



BEYOND, European Center of Excellence for EO based Disaster Management

The European Centre of Excellence BEYOND for Earth Observation based monitoring of Natural Disasters in South-Eastern Europe



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

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*



SciNetNatHazPrev - THESSALONIKI 30 October 2015 – OASP-ITSAK

Dr Haris KONTOES

Research Director of IAASARS/NOA

Project Coordinator





BEYOND, European Center of Excellence for EO based Disaster Management

The European Centre of Excellence for
Observation based monitoring of
South-Eastern Europe



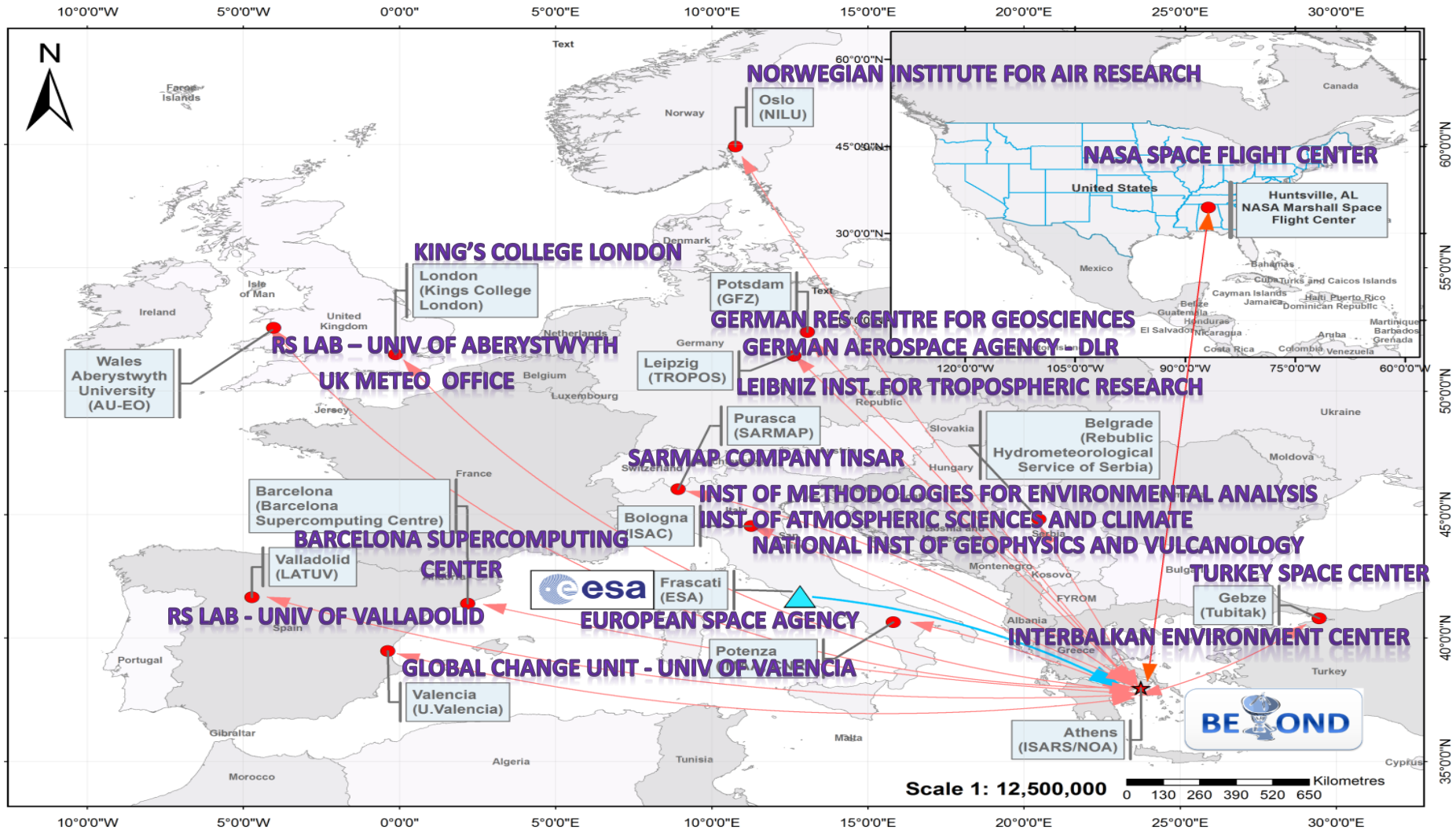
*Building a Centre of Excellence for
EO-based monitoring of Natural Disasters*

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*Activity: 4.1 Unlocking and developing the research potential of
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BEYOND, European Center of Excellence for EO based Disaster Management



- **BEYOND** aspires to setting 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

Funding: 2.3 MEuros EC Contribution

Additional funding from Structural Funds ~270KEuros

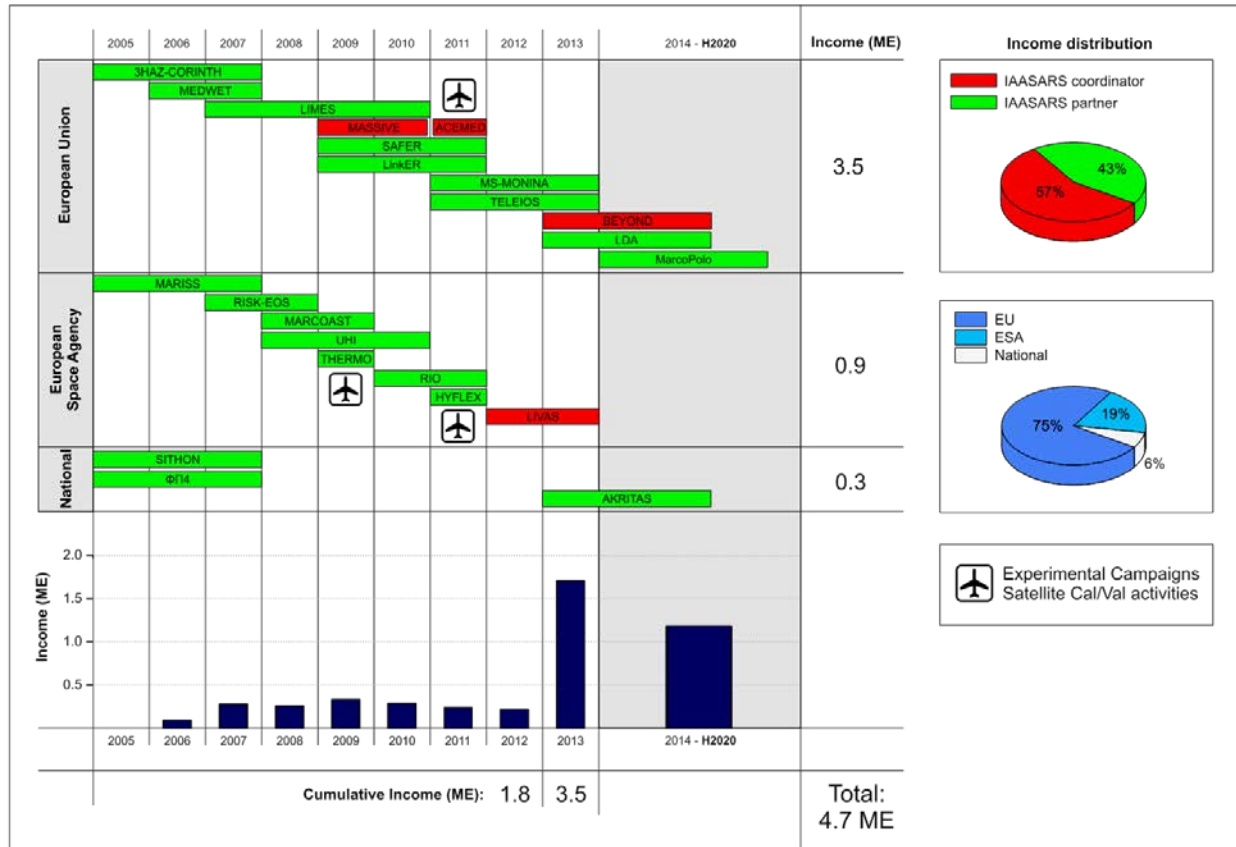
BEYOND, European Center of Excellence for EO based Disaster Management

LDA Large-scale demonstrators in support of GMES and GNSS based services in Athens, Greece, GMES/DG ENTR

MASSIVE: Mapping Seismic Vulnerability and Risk of Cities, European Commission - DG ENV A.3 – Civil Protection

TELEIOS—Virtual Observatory Infrastructure for Earth Observation Data, FP7-ICT-2009-5

LIMES (Land and Sea Integrated Monitoring for European Security/GMES / EC DG Enterprise



LinkER - Supporting the implementation of an operational GMES service in the field of emergency management, Invitation to Tender No: ENTR/08/028

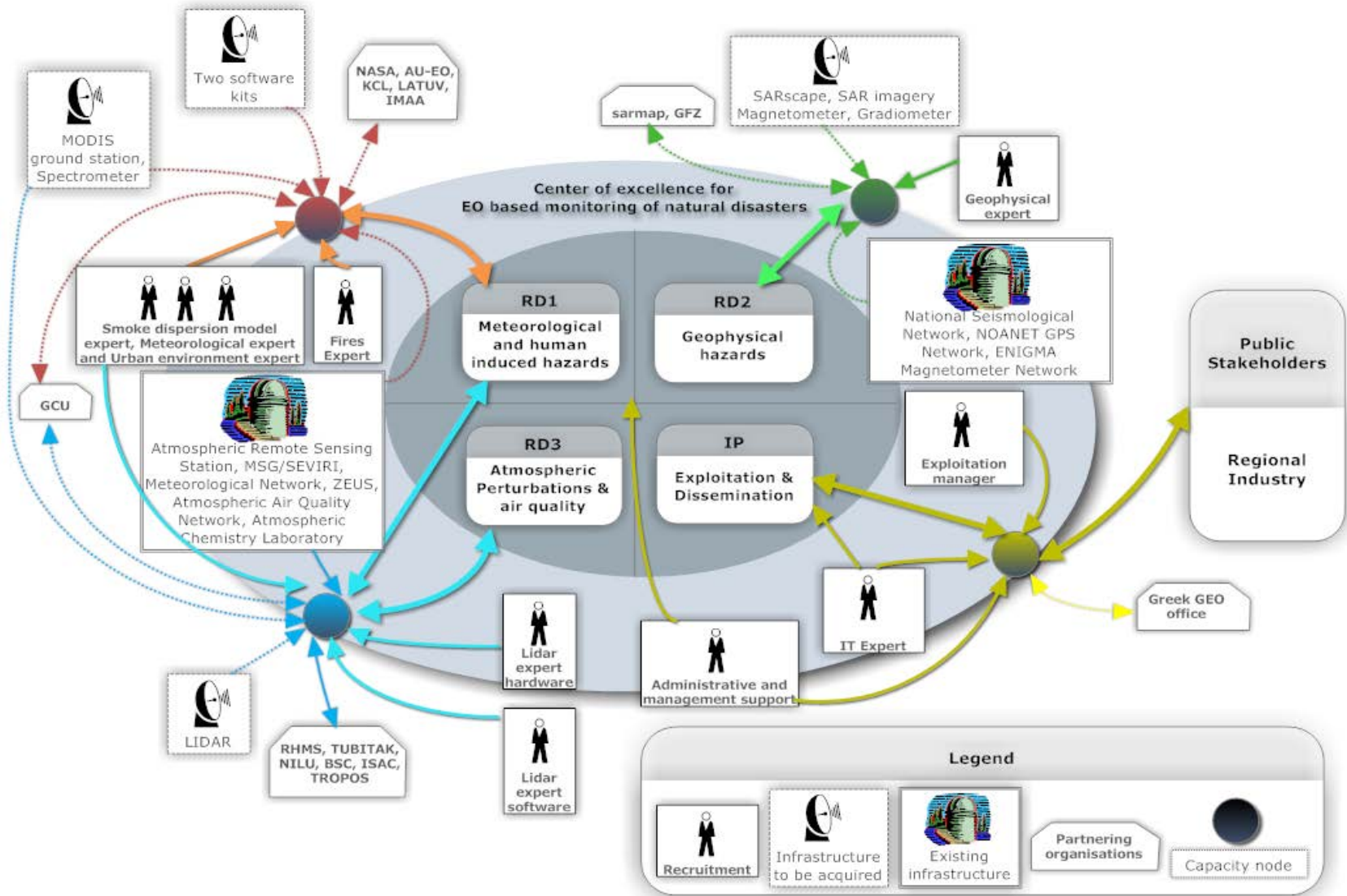
SAFER – EMERGENCY: Building Emergency Response Core Service, FP7-2007-SPACE-1/ GMES Collaborative Project

RISK-EOS Extension to Greece - Promotion of the GSE RISK-EOS fire services portfolio in Greece, EarthWatch GMES Services Elements, ESA/GSE

MARCOAST/ISSUE-OS - Integrated system for suspect vessels emergency tracking – OIL SPILLS



BEYOND, European Center of Excellence for EO based Disaster Management



Setting up integrated satellite based observational solutions

➤ **X-/L- band** acquisition station for (EOS Aqua and Terra, NPP, JPSS, NOAA, Met Op, FengYun) **(part of the DB network)**



IASARS/NOA X-/L-band Acquisition station



Infrastructure Capacity Building

Setting up integrated satellite based observational solutions

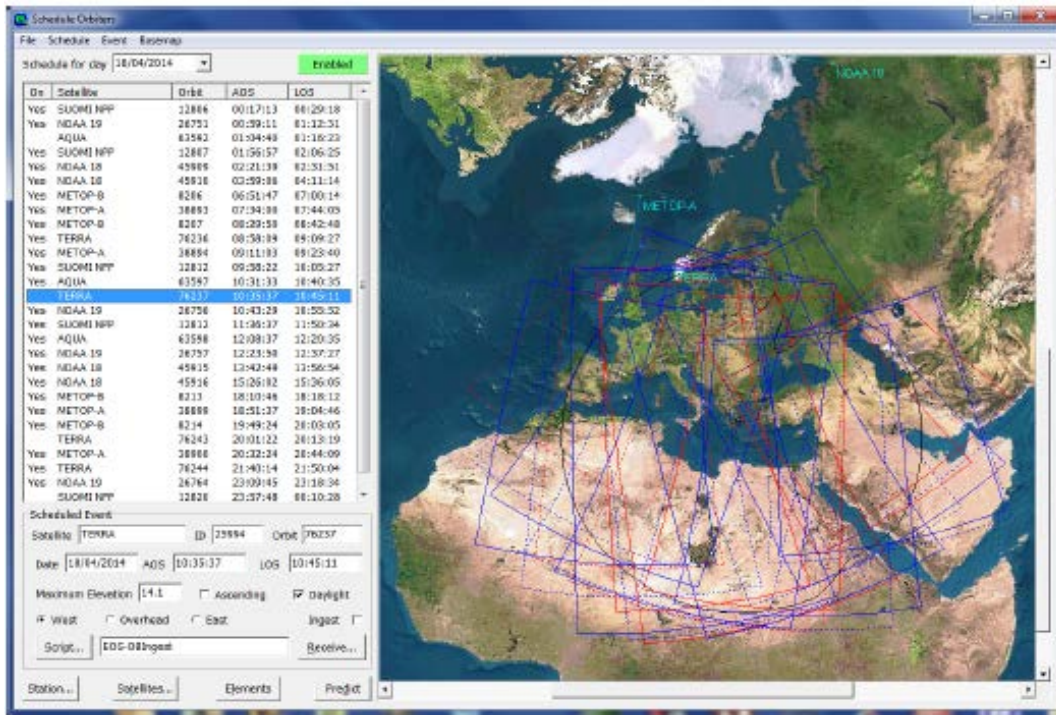
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IAASARS/NOA X-/L-band Acquisition station



Infrastructure Capacity Building



Setting up integrated satellite based observational solutions

- **MSG SEVIRI acquisition stations of DVB-S & DVB-S2 systems exploiting high throughput provided with the new EUMETCast Europe service, based on using the EUTELSAT 10A (part of EUMETSAT's network)**
- **Access to NOA's in-situ monitoring seismological, magnetometer, and GPS networks**



IAASARS/NOA MSG SEVIRI Acquisition station DVB-S2

- **Develop and Operate of NOA's Collaborative Ground Segment (Hellenic Sentinel Data Hub-Mirror Site) dedicated to ESA Sentinel missions (Copernicus), allowing near real time acquisition of S-1, S-2, and future S3, S5P satellite missions**

Setting up integrated satellite based observational solutions

- **MSG SEVIRI acquisition stations of DVB-S & DVB-S2 systems exploiting high throughput provided with the new EUMETCast Europe service, based on using the EUTELSAT 10A (part of EUMETSAT's network)**
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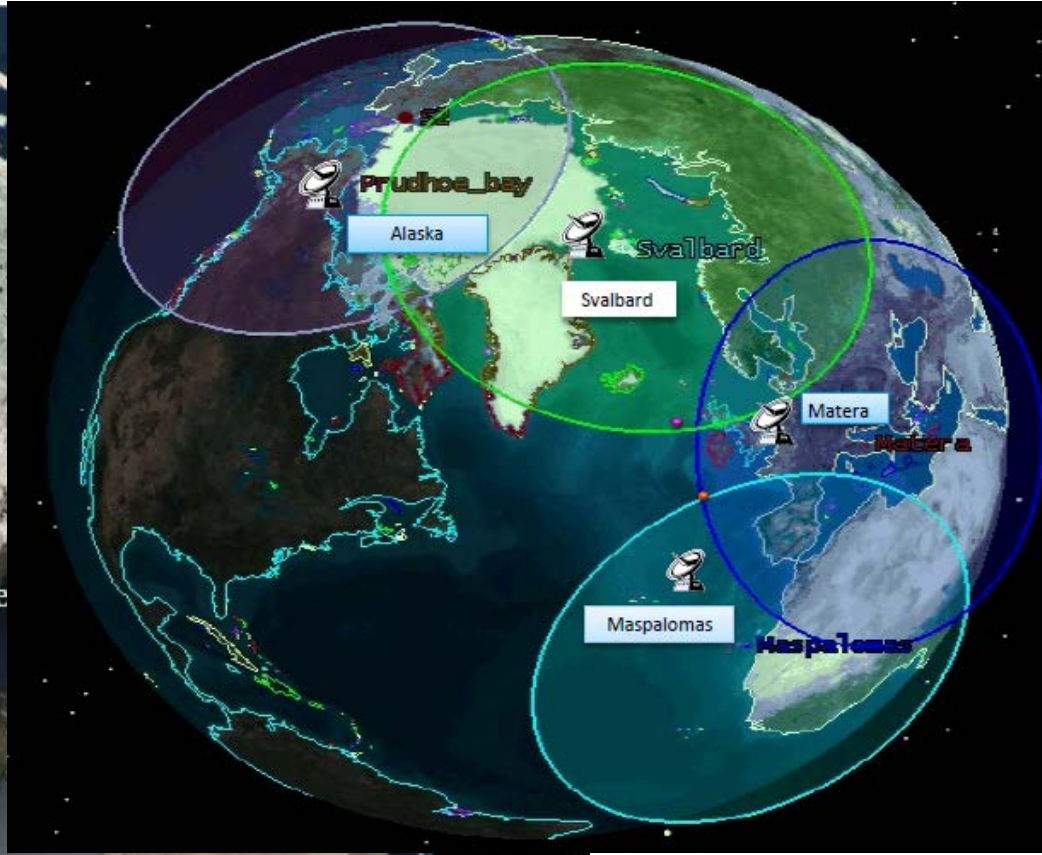
**Activity in the framework of the
COPERNICUS PROGRAM**
**The EUROPEAN EARTH OBSERVATION FLAGSHIP
PROGRAM (EU/ESA)**
<http://www.copernicus.eu/>

Infrastructure Capacity
Building

BEYOND, European Center of Excellence for EO based Disaster Management

➤ a **GSC Core Ground Segment**, with **GSC-funded Functions and Elements**, providing :

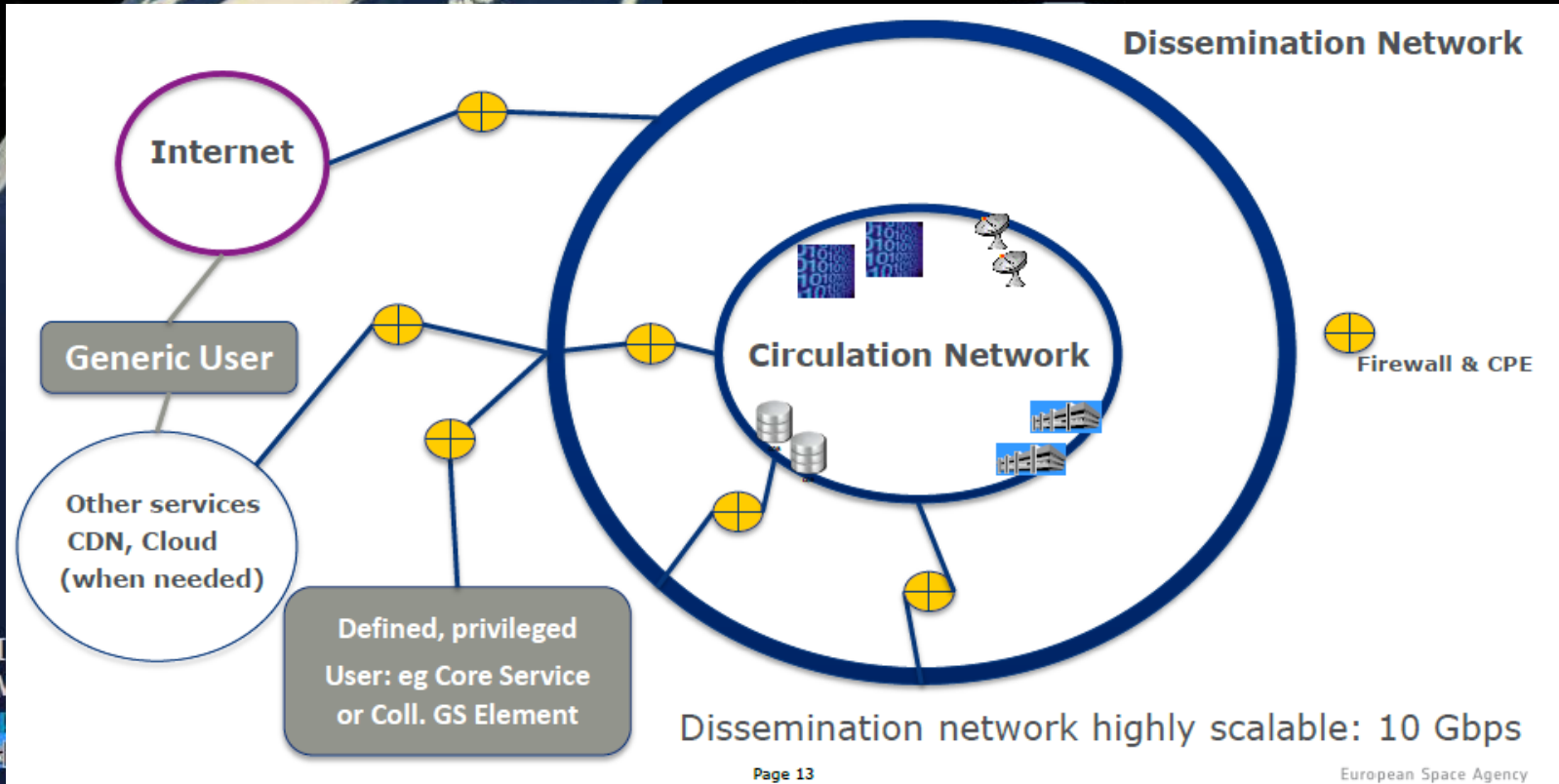
- the primary access to Sentinel Missions data as well as
- the coordinating access functions to Contributing Missions data



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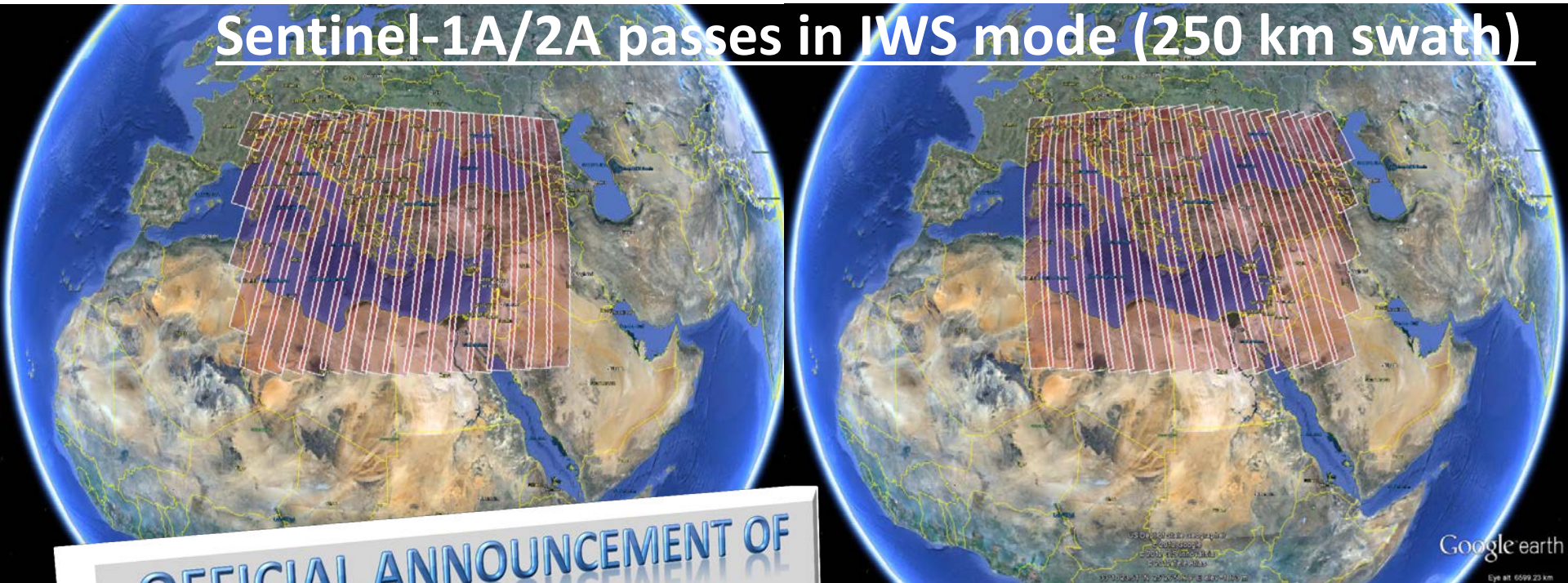
➤ a **GSC Core Ground Segment**, with **GSC-funded Functions and Elements**, providing :

- the primary access to Sentinel Missions data as well as
- the coordinating access functions to Contributing Missions data



Hellenic Sentinel Data Hub- Mirror Site

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



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

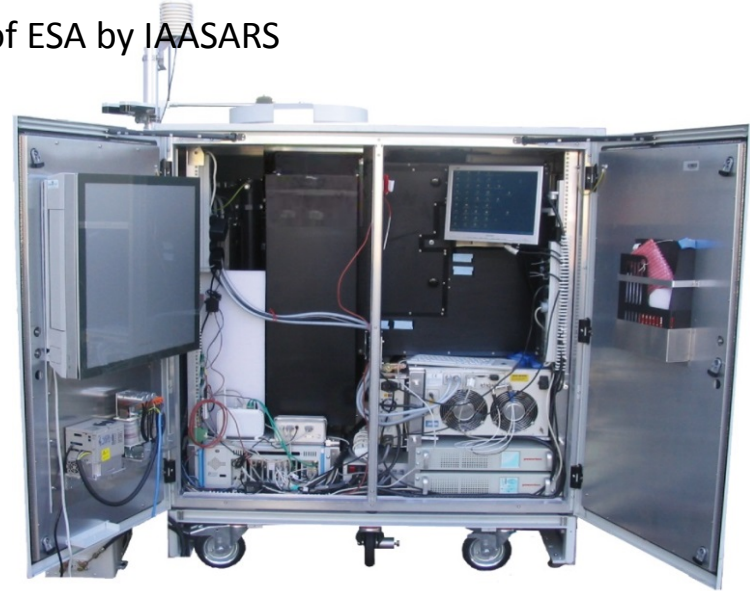
[HTTP://SENTINELS.SPACE.NOA.GR](http://sentinels.space.noa.gr)

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Operation of the mobile lidar of ESA by IAASARS

Development of a state-of-the-art multi-wavelength lidar to be installed in Crete (FKL), in the framework of the BEYOND project, part of the EARLINET network.



Infrastructure Capacity Building

ACHIEVEMENTS – EO SERVICES

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Service	Status	End Users	Scale	
EMERGENCY RESPONSE/EMERGENCY SUPPORT-METEO RELATED HAZARDS				Delivered
Real Time Fire Monitoring	Operational GMES Standard	Fire Brigades, Civil Protection, Public, Private Sector	National Regional	
Rapid Fire Mapping	Operational GMES Standard	Fire Brigades, Civil Protection, Forestry Services, Min of Env	Regional Local	
Disaster Event Mapping & Damage Ass.	Operational GMES Standard	Forestry Services, Min of Env (DG for Nat. Vegetation/Forest Protection)	Local	
Seasonal/Diachronic Fire Mapping & Damage Ass.	Operational GMES Standard	Forestry Services, Min of Env (DG for Nat. Vegetation/Forest Protection, Cadastral Org, Fire Brigades)	National	
Wild Fire Smoke Dispersion	Research/ Preoperational	Fire Brigades, Civil Protection, Min of Env	Regional Local	
Saharian Dust Episodes	Research/ Preoperational	Civil Protection, Min of Env, Public	National	
Flood Risk	Research/ Preoperational	National Electric Power Org, Min of Development, Local Authorities, Civil Protection	Regional Local	
Heat Waves Risk	Research/ Preoperational	Min of Public Health, Local Authorities, Medical Science	Local	
				To be Delivered as V1.0 in 2014
				To be Delivered as V1.0 in 2015-2016

Web service

Web service



BEYOND, European Center of Excellence for EO based Disaster Management

EMERGENCY RESPONSE/EMERGENCY SUPPORT- GEO- HAZARDS			
Earthquake related crustal deformation field	Operational GMES Standard	Anti-seismic Planning & Protection Org, EQ Scientists	Local
Volcano related surface velocity field	Operational GMES Standard	Anti-seismic Planning & Protection Org, Local Authorities, EQ Scientists	Local
Landslide related surface velocity field	Research	Anti-seismic Planning & Protection Org, Local Authorities, Entrepreneurs, Civ. Eng, Geologists	Local
ATMOSPHERIC DISTURBANCES - CLIMATOLOGY			
3D-Climatology	Operational GMES Standard	Cal/Val Industry, Global Atm Monitoring Networks	Global
Atmospheric Episodes	Research	Cal/Val Industry, Global Atm Monitoring Networks,	Local
LULC CHANGE MONITORING – UAV / AIRBORNE / SATELLITE			
Urban Mapping	Operational GMES Standard	World Bank, EIB, Min of Env, Cadastral Org	Local
UAV Damage Recording	Research/ Preoperational	Anti-seismic Planning and Protection Organisation	Local
Ecosystem Monitoring and Mapping (Forests/Wetlands)	Operational	Min of Env, Hellenic Biotope & Wetlands Center, Cadastral Org	National Regional

Delivered

To be Delivered as V1.0 in 2014

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Web service





BEYOND
FireHub

“FireHub: A Space Based Fire Management Hub “





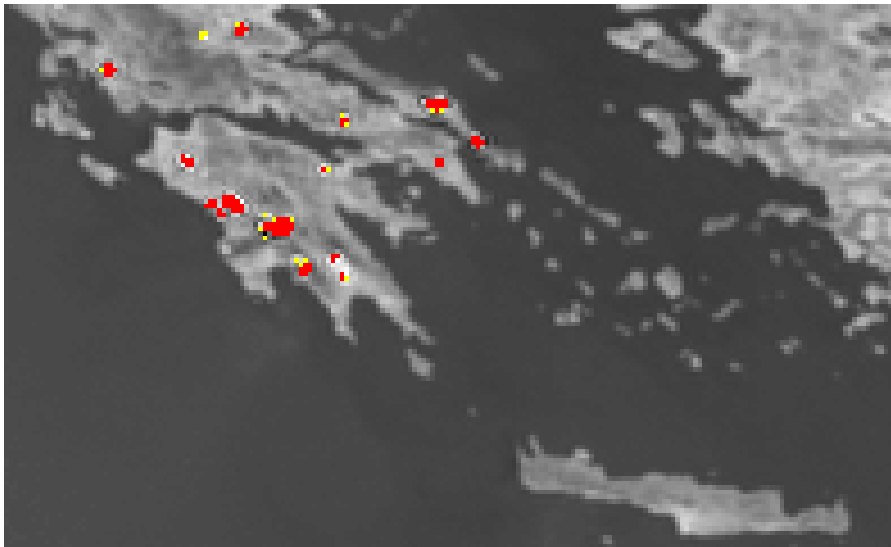
“FireHub: A Space Based Fire Management Hub “



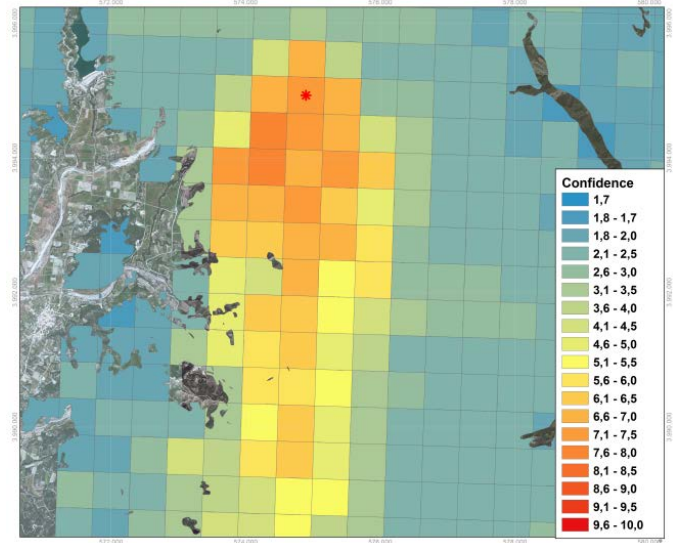
“FireHub: A Space Based Fire Management Hub “

The service consists of three pillars:

1. The real-time fire detection and monitoring application
2. The large scale Burnt Scar Mapping during and after wildfires and the Diachronic BSM
3. The fire smoke dispersion forecasting tool



Raw resolution: 3.5x3.5 km wide pixel over entire



Refined resolution: 0.5x0.5 km wide pixel over entire Greece

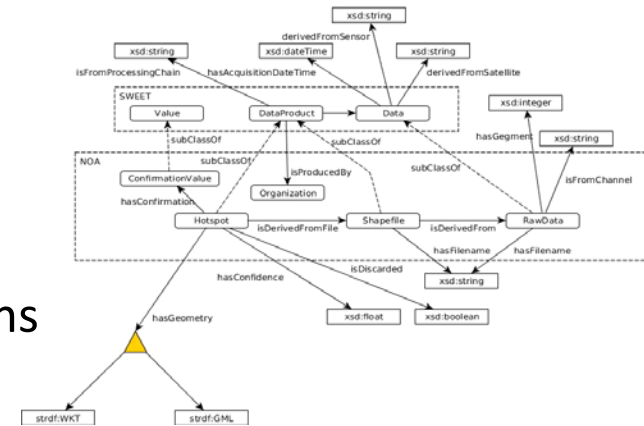
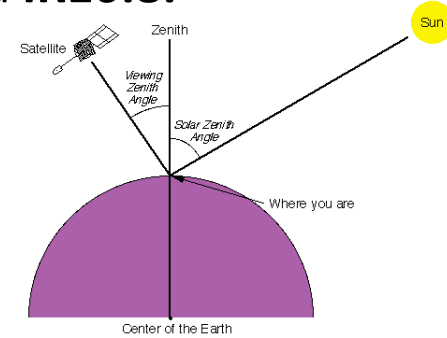
CLASSIFICATION PROCESS

Classification #1: The EUMETSAT Fire mapping algorithm (FIR) based on fixed thresholding approach, applied on the spectral bands **IR 3.9** and **IR10.8**.

Classification enhancement # 1: The thresholds are dynamically changing calculated for each image and every pixel location on the basis of the seasonally variations and time depended Solar Zenith Angle.

Classification enhancement # 2 : Create and integrate classification evidence through geo-spatial ontology schemes and reasoning queries, accounting for the

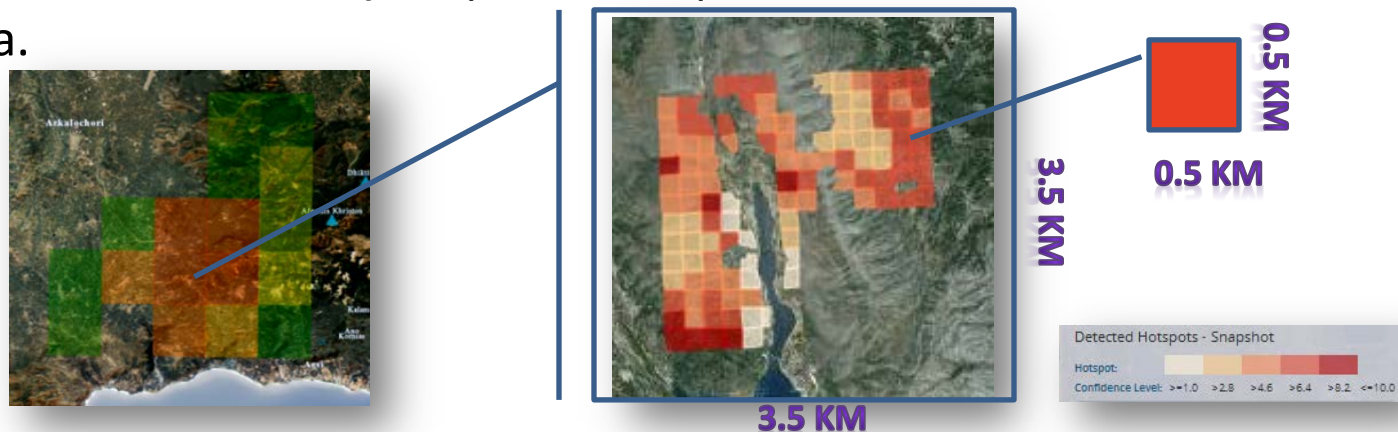
- a) thematic consistency by eliminating false alarms, and
- b) account for the time persistence of the fire observations



CLASSIFICATION PROCESS

Classification enhancement # 3: Downscaling the first classification output and calculate the fire occurrence probability in sub-areas of 500 m x 500 m wide, inside the initial observation area of 3.5km x 3.5 km, accounting for the real meteorological, physical / ecological, and morphological conditions in the affected area such as,

a) Wind conditions (speed/direction), **b)** Fuel types and fuel type's proneness to fire, **c)** Altitudinal zone, **d)** Slope and Aspect elements of each of the 500m x500m area.



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

IAASARS

Zaharo Fire

Olympia site Fire

Aliveri Euboea Fire

Korinthos Fire

Stira Euboea Fire

Parnon Mt Fire

Taygetos Mt Fire

Megalopolis Fire

Otilon Fire

EMERGENCY

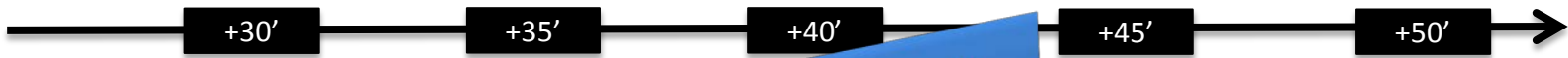
Control Room

Water Bombing Aircraft

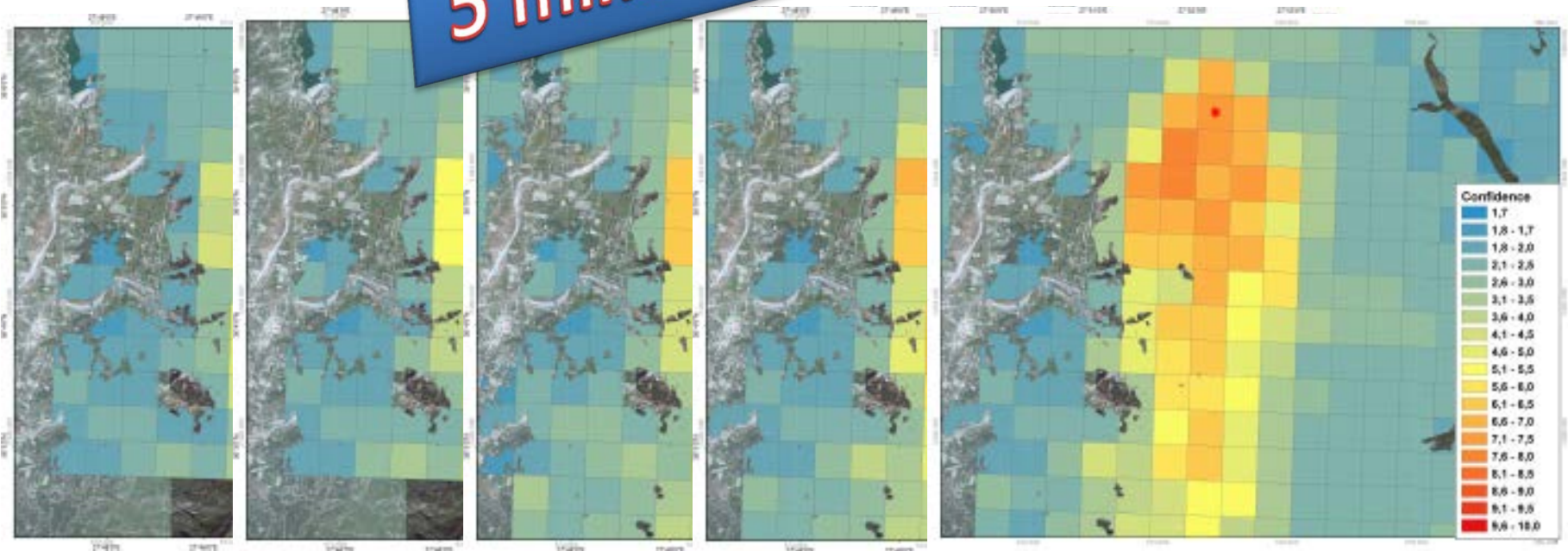
SEVIRI MIR 070823_1030 UTC

	POTENTIAL FIRE
	CONFIRMED FIRE

Results @ 150 minutes after fire ignition



5 minutes basis



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SEVIRI Monitor - NOAA GIS

ocean.space.noaa.gov/seviri/real_time/index.php

Google Earth

Google Earth
 LSO/VLSO
 Toponyms
 Spocis Slider
 CORINE LC 2000

EUMETSAT

Status Info
 Mode: Archive
 Beginning Time: 2013-07-27 09:00:00 GMT
 End Time: 2013-07-27 21:00:00 GMT
 Total #HotSpots: 377
 Latest #HotSpots: 2013-07-27 13:10:00

Demonstration of the "Real-time fire detection" functionality

Local Time: 27-07-2013 13:10

Fire Monitoring Service based on MSG SEVIRI

Raw | Refined | Realtime | Archive

Year: 2013 | Month of Reference: July | Subunit: 02

Show Fire

Detected Hotspots - Snapshot
 Hotspot: [Color Scale]
 Confidence Level: 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0

Snapshot Query Data

ID	RANK	Municipality	Date	Sender	Conf
757001	98	Δ. Politei	2013-07-27 13:10:00	MSG2_RSS	1.988419
757001	98	Δ. Politei	2013-07-27 13:10:00	MSG2_RSS	1.988319
757011	98	Δ. Politei	2013-07-27 13:10:00	MSG2_RSS	1.988302
757021	98	Δ. Politei	2013-07-27 13:10:00	MSG2_RSS	1.988454
757001	98	Δ. Politei	2013-07-27 13:10:00	MSG2_RSS	1.988302
759991	98	Δ. Politei	2013-07-27 13:10:00	MSG2_RSS	1.988302
759981	98	Δ. Politei	2013-07-27 13:10:00	MSG2_RSS	1.753441
757031	98	Δ. Politei	2013-07-27 13:10:00	MSG2_RSS	1.988488

View 1 - 390 of 393

NOAA Implementation Team:

National Observatory of Athens
 IAASARS

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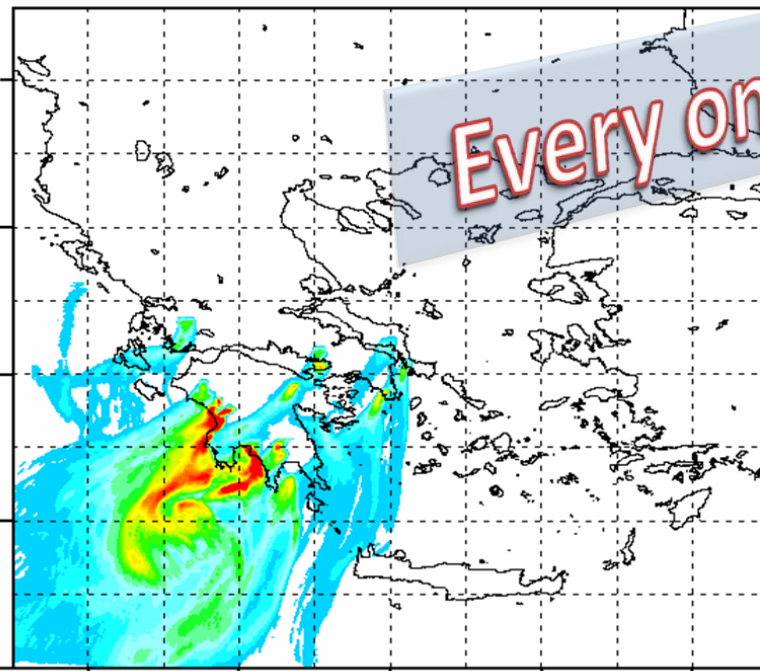
FLEXPART - NOA

Biomass Burning (Organic Carbon - OC)

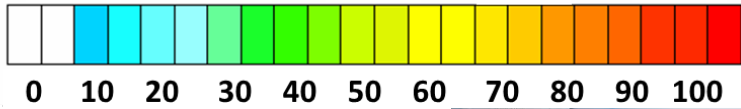
Valid Date: 26-08-2007 0900UTC

Model layer: Integrated Column

(ng m⁻³)



20°E 22°E 24°E 26°E 28°E

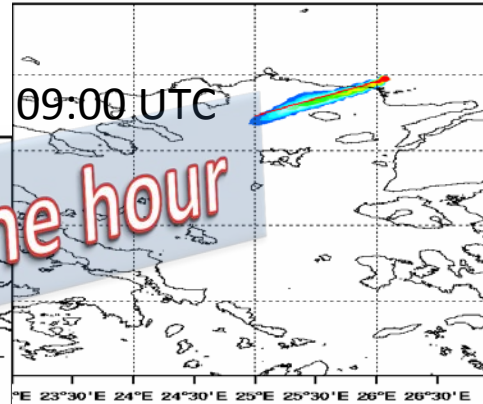


FLEXPART - NOA

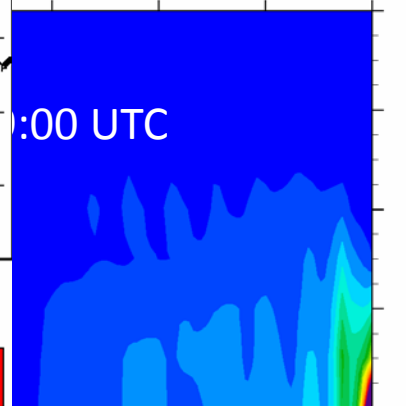
Biomass Burning (Organic Carbon -OC)

valid date: 24-08-2011 09UTC

Model layer: Integrated Column (ng m⁻³)



FLEXPART NOA
Biomass Burning (Organic Carbon -OC)
valid date: 24-8-2011 09UTC



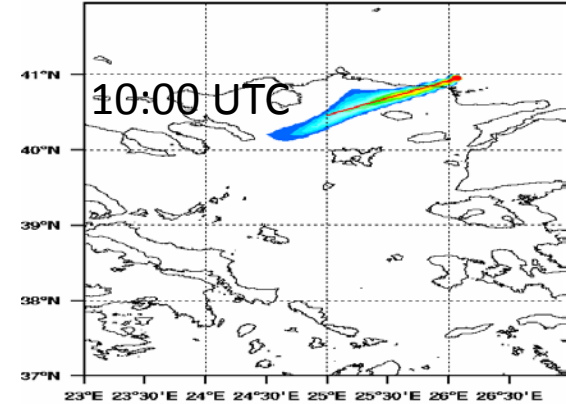
40.58, 25.27 40.71, 25.54 40.83, 25.82 40.96, 26.1

FLEXPART - NOA

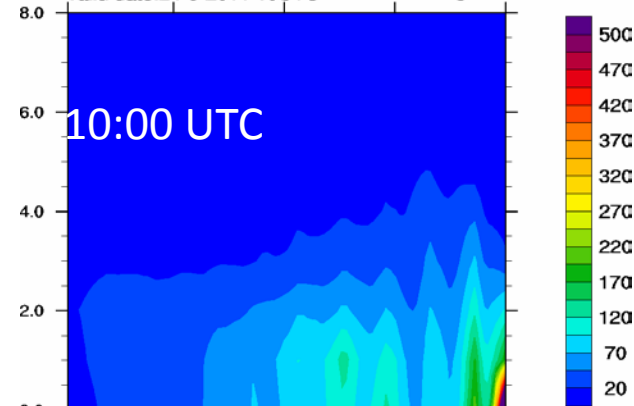
Biomass Burning (Organic Carbon -OC)

valid date: 24-08-2011 10UTC

Model layer: Integrated Column (ng m⁻³)



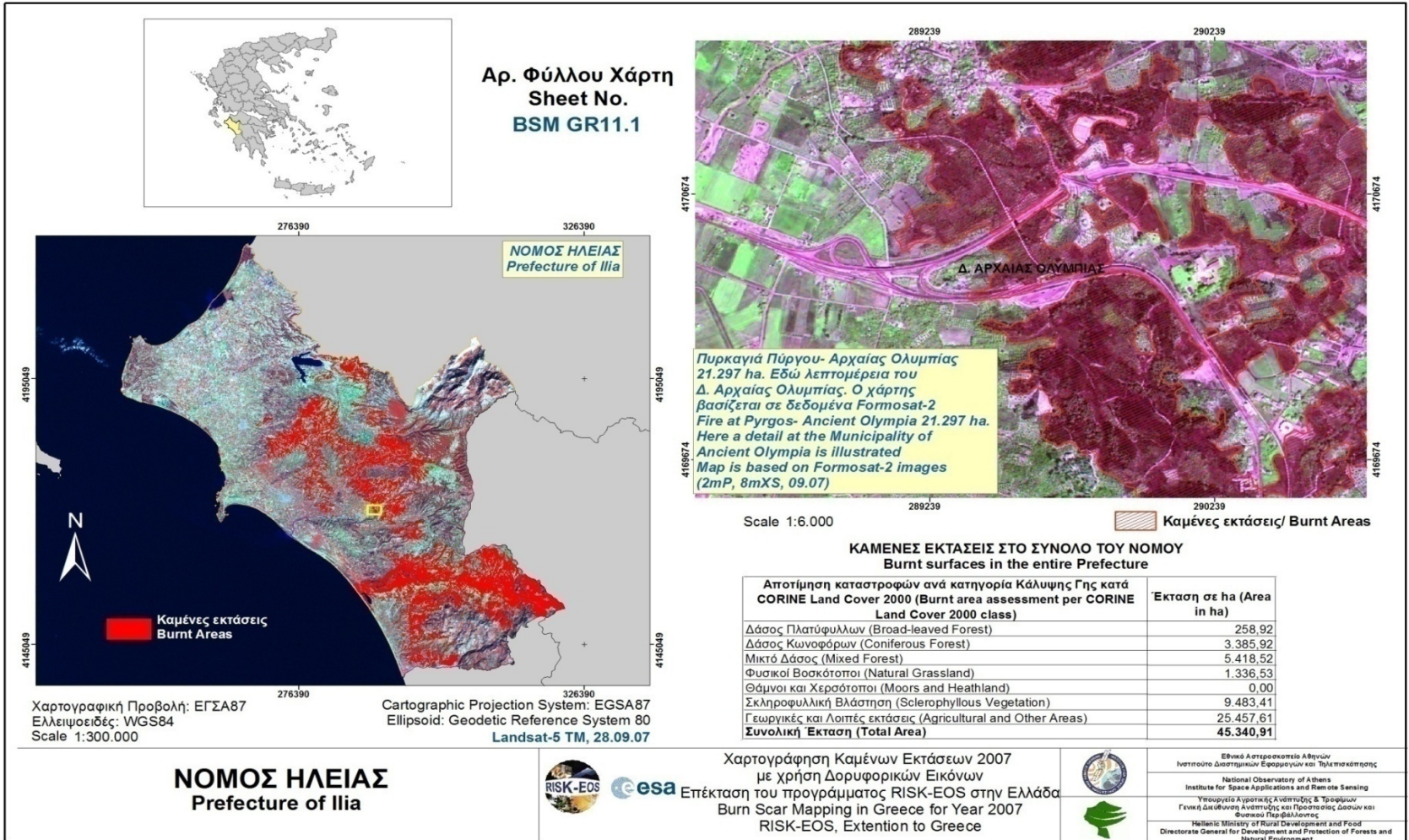
FLEXPART NOA
Biomass Burning (Organic Carbon -OC)
valid date: 24-8-2011 10UTC



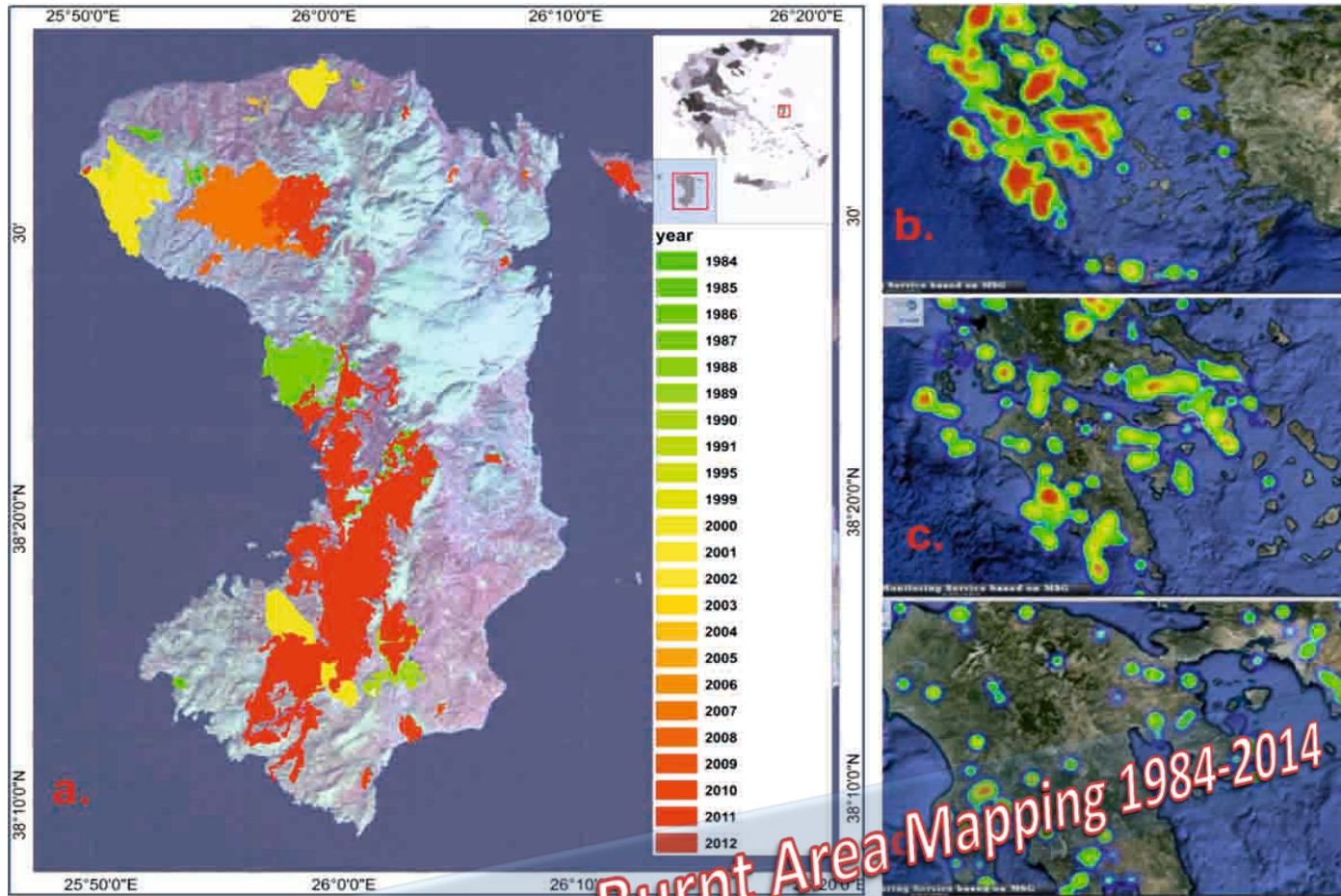
40.46, 25 40.58, 25.27 40.71, 25.54 40.83, 25.82 40.96, 26.1



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1) More than 650 Landsat TM images acquired over Greece in the period 1984-2013 residing on USGS archives were downloaded and processed fully automatically using the NOA processing chain.

2) Yearly maps of Burned Areas have been produced

3) Yearly statistics per land cover type and administrative data have been generated

4) On-line dissemination of the produced maps and statistics through the NOA's dedicated web interface

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Firefox SEVIRI Monitor - NOA GIS

papos.space.noa.gr/fend_static/index.html

Most Visited Getting Started Latest Headlines Γενική Γραμματεία Ερε... TeleiosWiki: Additiona... rts

TELEOS SWoFS gmes strabon EUMETSAT

Fire Monitoring Service based on MSG SEVIRI

RANK	Municipality	Duration	Ignition	End
0	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	27.25	2012-08-24T23:10:00	2012-08-26T02:20:00
2	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	26.17	2012-08-25T01:45:00	2012-08-26T03:50:00
4	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	17.83	2012-08-25T10:15:00	2012-08-26T04:00:00
5	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	17.75	2012-08-25T10:15:00	2012-08-26T03:55:00
6	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	11.83	2012-08-25T10:10:00	2012-08-25T21:55:00
10	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	11.83	2012-08-25T10:10:00	2012-08-25T21:55:00
12	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	10	2012-08-25T00:55:00	2012-08-25T10:50:00
13	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	16.33	2012-08-25T10:20:00	2012-08-26T02:35:00
14	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	10.67	2012-08-25T12:40:00	2012-08-25T23:15:00

View 1 - 39 of 39

All Detected Hotspots End Time (Days | Hours). From 2012-08-27T21:00:00 to 2012-08-21T21:00:00

Geotype: Populated (Population)

- ★ Athens ≥300000
- ★ Larisa ≥100000
- Chania ≥50000
- Tripoli ≥10000
- Epanomi ≥1000
- Areopoli ≥500
- Kalamos ≥100
- Platania ≥20

Geotype: Mountains (Height[m])

- ▲ M.Olympus ≥2500
- ▲ M.Pilion ≥1500
- ▲ M.Ymittos ≥1000
- ▲ M.Mounti ≥20

Geotype: Islands (Area km²)

- N.Crete ≥3000
- N.Rhodes ≥1000
- N.Andros ≥100
- N.Thira ≥10
- N.Plareaia ≥1
- N.Ploponisi ≥0

NOA Implementation Team: Haris Kontoes; Themistoklis Herekakis; Dimitris Michail; Ioannis Papoutsis

Contact Email: mailto:kontoes@noa.gr

3:04 μμ 14/9/2012





National Observatory of Athens

Continuous offer to the Scientific Research since 1842

Greek General Secretariat for Research and Technology

Event
Logo

<http://ocean.space.noa.gr/bsm>

**DIACHRONIC INVENTORY OF FOREST FIRES OVER
GREECE FROM 1984 TO PRESENT, WITH USE OF
LANDSAT 4,5,7 SATELLITE DATA**

URL: <http://www.noa.gr>

BEYOND for flood monitoring

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

HOME PROJECT INFRASTRUCTURE PEOPLE PARTNERS OUTREACH ANNOUNCEMENTS MULTIMEDIA BEYOND SHARE EVENTS

NATURAL DISASTER SERVICES

- FIRES
- FLOODS**
- OVERVIEW
- CASE STUDIES
- FLOODS
- OBSERVATORY
- URBAN ENVIRONMENT
- GEOPHYSICAL
- ATMOSPHERIC
- WEATHER
- UAV-BASED
- RECORDING

FLOODS

OVERVIEW

Flood is defined as 'a covering by water of land not normally covered by water' in the European Union Floods Directive 2007/60/EC. Human activities, such as agriculture, urban development, industry and tourism, contribute to an increase in the likelihood and adverse impacts of flood events. It is thus important to establish flood risk management plans focused on prevention, protection and preparedness.

The ultimate goal of the Flood Hazard activities in BEYOND is to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. In this direction, we select river basins at high risk of flooding, we study the hydraulic behaviour of the river, and we proceed to the flood modelling validation and enhancement with the integration of satellite optical and radar data.

In the context of the implementation of BEYOND, we have established the [FLOODS OBSERVATORY](#) where we register all the flood events in Greece and we publish the results we produce following process of satellite optical and radar images.

NOA has also established cooperation with the Public Power Corporation S.A. (PPC S.A.), as there is a mutual interest in cooperation in the field of the study of floods to develop a methodology for monitoring and management of flood risks. The contribution of PPC S.A. will cover the provision of relevant expertise and data derived from the processing of the measurements of the hydrometeorological network operated by PPC S.A., and/or data relating to the management of the hydrological basins under study. This cooperation will allow the improved adjustment and calibration of the hydrological models which are to be operated by the IAASARS/NOA, as well as the development of a methodology that will provide reliable observations to the services of PPC S.A. in the future. Our first area of interest is Arachthos river basin, a river with several flood events, very close to the city of Artas, where PPC is operating a large hydroelectric plant.

SEARCH

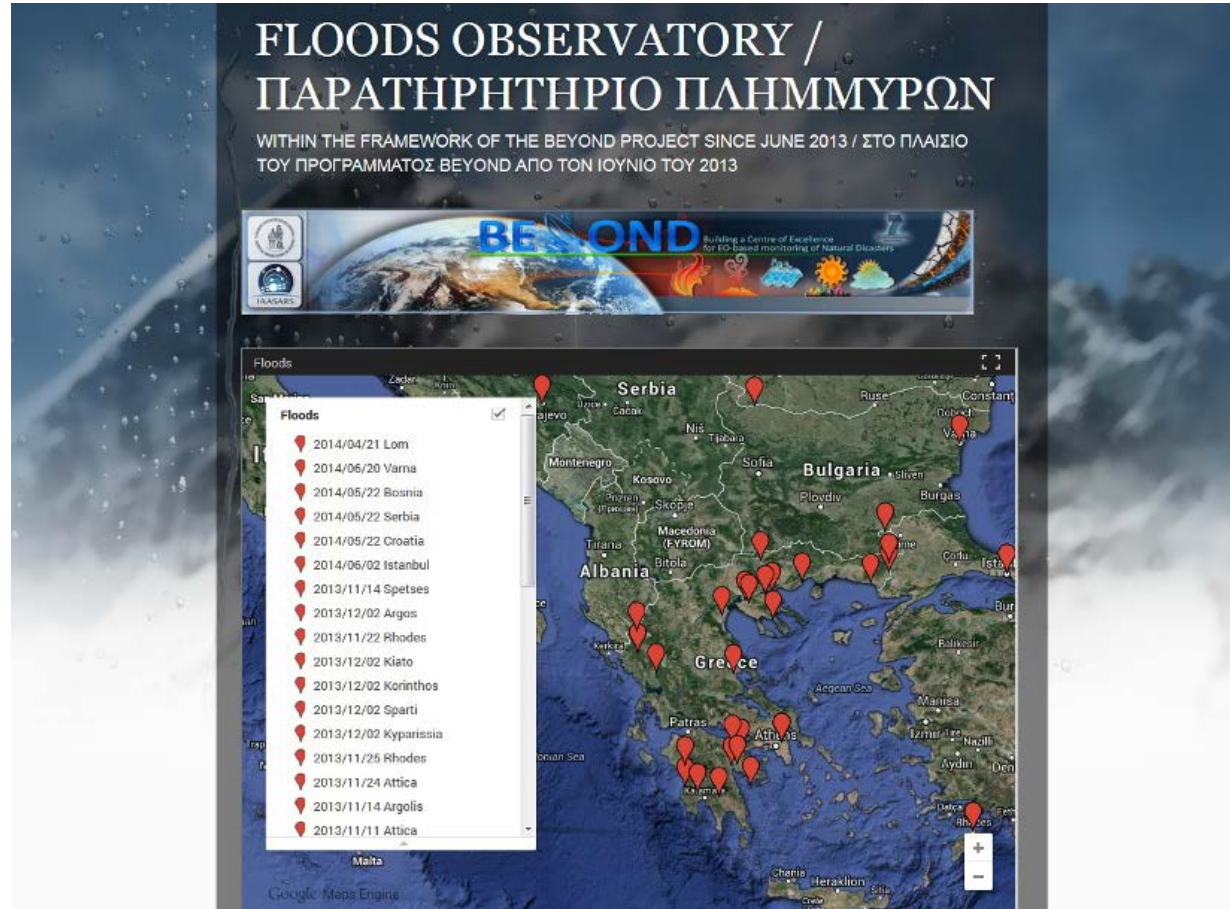
PROJECT MEETINGS

- > [Joint EARLINET-GA/ACTRIS Limassol, Cyprus, 25-29 November 2013](#)
- > [KO Athens 2013-07-18](#)

BEYOND NEWSLETTERS

- > [Newsletter No I](#)
- > [Newsletter No II](#)

We have established the **BEYOND Floods Observatory** where we register all the major flood events in Greece and South-Eastern Europe.



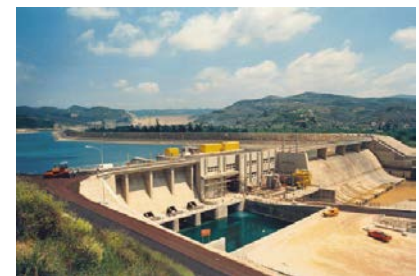
BEYOND Floods Early Warning System

This cooperation allows the improved adjustment and calibration of the hydrological and hydraulic models which are operated by NOA, as well as the development of a methodology that will provide reliable products and services to PPC S.A.

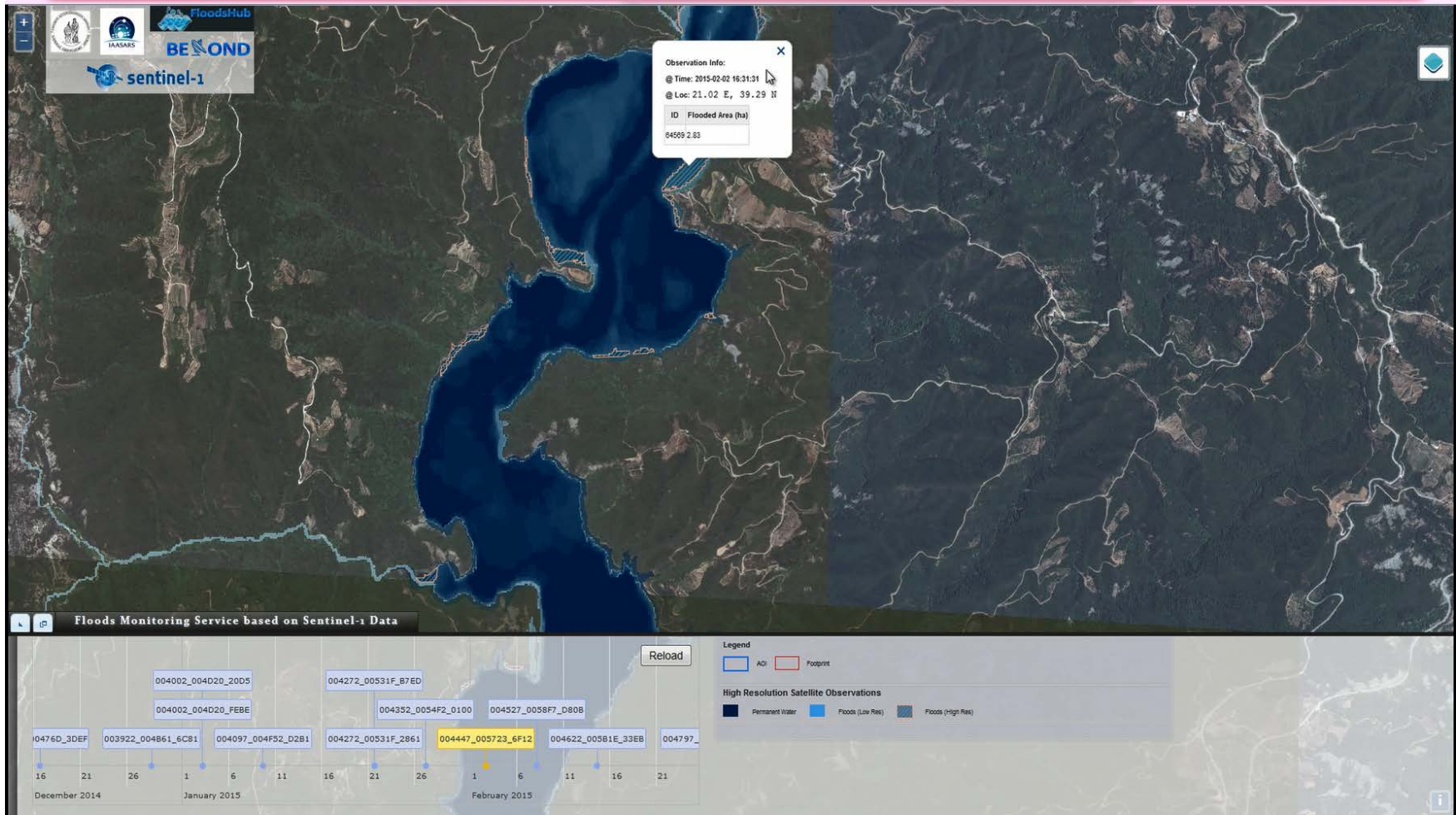
CASE STUDY:

The first case study is the river basin of Arachthos, a river with several flood events, upstream of the city of Arta, where PPC S.A. is operating two hydroelectric plants:

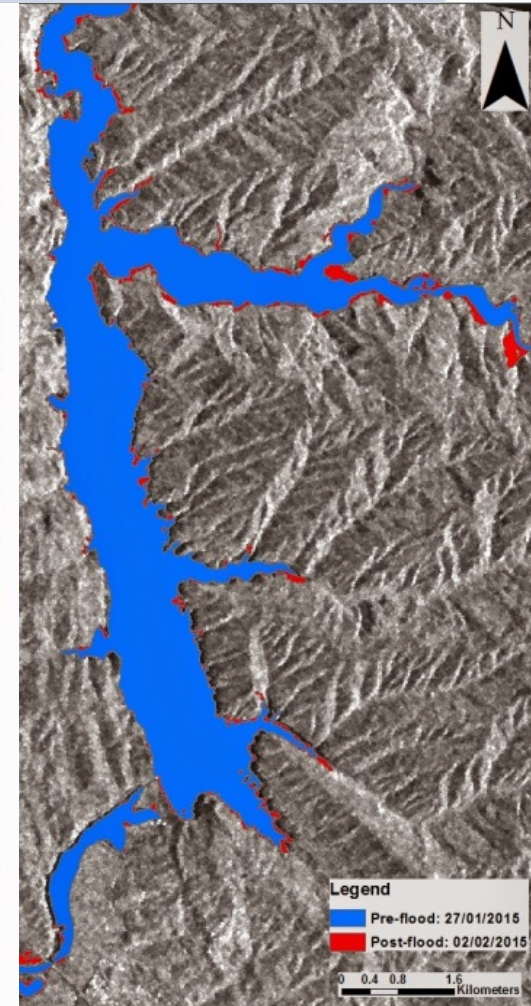
- 1) a large one known as Pournari I (effective capacity of reservoir 303 million m³)
- 2) a smaller one known as Pournari II (effective capacity of reservoir 4 million m³).



BEYOND's Floods Monitoring Service for Arachthos river basin

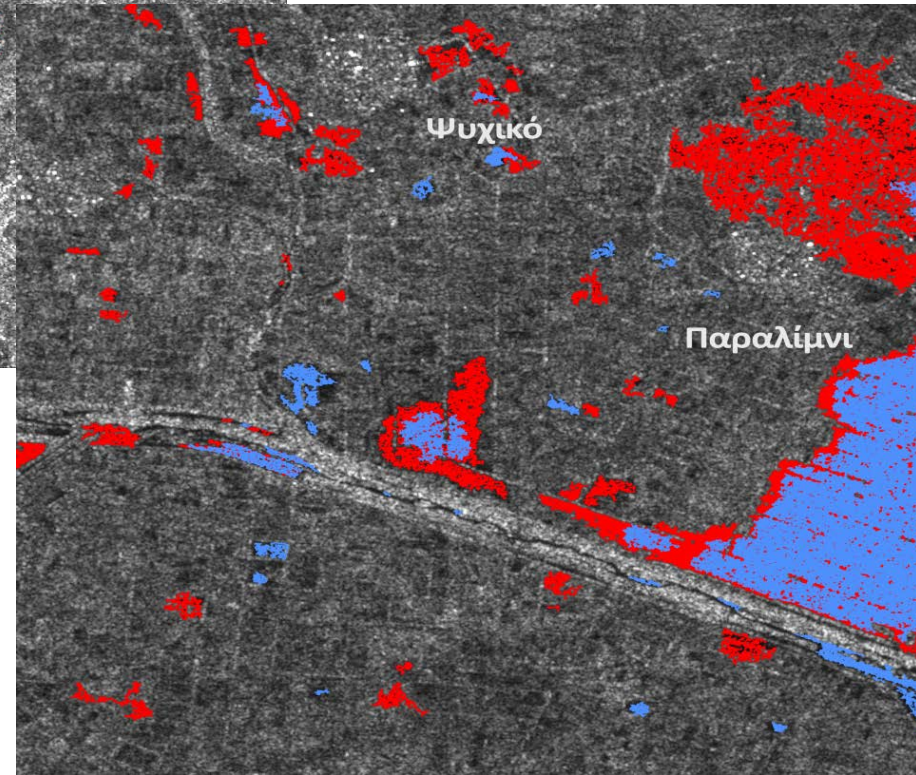
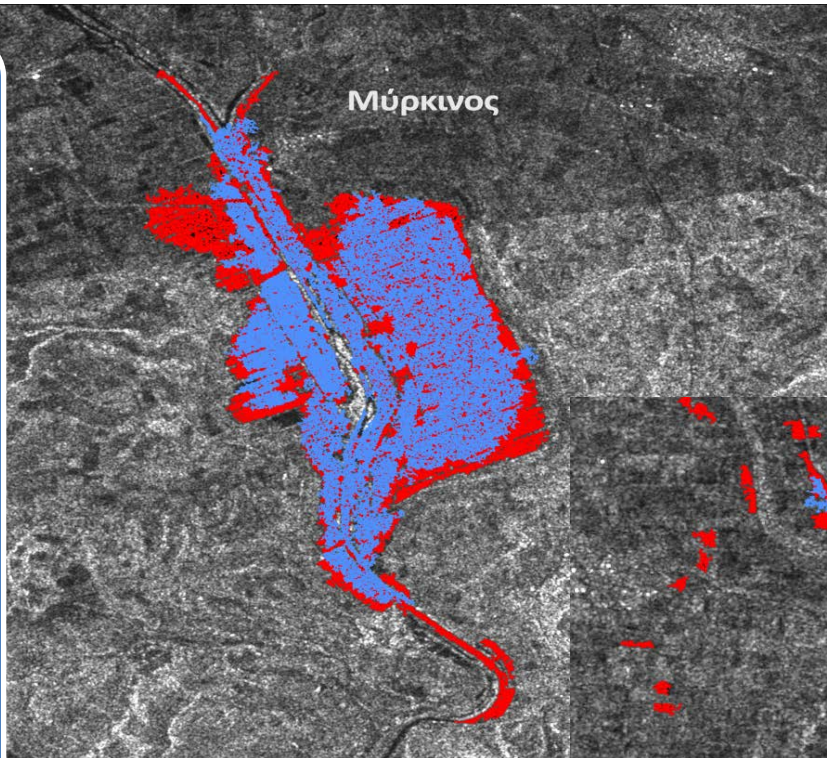


BEYOND NRT Flood Extend Assessment



Sentinel-1 based
flood monitoring
and mapping
service in
**BEYOND Floods
Observatory**

April 2015 flood
extent maps in
North Greece
produced by
automatic
ingestion and
processing of
satellite radar
images in RT



Geophysical hazards

Data & methods tier

NSN

ENIGMA

NOANET

In-situ

Earth Observation - SAR Interferometry

Services tier

Geodesy

Modeling

Hazard assessment

Large scale processing

Applications tier

Volcanoes

Tectonics

Landslides

Subsidence

Users tier

WEB GIS

GIS



The Web



Geohazard services - An overview

Service	Status	Input data	Scale
Mapping of large-scale ground velocities & 3D decomposition	Operational	SAR, GPS	National
Estimation of earthquake 3D crustal deformation	Operational	multi-angle SAR, GPS	Local
Seismic risk estimation	pre-operational	SAR, in-situ, GIS	Local
Mapping of tectonic hazard areas in subduction zones	Research	SAR, GPS	Regional
Monitoring of volcanic activity	Operational	SAR, GPS, in-situ	Local
Detection of new landslides	Operational	SAR	Local
Update of landslide inventory maps	pre-operational	SAR, in-situ	Local
Estimation of landslide susceptibility	pre-operational	SAR, in-situ, GIS	Local
Estimation of landslide hazard	Research	SAR, in-situ, GIS	Local
Detection of subsidence in urban & peri-urban areas due to manmade activities & physical processes	Operational	SAR, GPS	Local
Monitoring of construction activities in urban environment	Operational	SAR, GPS	Local

Earthquakes – Cephalonia case

Data

NSN

NOANET

ENIGMA

In-situ

Services

Geodesy

Modeling

Hazard Ass.

Large Proc.

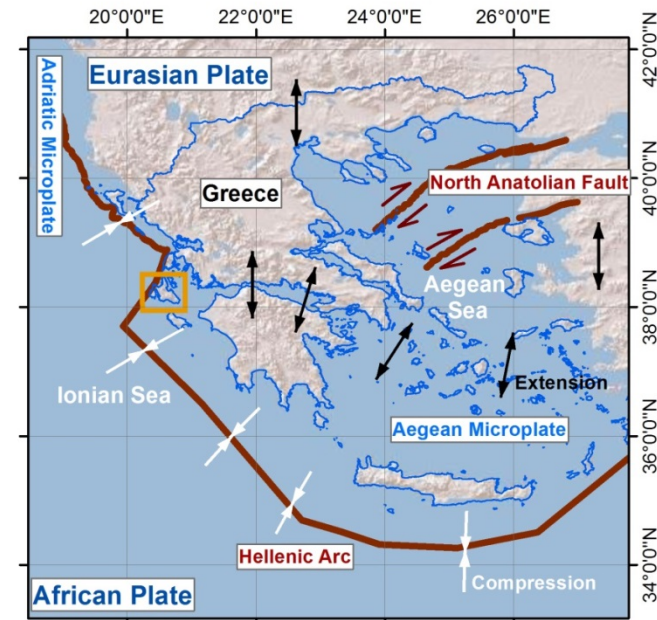
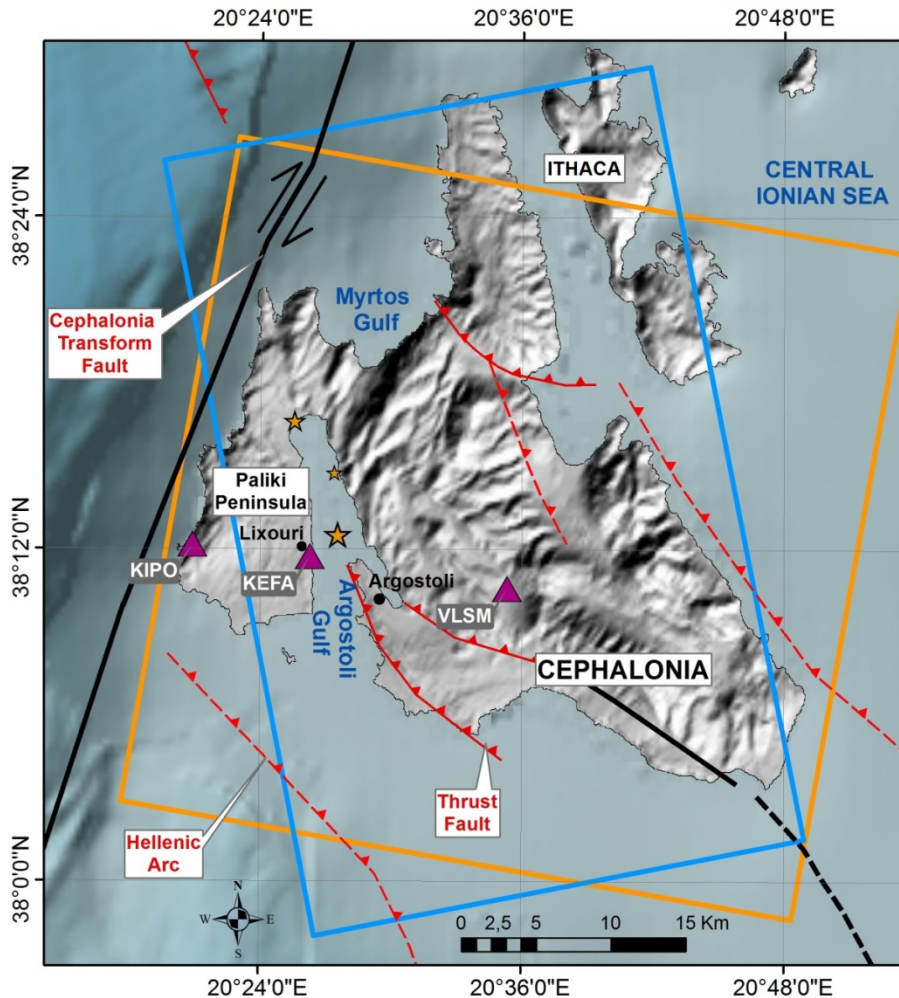
Applications

Tectonics

Volcanoes

Landslides

Subsidence



Mapped faults

- Strike-slip inferred
- Strike-slip
- - - Reverse inferred
- Reverse

GPS stations

- ▲ cGPS

Main earthquake events

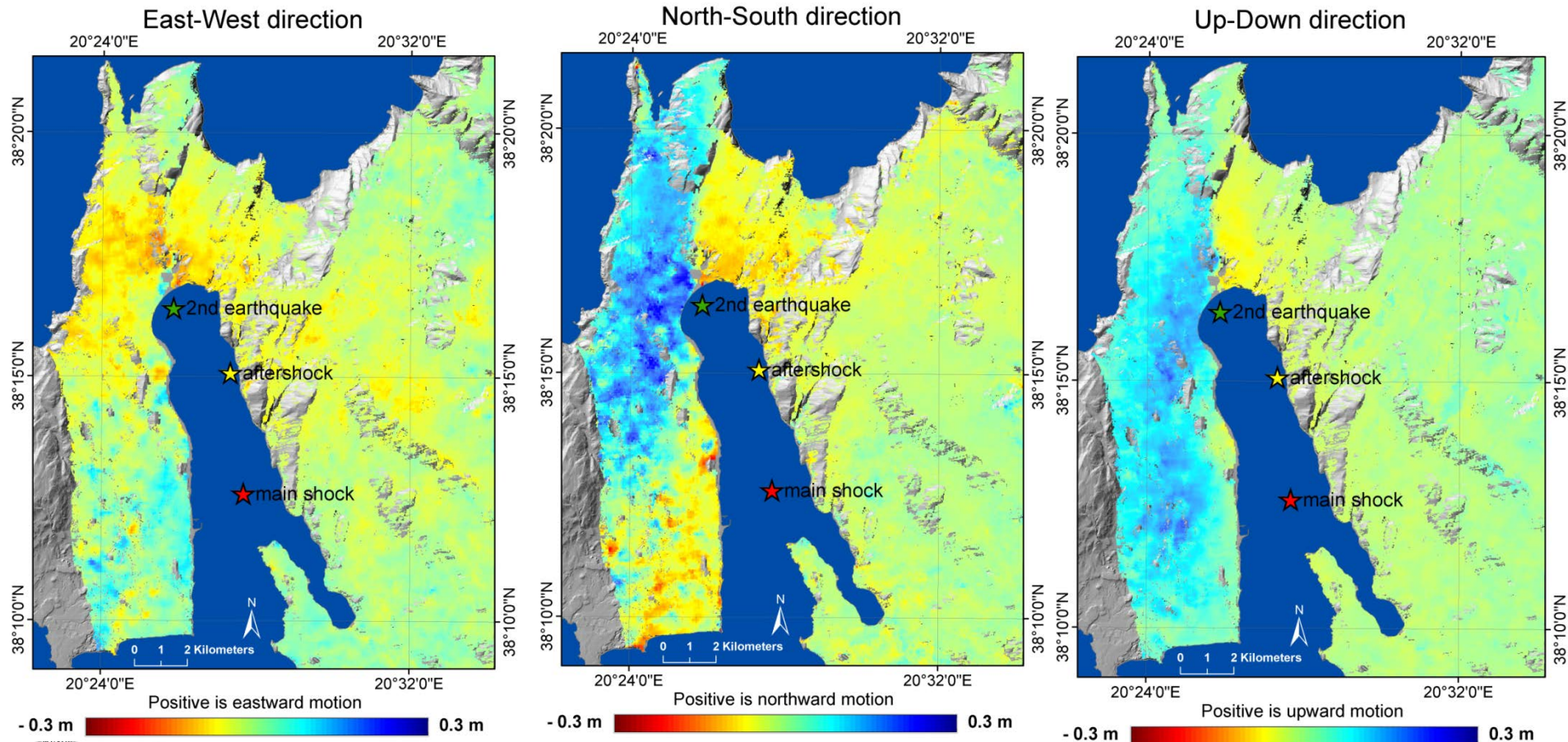
- ★ 26/1/2014 ML 5,1
- ★ 3/2/2014 ML 5,7
- ★ 26/1/2-14 ML 5,9

SARframes

- COSMO-SkyMED
- TerraSAR-X

Earthquakes – Cephalonia case

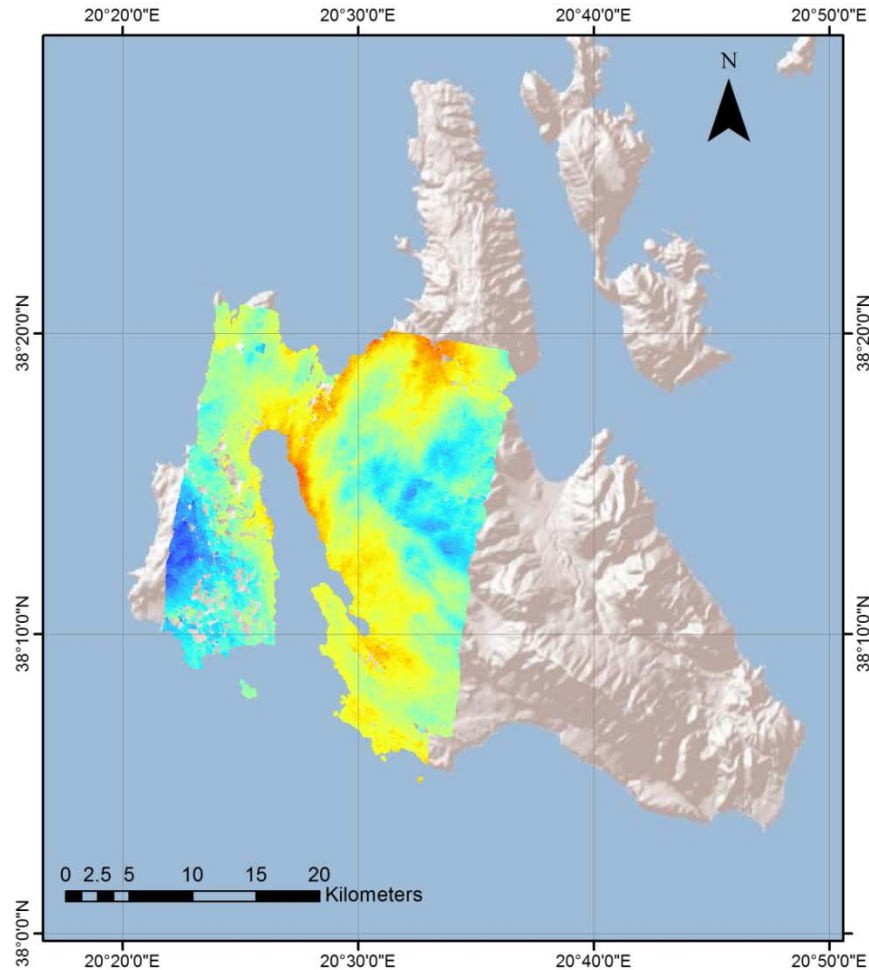
- 3D crustal deformation from TerraSAR-X & COSMO-SkyMed data
- Inversion to estimate fault parameters



Merryman Boncori et al., SRL 2015

Earthquakes – Cephalonia case

Post-seismic slip,
measured with
COSMO-SkyMed
data



-40 mm/yr  **+40 mm/yr**

Earthquakes – Nepal

Data

NSN

NOANET

ENIGMA

In-situ

Services

Geodesy

Modeling

Hazard Ass.

Large Proc.

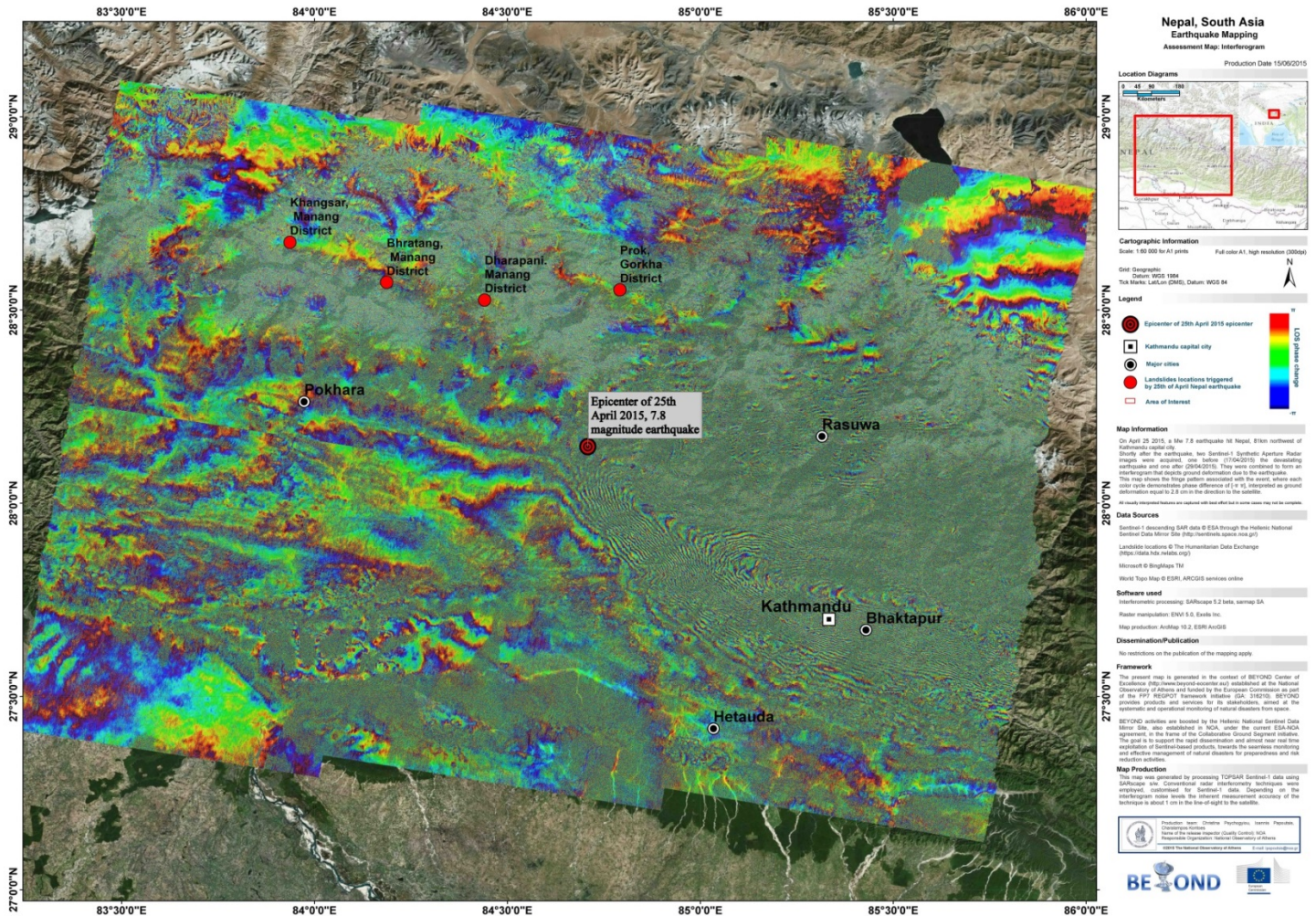
Applications

Tectonics

Volcanoes

Landslides

Subsidence



Volcanoes – Santorini case

Data

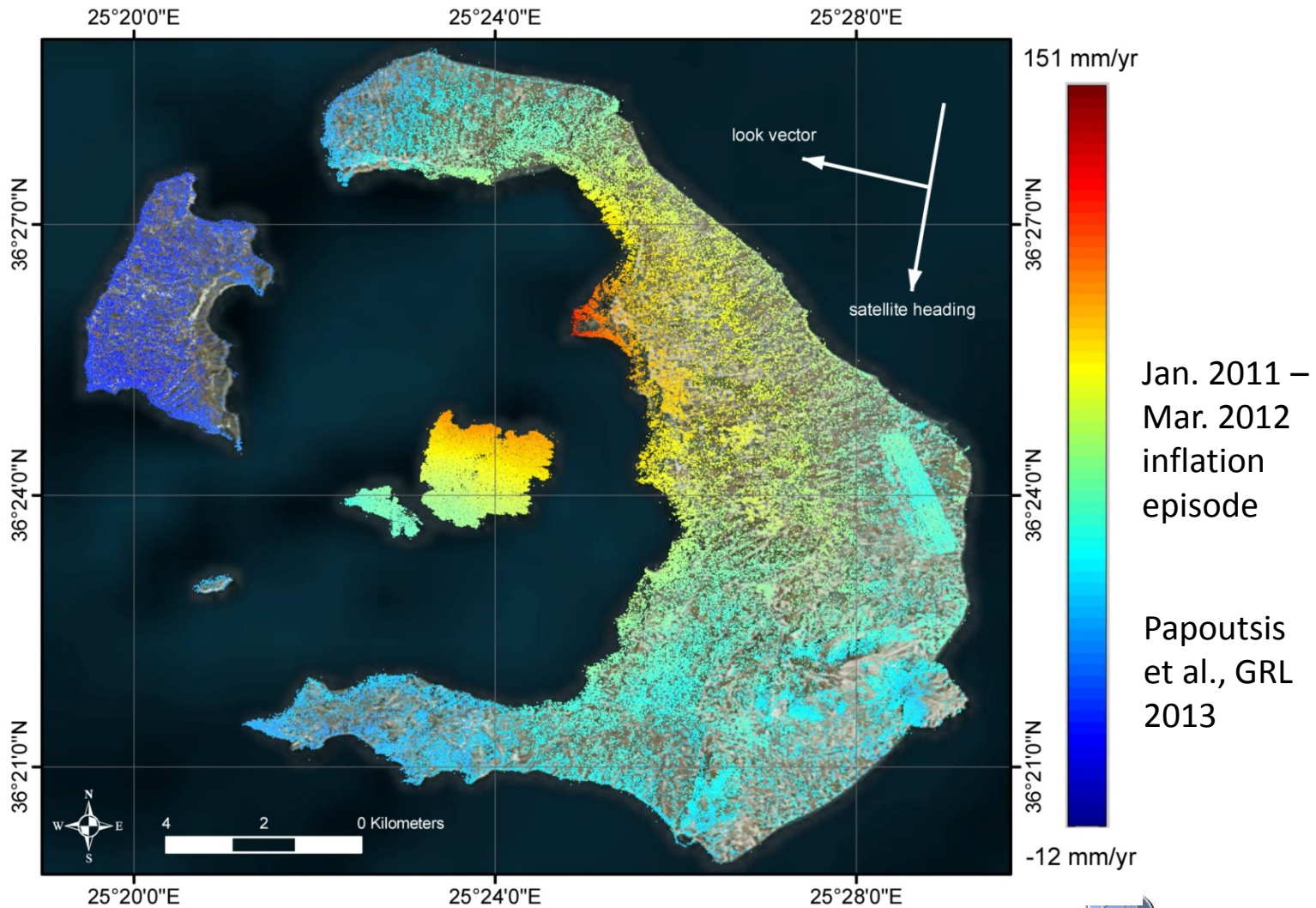
- NSN
- NOANET
- ENIGMA
- In-situ

Services

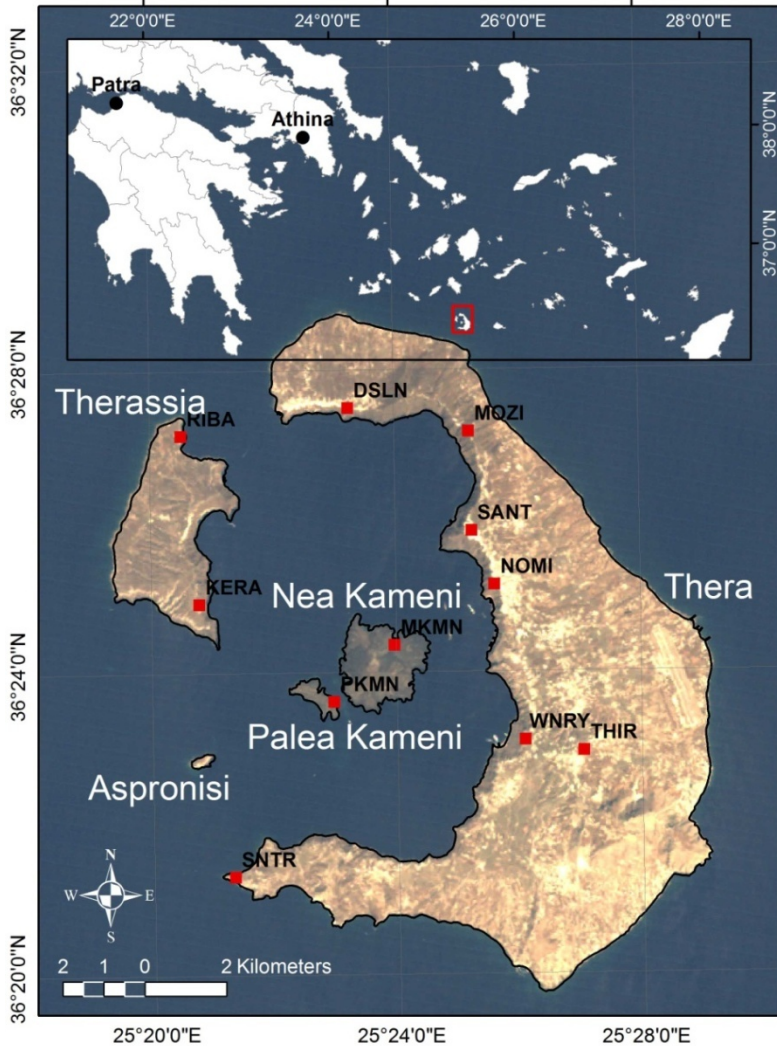
- Geodesy
- Modeling
- Hazard Ass.
- Large Proc.

Applications

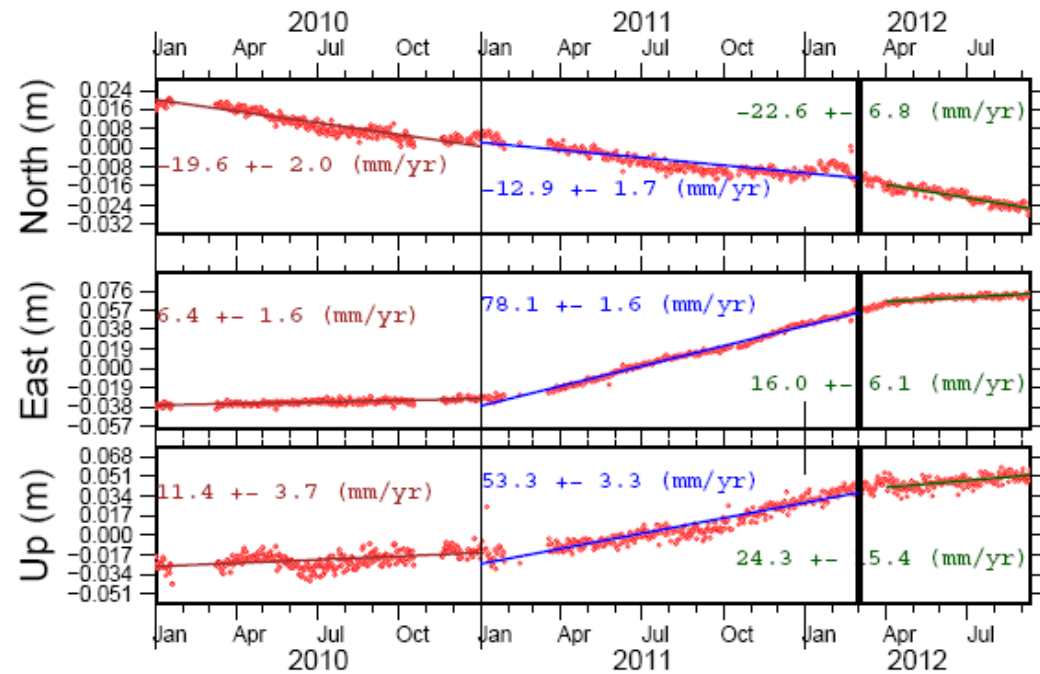
- Tectonics
- Volcanoes
- Landslides
- Subsidence



Volcanoes – Santorini case



Time-series monitoring with in-situ GPS stations



GPS data processing by Dionysos Satellite Observatory

Subsidence

Data

NSN

NOANET

ENIGMA

In-situ

Services

Geodesy

Modeling

Hazard Ass.

Large Proc.

Applications

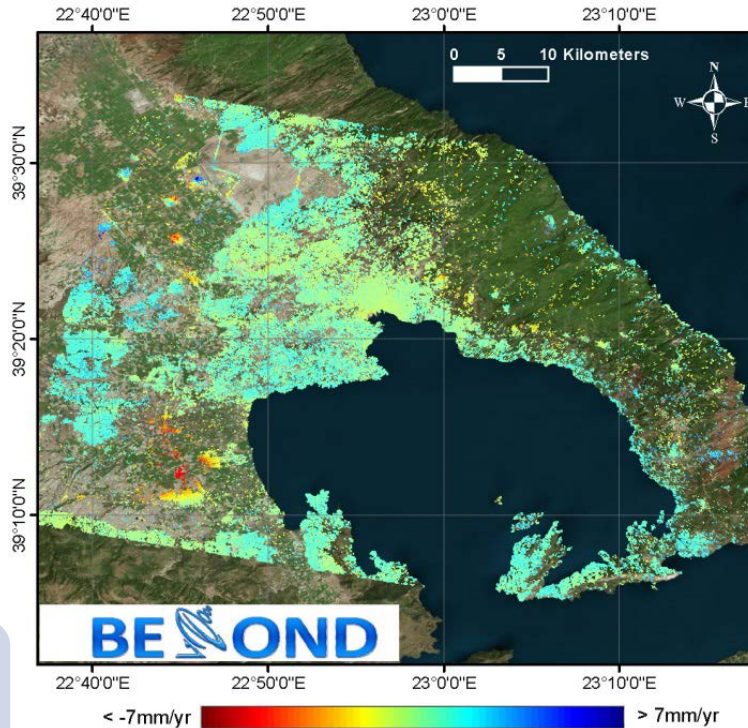
Tectonics

Volcanoes

Landslides

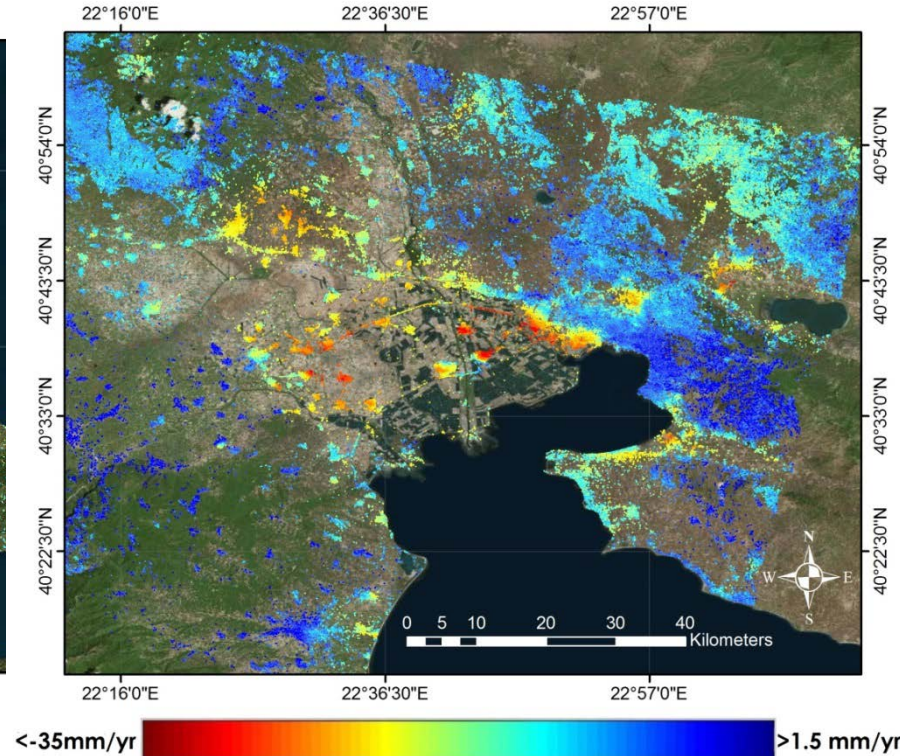
Subsidence

Volos (2002 -2010)



Driver: water over-pumping

Thessaloniki (1992 -2001)



Drivers:

- Over-pumping
- Natural compaction of deposits
- Tectonics

Subsidence

Data

NSN

NOANET

ENIGMA

In-situ

Services

Geodesy

Modeling

Hazard Ass.

Large Proc.

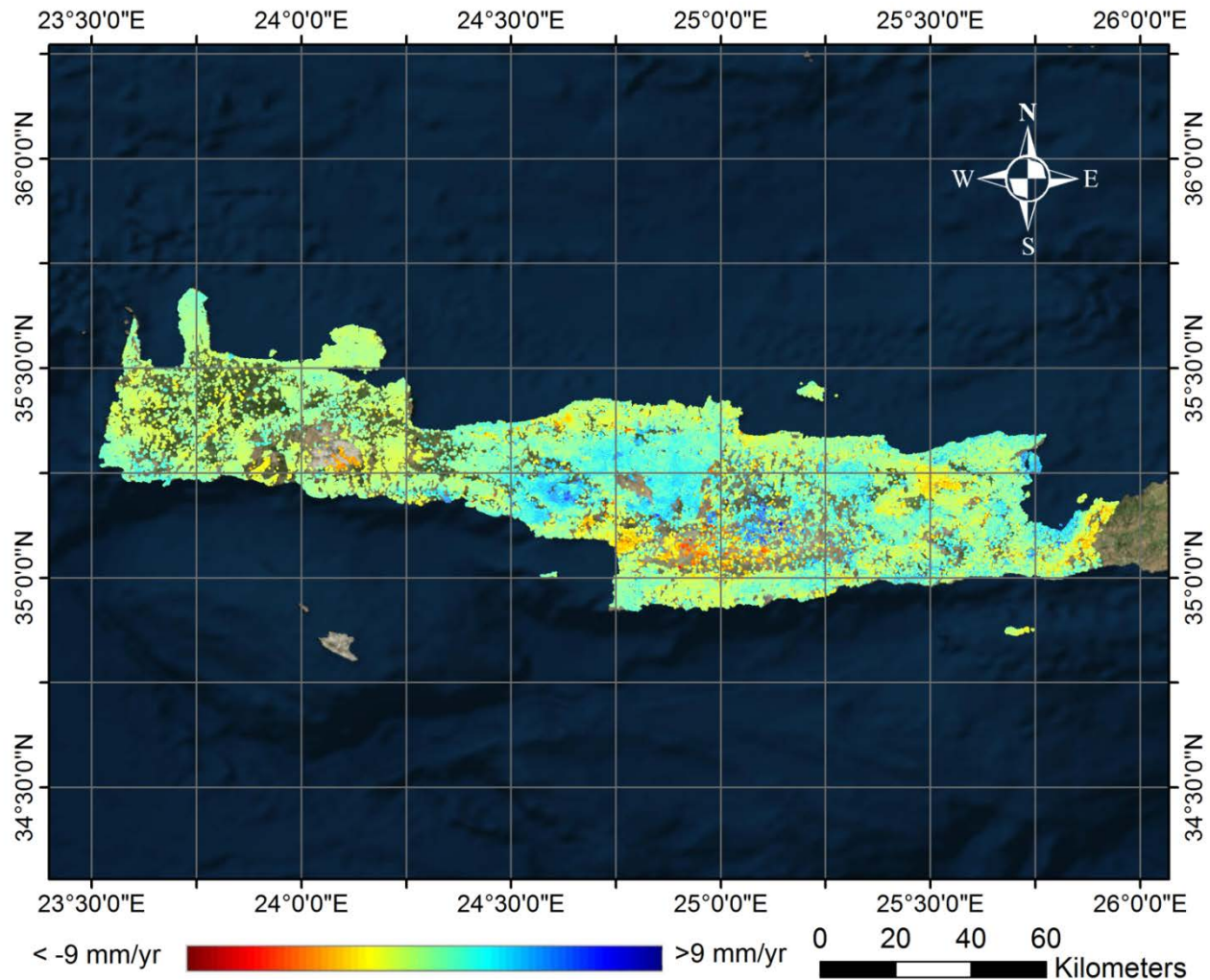
Applications

Tectonics

Volcanoes

Landslides

Subsidence



Seismic Risk – Athens

Data

NSN

NOANET

ENIGMA

In-situ

Services

Geodesy

Modeling

Hazard Ass.

Large Proc.

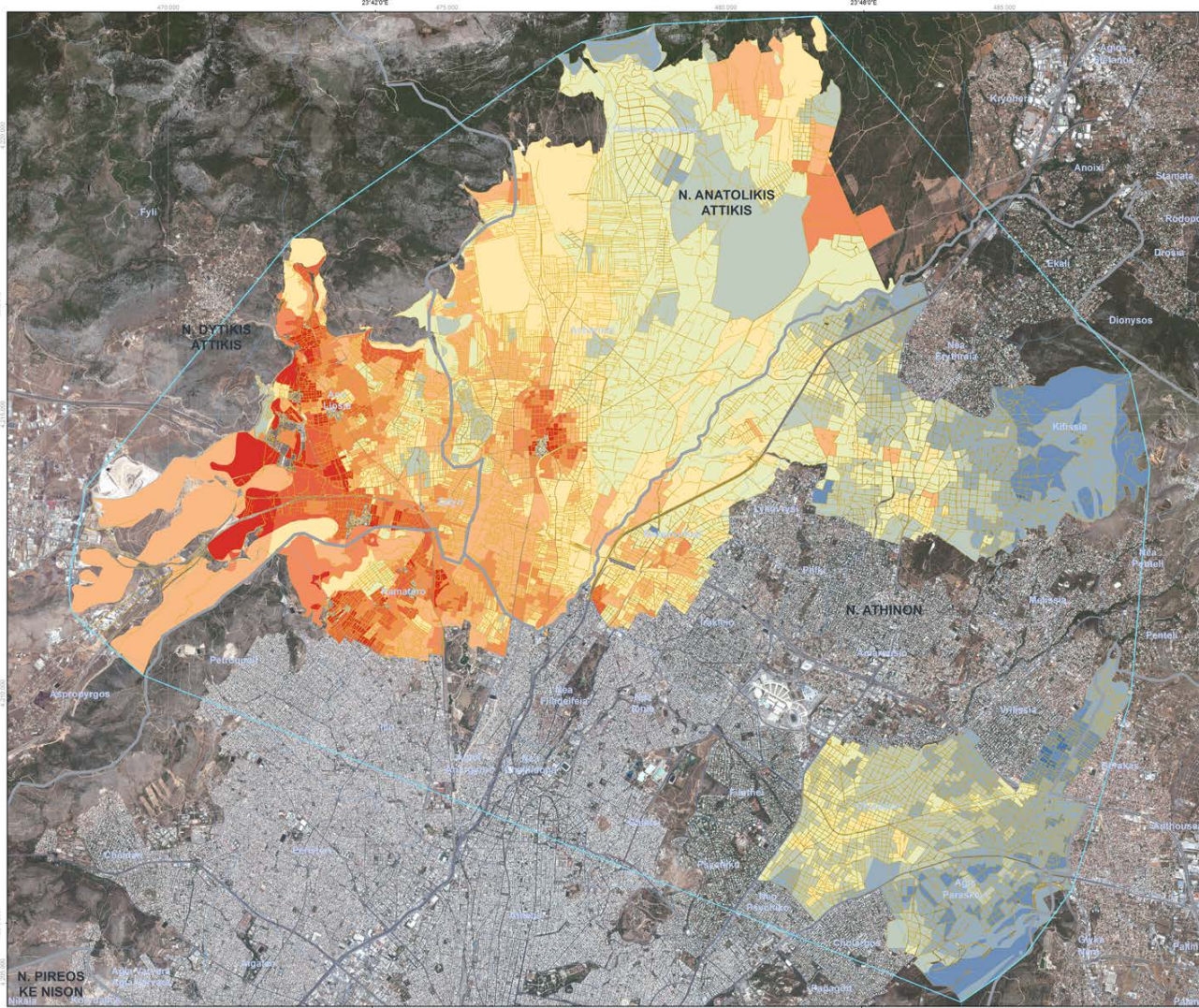
Applications

Tectonics

Volcanoes

Landslides

Subsidence



GLI02 number: EO-199-000352-GRG
 Product ID: GR-Dr-08_1
 Product N.: GR-Dr-08_1 (v01)

Greece - Attiki, Ano Liosia
 Seismic Risk Scenario (Athens Earthquake of 07/09/1999)
 Pre-disaster Situation Map: Seismic Risk Map
 Production Date 30/11/2010



Cartographic Information
 Scale: 1:3 000 to A1 print
 Full color A1, high-resolution (300dpi)
 0 435 870 1 740 Meters
 Data: Greek Grid GCS, UTM, 1987
 Datum: CGRS, 1987
 Legend: LatLon (DMS), Datum: WGS 84

Location Diagram		Seismic Risk	
Earth-Quake Epicenter	Area Of Interest	1.00 - 1.38	Blue
Main Map	Prefecture	1.39 - 1.77	Light Blue
Point Earth-Quakes	Municipality	1.78 - 2.15	Yellow
	Census Block	2.16 - 2.54	Orange
		2.55 - 2.82	Red-Orange
		2.83 - 3.20	Red
		3.21 - 3.59	Dark Red
		3.70 - 4.07	Dark Red
		4.08 - 4.45	Dark Red
		4.47 - 4.84	Dark Red

Map Information
 This Seismic Risk Map was used to assess the Athens Earthquake of September 7, 1999 (magnitude M=5.9) that hit the western side of the larger metropolitan area of Athens, capital city of Greece (GCR), causing 143 human victims.
 The map was produced in the framework of the MASSIE project which provided the Civil Protection authorities with accurate and up-to-date maps of seismic risk, urban vulnerability, and building damaged risk at census block scale, together with state-of-the-art uncontrolled population evacuation models.
 All readily interpreted features are captured with best effort but in some cases may not be complete.
Data Sources
 © Hellenic Republic, © EEA, 1, where date 2001
 © Copernicus of the European Union
 Building Information: IAI
Dissemination/Publication
 Publication of this map in the form of a printed product is not allowed due to the sensitive nature of the data.
 Delivery formats are GeoTIFF, GeoPDF, GeoJPEG

Framework
 MASSIEC was designed to provide information as appropriate as possible, including a geographic information system (GIS) to the local authorities, together with maps, tables and interpretation of the original source material. MASSIEC maps are not intended as a replacement of existing maps, nor are they intended to be used for any other purpose or use. The entire map is the result of the use of these data as assumed by the user and the supplier accepts no liability for any error, damage or inconvenience caused as a result of reliance on the map.
Map Production
 Seismic Risk depends on three main parameters (a) the seismic scenario that produced the hazard (a) on the ground motion that is attenuated away from the earthquake epicentre (b) the local soil conditions defined from a geological map.
 The seismic risk, which is closely related to the expected damage (D) is a function of Hazard (H) and Vulnerability (V): $D = H \times V$
 Hazard in a particular area is expressed by Peak Ground Acceleration (PGA) while Vulnerability is estimated by parameter I, related to building age hence: $CV = I \times V$
 In a particular area the relationship between PGA and macroseismic intensity (I) is denoted through an empirical relationship: $log(PGA) = f(I)$ where f is expressed in the 12-grade Mercalli-Sieberg scale
 The Area Unit is the Building Block.

Information prepared for Damage Contamination is presented in the following table:

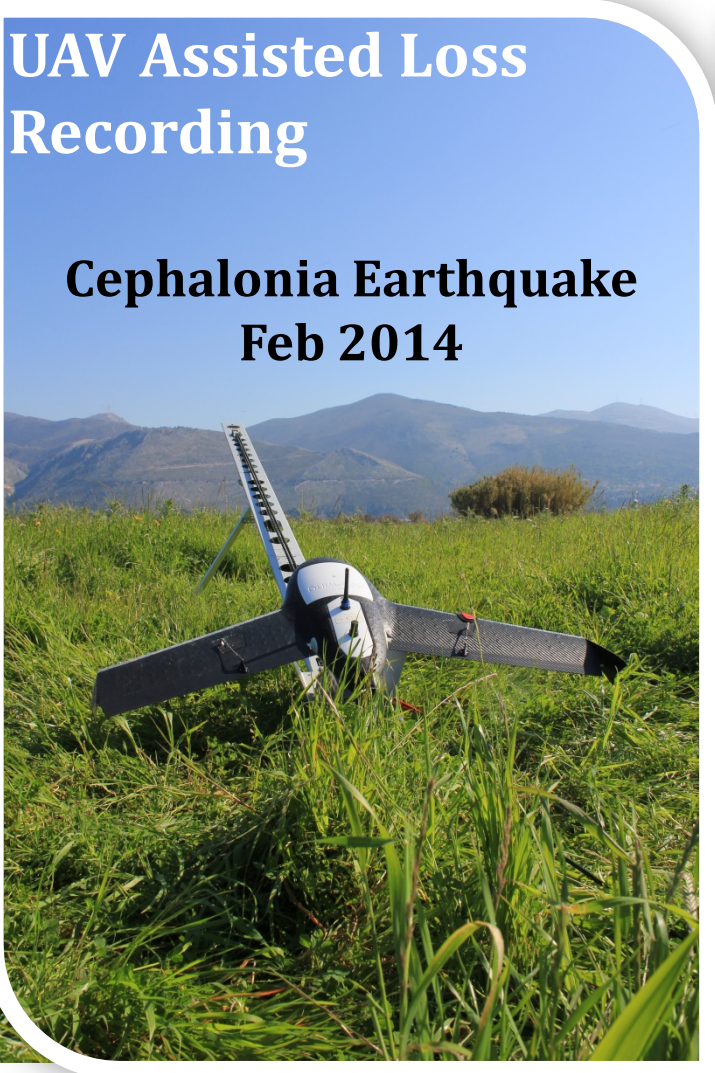
High	$log(PGA) \geq 0.848 - 1.27 \times 10^{-1} \times I + 1.1$	$I \geq 5.0$	0.000 (0.000)
Medium	$0.848 - 1.27 \times 10^{-1} \times I + 1.1 > log(PGA) \geq 0.699 - 0.061 \times 10^{-1} \times I + 0.932$	$4.5 \leq I < 5.0$	0.000 (0.000)
Low	$0.699 - 0.061 \times 10^{-1} \times I + 0.932 > log(PGA) \geq 0.550 - 0.012 \times 10^{-1} \times I + 0.783$	$4.0 \leq I < 4.5$	0.000 (0.000)
Very Low	$0.550 - 0.012 \times 10^{-1} \times I + 0.783 > log(PGA) \geq 0.401 - 0.003 \times 10^{-1} \times I + 0.634$	$3.5 \leq I < 4.0$	0.000 (0.000)
None	$0.401 - 0.003 \times 10^{-1} \times I + 0.634 > log(PGA) \geq 0.252 - 0.000 \times 10^{-1} \times I + 0.485$	$3.0 \leq I < 3.5$	0.000 (0.000)
None	$0.252 - 0.000 \times 10^{-1} \times I + 0.485 > log(PGA) \geq 0.103 - 0.000 \times 10^{-1} \times I + 0.336$	$2.5 \leq I < 3.0$	0.000 (0.000)
None	$0.103 - 0.000 \times 10^{-1} \times I + 0.336 > log(PGA) \geq 0.054 - 0.000 \times 10^{-1} \times I + 0.287$	$2.0 \leq I < 2.5$	0.000 (0.000)
None	$0.054 - 0.000 \times 10^{-1} \times I + 0.287 > log(PGA) \geq 0.005 - 0.000 \times 10^{-1} \times I + 0.238$	$1.5 \leq I < 2.0$	0.000 (0.000)
None	$0.005 - 0.000 \times 10^{-1} \times I + 0.238 > log(PGA) \geq 0.000 - 0.000 \times 10^{-1} \times I + 0.189$	$1.0 \leq I < 1.5$	0.000 (0.000)
None	$0.000 - 0.000 \times 10^{-1} \times I + 0.189 > log(PGA) \geq 0.000 - 0.000 \times 10^{-1} \times I + 0.140$	$0.5 \leq I < 1.0$	0.000 (0.000)
None	$0.000 - 0.000 \times 10^{-1} \times I + 0.140 > log(PGA) \geq 0.000 - 0.000 \times 10^{-1} \times I + 0.091$	$0.0 \leq I < 0.5$	0.000 (0.000)

Home of the European Centre of Excellence for EO based Disaster Management
 BEYOND
 Copernicus
 European Union

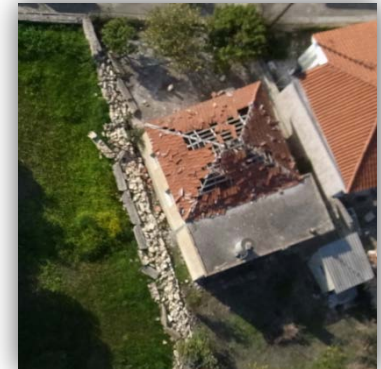
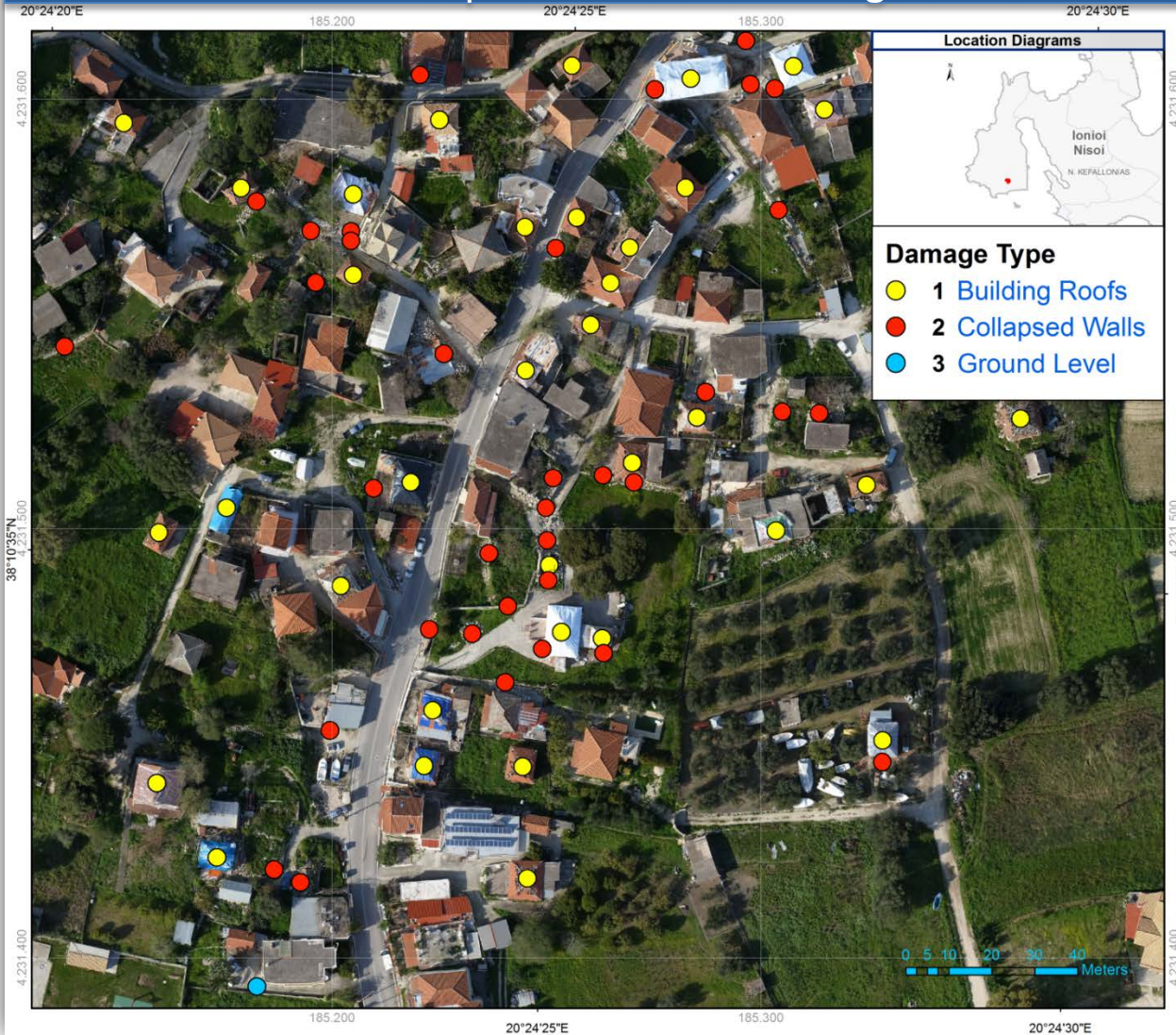


UAV Assisted Loss Recording

Cephalonia Earthquake Feb 2014



Cephalonia Island – Village of Mantzavinata



Landslides – South Pindus

Data

NSN

NOANET

ENIGMA

In-situ

Services

Geodesy

Modeling

Hazard Ass.

Large Proc.

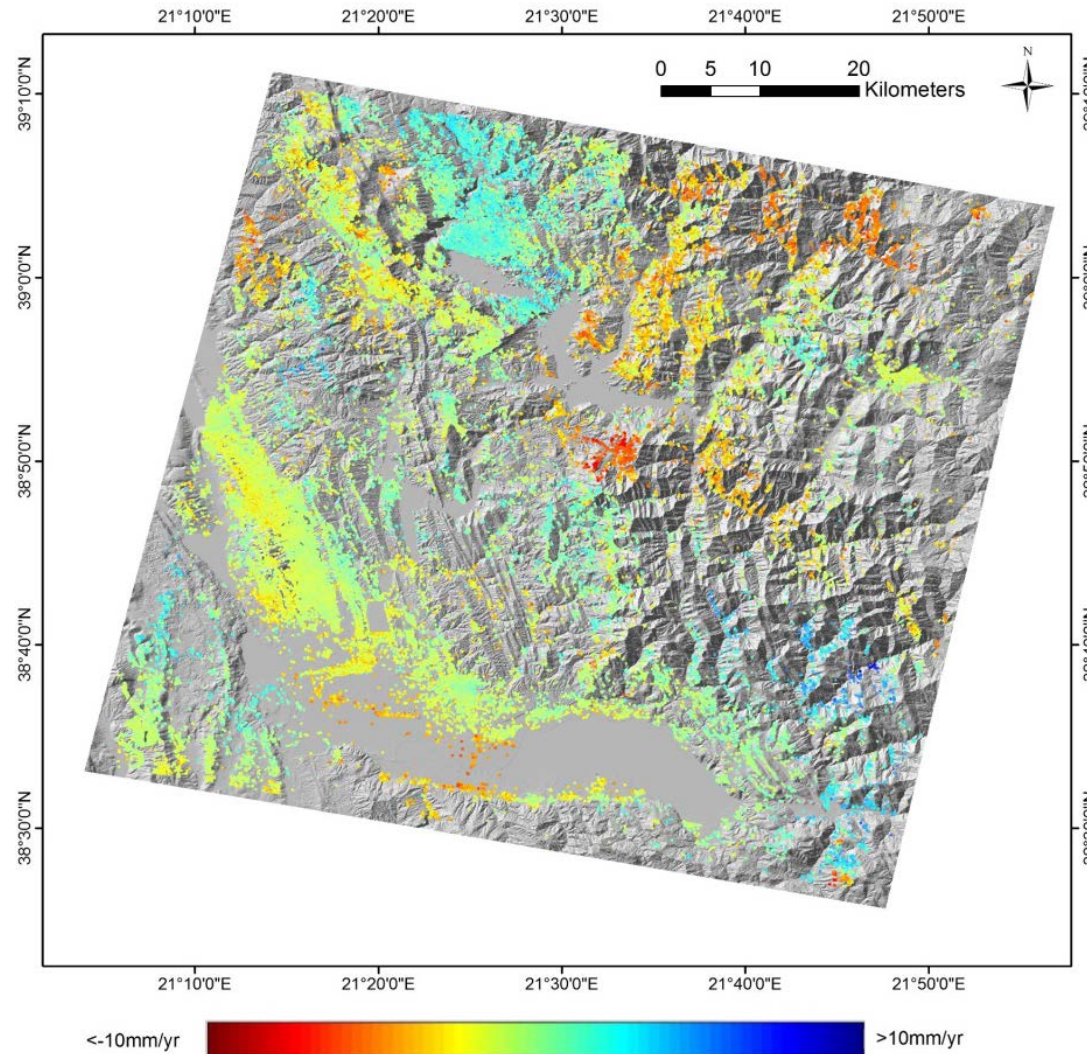
Applications

Tectonics

Volcanoes

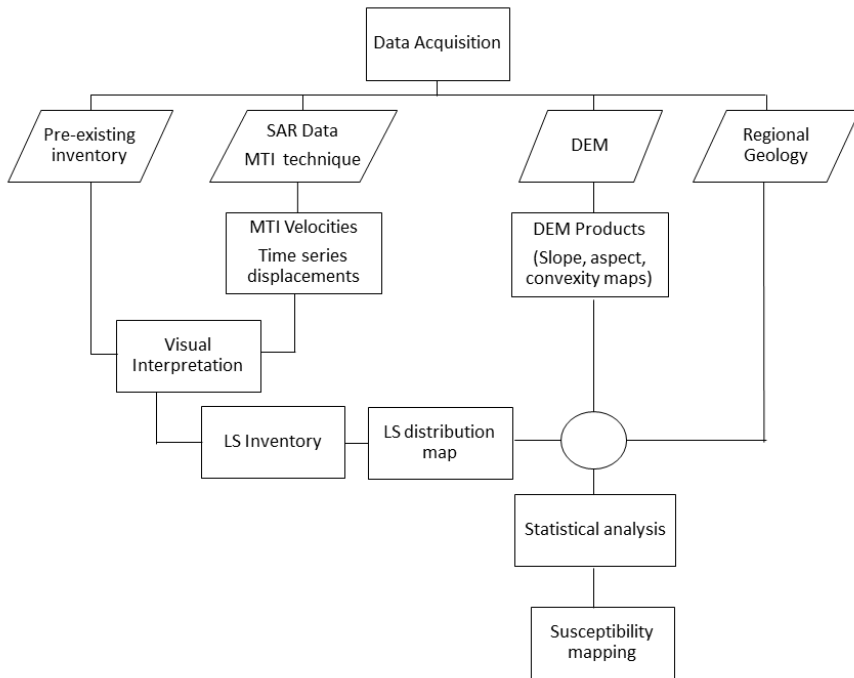
Landslides

Subsidence

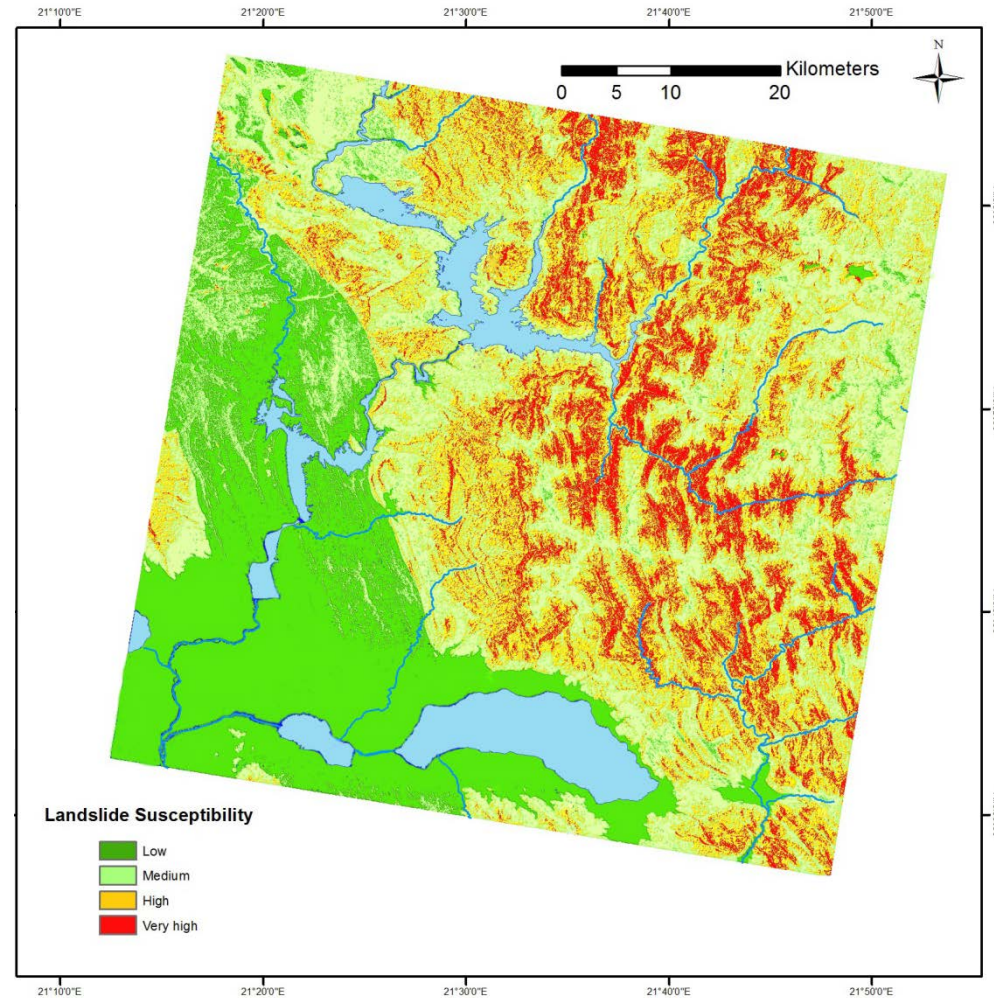


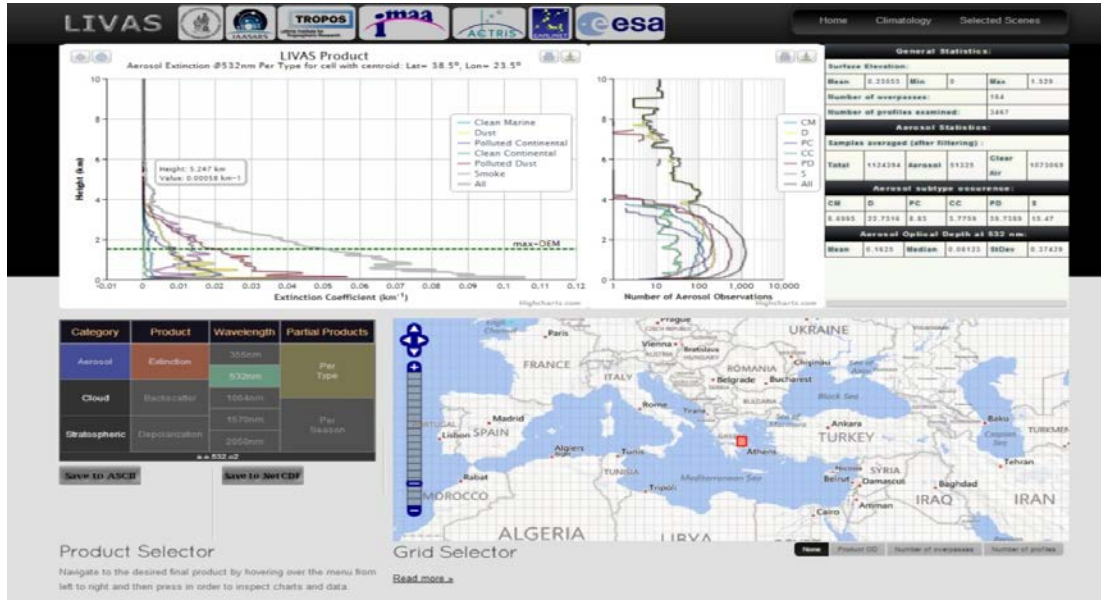
Landslides – South Pindus

Landslide susceptibility model

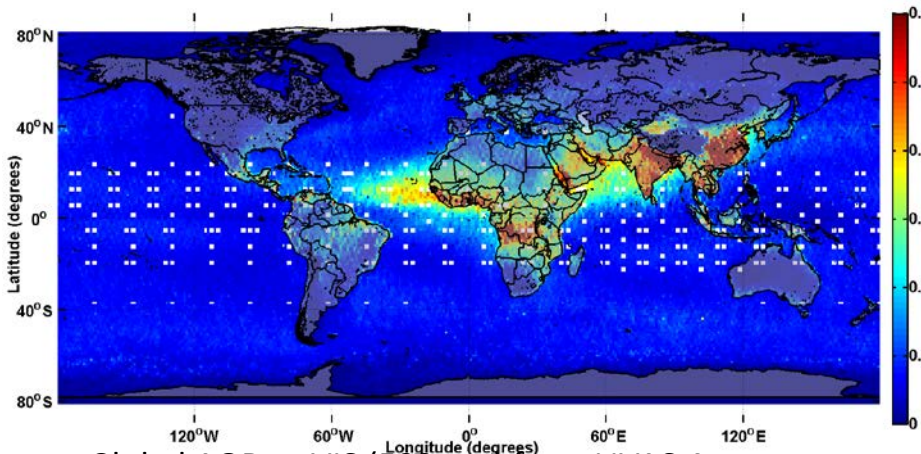


Landslide susceptibility map

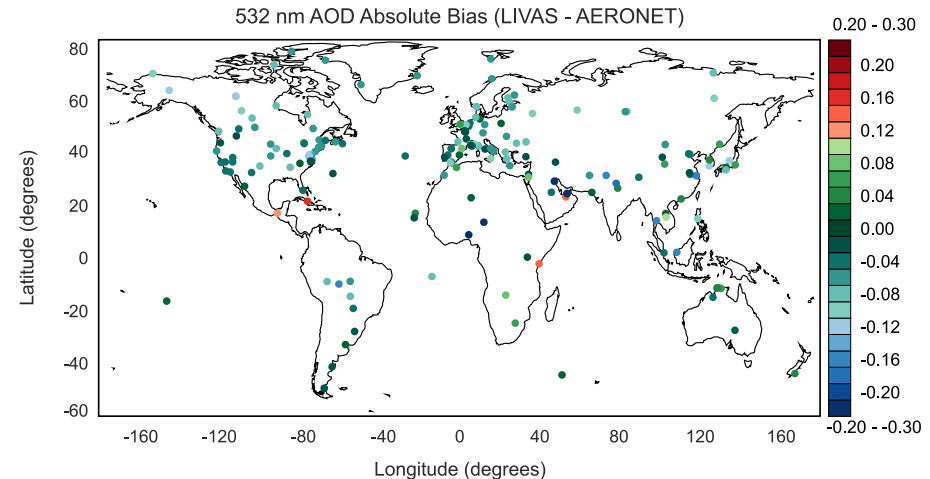




**Global 3D climatology of aerosols and clouds
LIVAS portal under BEYOND
(1x1 degree resolution)**



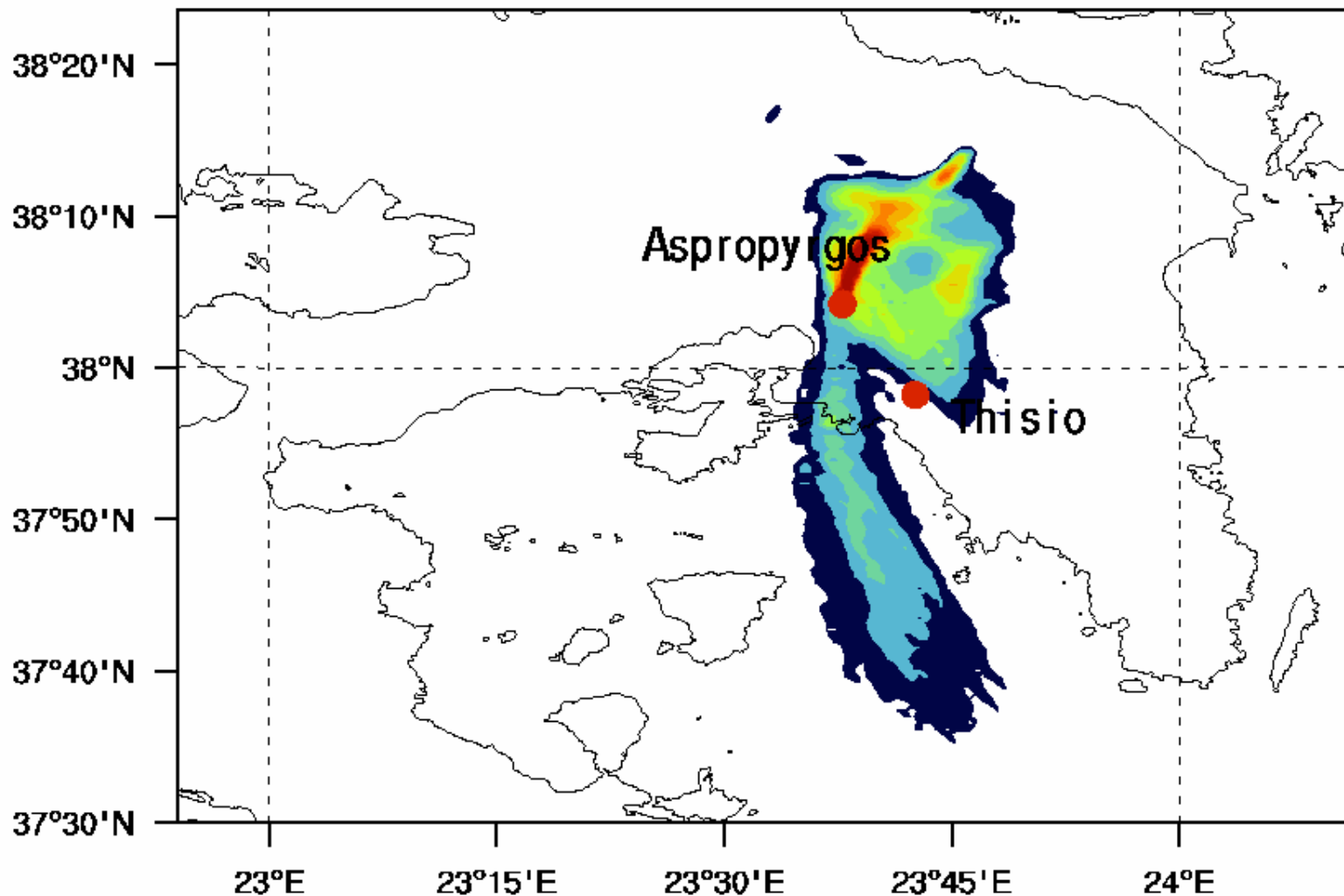
Global AOD at VIS (532 nm) from LIVAS 4-year averages of CALIPSO observations



LIVAS AOD evaluation against AERONET

BEYOND / NOA FLEXPART
Smoke Integrated Column

valid:09-06-2015 1300 UTC
(Arbitrary Values)



BEYOND PHASE 2 – FOLLOW UP

At the regional level ...

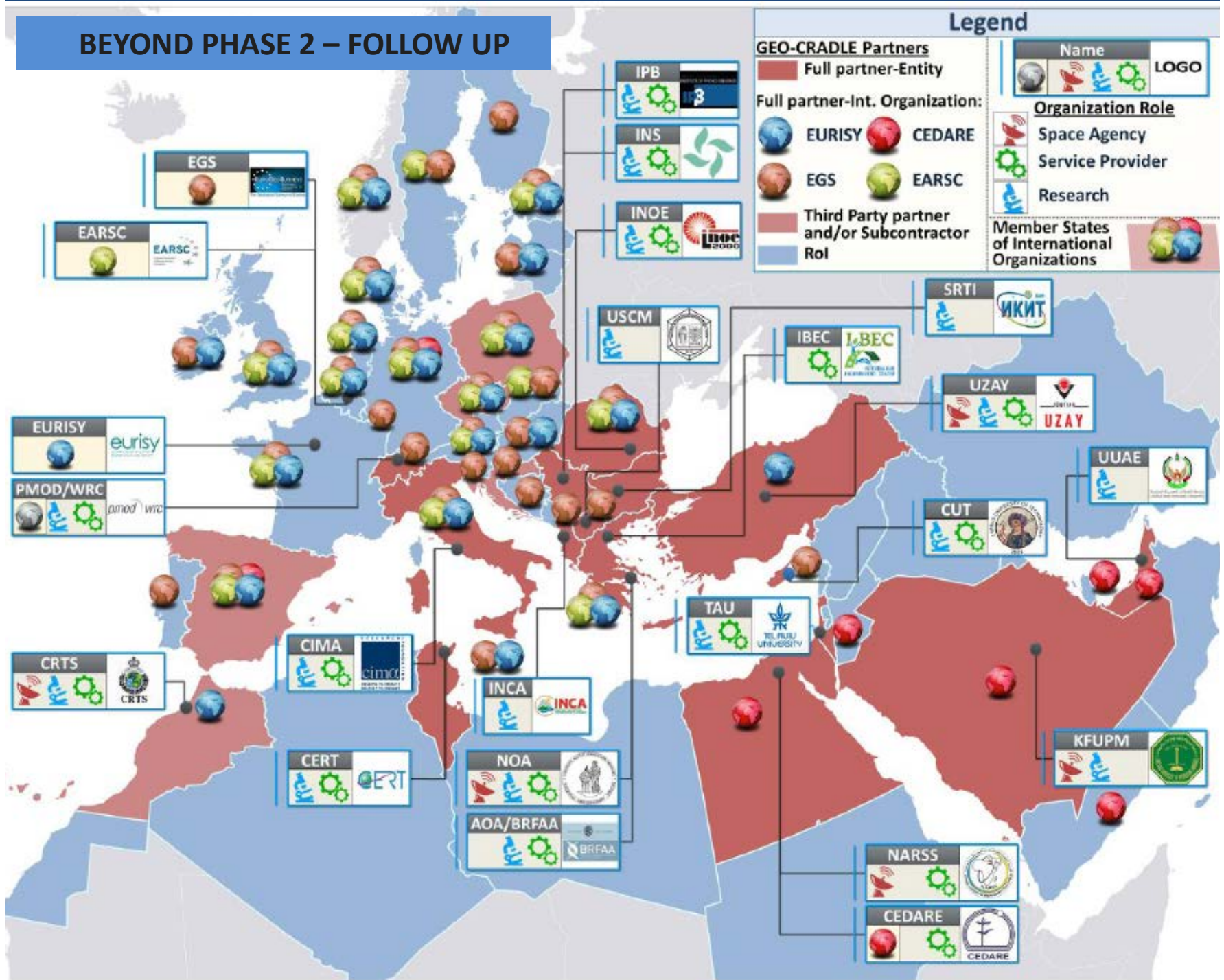


GEO-CRADLE

ID	Participant Organisation Name	Country	Logo
13	CIMA Research Foundation (CIMA)	Italy	
14	Academy of Athens (AOA)	Greece	
15	INOSENS (INS)	Serbia	
16	European Association of Remote Sensing Companies (EARSC)	EU	
17	EURISY	EU	
18	EuroGeoSurveys (EGS)	EU	
19	University of UAE (UUAЕ)*	UAE	
20	King Fahd University of Petroleum and Minerals (KFUPM)*	Saudi Arabia	
21	World Radiation Center (PMOD/WRC)*	Switzerland	
22	National Authority for Remote Sensing & Space Sciences (NARSS) (subcontractor to CEDARE)**	Egypt	
23	Royal Centre for Remote Sensing (CRTS) (subcontractor "in-kind" to EURISY)**	Morocco	



BEYOND PHASE 2 – FOLLOW UP

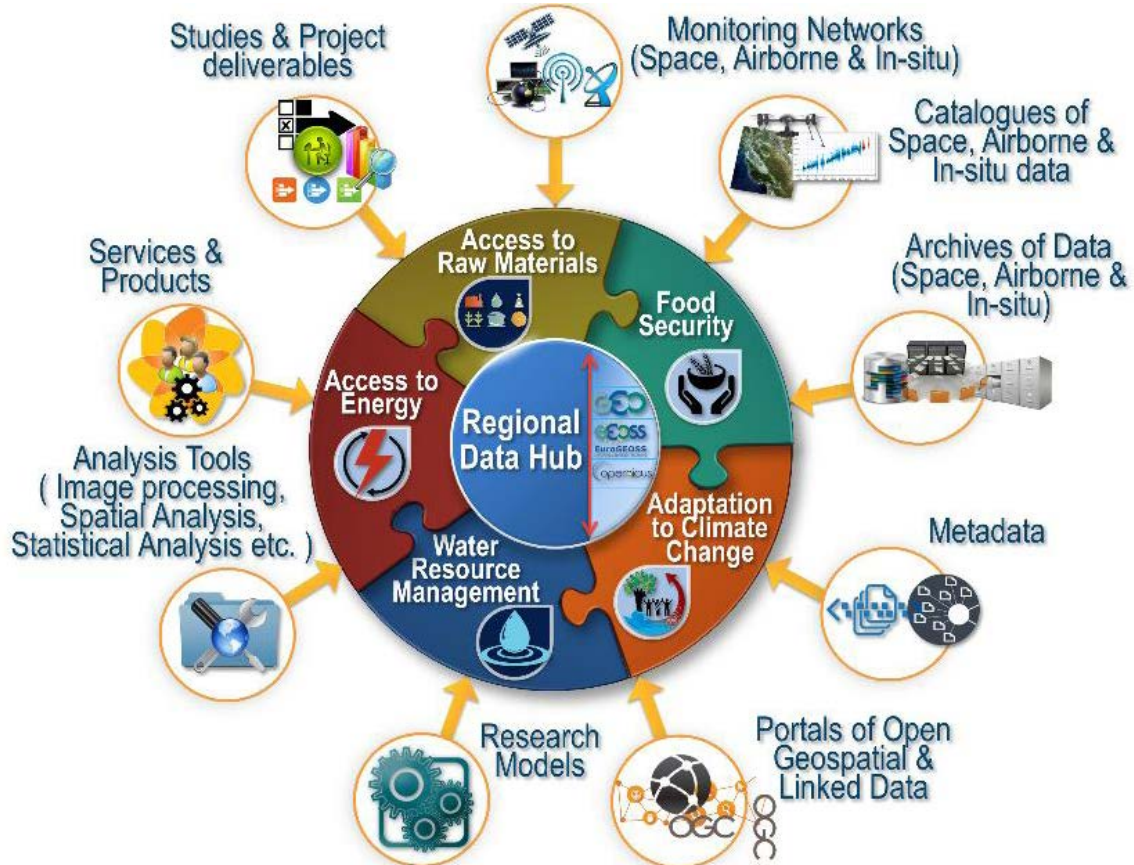


BEYOND PHASE 2 – FOLLOW UP

At the regional level ...



GEO-CRADLE



Thank you for your attention!

For more information

<http://www.beyond-eocenter.eu>