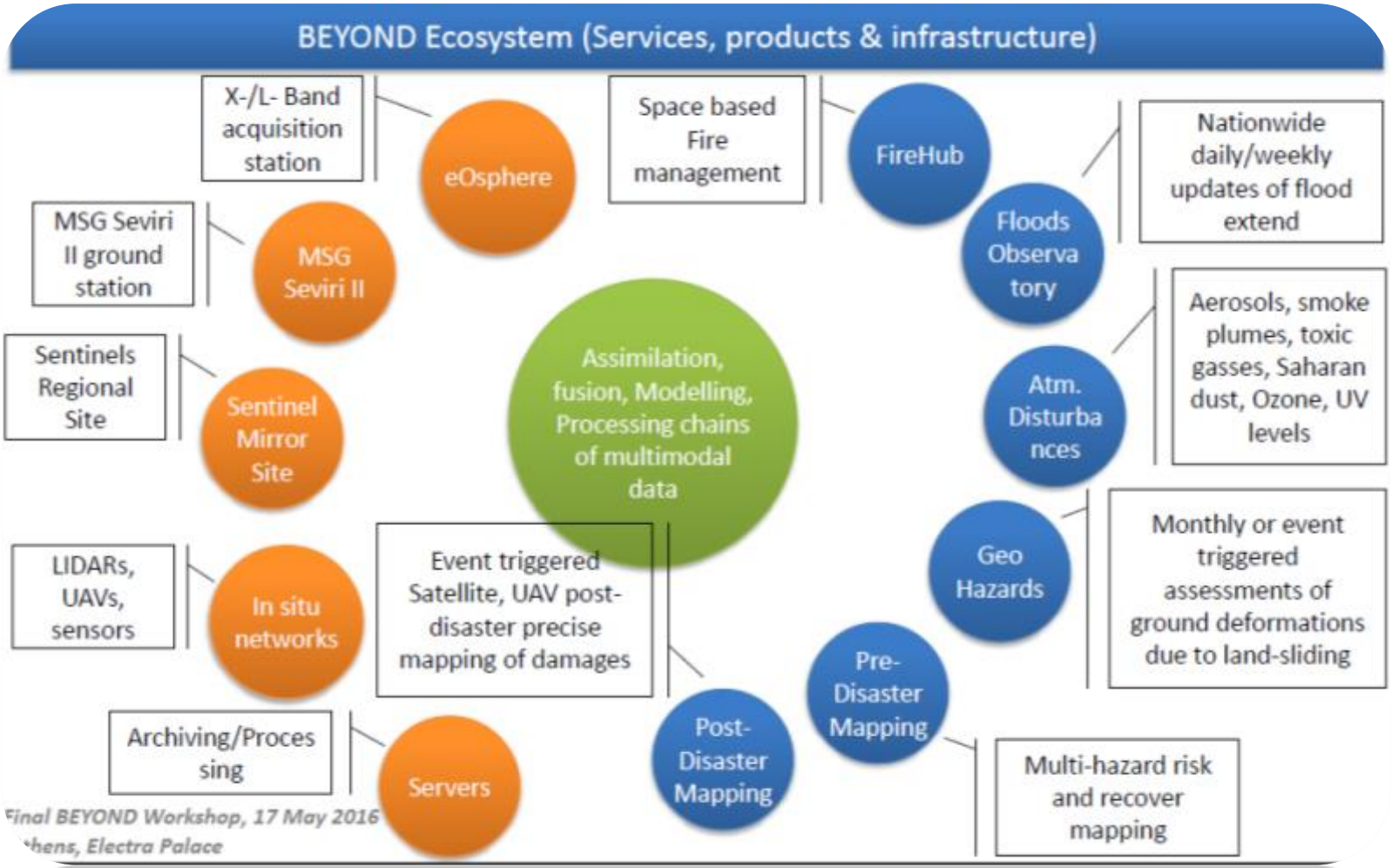

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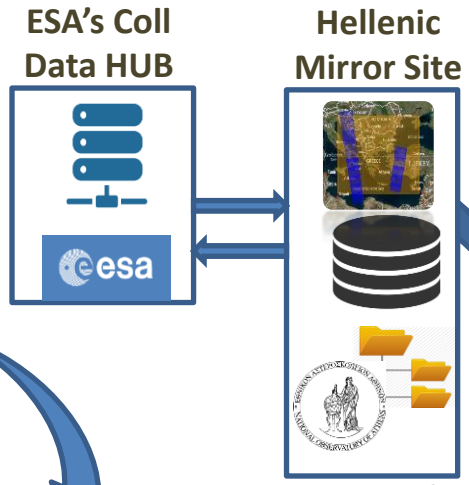

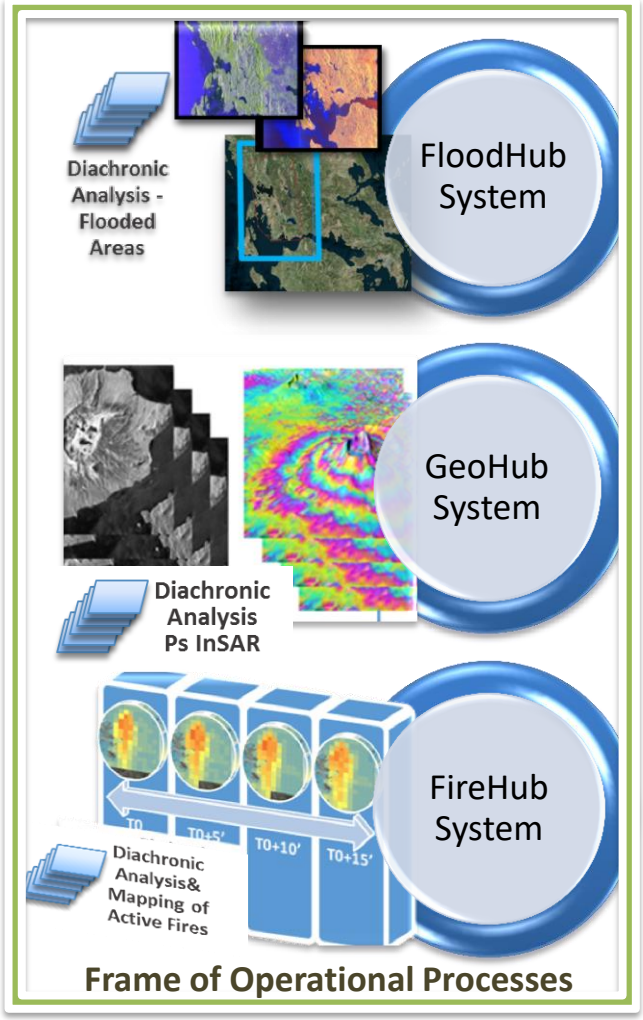

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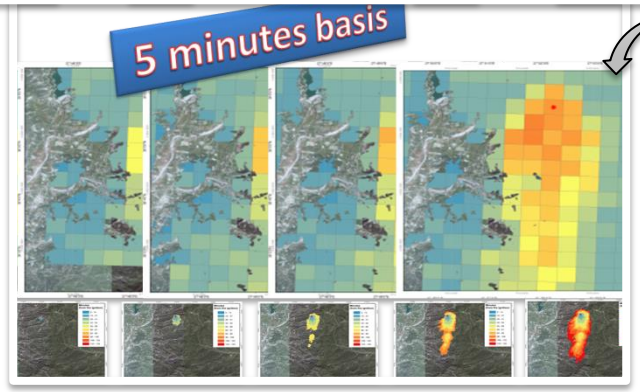
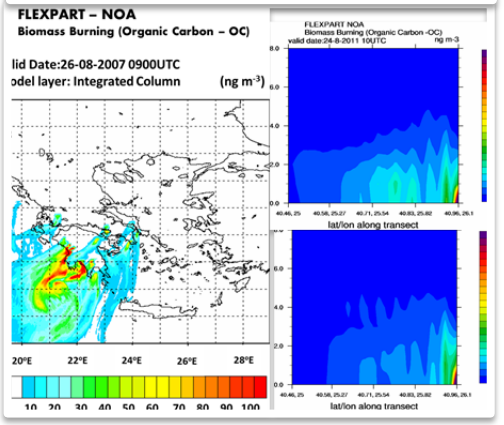
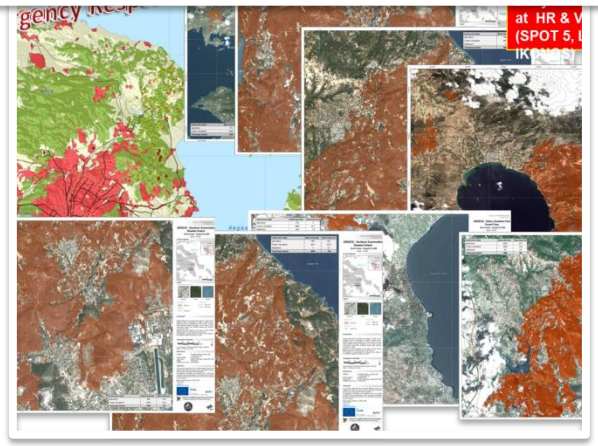
Active Fire Mapping: 5 ‘ - 500 m - 24/7



Hourly Fire Smoke dispersion

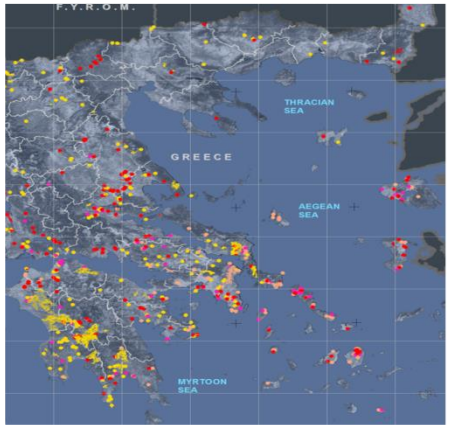


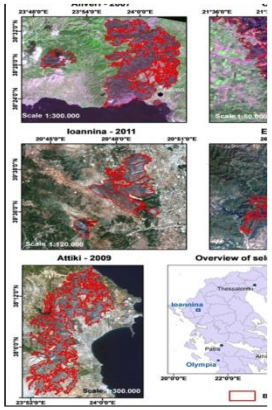
Burnt Area Mapping: HR/VHR – daily/weekly/seasonally



Fire Brigade Control Room

Diachronic Burnt Area Mapping





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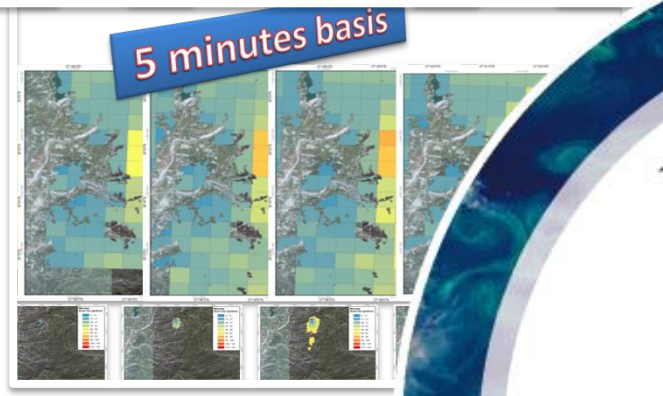
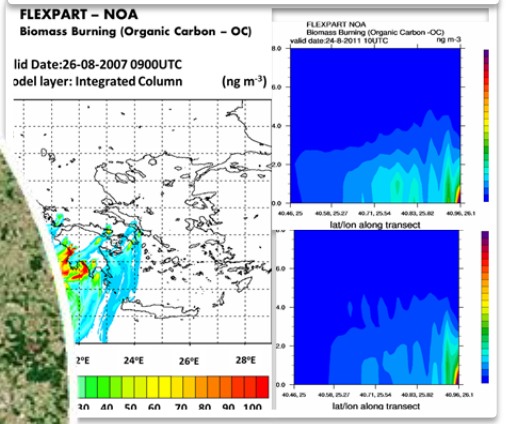
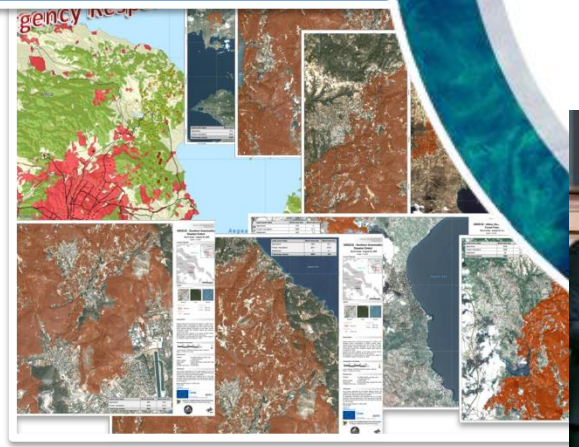


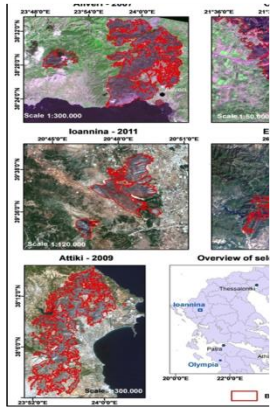
Hourly Fire Smoke dispersion



Burnt Area Mapping: daily/weekly/seas



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

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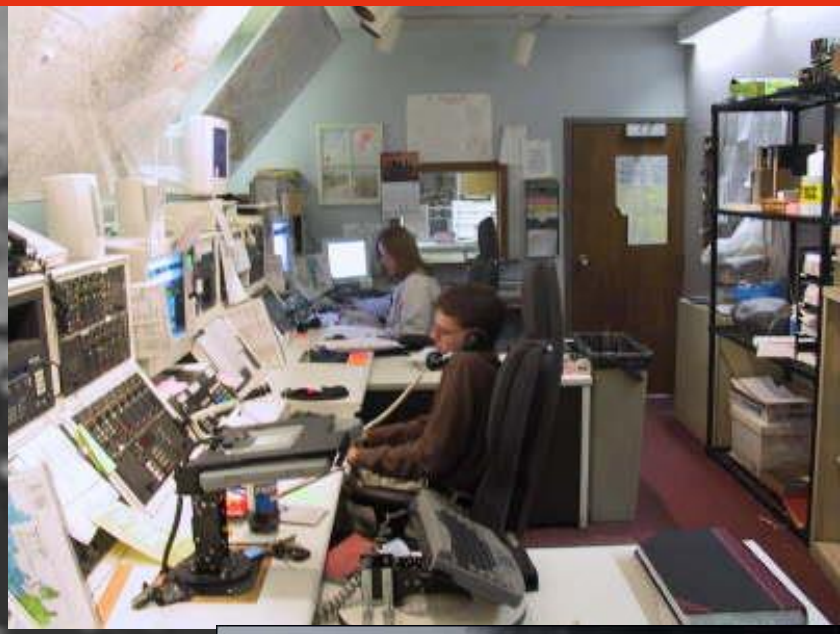

Taygetos Mt Fire

SEVIRI MIR 070823_1030 UTC

POTENTIAL FIRE

CONFIRMED FIRE

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

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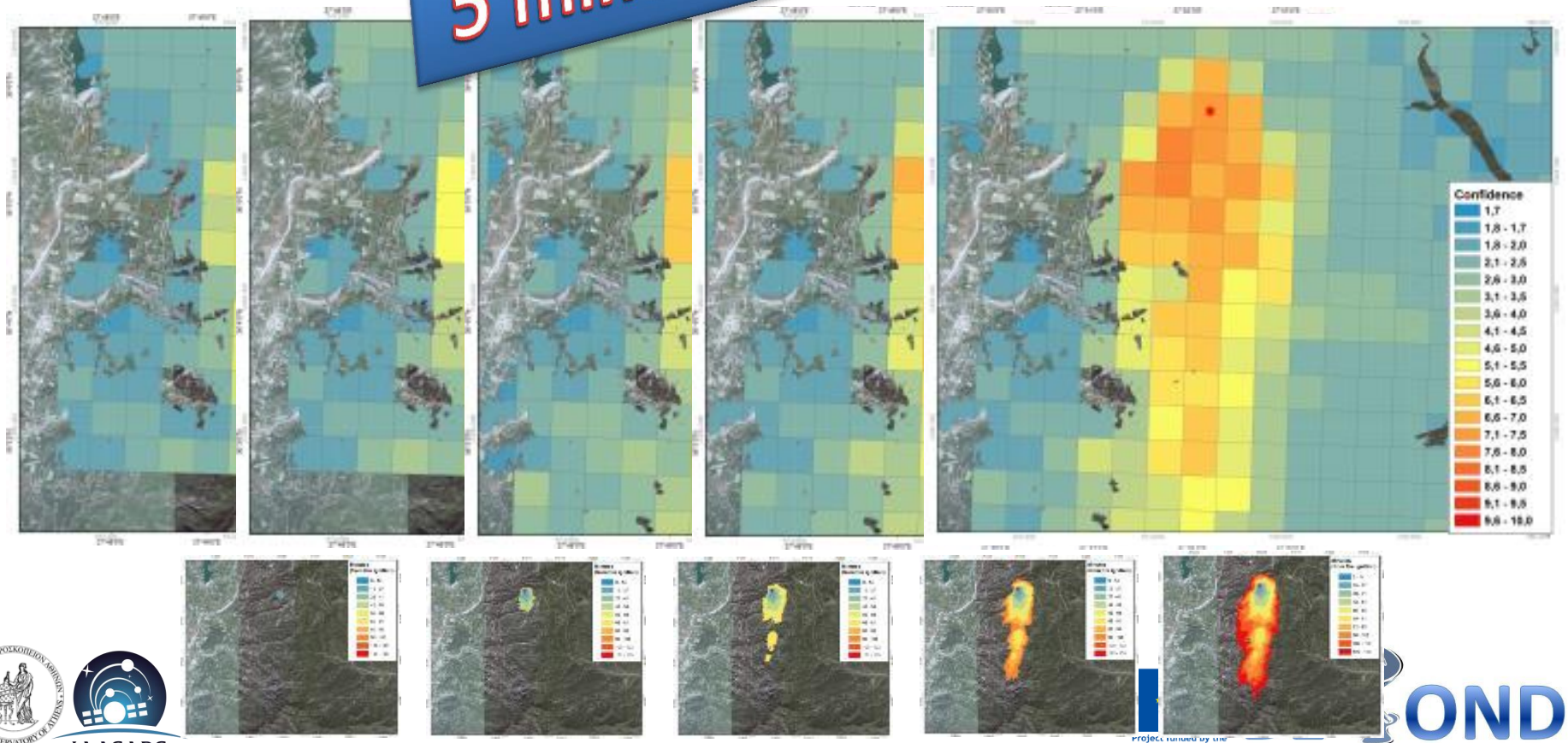
Results @ 150 minutes after fire ignition

+30’ → +35’ → +40’ → +45’ → +50’

5 minutes basis



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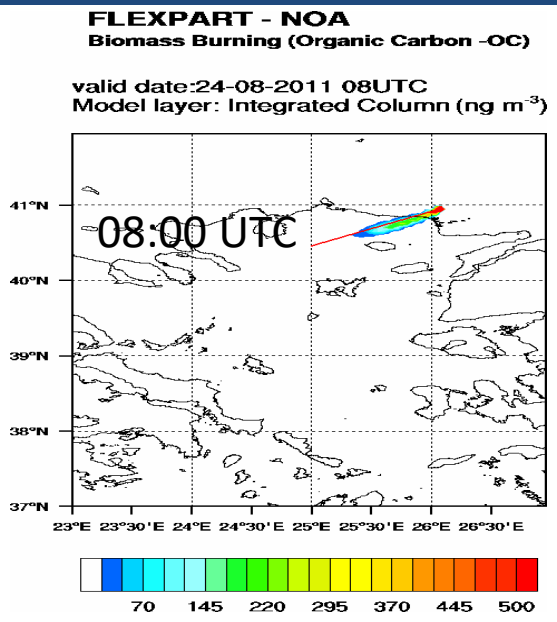
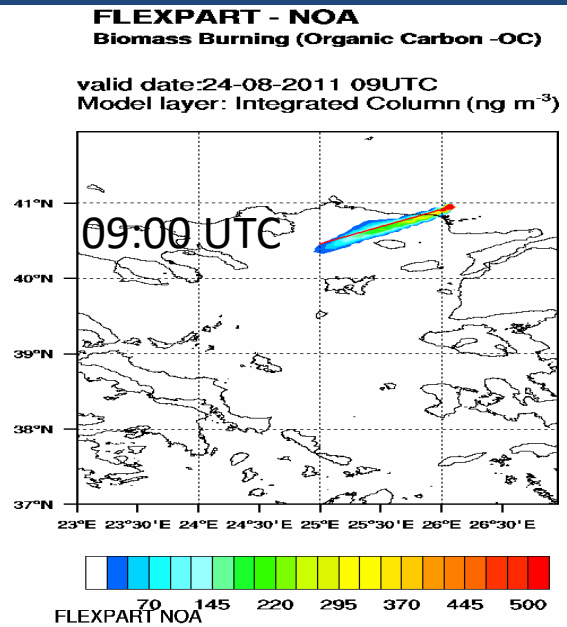
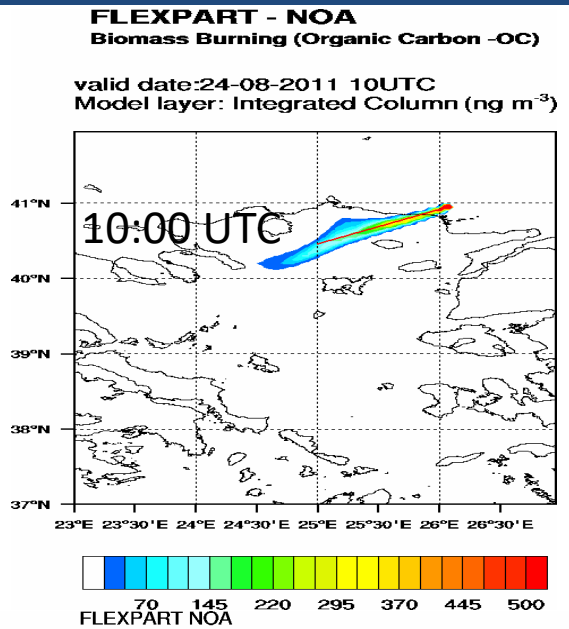
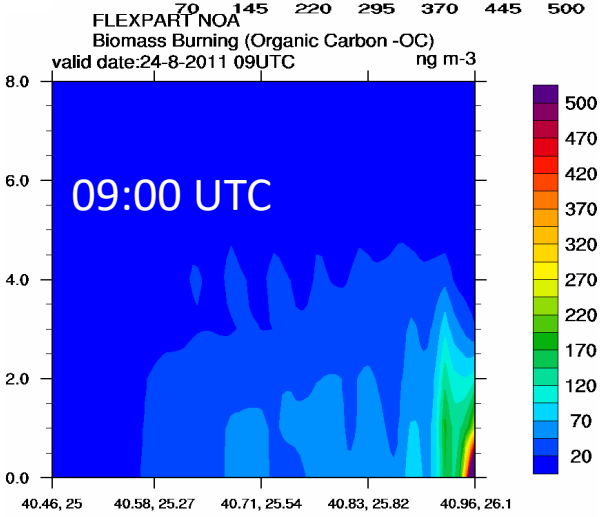
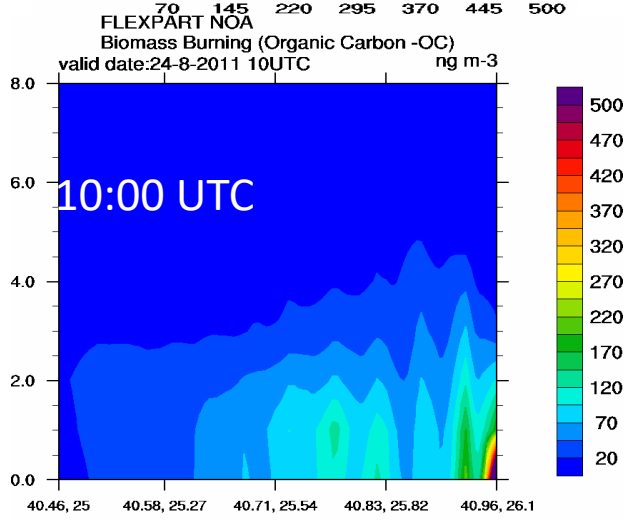






Forecasting Vertical structure of smoke plume Cross section of Organic Carbon concentration (ng m-3)





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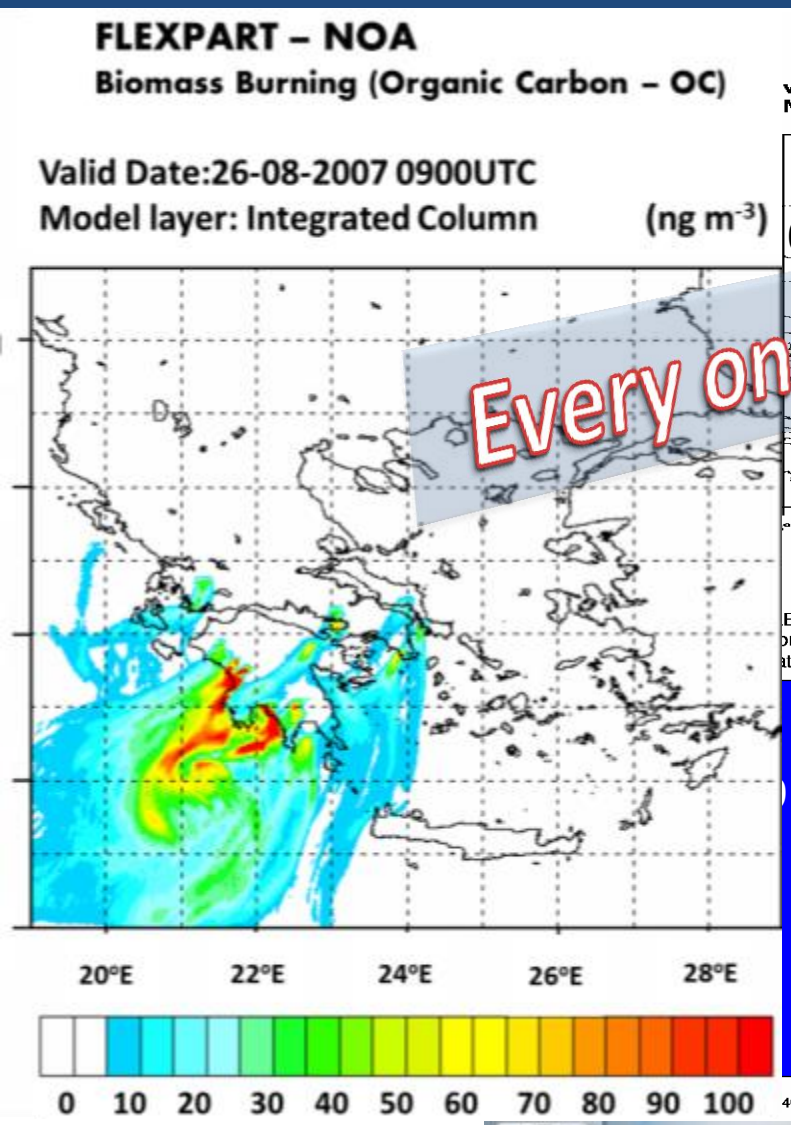
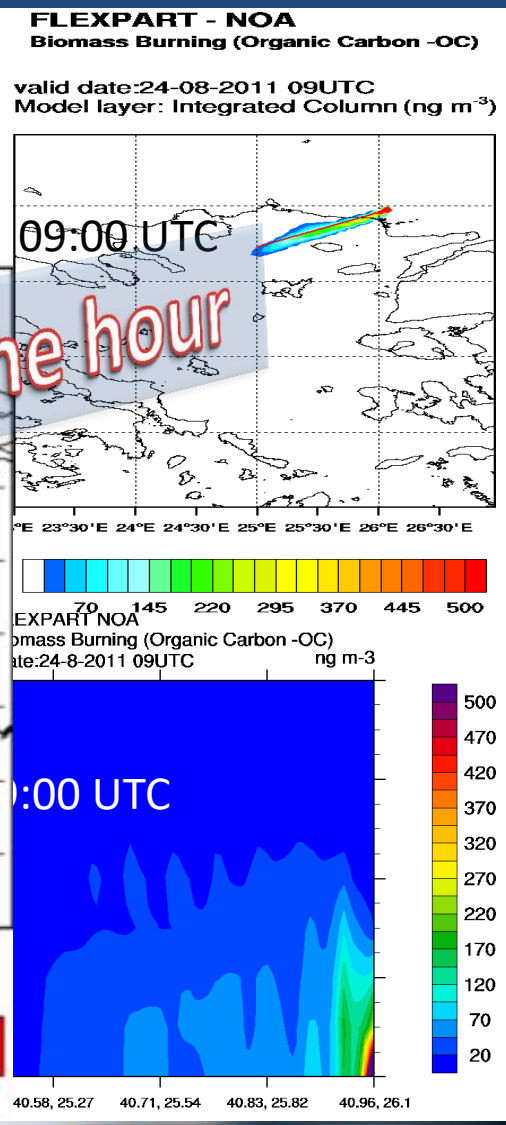
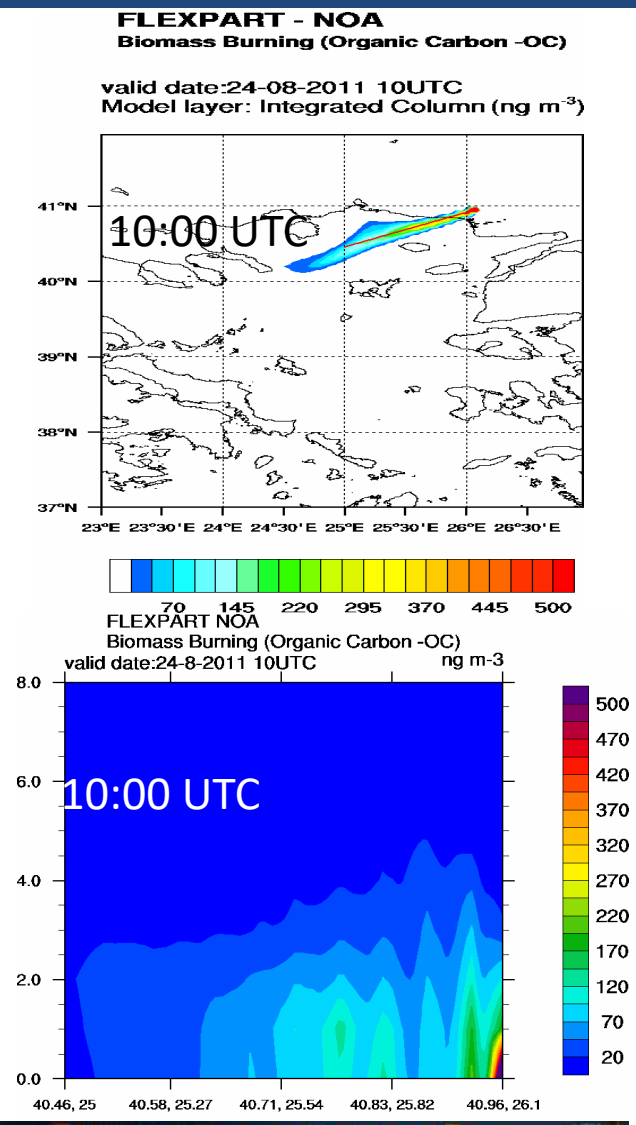






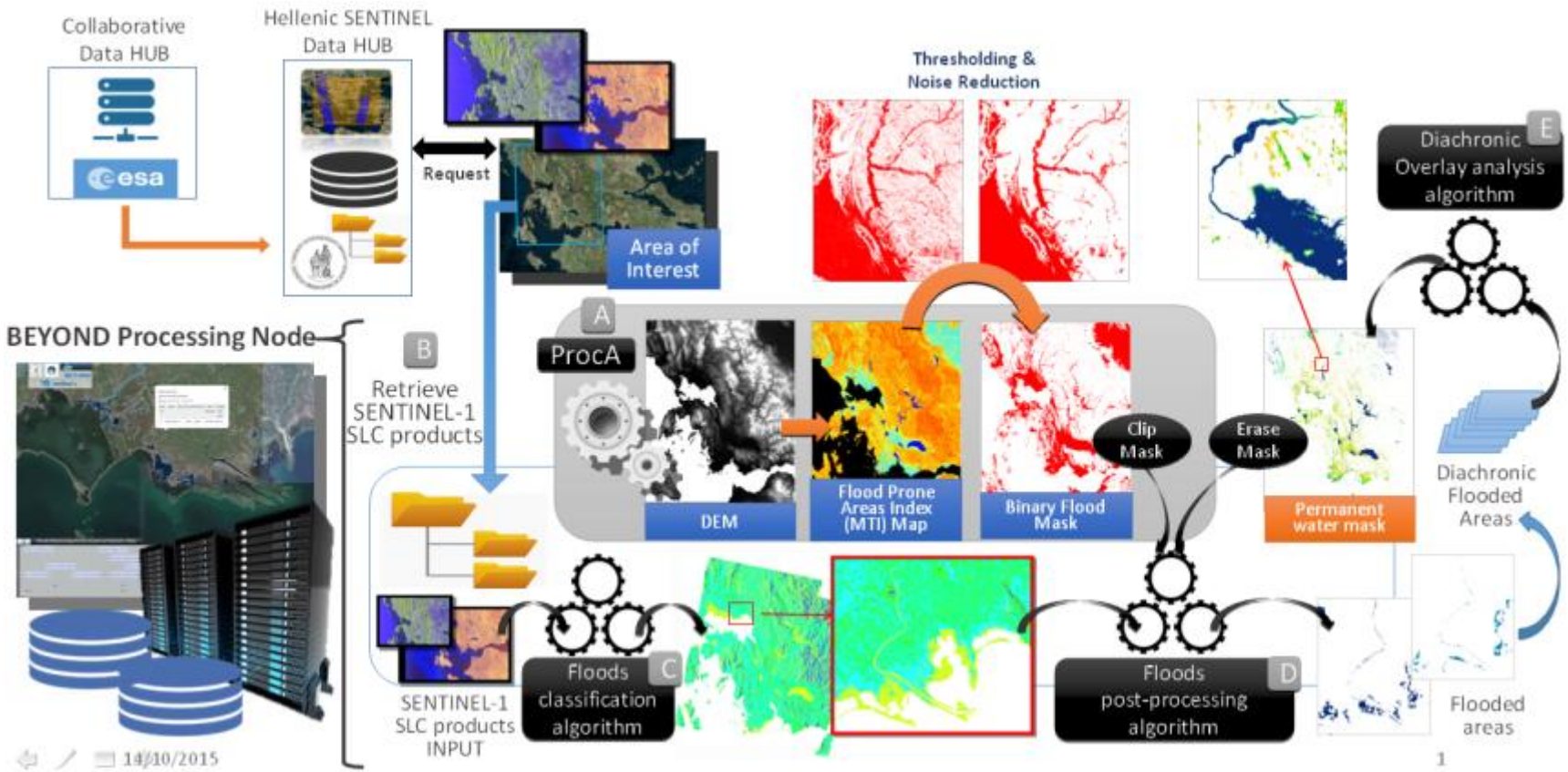
Every one hour

IAASARS

BEYOND FireHub

BEYOND, The European EO Center of Excellence in BAMENA

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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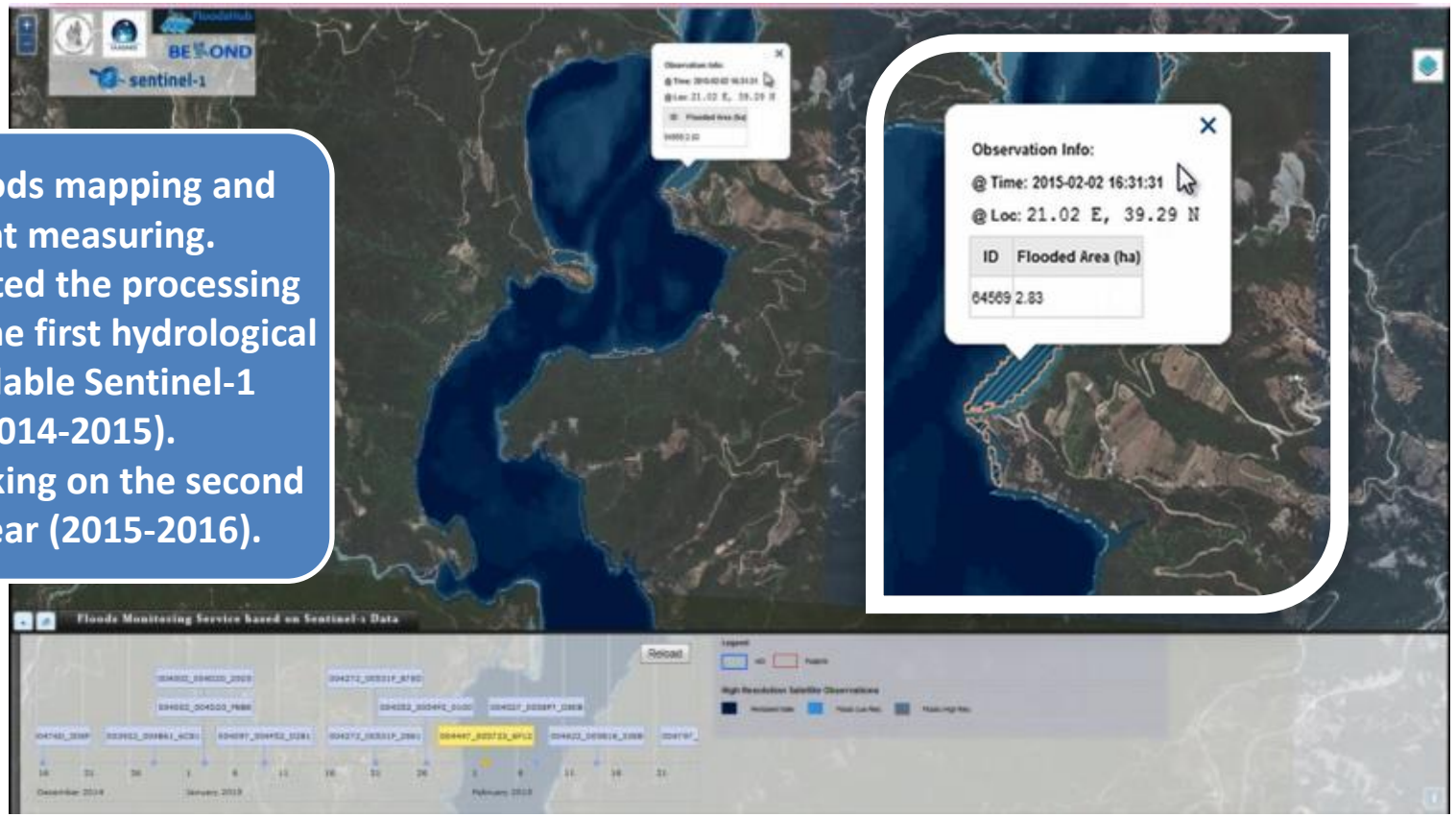
FloodHub: BEYOND's Floods Monitoring Service — Detail

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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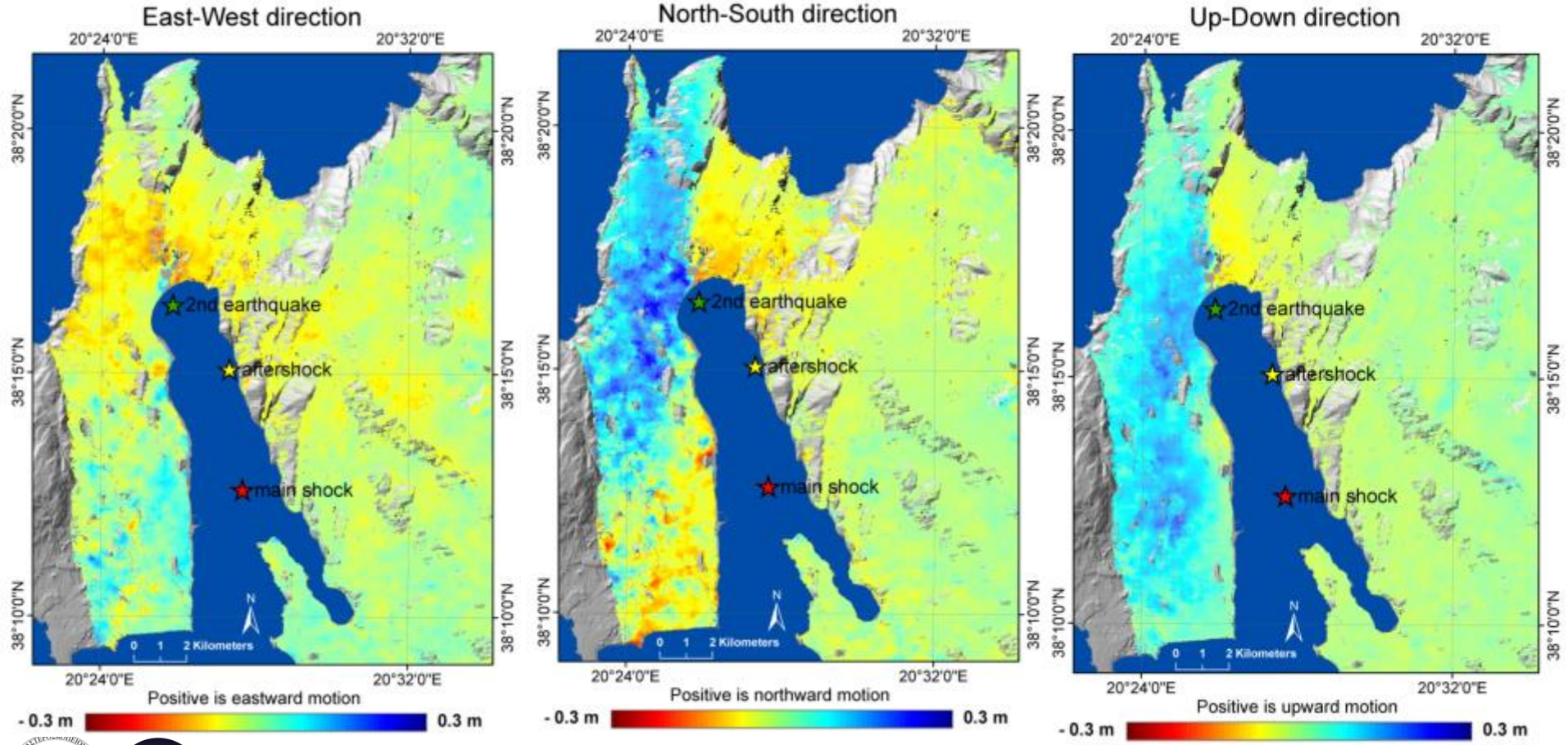
Earthquakes – Cephalonia case

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



Merryman Boncori et al., SRL 2015

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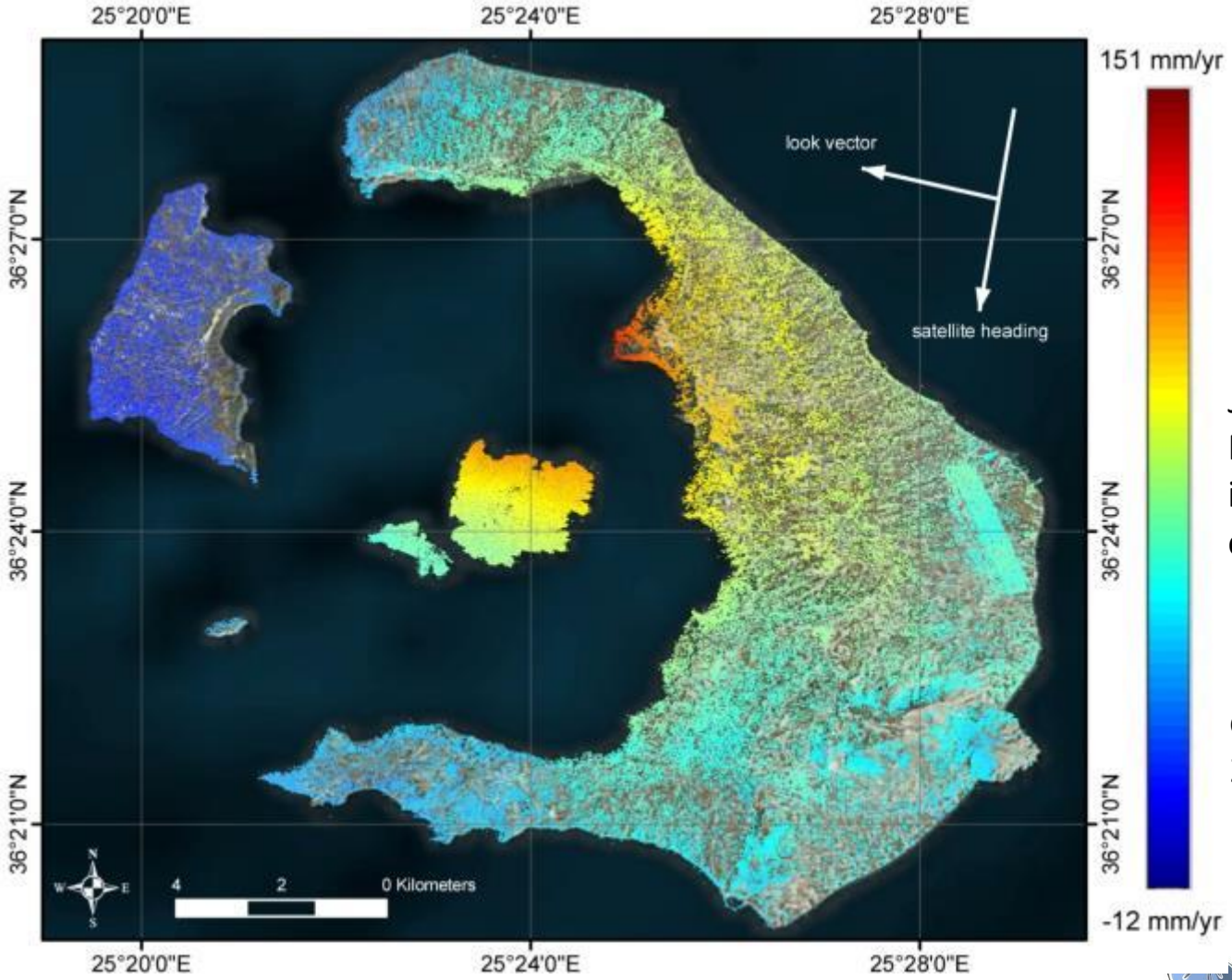
Volcanoes – Santorini case

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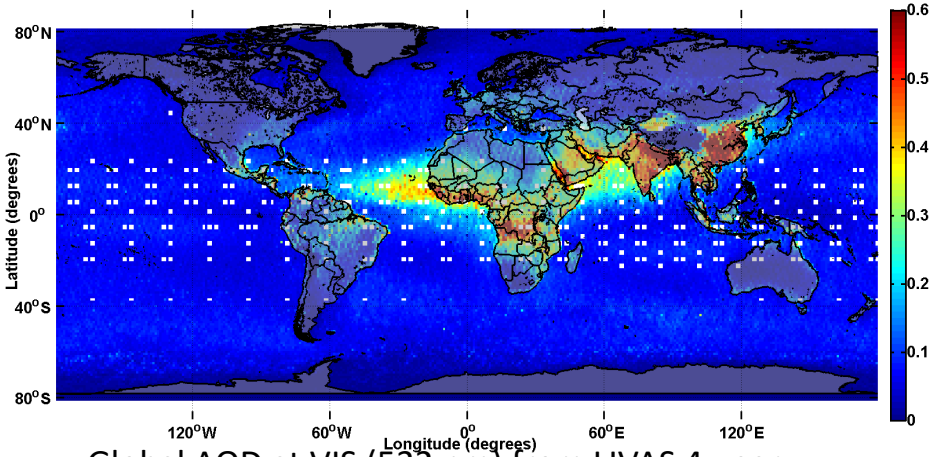
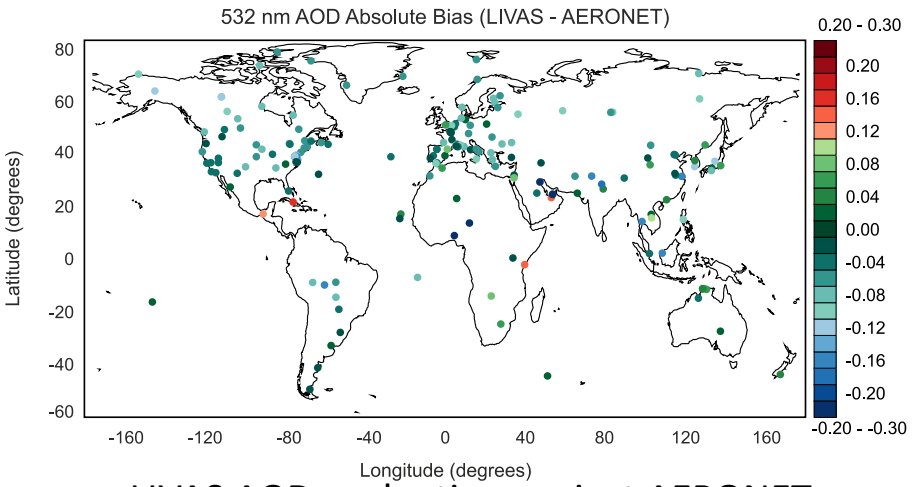
Global 3D climatology of aerosols and clouds
LIVAS portal under BEYOND (1x1 degree resolution)



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



LIVAS AOD evaluation against AERONET

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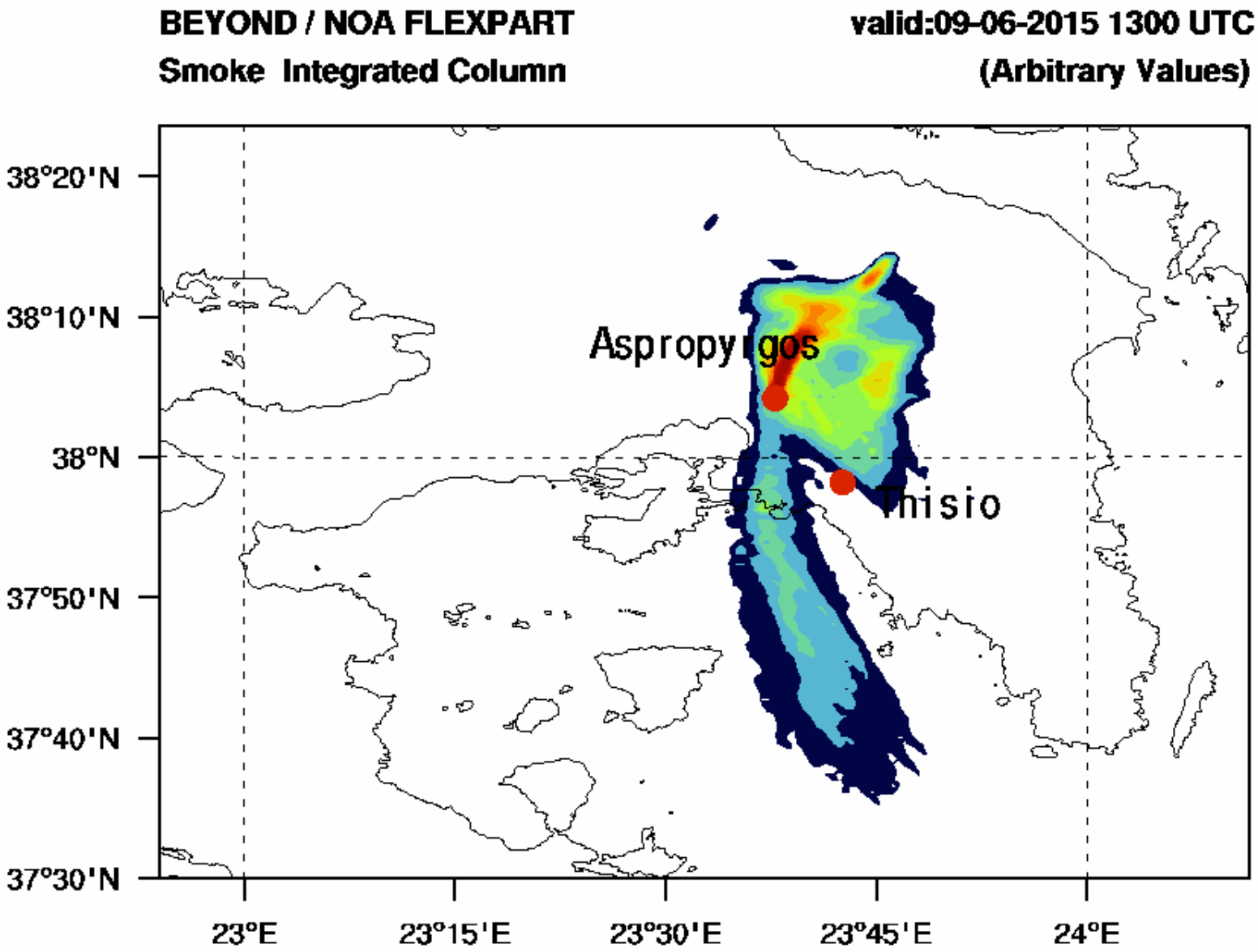
BEYOND / NOA FLEXPART
Smoke Integrated Column
valid:09-06-2015 1300 UTC
(Arbitrary Values)
38°20'N
38°10'N
38°N
37°50'N
37°40'N
37°30'N
23°E
23°15'E
23°30'E
23°45'E
24°E
Aspropyrgos
Thisio

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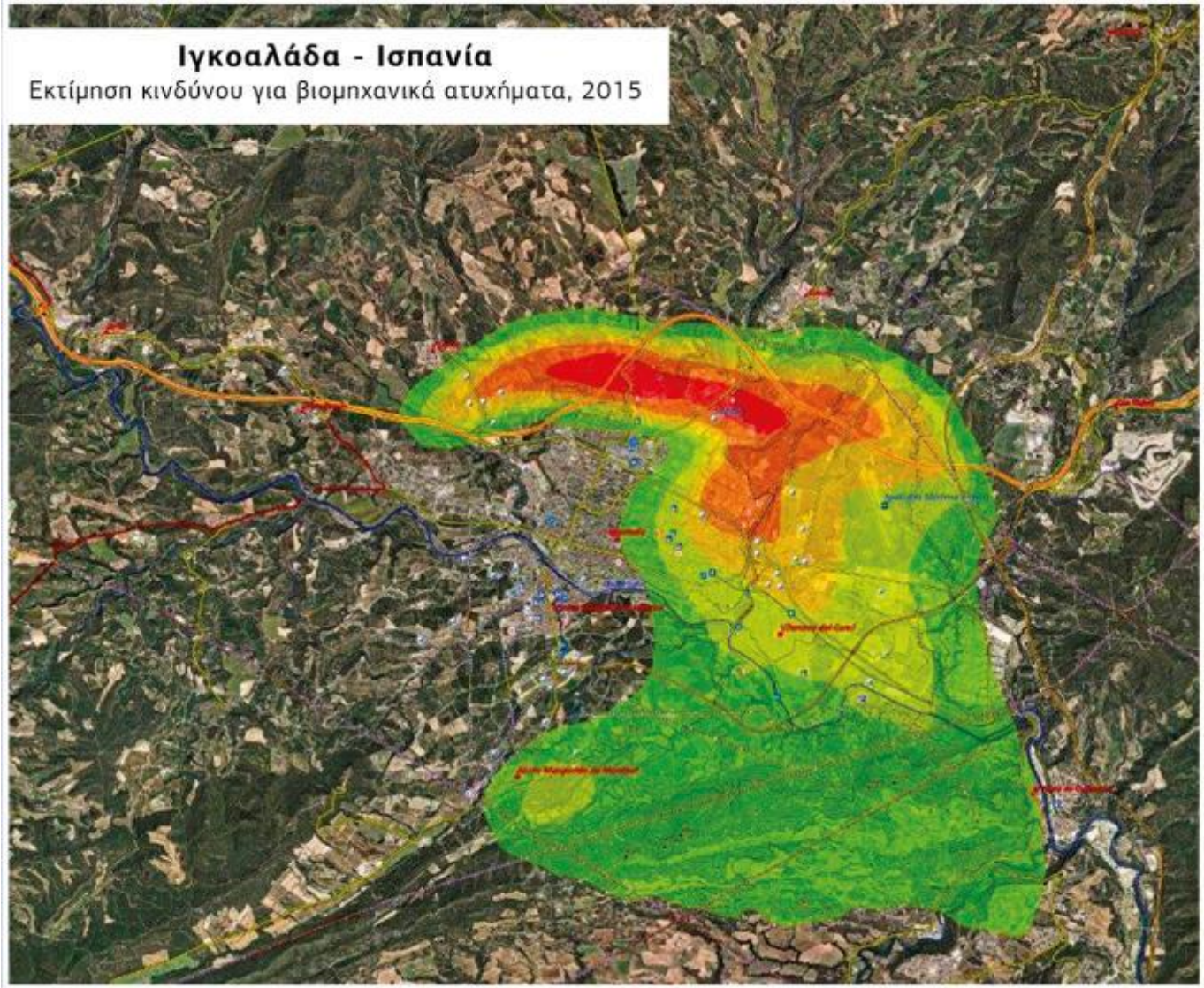
Copernicus EMS Risk & Recovery Activations

Catalonia, Spain
EMSN026

Toxic cloud after an industrial accident



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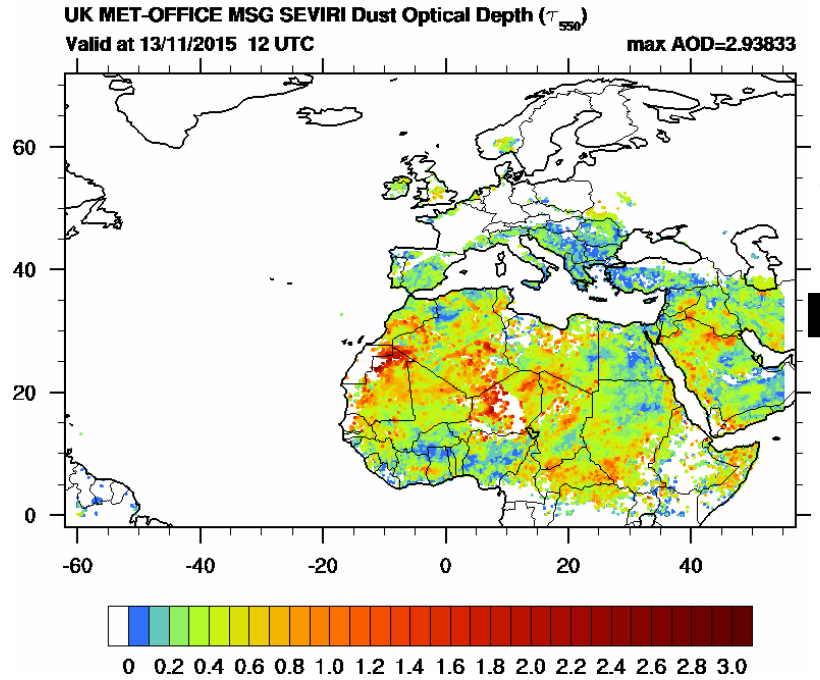
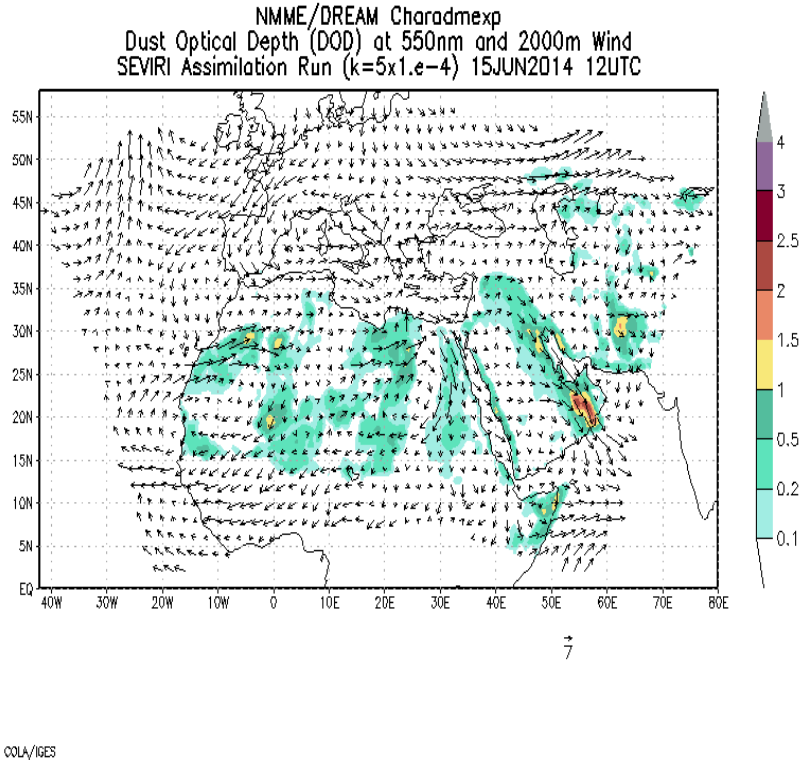


Dust initial field assimilation



U.K. Met Office MSG dust optical thickness

NMME-DREAM model with dust assimilation

Solomos et al., 2016, COMECAP

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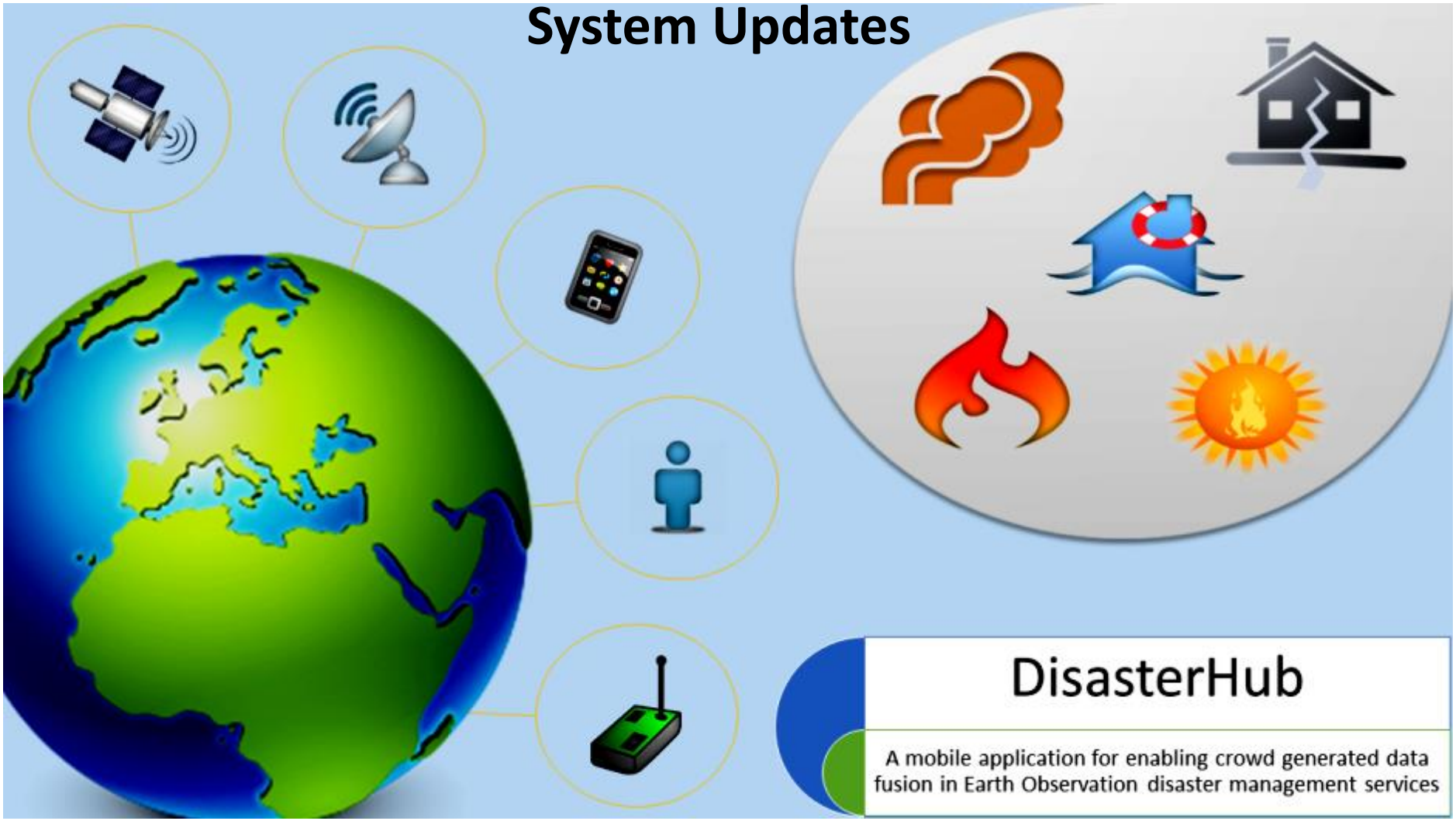
System Updates



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UAV Assisted Loss Recording

Cephalonia Earthquake
Feb 2014

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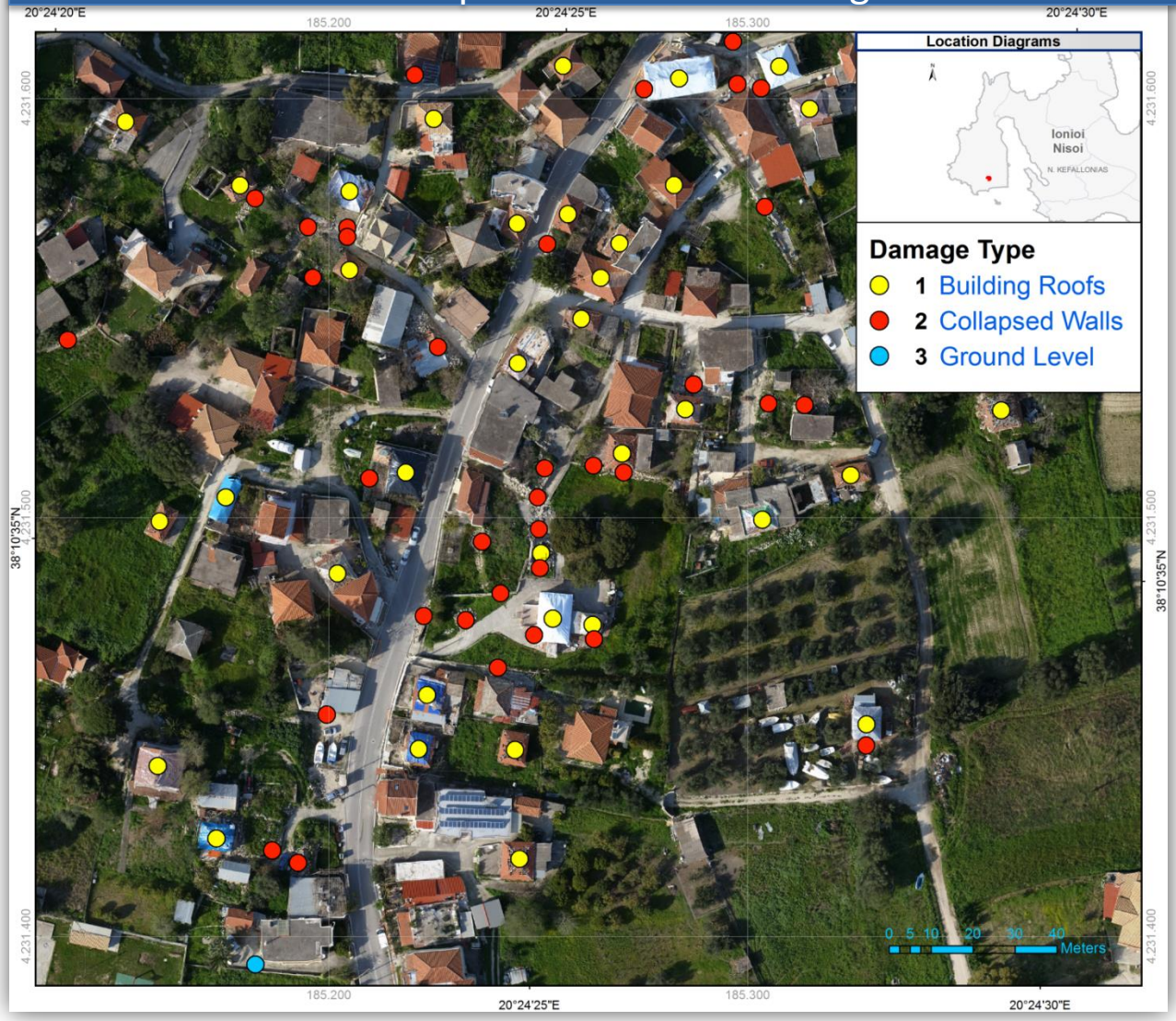
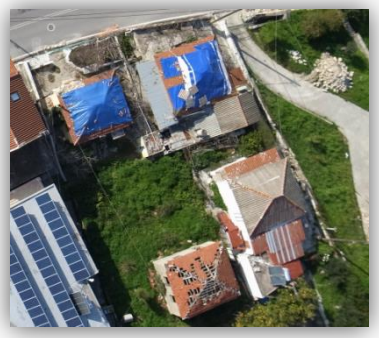
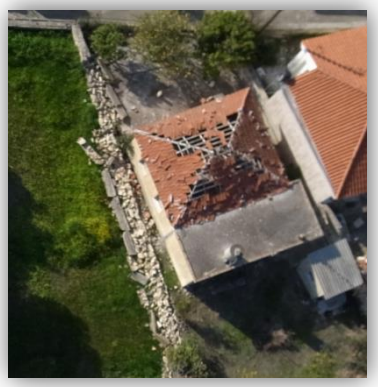
Cephalonia Island – Village of Mantzavinata







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Activation

Thasos, Greece

Fire

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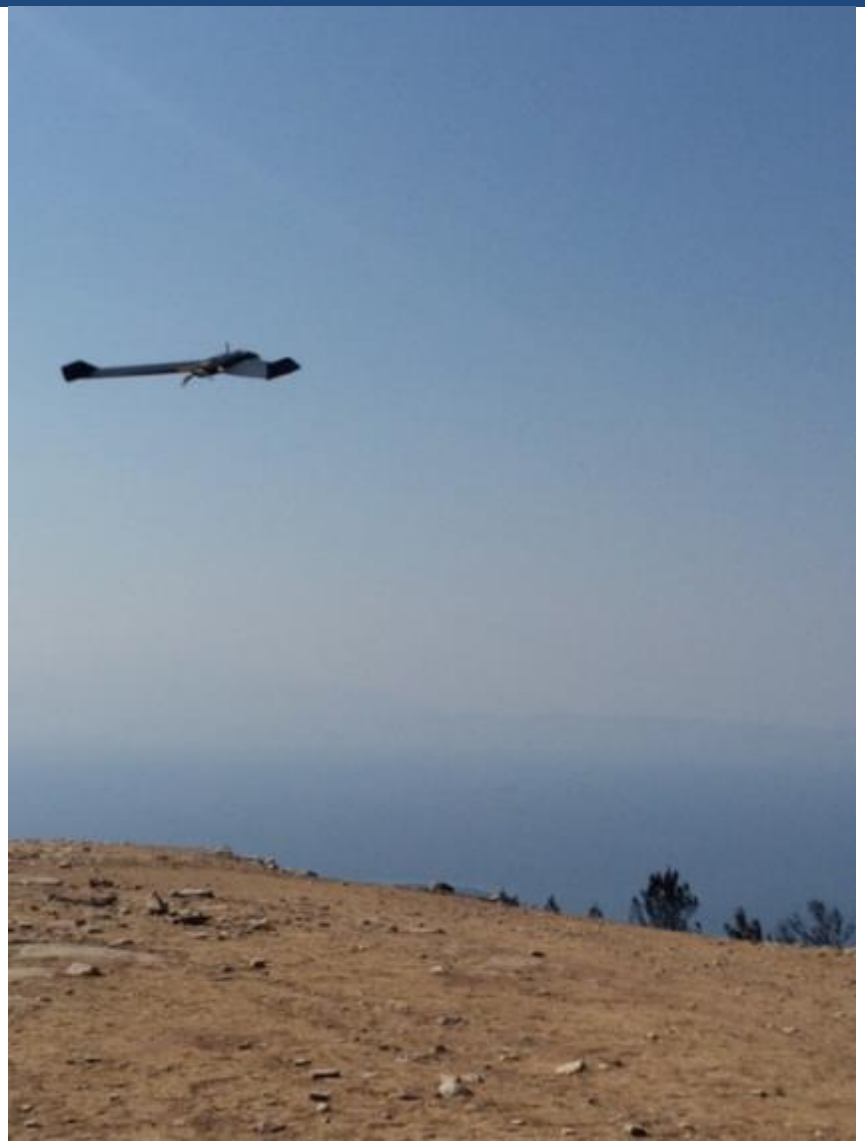
Activation

Thasos, Greece

Fire



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Activation

Thasos, Greece

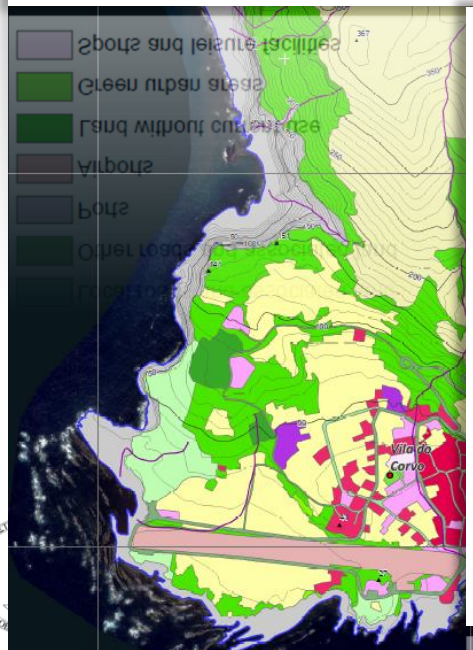
Fire

Azores activation Reference mapping

Thematic Layers / nomenclature

Land Use - Land Cover

- Continuous Urban Fabric (P.B.F. > 80%)
- Isolated Structures
- Commercial, Public & Private Services
- Industry & Utilities
- Main roads and associated land
- Local roads and associated land
- Other roads and associated land
- Ports
- Airports
- Land without current use
- Green urban areas
- Sports and leisure facilities
- Arable land
- Pastures
- Broad-leaved forest
- Coniferous forest
- Shrubs and/or herbaceous vegetation
- Natural grassland
- Bare rock
- Beaches, dunes and sand planes
- Sparsely vegetated areas
- Inland wetlands
- Lakes
- Water reservoirs



Risk Level

- Very Low
- Low
- Medium
- High
- Very High

First Aid Areas

- First Aid Areas
- Camp location
- Shelter
- Field hospital
- Helicopter landing spot
- Gasoline tank

Mitigation Measures

- Breakwaters, seawalls, groynes
- Structural reinforcement of assets

Administrative boundaries

- Municipality

Populated places

- City
- Town
- Village

Buildings

- Airport
- Port
- Commercial, Public & Private Services
- Industry & Utilities
- Place of worship
- Other
- Unclassified

Transportation

- Airport
- Port
- Bridge & overpass
- Tunnel
- Highway
- Primary Road
- Secondary Road
- Local Road
- Other

Physiography

- 300 - Primary
- Secondary
- Spot heights

Hydrography

- Rivers & streams
- Coastline

Points of Interest

- Hospital
- Fire station
- Police
- Education
- Sports
- Government Facilities
- Industrial facilities
- Water infrastructure
- Electricity infrastructure
- Wave power infrastructure
- Power stations
- Wind turbines
- Oil
- Marina
- Military

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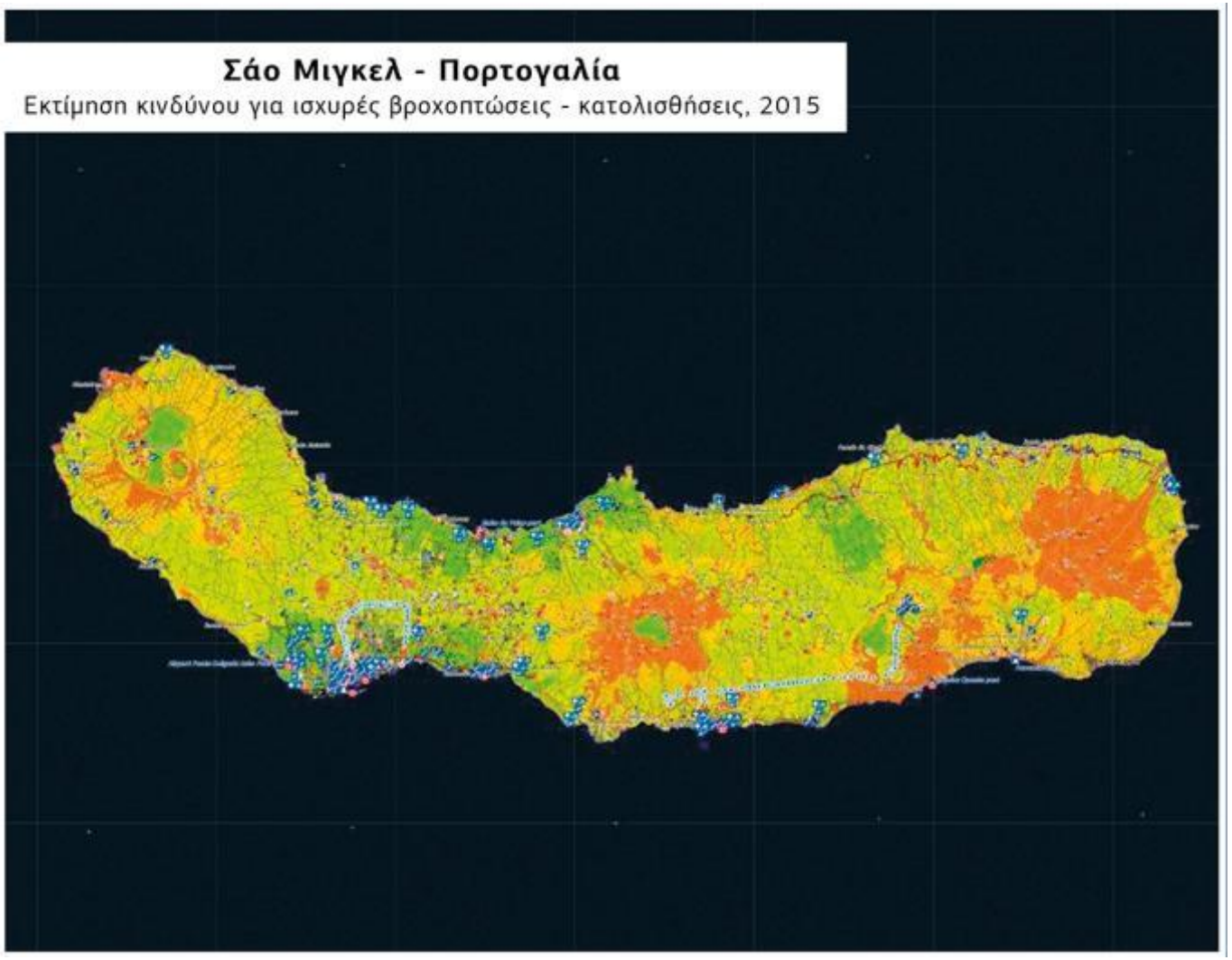
Copernicus EMS Risk & Recovery Activations

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

Tsunami Hazard Severity	Local Water Depth (m)
Very Low	<2
Low	2-4
Medium	4-6
High	6-8
Very High	>8

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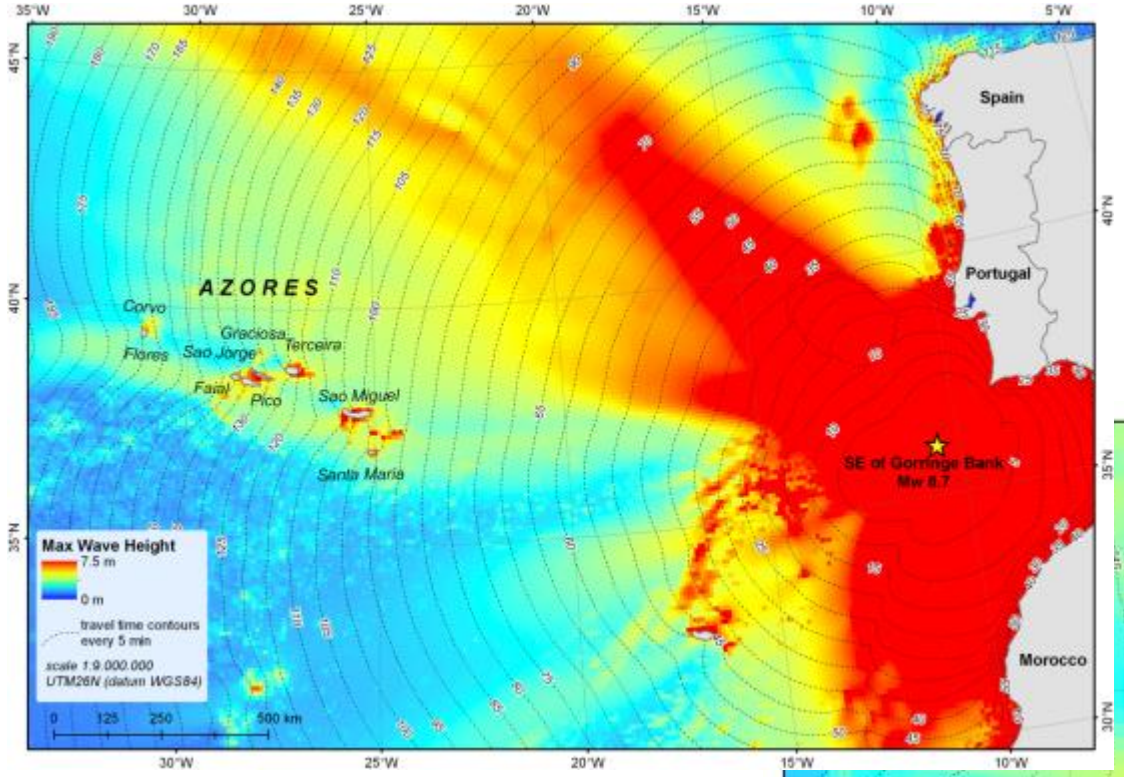
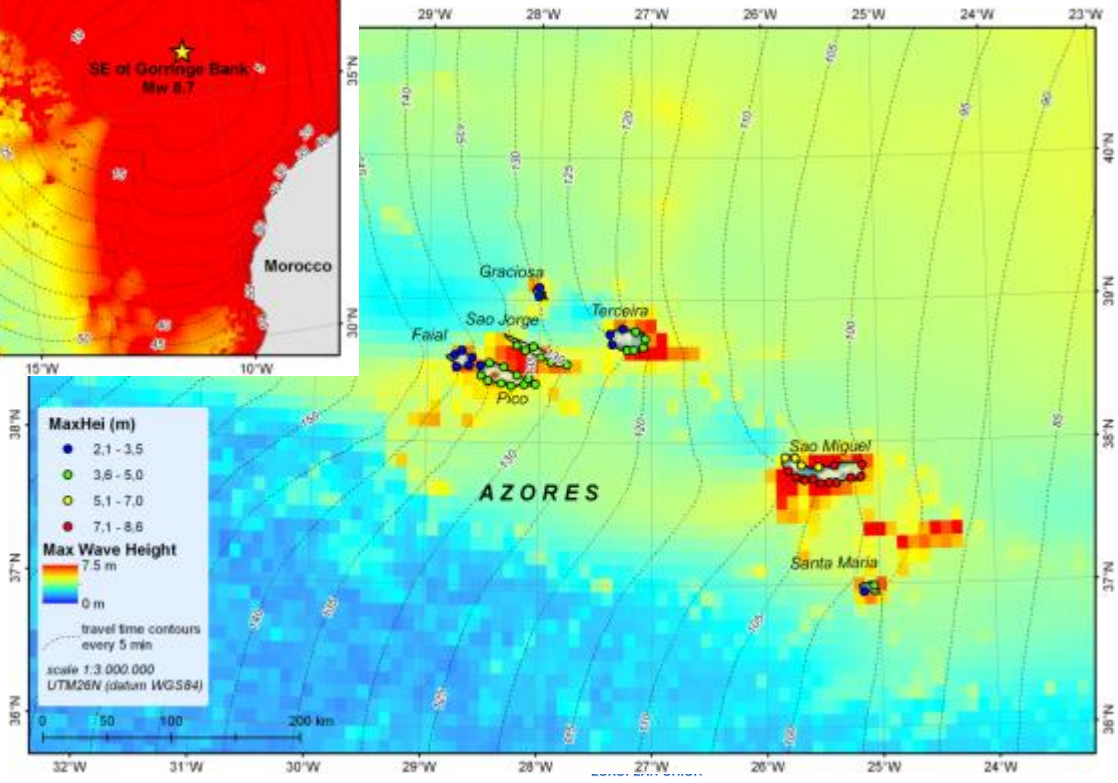
Azores activation

Tsunami





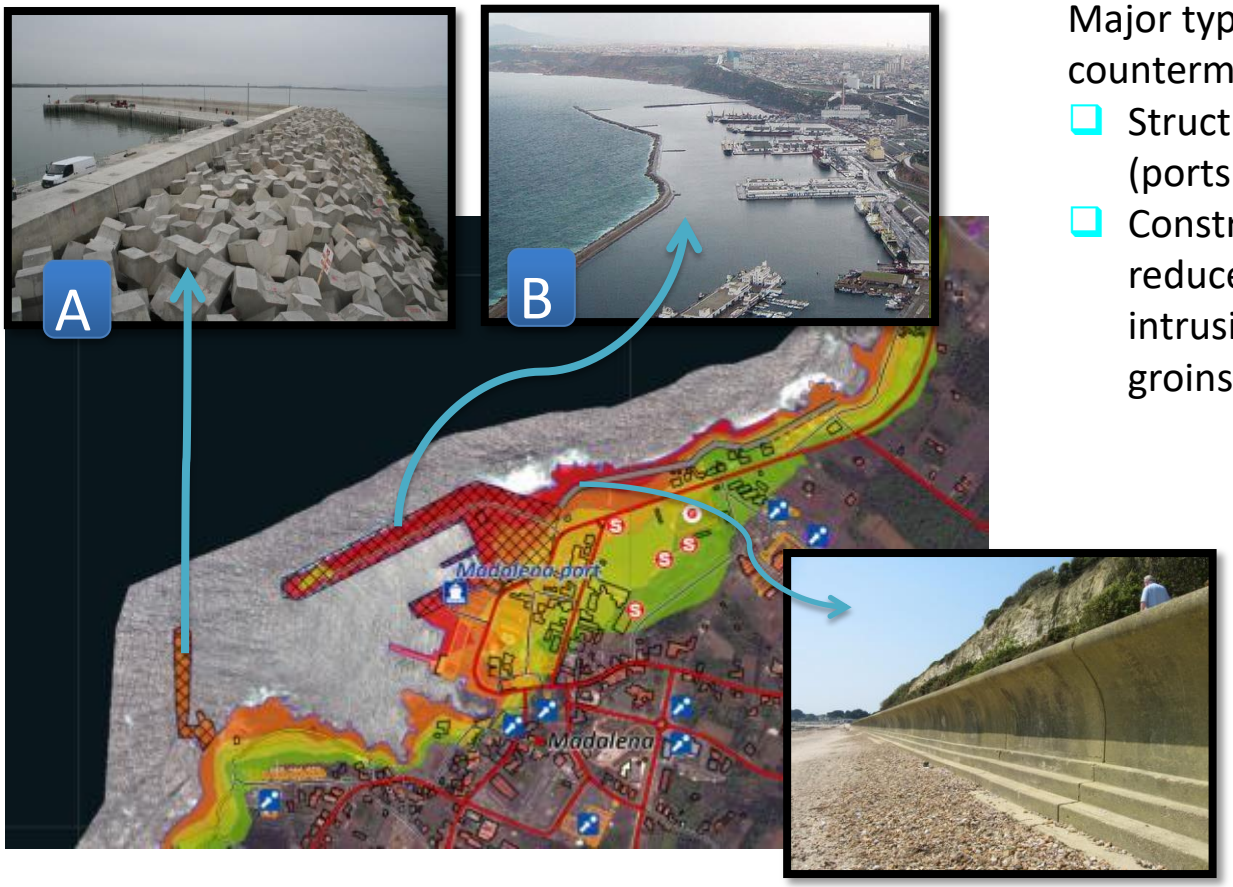
IAASARS

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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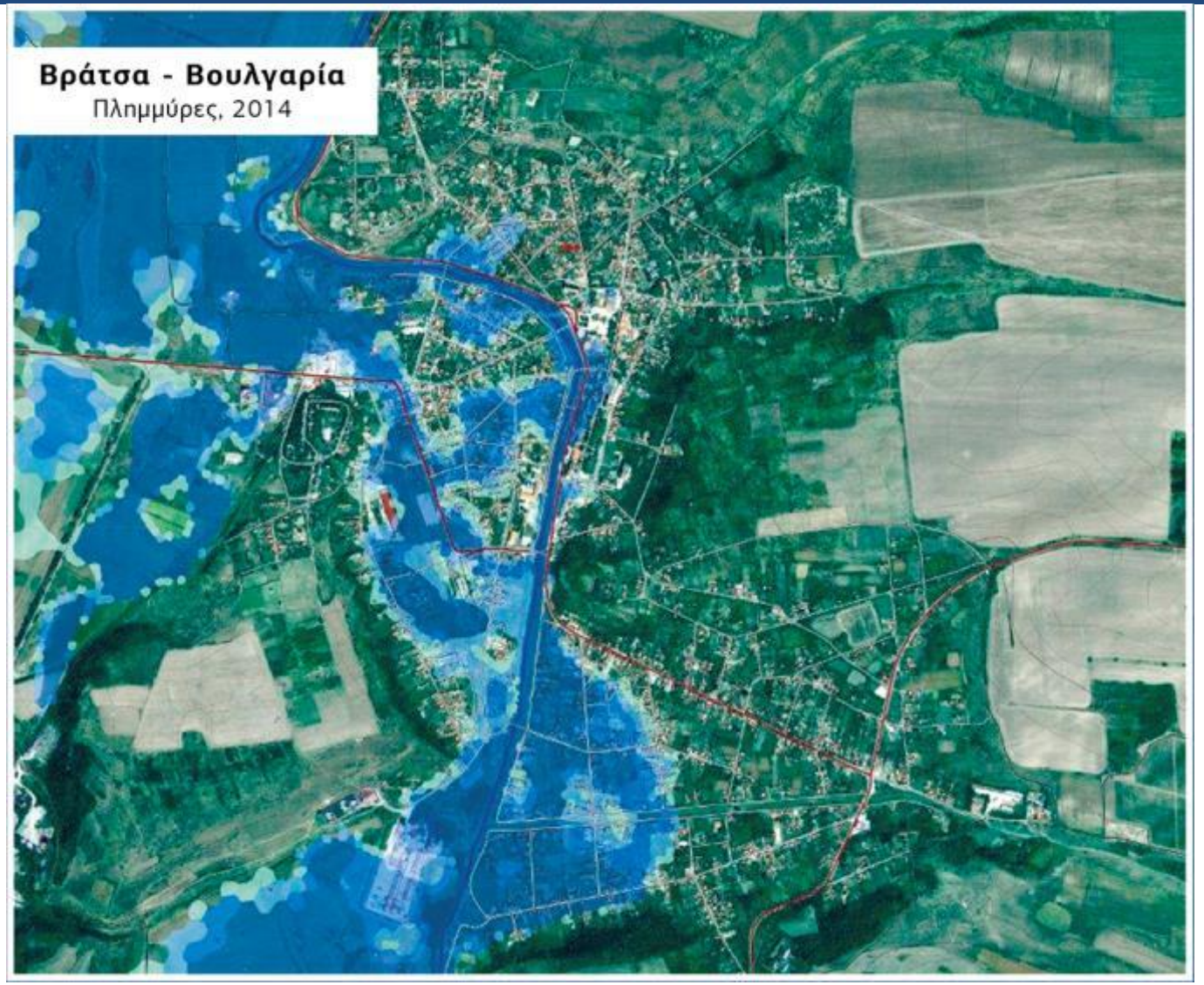
Copernicus EMS Risk & Recovery Activations

Bulgaria
EMSN022

Flood



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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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GEO GROUP ON EARTH OBSERVATIONS