

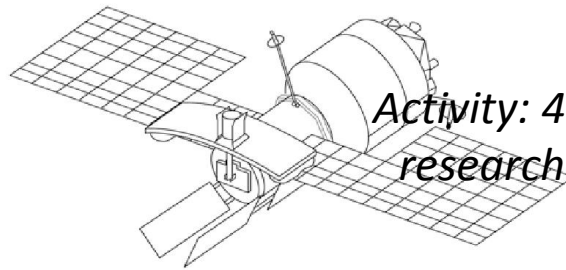


BE OND

*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*



Dr Haris KONTOES
Research Director of IAASARS/NOA
Project Coordinator

SWF/GEO Workshop on Natural Disasters
Mitigation and Earth Observations
13/01/2014, Geneva, Switzerland



FP7-Regpot-2012-23-1

BEYOND Concept

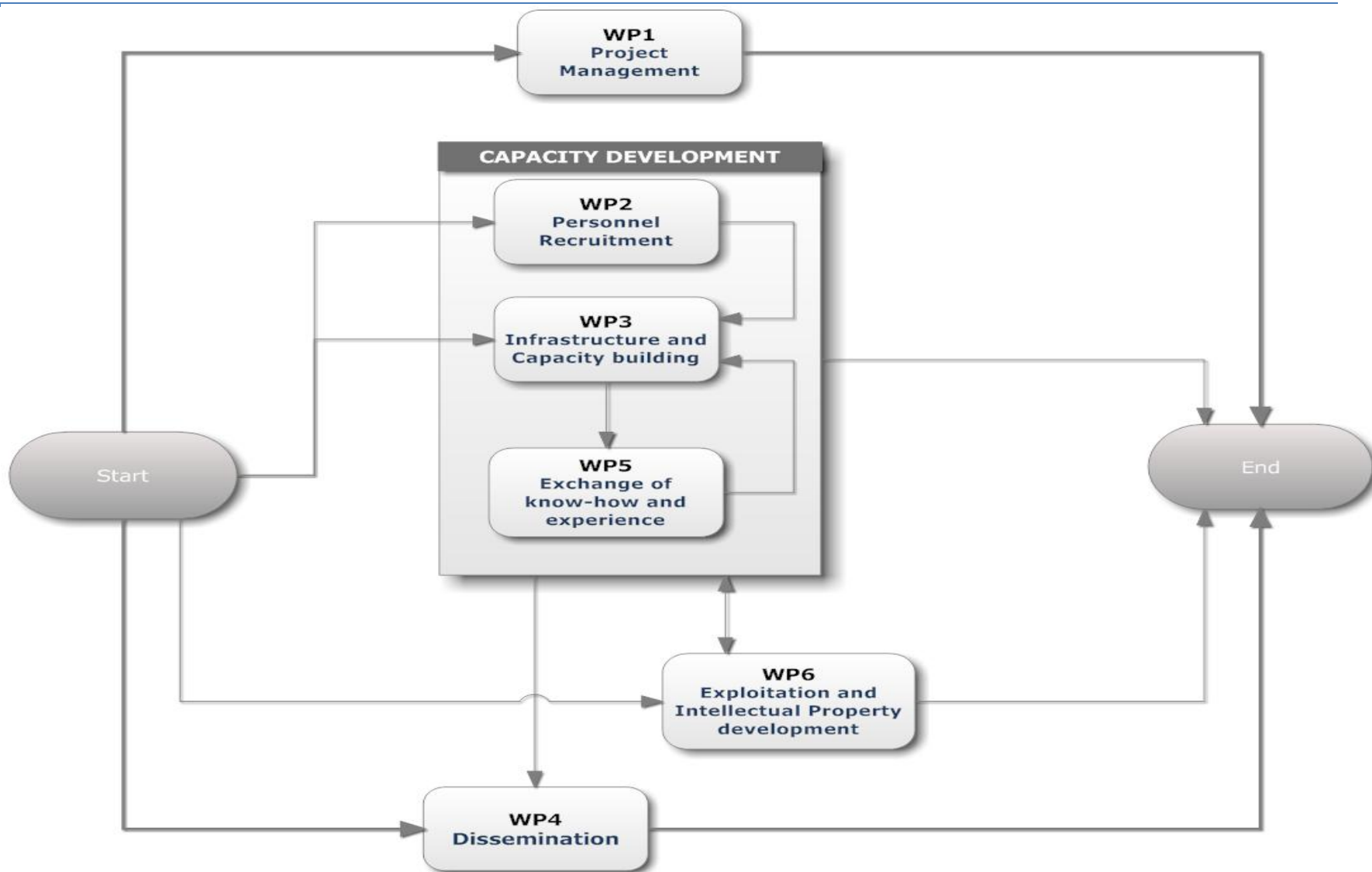


BEYOND aims to maintain and expand the existing state-of-the-art and interdisciplinary research potential, by

Building a Centre of Excellence for Earth Observation based monitoring of Natural Disasters

in south-eastern Europe, with a prospect to increase its access range to the wider Mediterranean region through the integrated cooperation with more than 20 **twining organizations at Europe and US**

BEYOND WP structure



BEYOND Financial Aspects



FP7 REGPOT 2012-2013 funding – Period 2013-2016

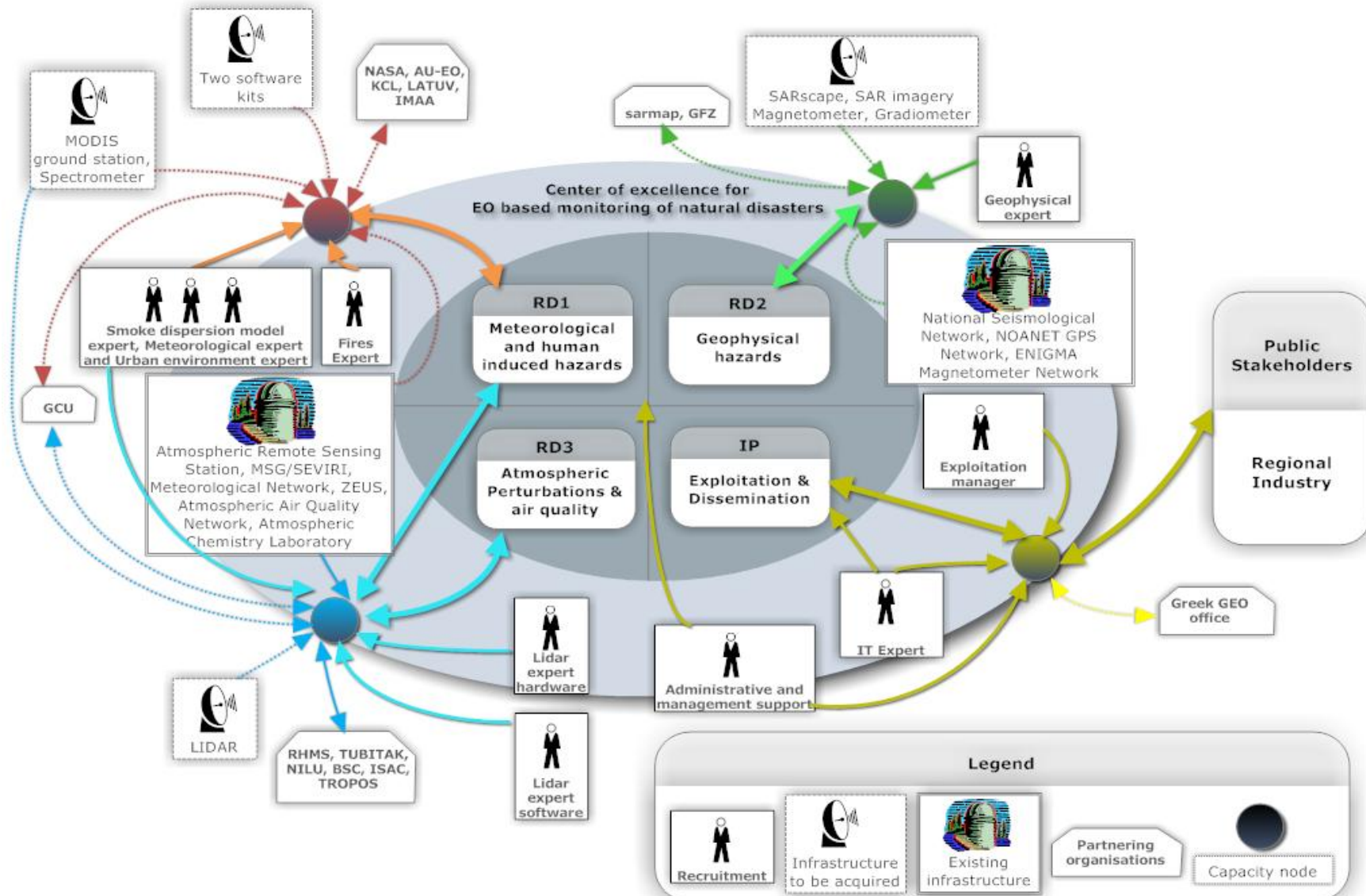
TOTAL	ALL WPs		P.M.	Person- nel Costs	Travel	Other direct costs	Sub- contract	Indirect	Total
			469	1207980	245864	599100	109000	143706.08	2305650
Total costs WP1	MANAGEMENT		24	73181	12000	0	6000	5962.67	97143.67
Total costs WP2	PERSONNEL RECRUITMENT		356	863438	0	3100	0	60657.66	927195.66
Total costs WP3	INFRASTRUCTURE AND CAPACITY BUILDING		49	149401	0	596000	70000	52178,07	867579,07
Total costs WP4	DISSEMINATION		21	64029	114196	0	23000	12475,75	213700,75
Total costs WP5	EXCHANGE OF KNOW-HOW AND EXPERIENCE		10	30490	119668	0	0	10511.06	160669.06
Total costs WP6	EXPLOITATION AND INTELLECTUAL PROPERTY DEVELOPMENT		9	27441	0	0	10000	1920,87	39361,8721

2.3 MEuros EC Contribution

Additional funding from Structural Funds ~270KEuros

BEYOND

How to achieve goals?



BEYOND Twining Organisations- Know How Exchange



➤ **Enhancing research capacity via training and integration of new technologies and know-how**, by establishing sustainable strategic partnerships with high profile research entities

- **DLR – EO Center of the German Aerospace Center**
- **ESA – European Space Agency (Directorate of Earth Observation Programmes)**
- **GCU-Global Change Unit of the University of Valencia**
- **LATUV-Remote Sensing Laboratory of the Un. Of Valadolid**
- **BSC – Barcelona Supercomputing Center**
- **NILU – Norwegian Institute for Air Research**
- **TUBITAK – Scientific and Technological Research Council of Turkey**
- **IMAA – Inst of Methodologies for Environmental Analysis of INRC**
- **ISAC – Inst of Atmospheric Sciences and Climate of INRC**
- **KCL - King’s College London**
- **SARMAP**
- **HIDMET – Republic Hydrometeorological Service of Servia**
- **GFZ - German Research for Geosciences**
- **TROPOS – Leibniz Inst for Tropospheric Research**
- **AU-EO – EO Laboratory of the Aberystwyth University**
- **NASA – NASA Marshall Space Flight Center, Earth Science Office**
- **Chapman University – USA**

Know-How Capacity
Building

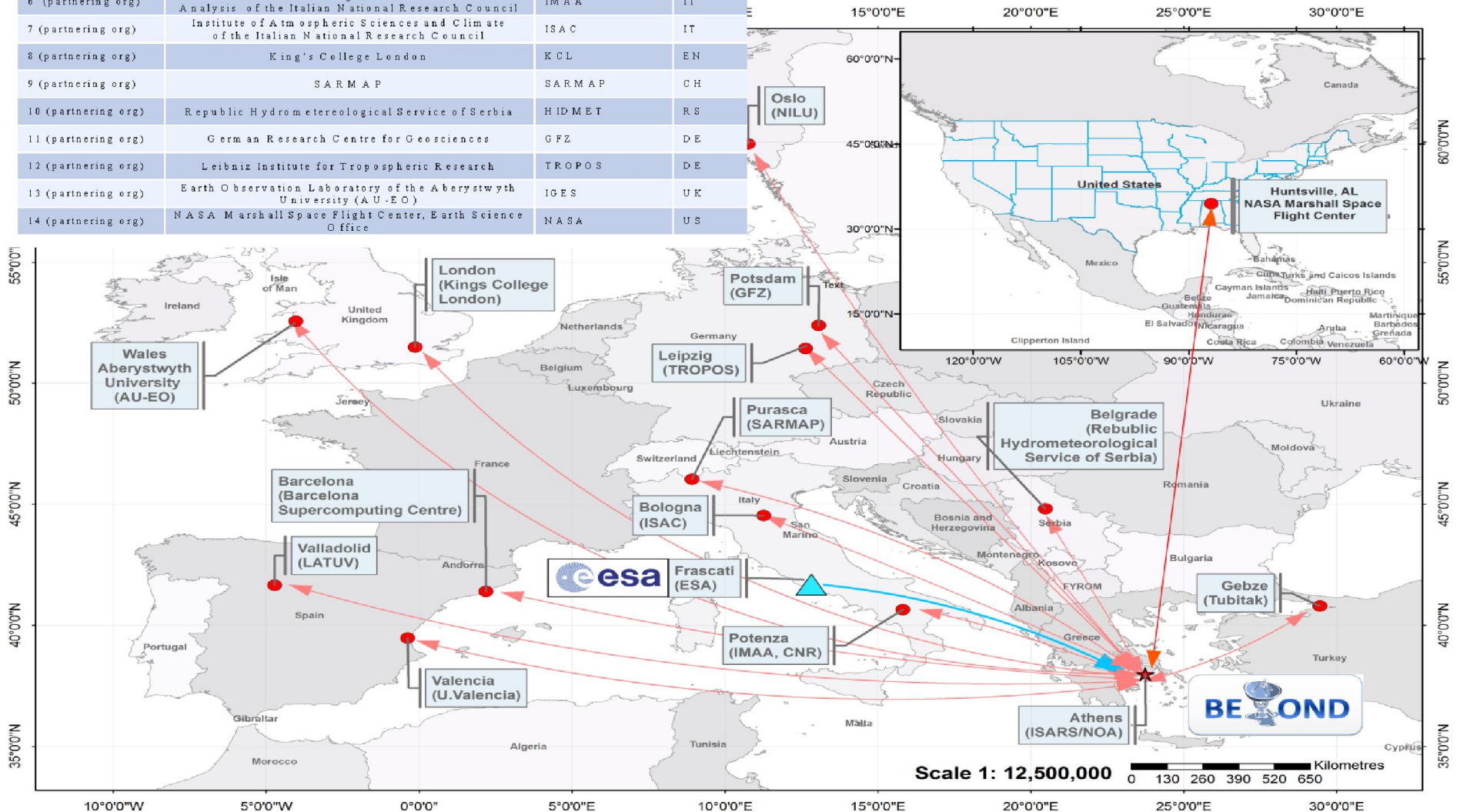
BEYOND Twining Organisations-



Know How Exchange

Participant	Participant Organisation name	Participant Short Name	Country
1 (participant)	Institute for Space Applications and Remote Sensing (National Observatory of Athens)	ISARS/NOA	GR
1 (partnering org)	Global Change Institute (University of Liverpool)	GC	ES
2 (partnering org)	Remote Sensing Laboratory of the University of Valladolid	LATUV	ES
3 (partnering org)	Barcelona Supercomputing Center	BSC	ES
4 (partnering org)	Norwegian Institute for Air Research	NILU	NO
5 (partnering org)	Scientific and Technological Research Council of Turkey - Marmara Research Center	TUBITAK	TR
6 (partnering org)	Institute of Methodologies for Environmental Analysis of the Italian National Research Council	IMAA	IT
7 (partnering org)	Institute of Atmospheric Sciences and Climate of the Italian National Research Council	ISAC	IT
8 (partnering org)	King's College London	KCL	EN
9 (partnering org)	SARMAP	SARMAP	CH
10 (partnering org)	Republic Hydrometeorological Service of Serbia	HIDMET	RS
11 (partnering org)	German Research Centre for Geosciences	GFZ	DE
12 (partnering org)	Leibniz Institute for Tropospheric Research	TROPOS	DE
13 (partnering org)	Earth Observation Laboratory of the Aberystwyth University (AU-EO)	IGES	UK
14 (partnering org)	NASA Marshall Space Flight Center, Earth Science Office	NASA	US

Partnering Organisations



BEYOND Observation & Monitoring Infrastructures



Through BEYOND it will be possible to:

➤ **Set up innovative integrated observational solutions** that will allow to a multitude of monitoring networks (space borne and ground-based) to operate at the premises of the National Observatory of Athens, in a complementary, unified and coordinated manner with similar existing capacities/infrastructures at Europe and US. The monitoring infrastructure includes:

- **X-/L- band acquisition station** (MODIS-EOS Aqua and Terra, NPP, JPSS, NOAA, Met Op, FengYun) (South Easter Europe, Balkans, Middle East, Continental Coverage) **to be part of the DB network**
- **MSG SEVIRI Acquisition station** (Continental Coverage)
- **Mirror Site of ESA's Sentinel missions** (Copernicus) for full and near real time image acquisition of S-1, S-2, and future S3, S5P missions (South Easter Europe, Balkans, Middle East, Continental Coverage)
- Active remote sensing system, namely **PollyXT portable Raman lidar system**, enhancing the existing in-situ Air quality monitoring capabilities used in field studies of aerosols (Regional Coverage)
- **Magnetometer stations** part of the ENIGMA-NOA network (National Coverage)
- Nationwide **Seismological network** (National Coverage)
- Nationwide **GPS/GNSS network** (National Coverage)
- Nationwide **Meteo network** (National Coverage)

Infrastructure Capacity
Building

BEYOND/NOA Observation & Monitoring Networks



Atmospheric Remote Sensing Station in Athens since 2008 (member of the NASA – AERONET network)



Operation of the mobile lidar of ESA by IAASARS



Development of a sophisticated advanced lidar system in the frame of BEYOND

Infrastructure Capacity Building

BEYOND Data Acquisition, Archiving and Delivery



- **Create archives and databases** of long series of space based and in-situ observations and derived higher level products
 - Design and operate **the HW/SW infrastructure** (servers) to host the processing of the data from the deployed ground segment (**X-/L-band, MSG/SEVIRI, ESA's Mirror Site Sentinel**), and meet the requirements of the **DB network** to integrate the hosted acquisition stations
 - Design and operate **cloud computing archiving/ processing/ retrieval facilities** to host the satellite image files and data catalogues of the ground segment (GEANT cloud computing services)
- **Make the observations and products available for exploitation** with the involvement of stakeholders, scientists and/or institutional users, applicable for down-streaming to their specific needs
- **Establishing continuous contacts, and sign new MOUs** with End Users, Scientists, and International Organisations e.g., DEH SA, Hellenic Min. of Environment, Fire Brigades, Civil Protection Authorities, InterBalkan Center, ESA, GEO-Natural Disaster Task, GEO-Urban Env Task, DLR, ACTRIS, EARLINET, EFMC

Infrastructure Capacity
Building

BEYOND Outreach and Visibility



- **Expanding visibility to the national, regional and European communities, and expand the know-how, through:**
 - **Participation and contributions to international conferences related to BEYOND subjects**
 - **Organisation BEYOND related dedicated conferences**
 - **Making media publications in widely circulated national and international journals**
 - **Issuing the BEYOND newsletter**
 - **Setting up and maintaining the BEYOND Web Site**

- **Designing a robust Intellectual Property development plan for management and protection of the built capacity and project output**

Expanding Visibility
Enhancing Know
Dissemination Actions

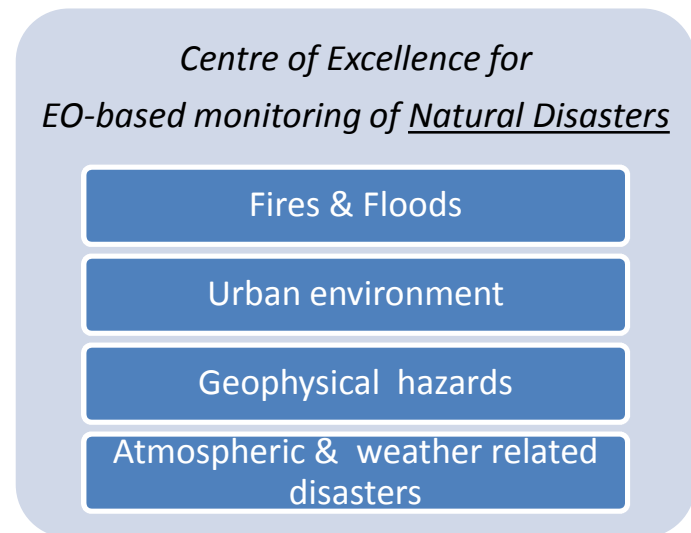
BEYOND Service/Product Archiving and Delivery



➤ Cover research/product/service generation requirements for a broad portfolio of natural disaster phenomena as

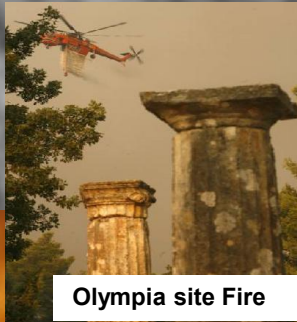
- Earthquakes
- Volcanoes
- Landslides
- Wildfire monitoring and mapping
- Smoke and toxic gasses dispersion
- Dust storms
- Air quality
- Floods
- Urban Heat islands

(three research domains of BEYOND, **RD1: Meteorological and human induced hazards**, **RD2: Geophysical hazards**, and **RD3: Atmospheric pollution and air quality**)



Service Capacity Building

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

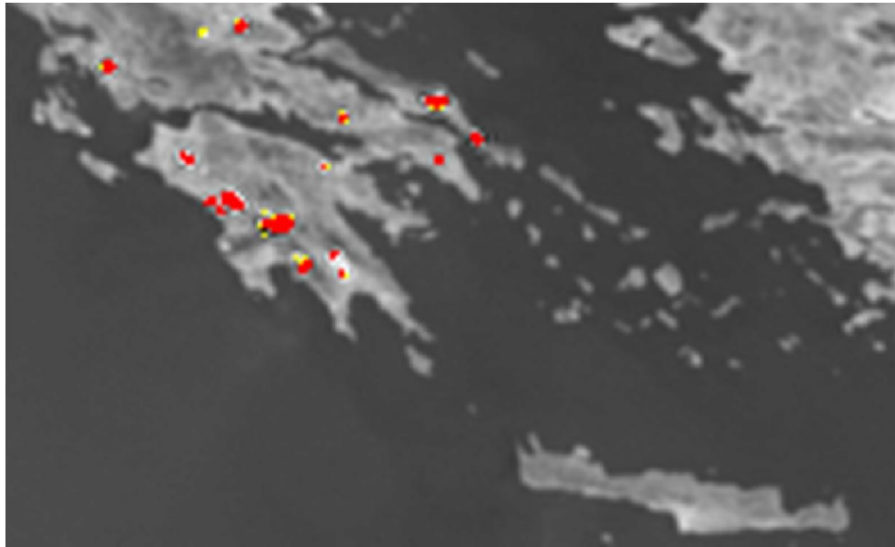


EMERGENCY

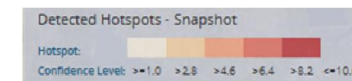
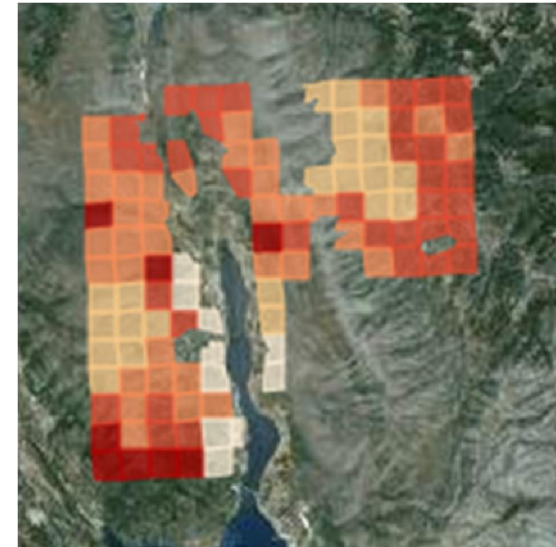
SEVIRI MIR 070823_1030 UTC

	POTENTIAL FIRE
	CONFIRMED FIRE

On-line Fire Services dissemination Through NOA's dedicated web interface (http://ocean.space.noa.gr/seviri/fend_new/index.php)



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



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

On-line Fire Services dissemination Through NOA's dedicated web interface (http://ocean.space.noa.gr/seviri/fend_new/index.php)



The major wildfire that burned 148,000 acres of land on the Greek island of Chios between 18 and 22 August 2012, distinguishes 2012 as the year with the largest burned areas that has witnessed the island in the last 30 years. After a natural disaster of that magnitude, in order not to further change the landscape of the island as the forest vegetation of the island deteriorates over time, immediate as well as long-term measures are needed. (source: WWF)

ML	LINE_C	Probability	Count	Start	End
201202-0304	"S-BAND 300"	95.50	2012-09-19 06:00	2012-09-19 06:00	
201202-0304	"S-BAND 300"	95.50	2012-09-19 06:00	2012-09-19 06:00	
201202-0304	"S-BAND 300"	95.50	2012-09-19 06:00	2012-09-19 06:00	
201202-0304	"S-BAND 300"	27.02	2012-09-19 06:00	2012-09-19 06:00	
201202-0304	"S-BAND 300"	95.50	2012-09-19 06:00	2012-09-19 06:00	
201202-0304	"S-BAND 300"	95.50	2012-09-19 06:00	2012-09-19 06:00	
201202-0304	"S-BAND 300"	95.50	2012-09-19 06:00	2012-09-19 06:00	
201202-0304	"S-BAND 300"	24.17	2012-09-19 06:00	2012-09-19 06:00	

Fire Monitoring Service based on MSG SEVIRI

Year: 2012, Month of Reference: August

Legend: 0-10, 10-20, 20-30, 30-40, 40-50, 50-60, 60-70, 70-80, 80-90, 90-100

On-line Fire Services dissemination Through NOA's dedicated web interface (http://ocean.space.noa.gr/seviri/fend_new/index.php)



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

TELEIOS SWoFS gmes strabon EUMETSAT

Status Info:
Mode: Archive
Beginning Time: 2012-08-21T21:00:00 GMT
End Time: 2012-08-27T21:00:00 GMT
Total #HotSpots: 2361
Latest #HotSpots:

Northern Sporades Nisos Evvoia Nisos Lesvos Nisos Skyros Nisos Andros Nisos Kea Nisos Thira Nisos Crete

Aggregated Query Data

HID	RANK	Municipality	Duration	Ignition	End
0	1910	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	27.25	2012-08-24T23:10:00	2012-08-26T02:20:00
2	1910	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	26.17	2012-08-25T01:45:00	2012-08-26T03:50:00
4	1910	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	17.83	2012-08-25T10:15:00	2012-08-26T04:00:00
5	1910	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	17.75	2012-08-25T10:15:00	2012-08-26T03:55:00
6	1910	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	11.83	2012-08-25T10:10:00	2012-08-25T21:55:00
10	1910	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	11.83	2012-08-25T10:10:00	2012-08-25T21:55:00
12	1910	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	10	2012-08-25T00:55:00	2012-08-25T10:50:00
13	1910	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	16.33	2012-08-25T10:20:00	2012-08-26T02:35:00
14	1910	ΔΗΜΟΣ ΚΥΜΗΣ-ΑΛΙΒΕΡΙΟΥ	10.67	2012-08-25T12:40:00	2012-08-25T23:15:00

Fire Monitoring Service based on MSG SEVIRI

Realtime Archive

Year & 2012 Month of Reference

Submit Ignition Fire End Duration

Fire Simulation

NOA Implementation Team: Haris Kontoes, Theodoros Heraklis, Dimitris Michail, Ioannis Papoutsis
Contact Email: mailto:kontoes@noa.gr

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 ● Platinia ≥0

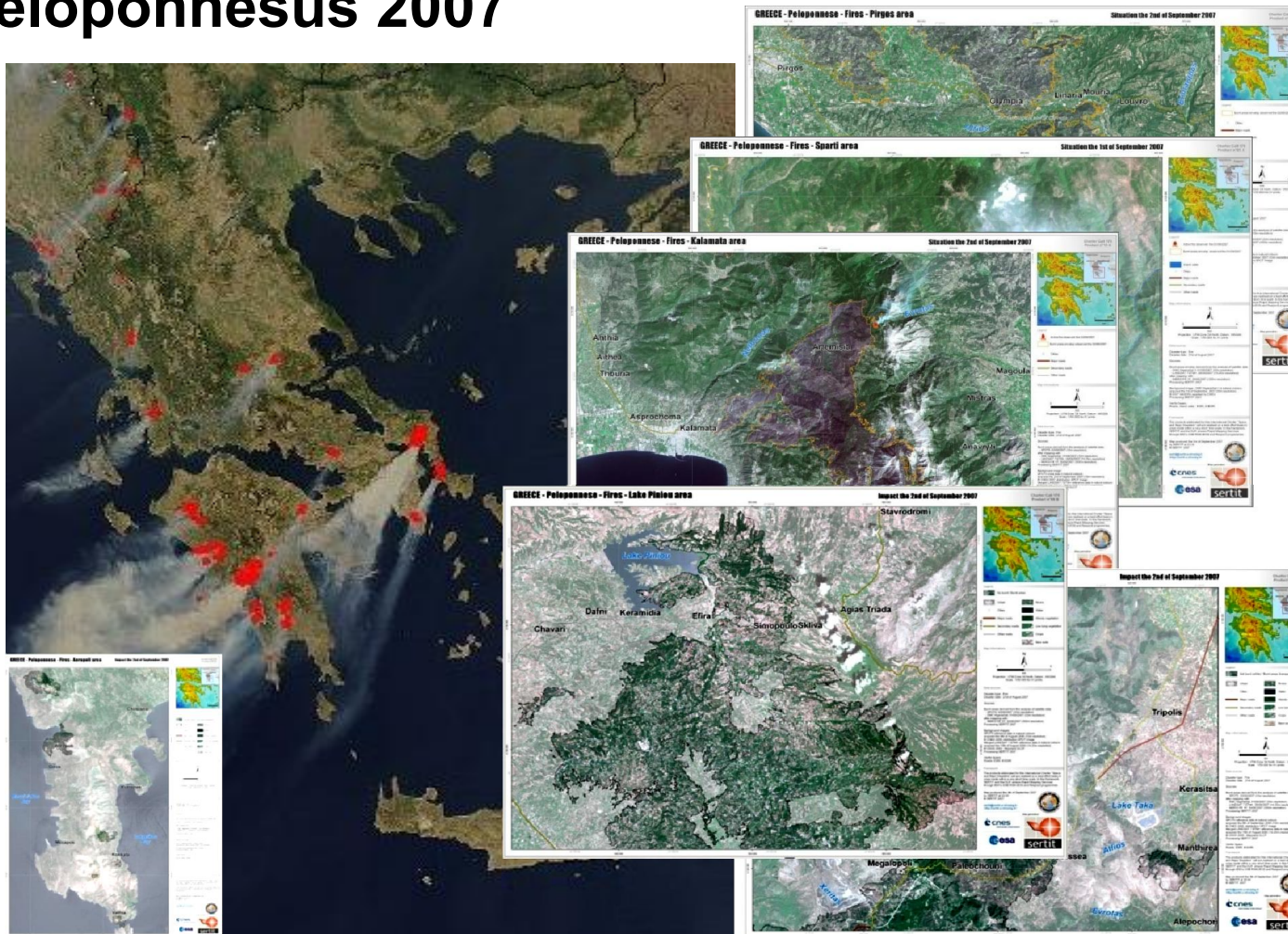
Geotype: Mountains (Height m)
 ▲ Mt.Olympus ≥2500 ▲ Mt.Pilion ≥1500 ▲ Mt.Ymittos ≥1000 ▲ Stavroulani ≥0

Geotype: Islands (Area km2)
 N.Crete ≥3000 N.Rhodes ≥1000 N.Andros ≥100 N.Thira ≥10 N.Plareaia ≥1 N.Pileias ≥0

Powered by Leaflet

3:04 μμ 14/9/2012

Rapid Fire Mapping Activation in Greece – Peloponnesus 2007

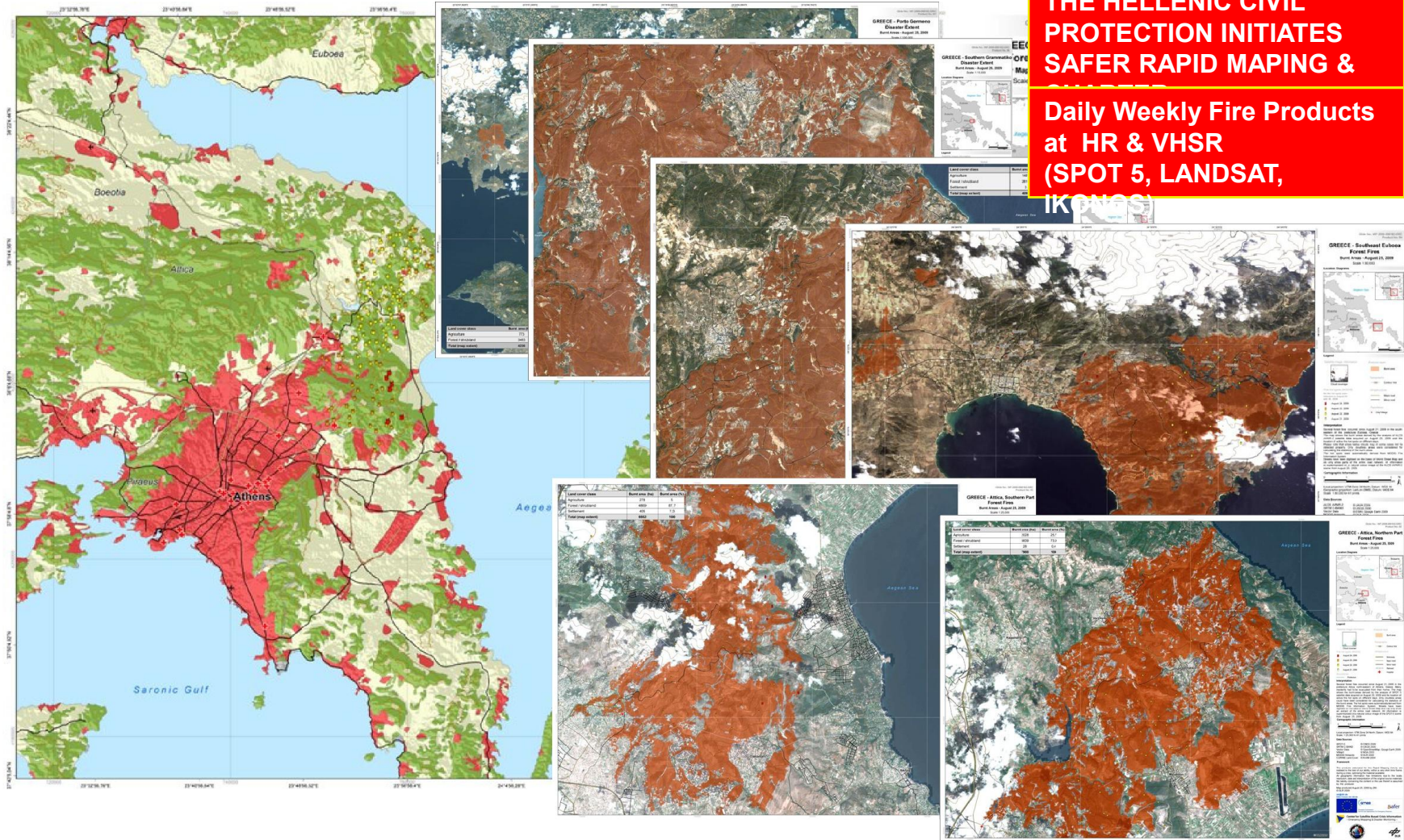



**INTERNATIONAL
CHARTER
OF MAJOR
DISASTERS
IS
ACTIVATED**

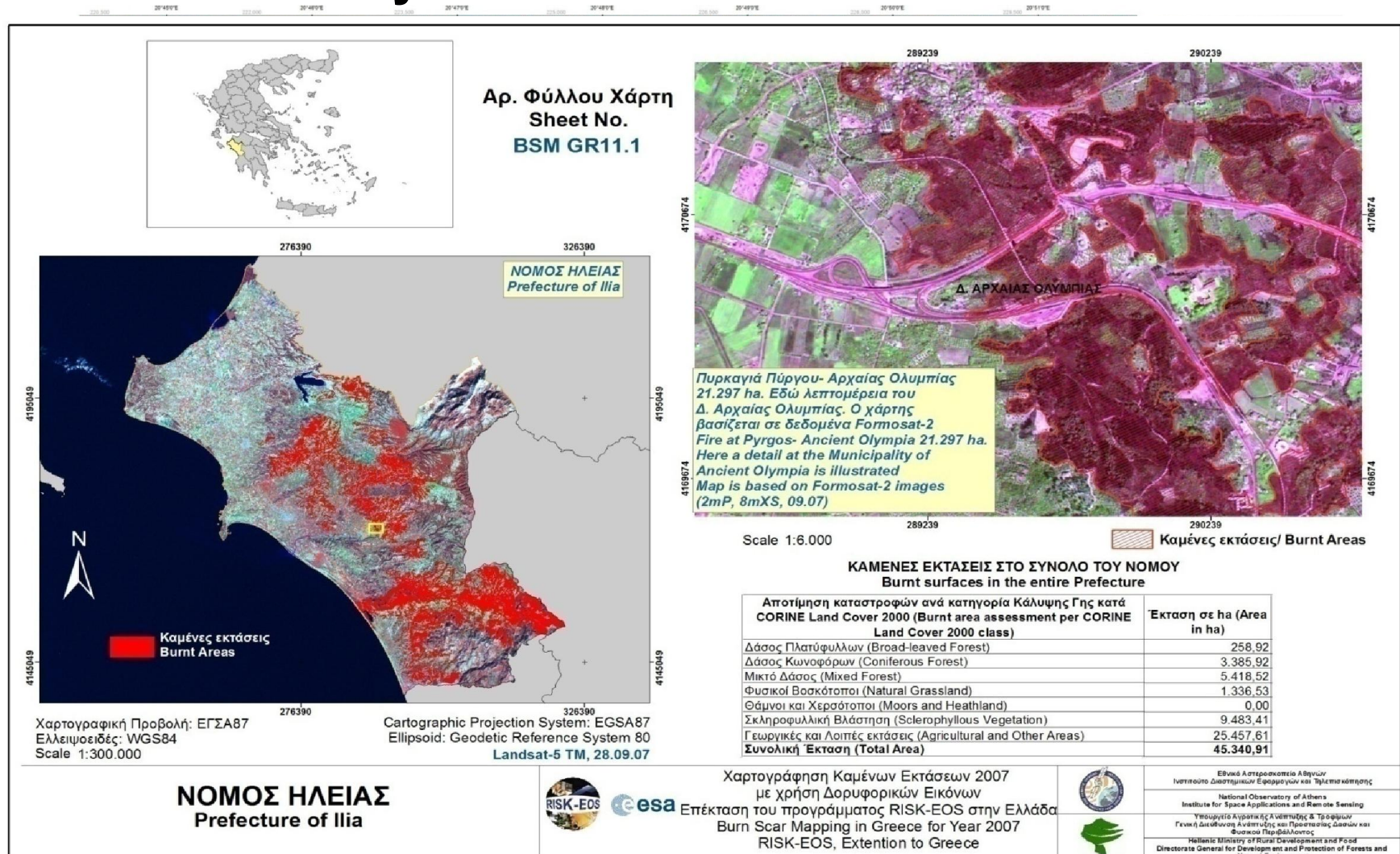


Rapid Fire Mapping Activation in Greece – Athens 2009

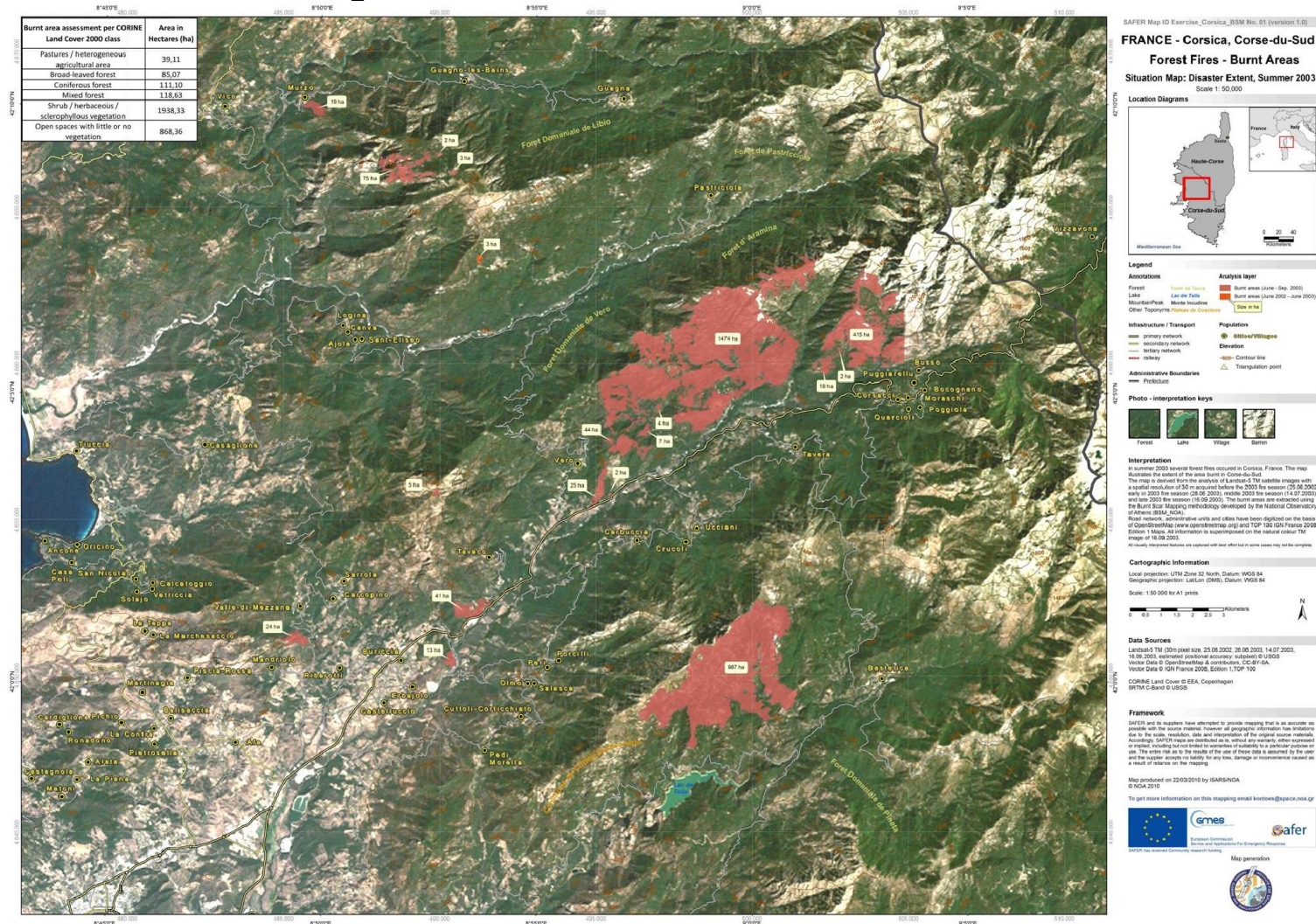
THE HELLENIC CIVIL PROTECTION INITIATES SAFER RAPID MAPPING & Daily Weekly Fire Products at HR & VHSR (SPOT 5, LANDSAT, IKONOS)



Burnt Area Mapping - Emergency Support Immediate Recovery Actions



Burnt Area Mapping - Emergency Support Immediate Recovery Actions

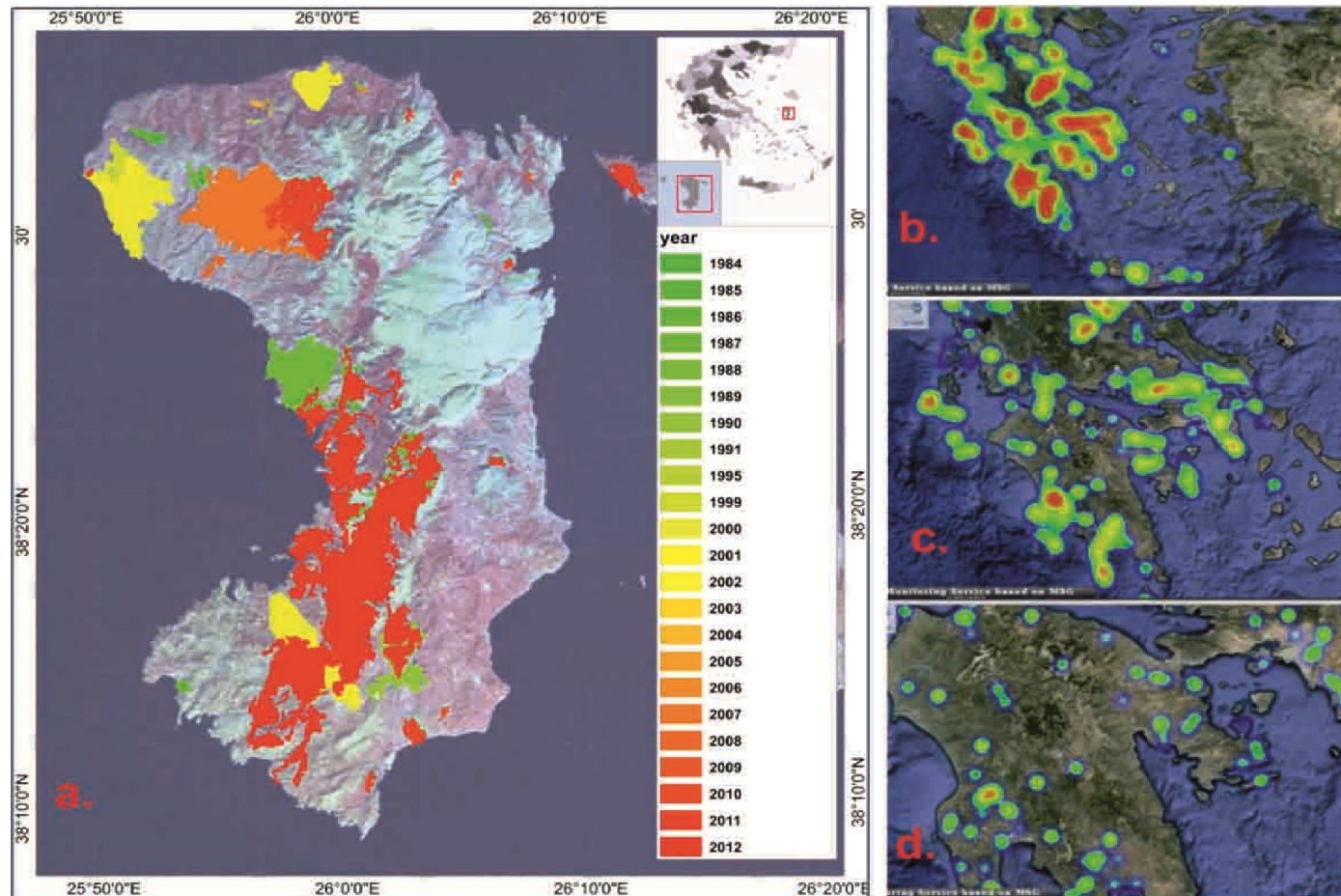


Seasonal Burn Scar Mapping & Damage Assessments – Recovery Phase



Diachronic Burn Scar Mapping & Damage Assessments at HR

On-line dissemination through NOAA's dedicated web interface
 (http://ocean.space.noa.gr/diachronic_bsm/index.php)



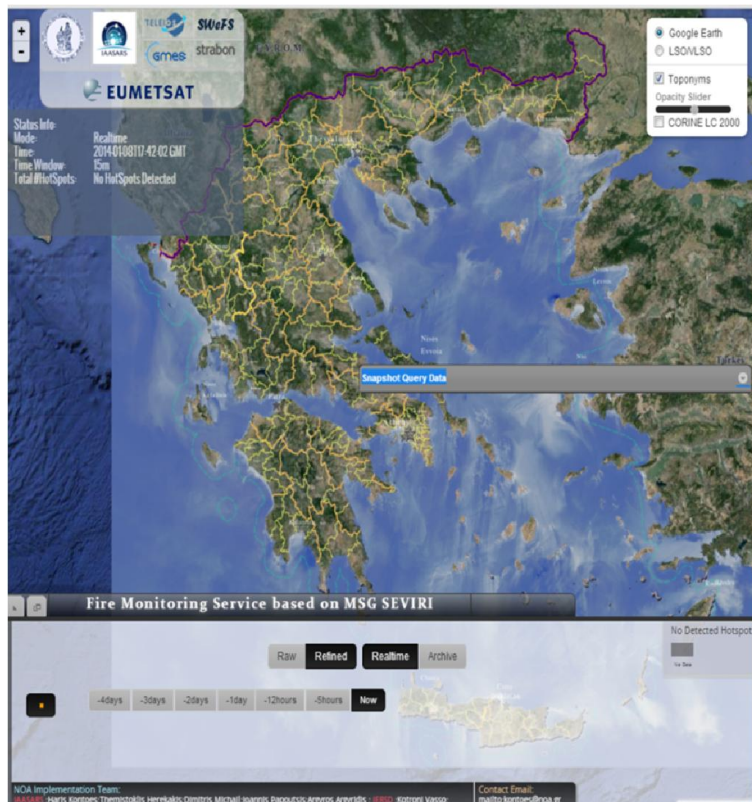
Diachronic Burn Scar Mapping

On-line dissemination through NOA's web interface
(http://ocean.space.noa.gr/diachronic_bsm/index.php)



The screenshot shows the website interface for the Diachronic Burn Scar Mapping project. At the top left is the logo of the National Observatory of Athens. The main header includes the text "National Observatory of Athens" and "Greek General Secretariat for Research and Technology". A box on the right contains the text "Event Logo". The background features a collage of images: a volcanic landscape with orange lava flows, a blue sky with white clouds, a cracked, dry earth surface, and a dark, charred tree. A large, semi-transparent white box in the center contains the URL <http://ocean.space.noa.gr/bsm> and the title "DIACHRONIC INVENTORY OF FOREST FIRES OVER GREECE FROM 1984 TO PRESENT, WITH USE OF LANDSAT 4,5,7 SATELLITE DATA". At the bottom center, a small box displays the URL "URL: <http://www.noa.gr>".

Forecasting of wild fire smoke dispersion



Fire monitoring service based on MSG SEVIRI
(satellite fire detection every 5 minutes)



WRF modeling system
(meteorological forecasting)



FLEXPART
Lagrangian Dispersion model



Smoke plume
trajectories

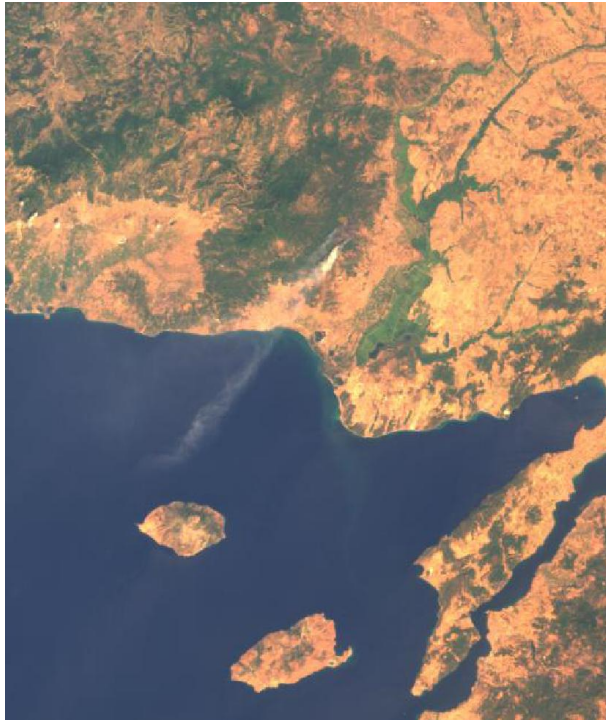


Gas and particle
concentrations



Deposition
fluxes

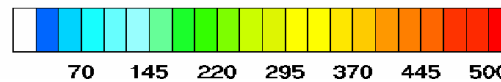
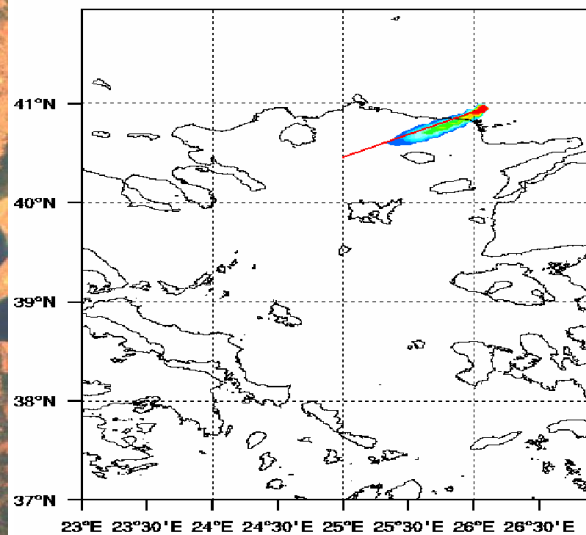
Forecasting of wild fire smoke dispersion



MISR satellite image
24 August 2011, 08:00 UTC

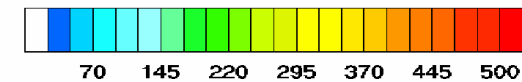
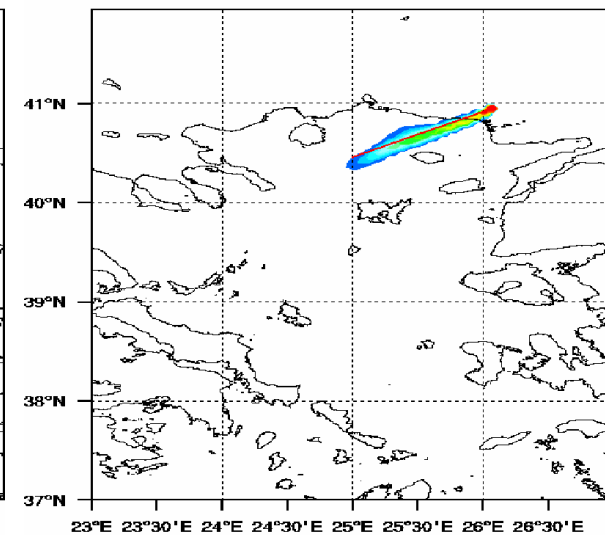
FLEXPART - NOA
Biomass Burning (Organic Carbon -OC)

valid date: 24-08-2011 08UTC
Model layer: Integrated Column (ng m⁻³)



FLEXPART - NOA
Biomass Burning (Organic Carbon -OC)

valid date: 24-08-2011 09UTC
Model layer: Integrated Column (ng m⁻³)



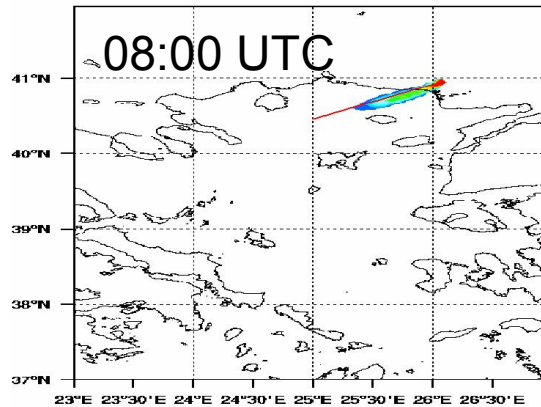
Simulated concentration of Organic Carbon (ng m⁻³) 24 August 2011, 08:00 (left) and 09:00 (right) UTC

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

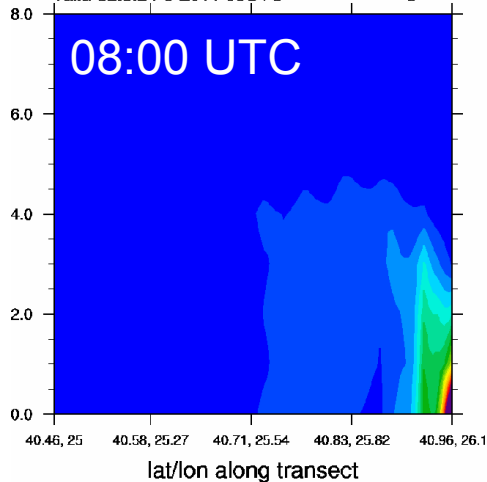


FLEXPART - NOA
Biomass Burning (Organic Carbon -OC)

valid date:24-08-2011 08UTC
Model layer: Integrated Column (ng m⁻³)

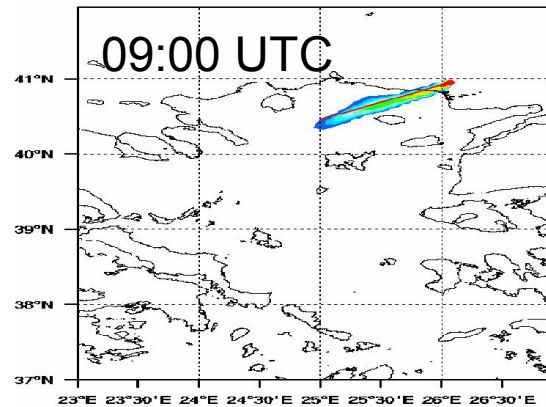


FLEXPART NOA
Biomass Burning (Organic Carbon -OC)
valid date:24-8-2011 08UTC
ng m⁻³

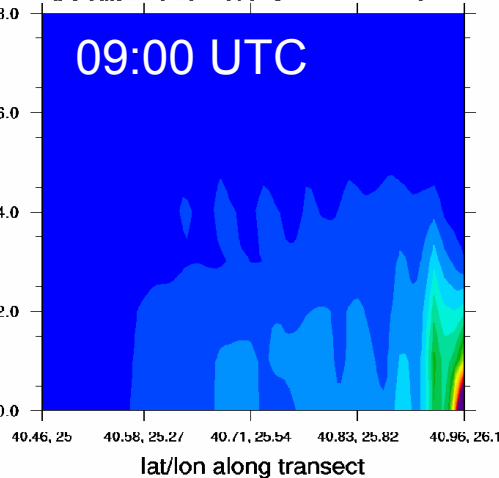


FLEXPART - NOA
Biomass Burning (Organic Carbon -OC)

valid date:24-08-2011 09UTC
Model layer: Integrated Column (ng m⁻³)

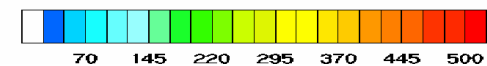
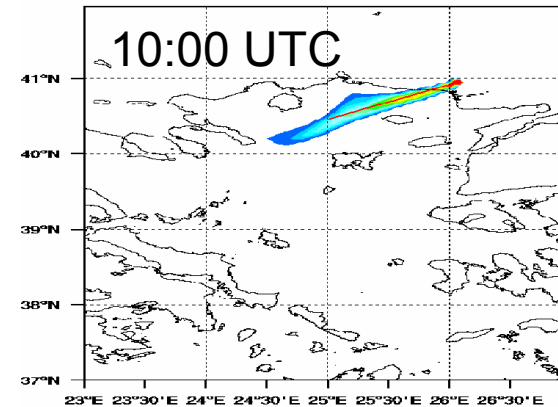


FLEXPART NOA
Biomass Burning (Organic Carbon -OC)
valid date:24-8-2011 09UTC
ng m⁻³

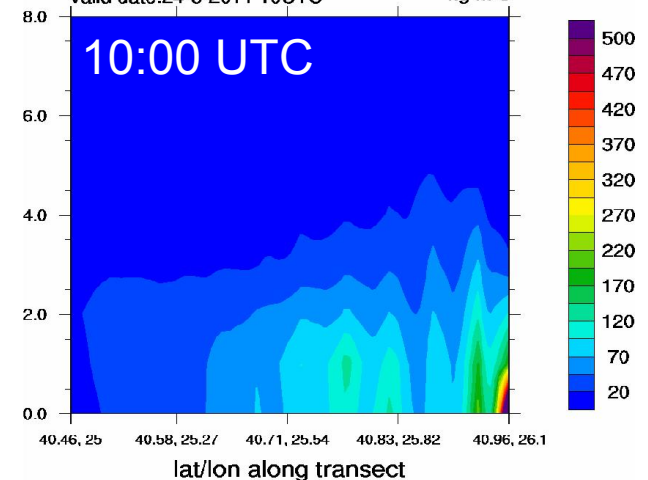


FLEXPART - NOA
Biomass Burning (Organic Carbon -OC)

valid date:24-08-2011 10UTC
Model layer: Integrated Column (ng m⁻³)



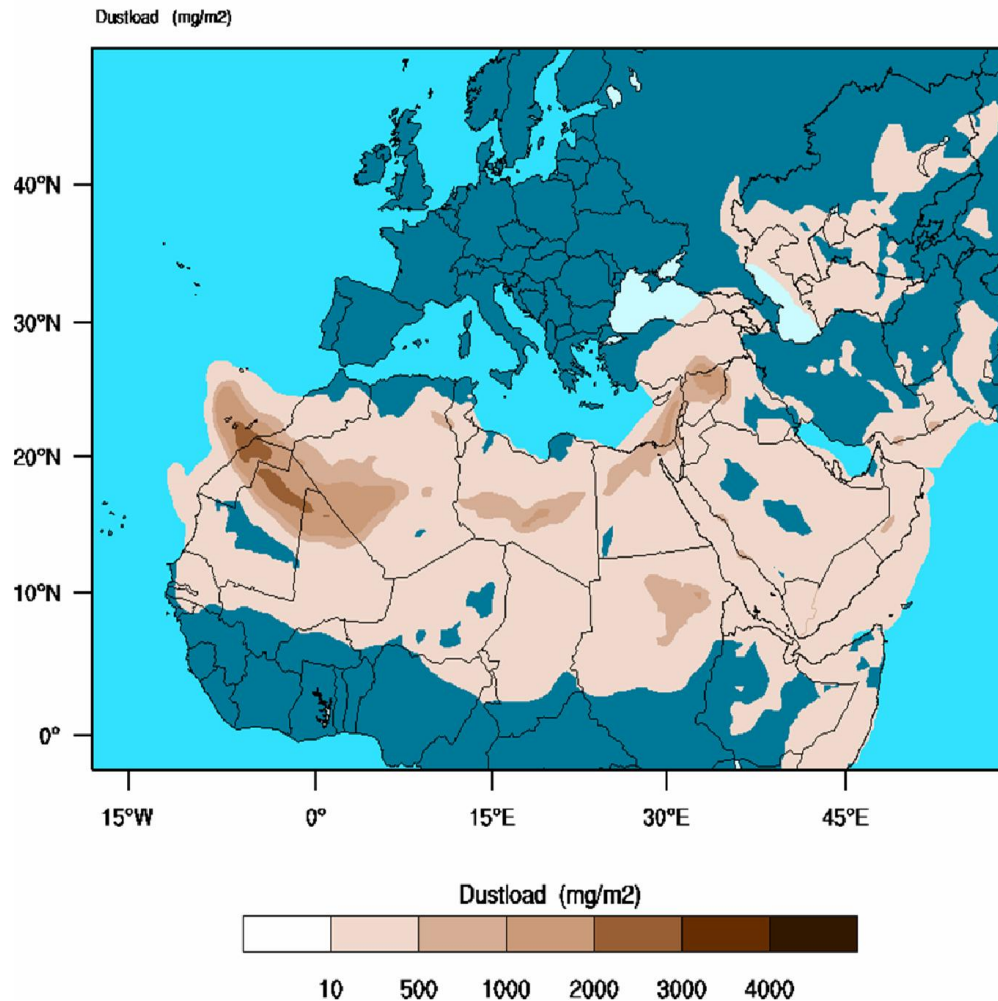
FLEXPART NOA
Biomass Burning (Organic Carbon -OC)
valid date:24-8-2011 10UTC
ng m⁻³



Forecasting of mineral dust transport in the atmosphere



Valid: 2013-11-27_06:00:00



Vertically integrated concentration of airborne dust particles (mg/m²)

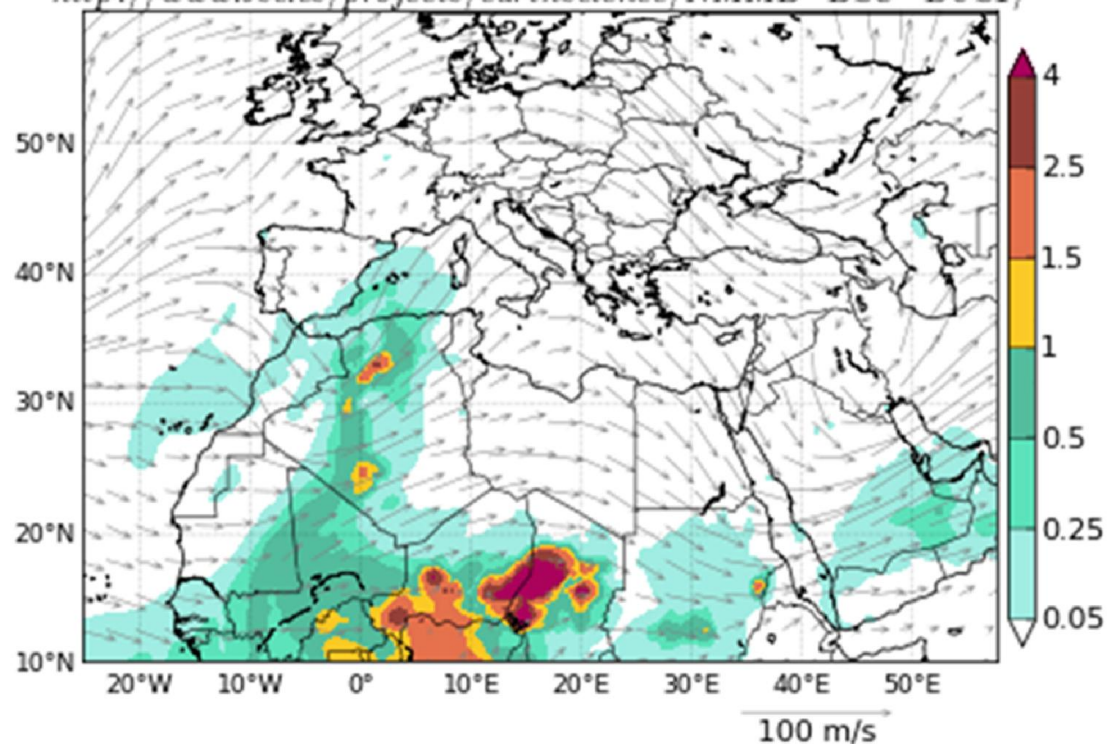
WRF-CHEM simulation, 27 November 2013, 06:00 UTC

Forecasting of mineral dust transport in the atmosphere



NMMB/BSC-Dust Dust Load (g/m^2) and 700 hPa Wind
72h forecast for 12UTC 11 Jan 2014

<http://www.bsc.es/projects/earthscience/NMMB-BSC-DUST/>

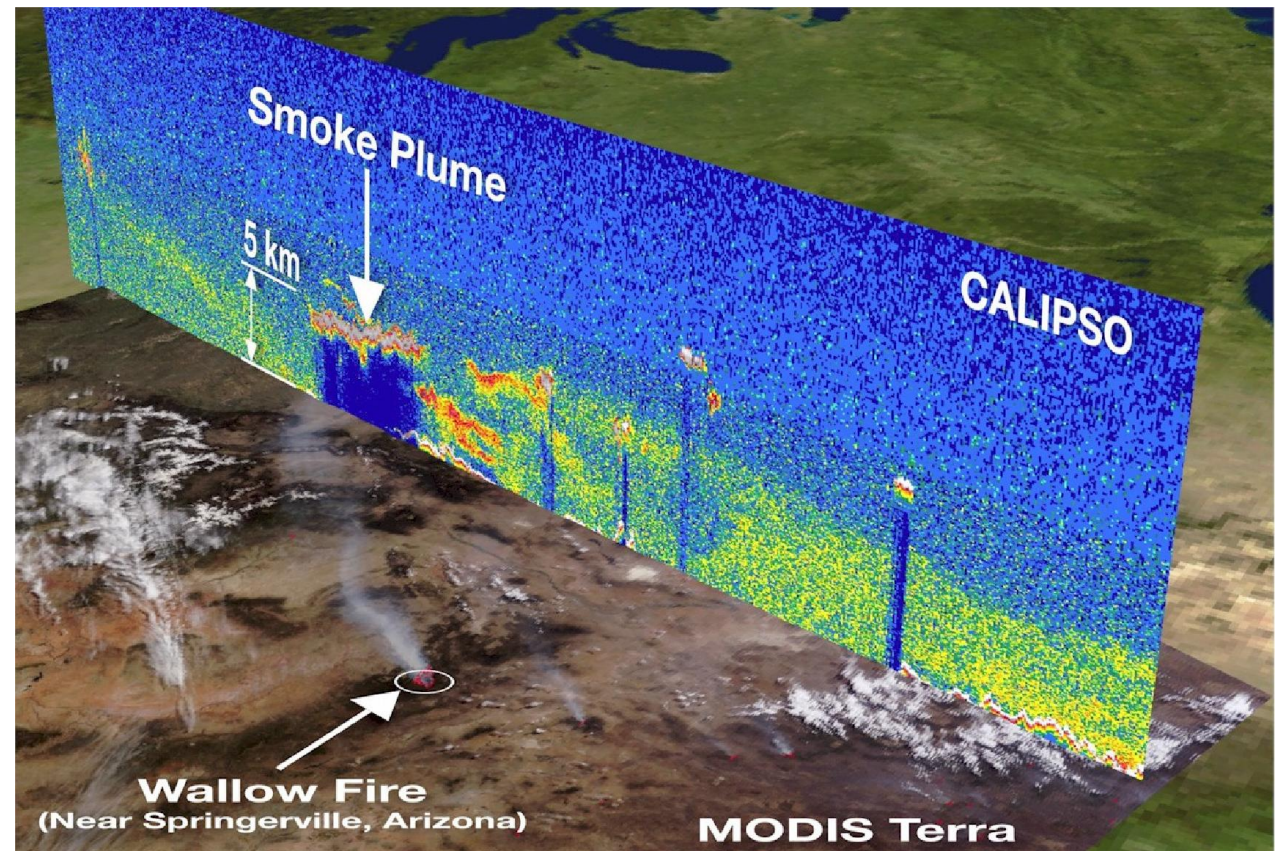
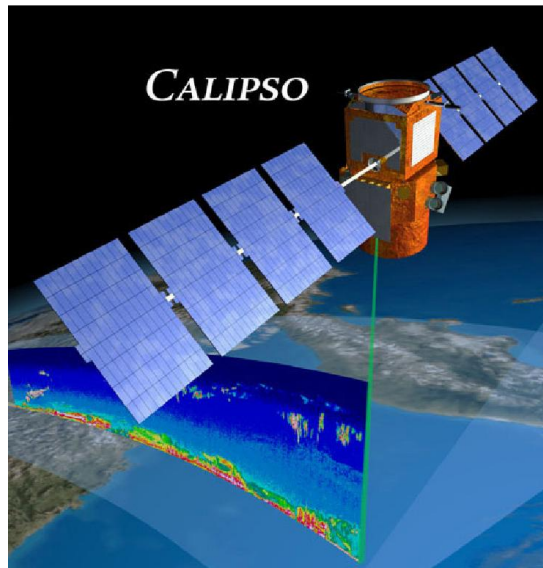


Vertically integrated concentration of airborne dust particles (g/m^2) and wind vectors at 700 hPa

NMMB-BSC-DUST simulation, 14 January 2014, 12:00 UTC

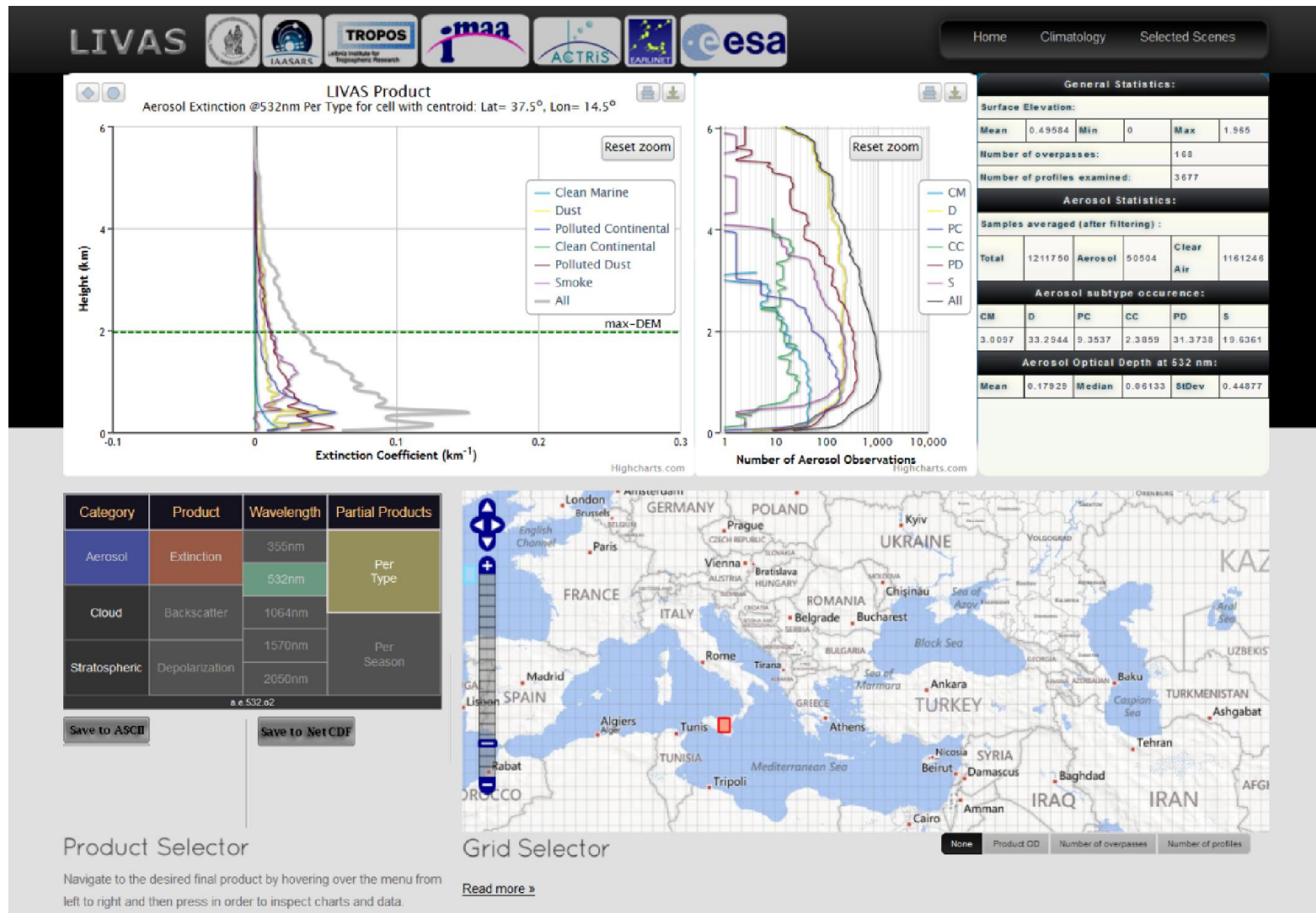
Vertical structure of smoke plume

Space based derived observations



Global 3D climatology of aerosols and clouds

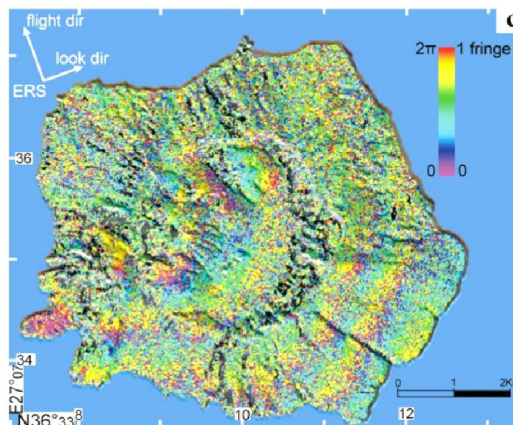
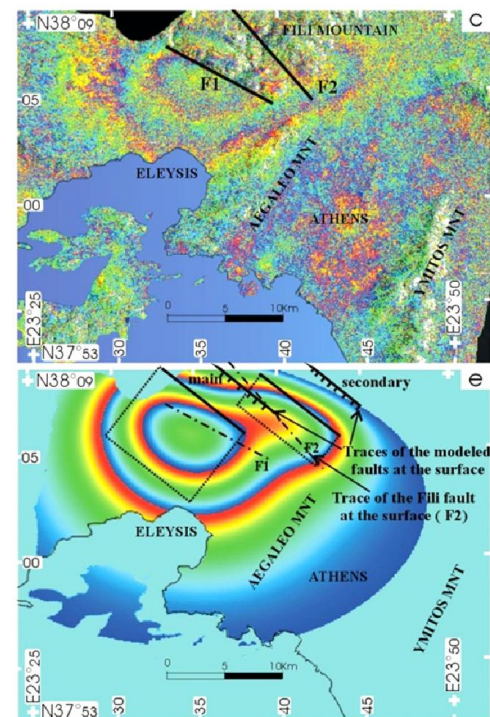
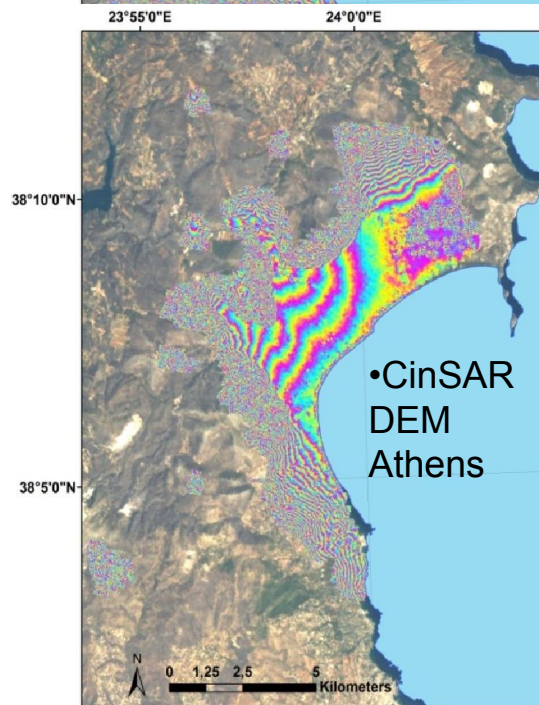
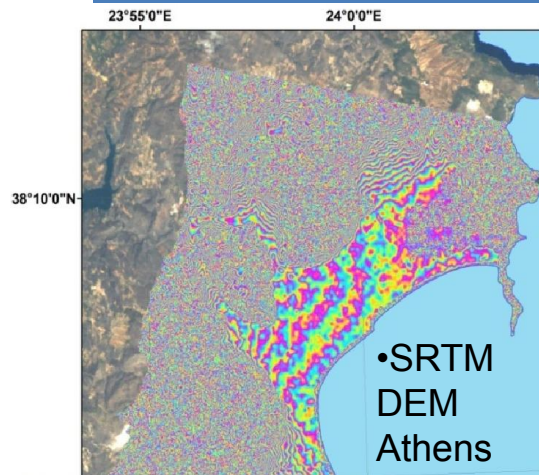
LIVAS portal under BEYOND (1x1 degree resolution)



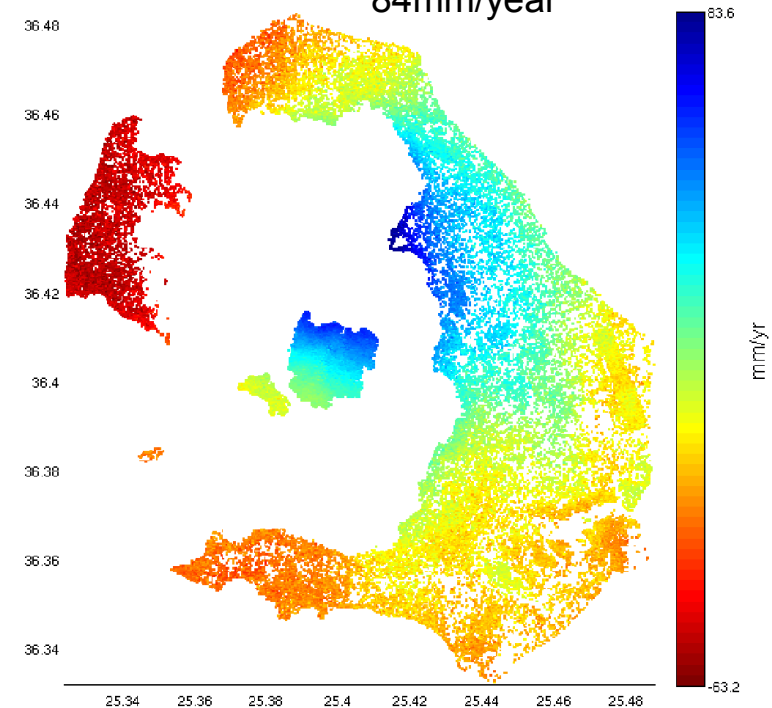
InSAR and CinSAR services

Operational Deformation Rate monitoring

ESA AO ERS & ENVISAT awarded projects



- 1999 Athens earthquake
Crustal Post Seismic
Deformation 80-90mm
- Santorini volcano unrest 2011-12
- ~60000 points
- Deformation rate -
63mm/year -
84mm/year

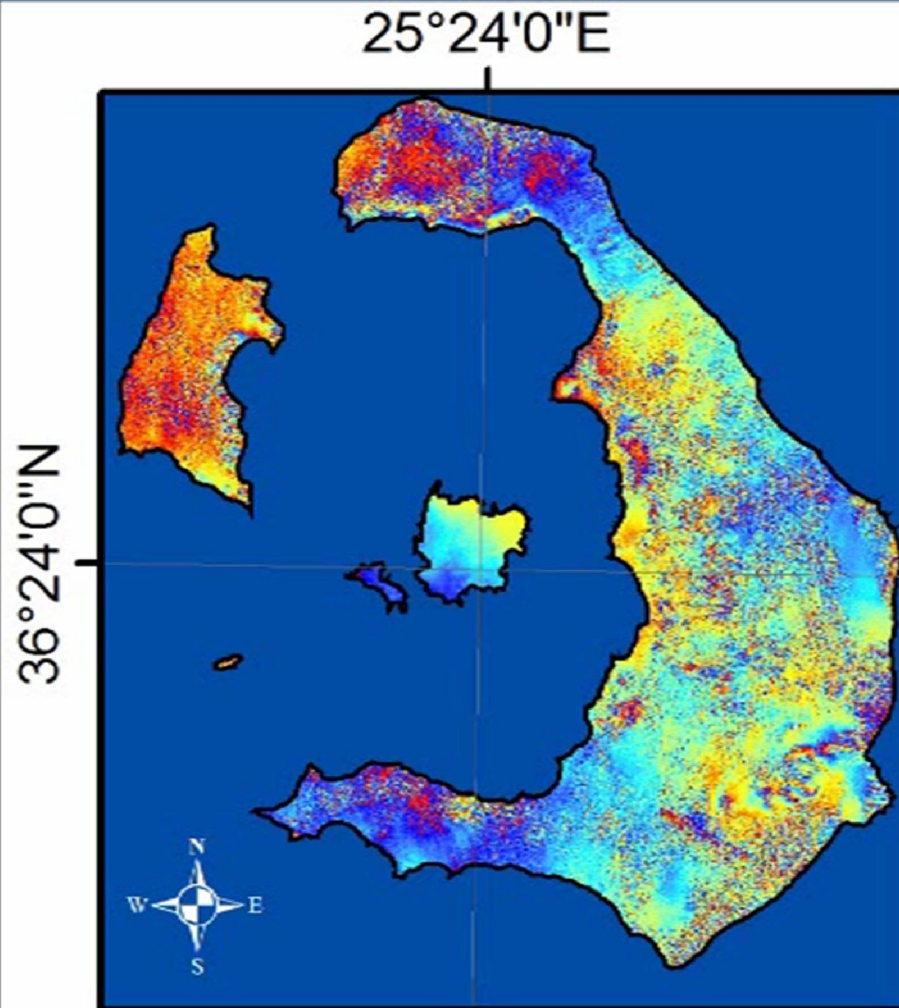


- Nisiros volcano unrest
Deformation rate 1997-
2000 87mm/year

InSAR and CinSAR services
Operational Deformation Rate monitoring
ESA AO ERS & ENVISAT awarded projects



November
2011



Flood Risk Modelling and Flood extend

The area of the basin is over 6300 km², with an average annual rainfall of 779 mm. The flood event occurred on 21-28 January 2003.



Figure 1: study area



Flood Risk Modelling and Flood extend

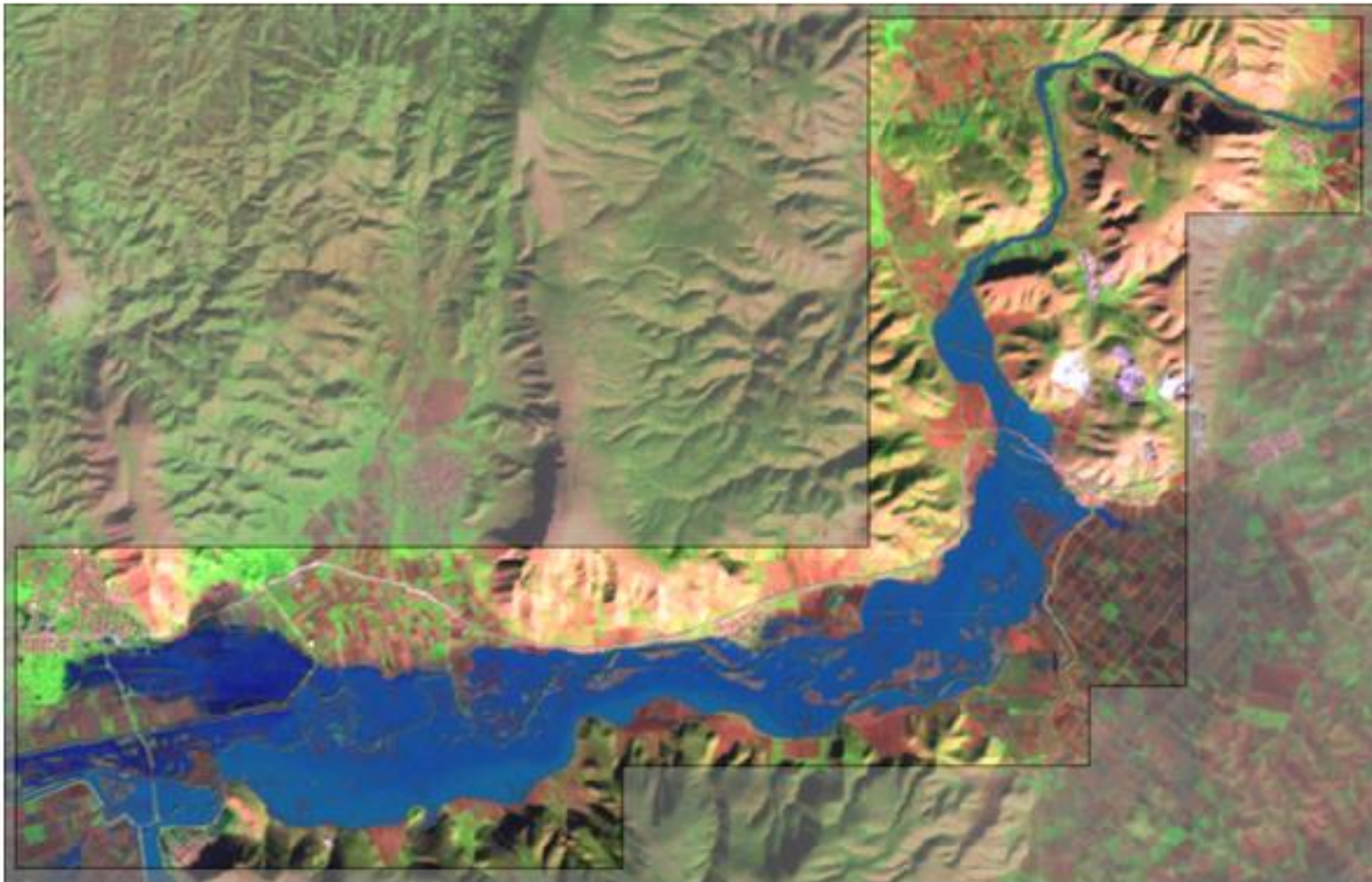


Figure 3: Landsat-7 satellite image (flooded area)

Flood Risk Modelling and Flood extend

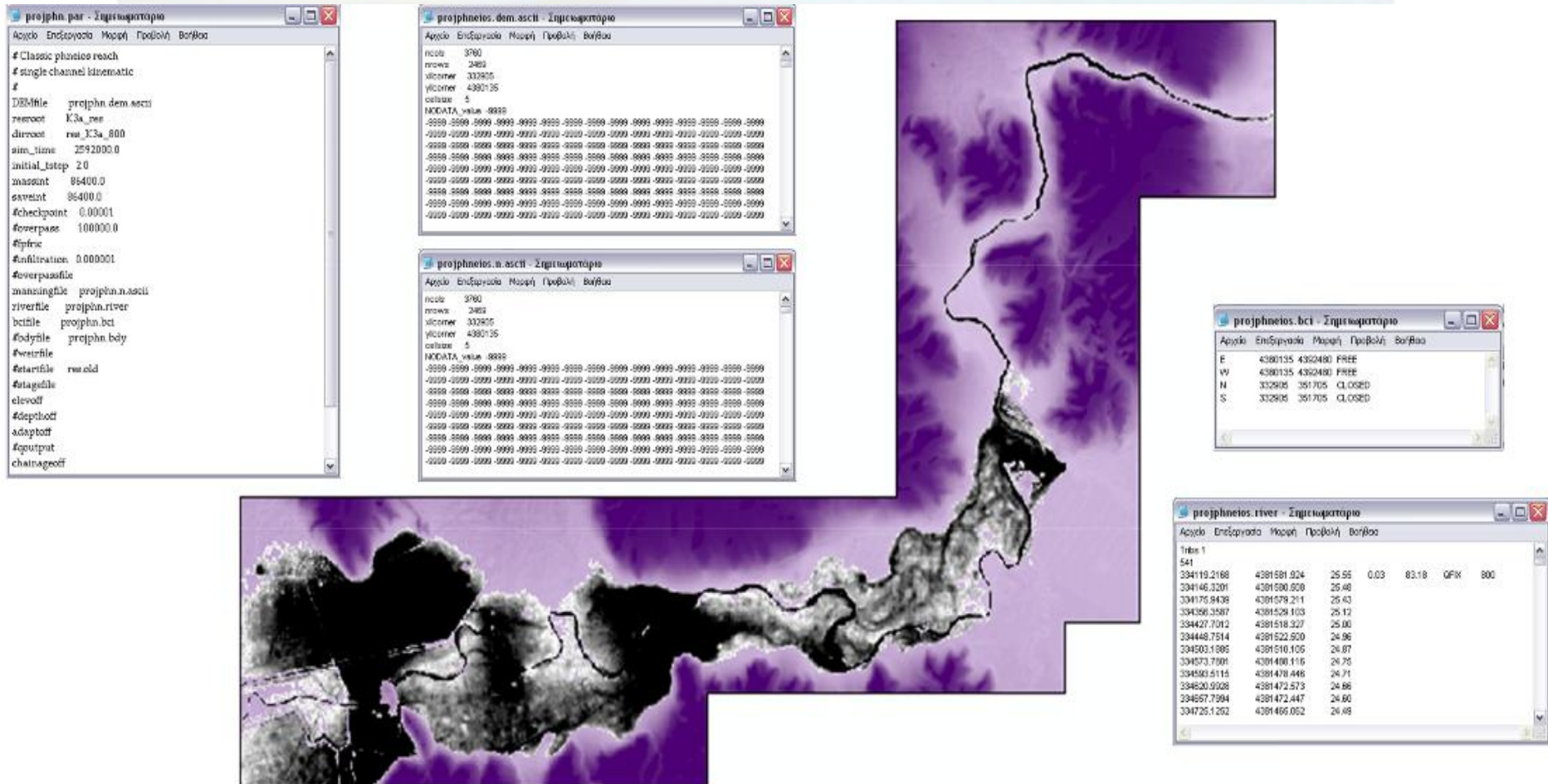


Figure 5: LISFLOOD-FP hydraulic model

Thank you for your attention!

For more information

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