



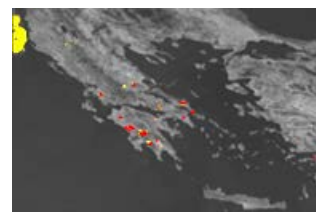
FireHub: A Space based Fire Management Hub

Haris KONTOES, Research Director NOA
BEYOND Coordinator



BEYOND participated in the Best Service Challenge Copernicus - Masters competition

Submitted Service : The Operational EO based fire management service, known as:



“FireHub: A Space Based Fire Management Hub “

The service consists of four pillars:

1. The early fire detection and real-time fire monitoring
2. The large scale Burnt Scar Mapping during and after wildfires
3. The diachronic BSM and damage assessment
4. The hourly forecasting of fire smoke dispersion



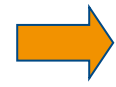
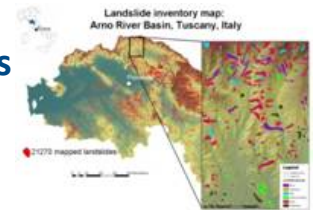
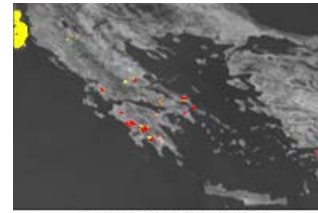
FireHub

“FireHub: A Space Based Fire Management Hub “





Institutional End Users and stakeholders receiving the fire disaster services:



The European Copernicus Program (EMS service)

The Hellenic Fire Brigades Operations' Control Room
The Ministry of Env. (Directorate for Forests Protection)

The Gen. Sec. Civil Protection

The Forestry Services over Greece and Europe

The National Cadastral Organisation

The Local Authorities & Environmental Organisations

The Greek Army

The Public

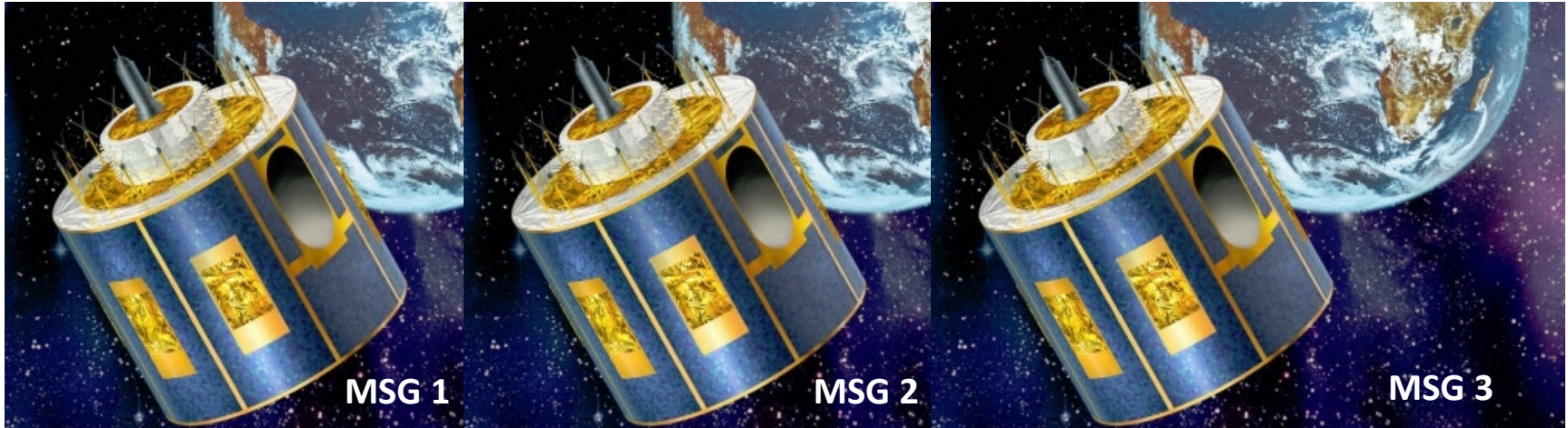
The Serbian HydroMet Service

The BBU - Research Center for Disaster Management- Romania

The European Fire Monitoring Center



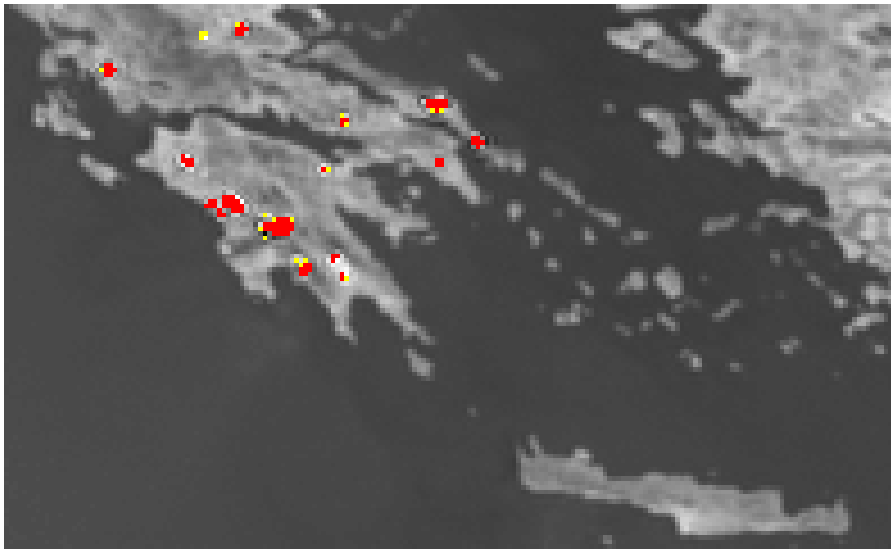
Active Fire Detection by MSG SEVIRI Instrument



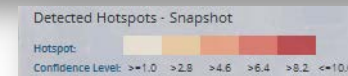
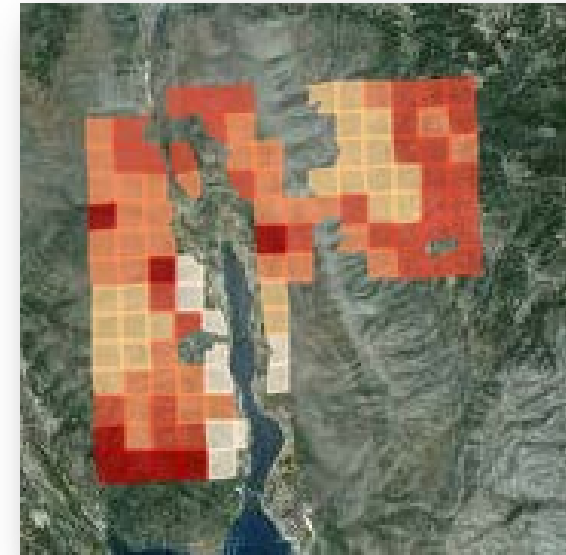
1	VIS0.6	0.635	0.56	0.71	Surface, clouds, wind fields
2	VIS0.8	0.81	0.74	0.88	Surface, clouds, wind fields
3	NIR1.6	1.64	1.50	1.78	Surface, cloud phase
4	IR3.9	3.90	3.48	4.36	Surface, clouds, wind fields
5	WV6.2	6.25	5.35	7.15	Water vapor, high level clouds, atmospheric instability
6	WV7.3	7.35	6.85	7.85	Water vapor, atmospheric instability
7	IR8.7	8.70	8.30	9.1	Surface, clouds, atmospheric instability
8	IR9.7	9.66	9.38	9.94	Ozone
9	IR10.8	10.80	9.80	11.80	Surface, clouds, wind fields, atmospheric instability
10	IR12.0	12.00	11.00	13.00	Surface, clouds, atmospheric instability
11	IR13.4	13.40	12.40	14.40	Cirrus cloud height, atmospheric instability
12	HRV	Broadband (about 0.4 - 1.1 μm)			Surface, clouds



Regional Real Time Fire Monitoring Service based on EUMETSAT MSG SEVIRI Data Monitoring



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



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



Active Fire Detection by MSG SEVIRI Instrument

The best suited MSG SEVIRI Channels for active fire detection of forest and vegetation fuels and discrimination from ambient temperatures are:

Channel	Central Wavelength (μm)	Spectral Band (μm)
IR 3.9	3.92	3.48 - 4.36
IR 10.8	10.8	9.80 - 11.80

Classification step #1: The EUMETSAT Fire mapping algorithm (FIR) is based on fixed thresholding approach, applied on the spectral bands **IR 3.9** and **IR10.8**. The FIR algorithm uses the following criteria to check for **potential fire and fire pixels**:

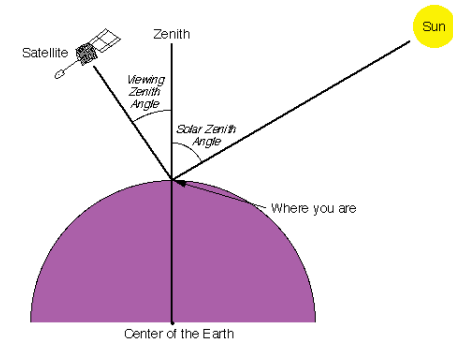
1. Brightness temperature of channel IR3.9 > **threshold 1**
2. Brightness temperature difference of channels IR3.9 and IR10.8 > **threshold 2**
3. Difference of the standard deviations of channel IR3.9 and IR10.8 > **threshold 3**
4. Standard deviation of channel IR3.9 > **threshold 4**
5. Standard deviation of channel IR10.8 < **threshold 5**

(all standard deviations are computed over a 3x3 pixel group)



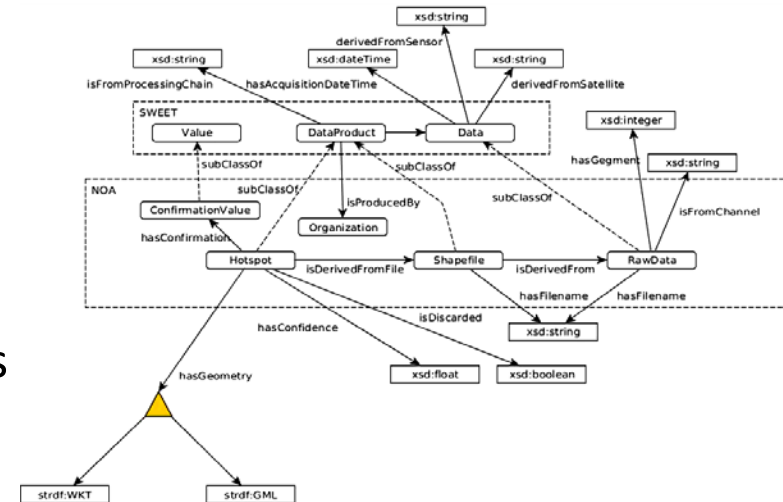
CLASSIFICATION PROCESS

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
- b) account for the time persistence of the fire observations





The FIREHUB System

Data Import

- Extension module in MonetDB to load HRIT file into an SQL table or SciQL array
- HRIT_load_image(URIs) function

Product generation

- SciQL query that outputs a polygon to WKT format
- Final products in raster and shapefile formats

Georeferencing

- Initial transformation by hand
- Concise implementation using SciQL

Classification

- Assign each pixel a fire non-fire flag with an associated level of confidence, via index thresholding
- Uses a 3x3 window



Regional Real Time Fire Monitoring - NOA's MSG SEVIRI Station – Raw Resolution mode



Zaharo Fire



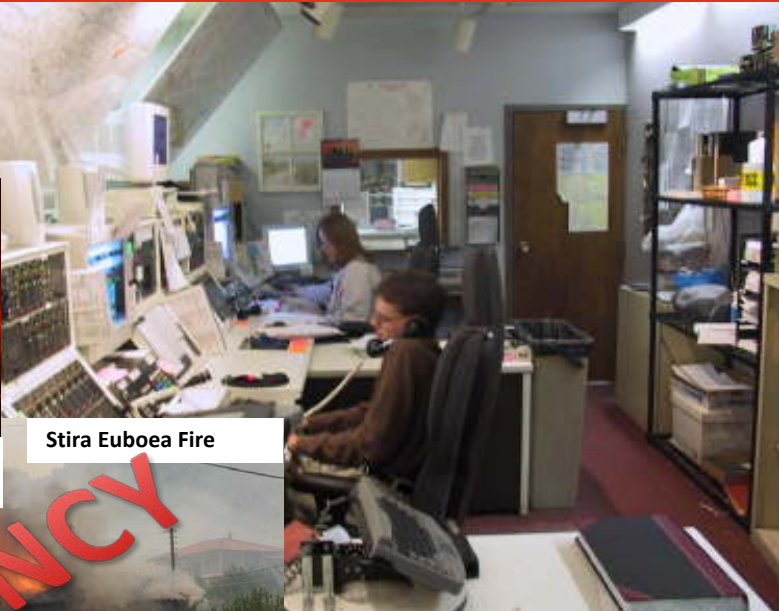
Olympia site Fire



AliveriEuboea Fire



Korinthos Fire



Stira Euboea Fire



Parnon Mt Fire



Taygetos Mt Fire



Megalopolis Fire



Otilon Fire



SEVIRI MIR 070823_1030 UTC

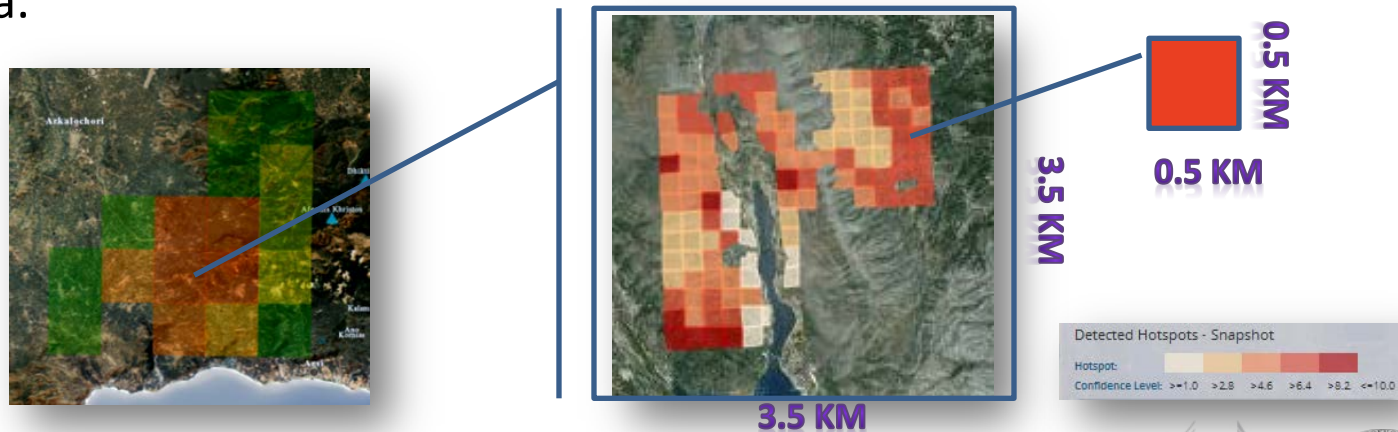
	POTENTIAL FIRE
	CONFIRMED FIRE



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.



Results @ 150 minutes after fire ignition

+30'

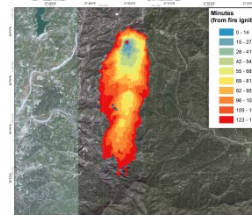
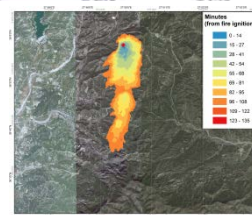
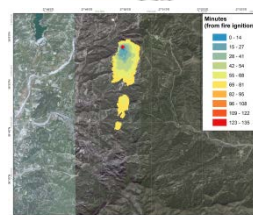
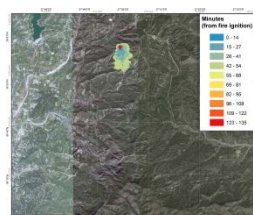
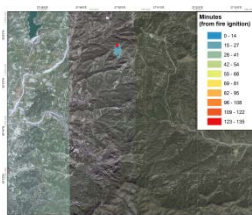
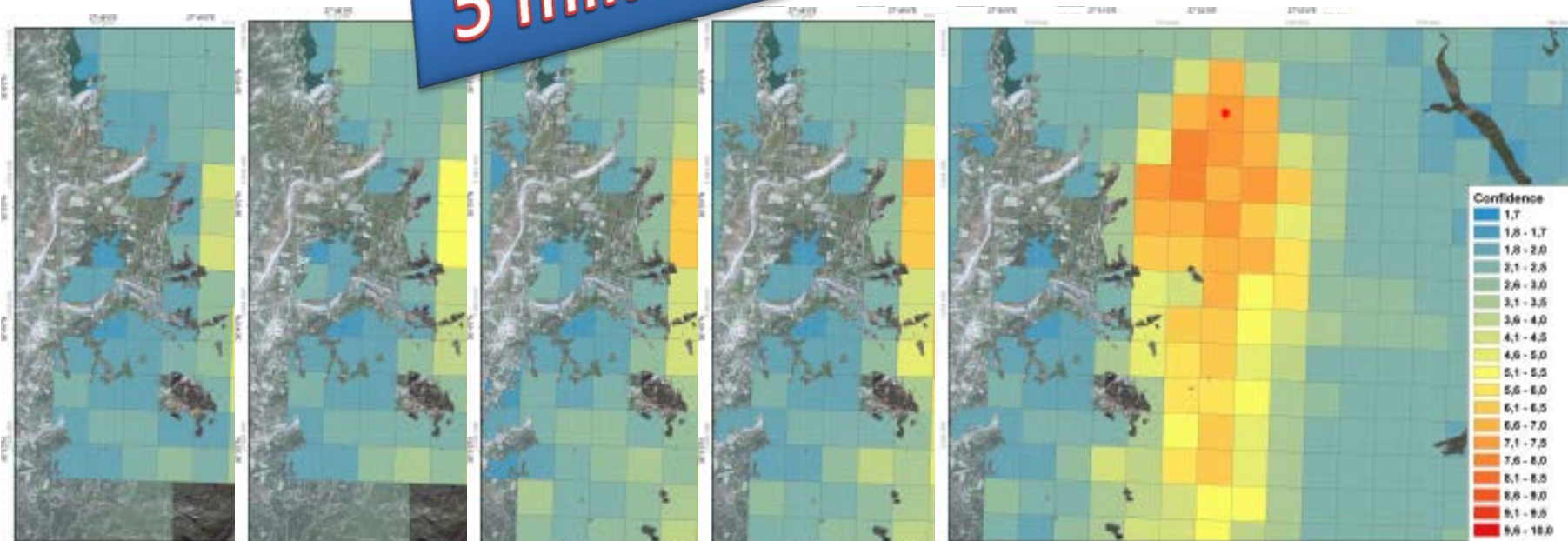
+35'

+40'

+45'

+50'

5 minutes basis





SEVIRI Monitor - NOAA GIS

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

Google Earth

Google Earth
LSO/VLSO
Toponyms
Opacity Slider
CORINE LC 2000

SWIFS
strabon
EUMETSAT

Status Info
Mode: Archive
Beginning Time: 2013-07-27 09:00:00 GMT
End Time: 2013-07-27 23:00:00 GMT
Total HotSpots: 377
Latest HotSpots: 2013-07-27 13:10:40

Demonstration of the "Real-time fire detection" functionality

Local Time: 27-07-2013 13:10

ID	RANK	Municipality	Date	Sensor	Conf
757001	96	Δ. Pellex	28-13-07-27 13:18:00	MSG2_RSS	1.988319
757001	96	Δ. Pellex	28-13-07-27 13:18:00	MSG2_RSS	1.988319
757011	96	Δ. Pellex	28-13-07-27 13:18:00	MSG2_RSS	1.988302
757021	96	Δ. Pellex	28-13-07-27 13:18:00	MSG2_RSS	1.988454
757001	96	Δ. Pellex	28-13-07-27 13:18:00	MSG2_RSS	1.988302
756991	96	Δ. Pellex	28-13-07-27 13:18:00	MSG2_RSS	1.988302
756981	96	Δ. Pellex	28-13-07-27 13:18:00	MSG2_RSS	1.753441
757031	96	Δ. Pellex	28-13-07-27 13:18:00	MSG2_RSS	1.988488

Fire Monitoring Service based on MSG SEVIRI

Detected Hotspots - Snapshot

Intensity: 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

Confidence Level: 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

Raw Refined Realtime Archive

Year & Month of Reference: Jul 25 26 27 28 29 30 31 Aug 01 02

Show Fire

NOA Implementation Team
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SEVIRI Monitor - NOAA GIS

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

Google

Google Earth
LSO/VLSO
Toponyms
Opacity Slider
CORINE LC 2000

SWIFS
strabon
EUMETSAT

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757031	98	Δ Pellex	2013-07-27 13:10:00	MSG2_RSS	1.988488

Fire Monitoring Service based on MSG SEVIRI

Detected Hotspots - Snapshot

Intensity: 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

Confidence Level: 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

Year & Month of Reference: Jul 25 26 27 28 29 30 31 Aug 01 02

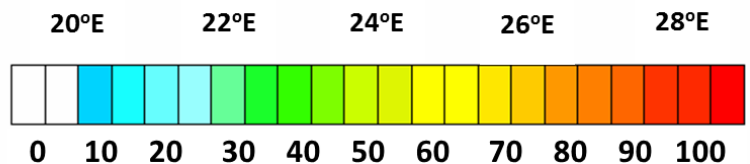
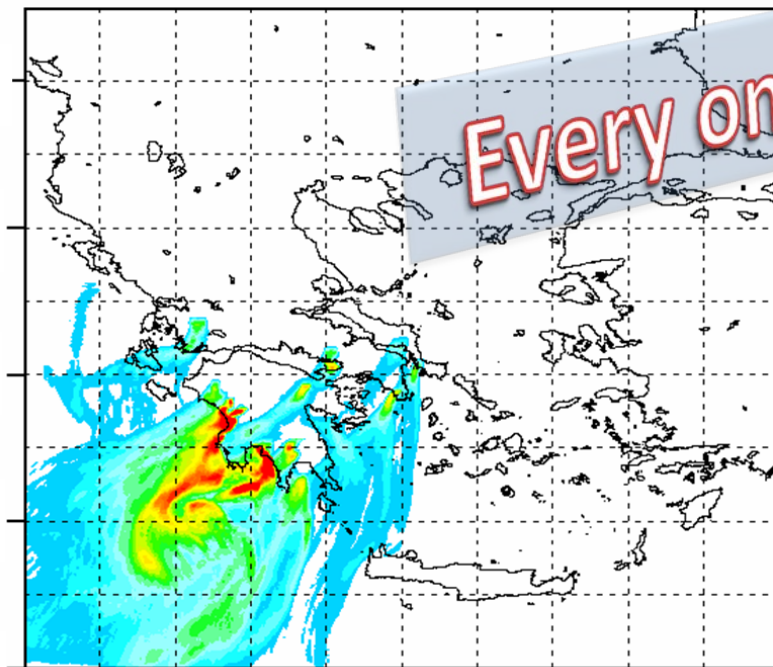
Show Fire

NOA Implementation Team
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Contact Email: mth@noa.gr

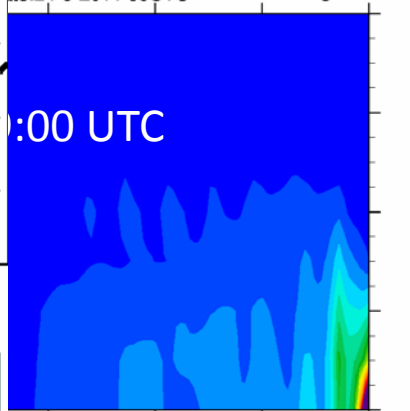
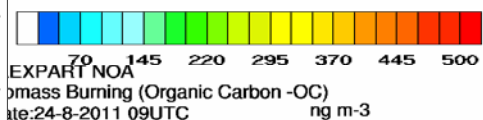
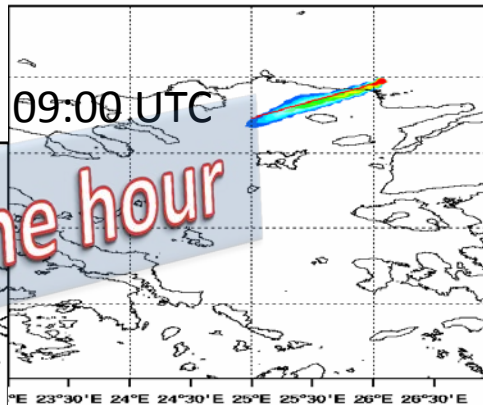
FLEXPART - NOA
Biomass Burning (Organic Carbon - OC)

Valid Date:26-08-2007 0900UTC
Model layer: Integrated Column



FLEXPART - NOA
Biomass Burning (Organic Carbon -OC)

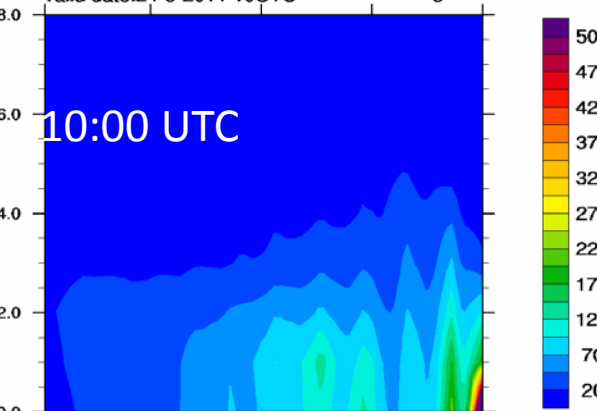
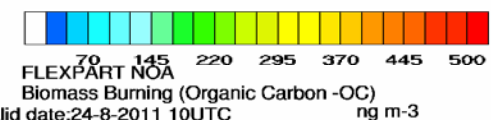
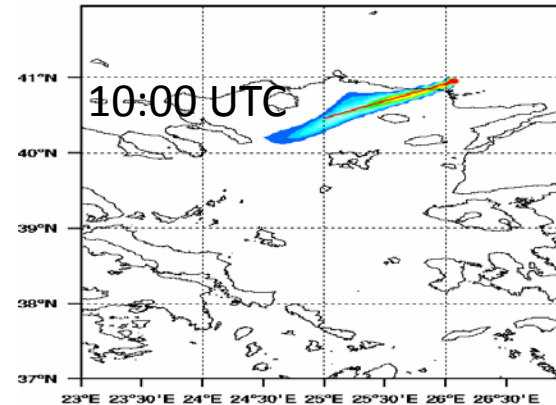
valid date:24-08-2011 09UTC
Model layer: Integrated Column (ng m⁻³)



lat/lon along transect

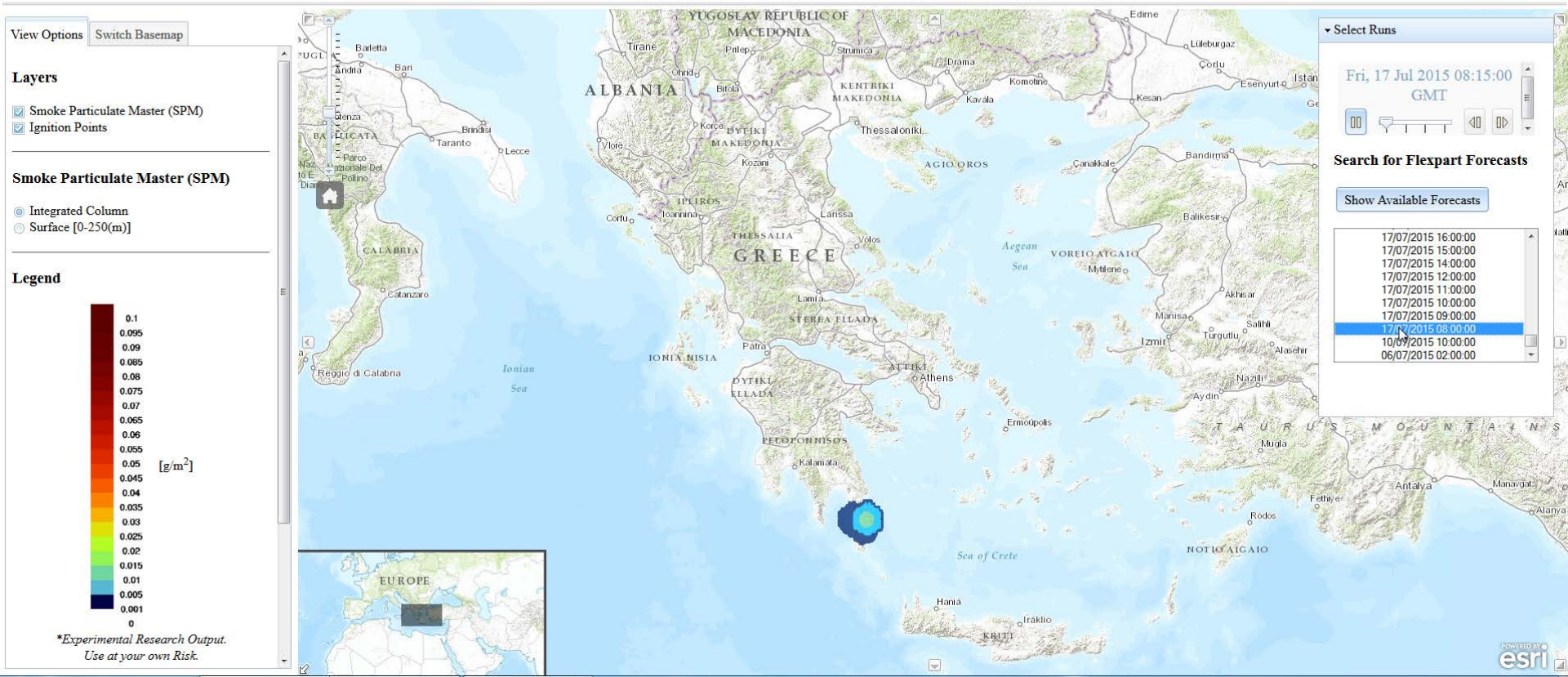
FLEXPART - NOA
Biomass Burning (Organic Carbon -OC)

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



lat/lon along transect

Every one hour



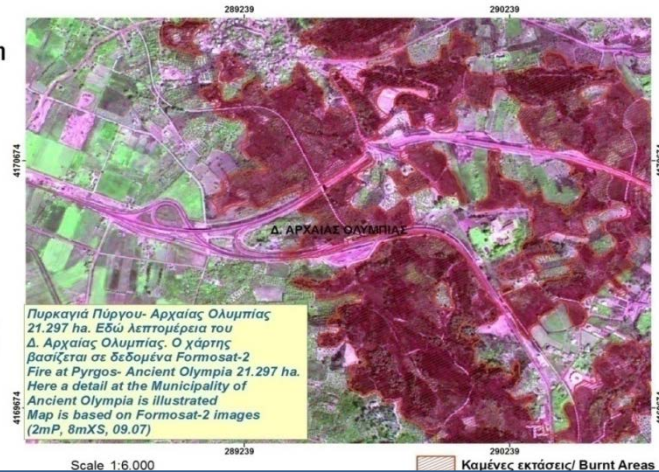


Rapid Mapping During Crisis - Off-line Mapping After Crisis

Fully Automatic Processing Chain

Applies to any type of High and Very High Resolution Satellite Data

(Landsat TM, SPOT XS, IKONOS, Formosat-2, Worldview, Quickbird)



Advanced Informatics Processing Languages

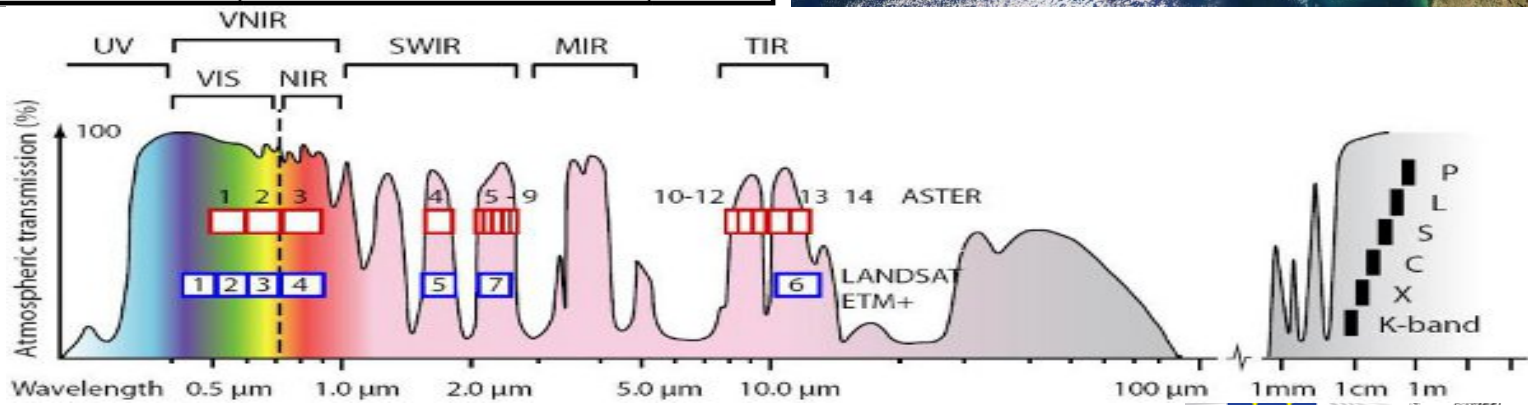
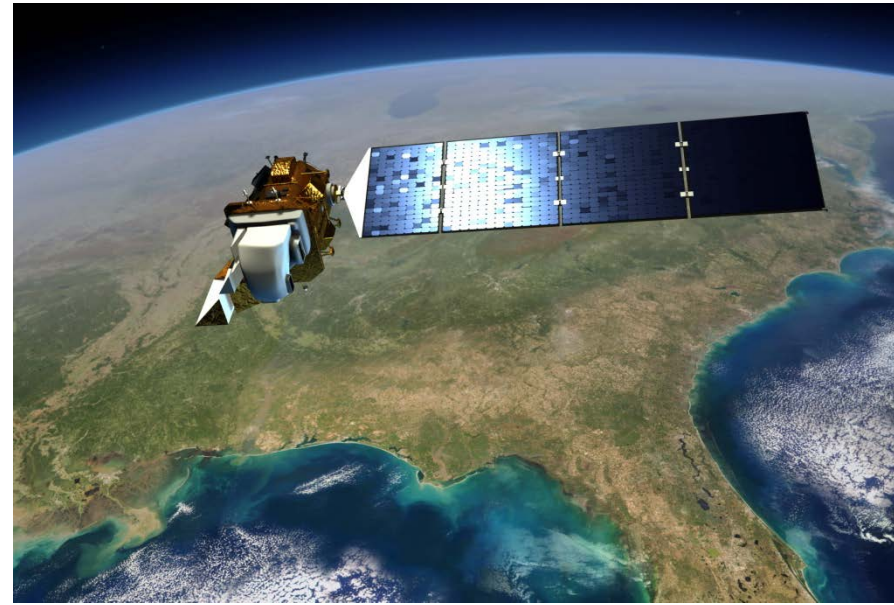
Array Data Base processing - SciQL

Scientific Python, ontology schemes and ontology based queries for linking open geo-spatial data (e.g. geo-names, administrative boundaries)



(Single/multi-date) Burn Scar Mapping from reflected Near - Mid Infrared radiation captured by multispectral sensor systems

Landsat-7 ETM+ Bands (µm)			Landsat-8 OLI and TIRS Bands (µm)		
			30 m Coastal/Aerosol	0.435 - 0.451	Band 1
Band 1	30 m Blue	0.441 - 0.514	30 m Blue	0.452 - 0.512	Band 2
Band 2	30 m Green	0.519 - 0.601	30 m Green	0.533 - 0.590	Band 3
Band 3	30 m Red	0.631 - 0.692	30 m Red	0.636 - 0.673	Band 4
Band 4	30 m NIR	0.772 - 0.898	30 m NIR	0.851 - 0.879	Band 5
Band 5	30 m SWIR-1	1.547 - 1.749	30 m SWIR-1	1.566 - 1.651	Band 6
Band 6	60 m TIR	10.31 - 12.36	100 m TIR-1	10.60 - 11.19	Band 10
			100 m TIR-2	11.50 - 12.51	Band 11
Band 7	30 m SWIR-2	2.064 - 2.345	30 m SWIR-2	2.107 - 2.294	Band 7
Band 8	15 m Pan	0.515 - 0.896	15 m Pan	0.503 - 0.676	Band 8
			30 m Cirrus	1.363 - 1.384	Band 9





Rapid Mapping During Crisis - Off-line Mapping After Crisis

BSM_NOA Pre- Processing

(1) Separate **clouds** from **vegetation** – Create **water** and **shadow** masks

(3) Perform **sensor radiometric calibration** and scene **radiometric normalisation** to create compatible time series of satellite image acquisitions for multi-date analysis

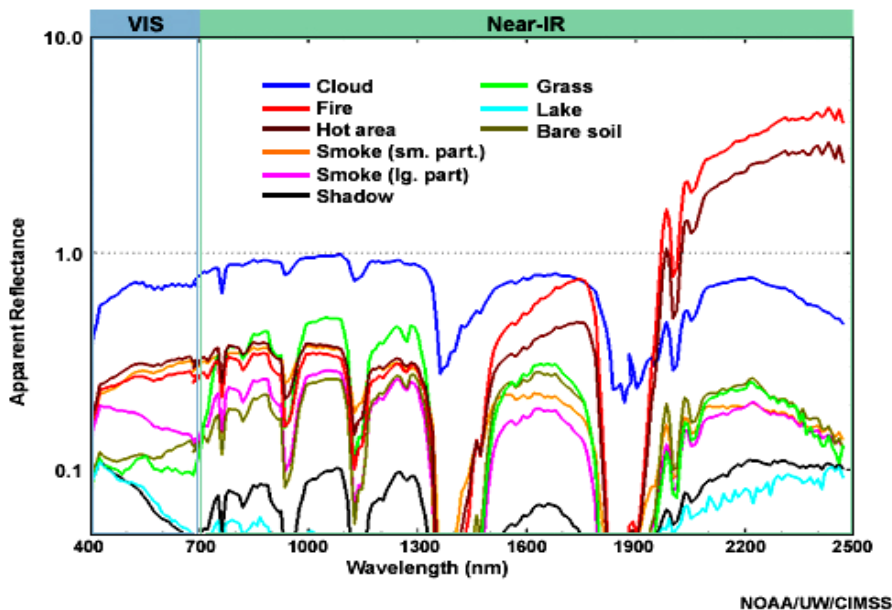
(4) **Geo-reference the input satellite** data using fully automatic image co-registration techniques with appropriate sensor geometric models





Rapid Mapping During Crisis - Off-line Mapping After Crisis

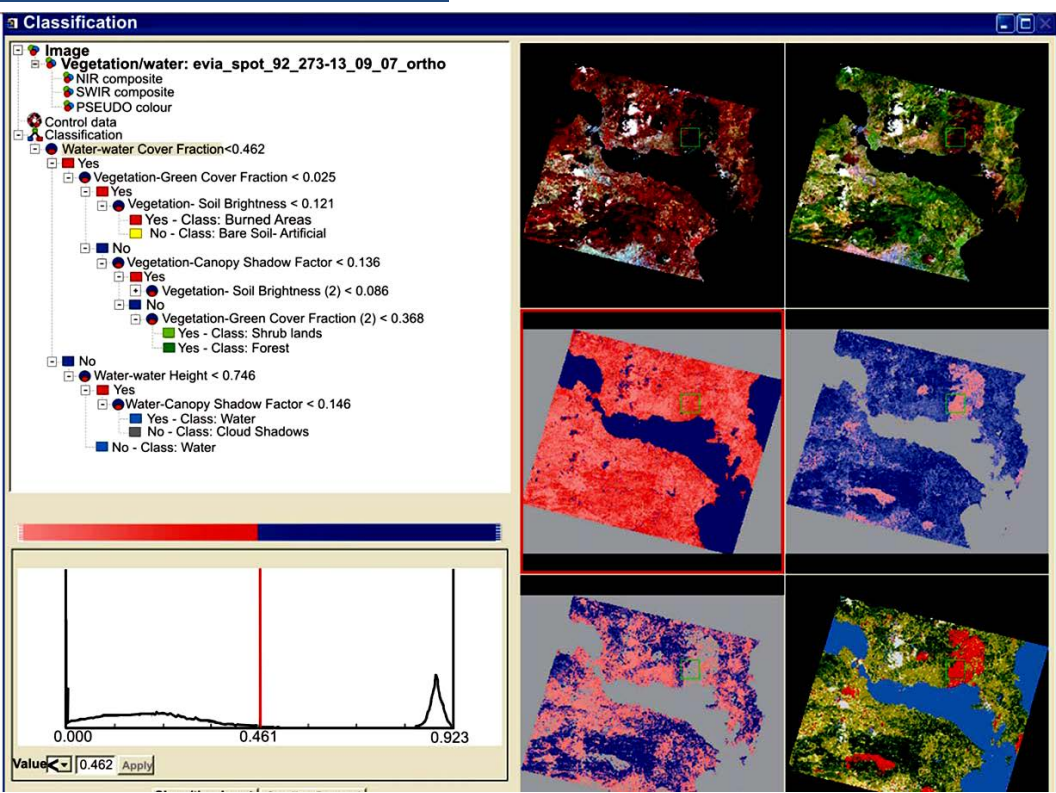
Vis & Near IR Spectral Signatures



BSM_NOA Processing

(1) Generate band transformation indices
Normalised Burn Ratio Index,
Albedo, NDVI, multi-date NDVI,
NDVIdiff, multi-date derived
Radiometric Change Vectors

(2) Define **appropriate image /sensor/land use dependent threshold values** and apply to the band transformation indices in order to: a) identify yearly changed from unchanged areas due to fire disasters and other ecosystem disturbances, b) identify burnt spectra on the image plane, and c) resolve for open, urban, and less vegetative areas' confusion

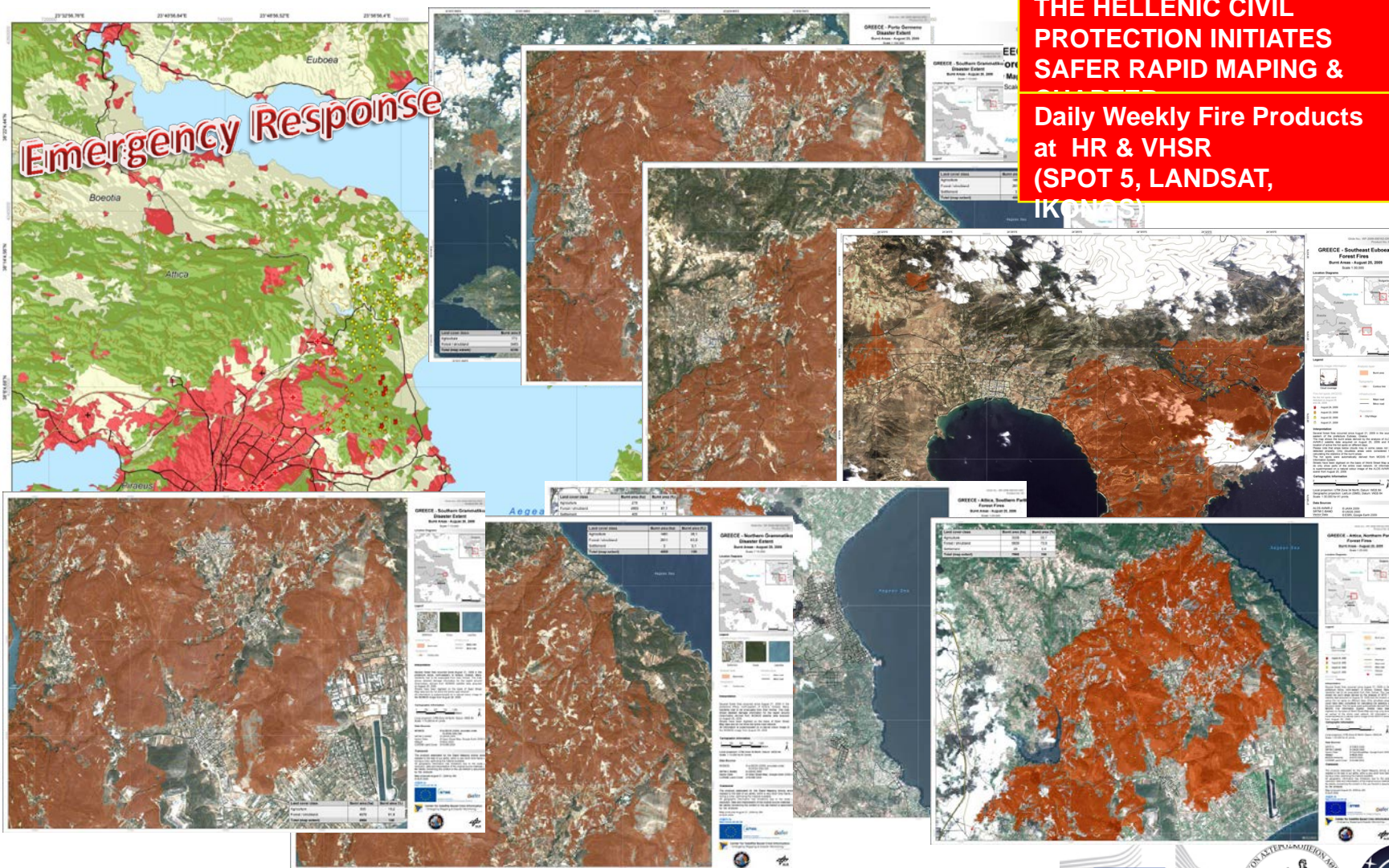


Rapid Mapping During Crisis -
Off-line Mapping After Crisis

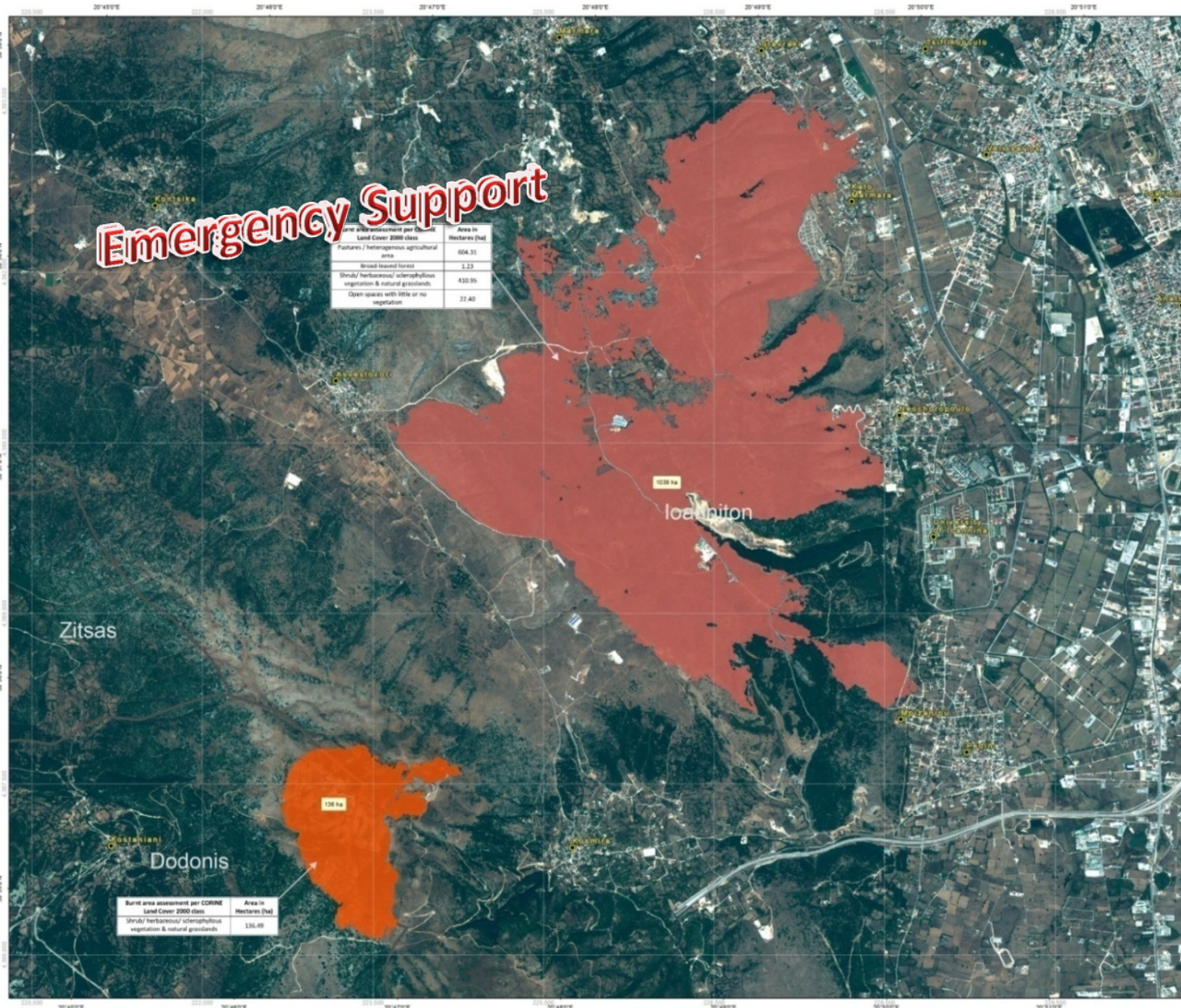
BSM_NOA Post Processing

- (1) **Clean** from isolated pixels, and small area classification noise using a 3x3 smoothing kernel, and proceed with the join of small disconnected fire pixel clubs to larger segments (>1ha) . Filter out objects smaller than 1ha
- (2) **Convert** raster fire classification layer to vector fire polygons and **smooth** the fire polygon boundaries to resolve from pixel effect
- (3) **Apply** a series of geospatial reasoning queries in GIS using expert knowledge in order to generate refined classifications of Burnt Areas (**based on knowledge extracted from over than 30 years of fire occurrence statistical observations**)
- (4) **Assign** attribute data to the fire vector polygons (administrative data, land cover data, toponyms, area (ha), perimeter, etc)





THE HELLENIC CIVIL PROTECTION INITIATES SAFER RAPID MAPPING & DAILY WEEKLY FIRE PRODUCTS AT HR & VHSR (SPOT 5, LANDSAT, IKONOS)



SAFER Map ID 0FR20110805_1 (version 1.0)

Greece - Epirus, Ioannina

Forest Fires - Burnt Areas

Situation Map: Disaster Extent, Summer 2011
Scale 1: 15,000

Location Diagrams

Legend

Population: ● 080647918people

Analysis layer:
■ Burnt area (19 Aug 2011)
■ Burnt area (17 August 2011)

Administrative Boundaries - "The Kallikratis Project"

Photo interpretation keys

Interpretation

In Summer 2011 forest fires occurred in the Peripheral Unit of Ioannina, Greece. This map illustrates the extent of the areas burnt by two events:

- Assessment Event - Municipality of Ioannina - 06/07/2011
- Assessment Event - Municipality of Dodoni - 11/08/2011

The map is compiled from the products of multispectral multi-satellite imagery with a spatial resolution of 1.85m acquired on 07/08/2011. The burnt areas were generated using the Burnt Area Mapping methodology developed by the National Observatory of Athens (NOA, NGA). Administrative units and cities have been digitized on the basis of geodata provided by the National Observatory of Athens (NOA, NGA) and the National Geographic Institute (IGN) of Greece.

All metadata information is superimposed on the natural colour WorldView-2 image of 07/08/2011.

All visually highlighted features are captured with high accuracy in vector data files and are available for download.

Cartographic Information

Local projection: Greek Geocentric Reference System 1987
 Datum: G_GRS85, 1987
 Geographic projection: LatLon (GMS), Datum: WGS 84
 Scale: 1:15 000 for A1 prints

0 150 300 450 Meters

Data Sources

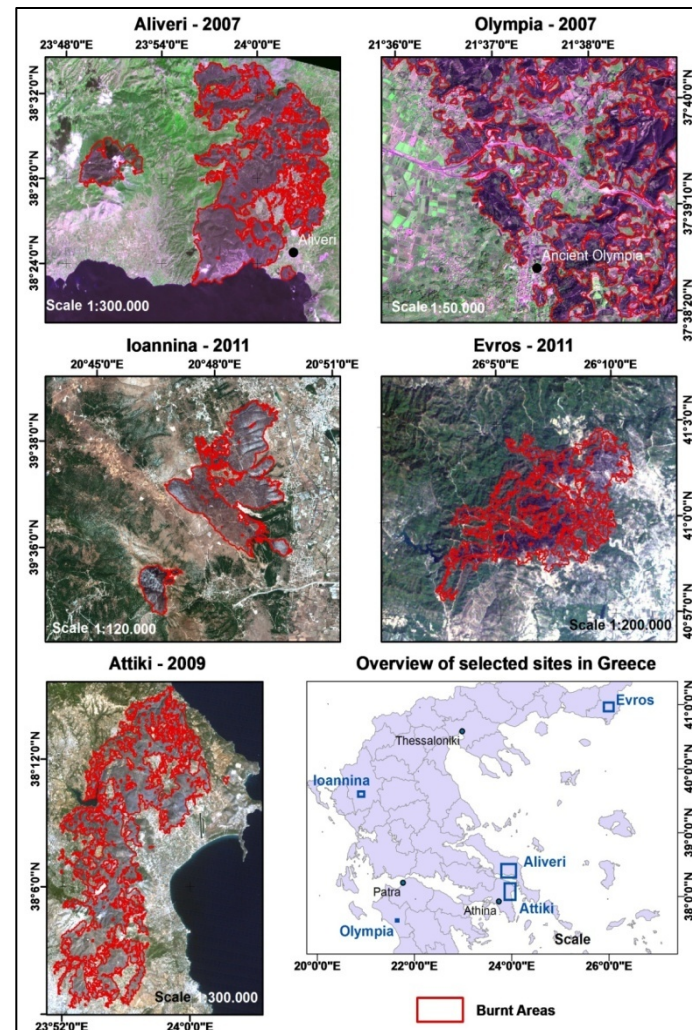
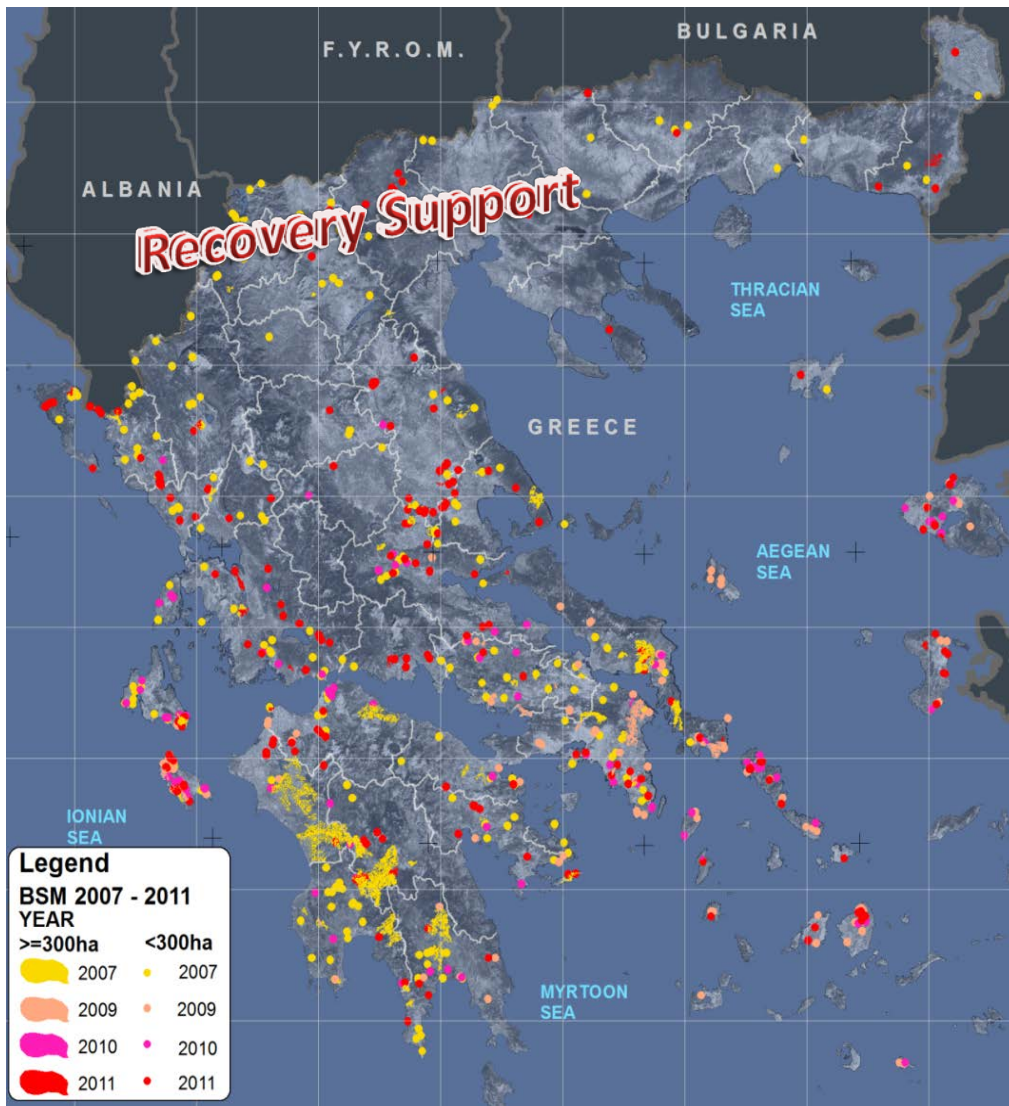
WorldView-2 multi-spectral 1.85m panchrom. 07/08/2011, administrative boundary, vector
 Vector Data © OpenStreetMap & contributors, CC-BY-SA
 Vector Data © Road Editor, Mapbox
 Vector Data © geodata.gov.gr
 Vector Data ©IGN © Google, ©IGN © Digital Globe, ©2011 Terra Atlas
 CORINE Land Cover © ESA, Copenhagen

Framework

SAFER and its suppliers have endeavored to provide mapping that is as accurate as is possible with the source material. However, all geographic information has limitations due to the nature, resolution, size and degradation of the source source material. SAFER maps are distributed as-is, without any warranty, either expressed or implied, including but not limited to, merchantability or fitness for a particular purpose or for any other use. In the absence of any other terms, the user shall be held liable for any use, damage or consequences incurred as a result of reliance on the mapping.

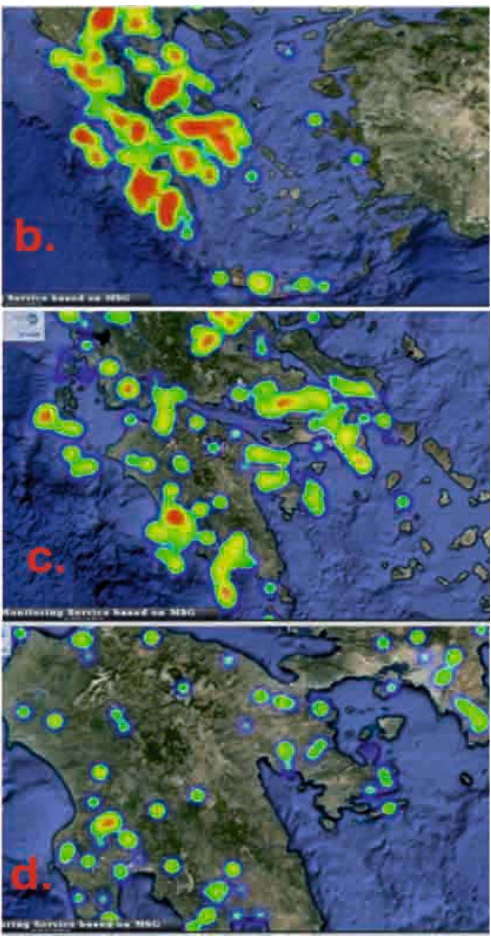
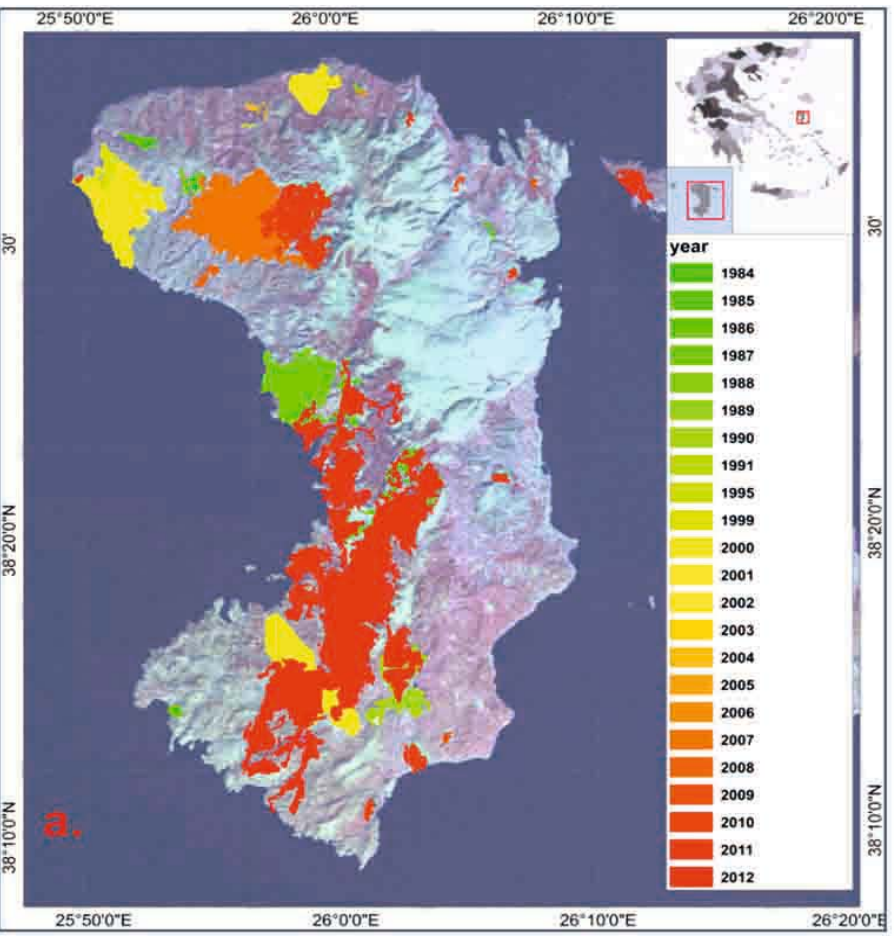
Map produced on 19/09/2011 by ISARS/NOA © NOA 2011

To get more information on this mapping email kantaris@epce.noa.gr





- 1) More than 700 Landsat TM images acquired over Greece in the period 1984-2014 residing on USGS archives were downloaded and processed fully automatically using the NOAA 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 NOAA's dedicated web interface





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>

ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
ΥΠΟΥΡΓΕΙΟ ΔΗΜΟΣΙΑΣ ΤΡΑΧΗΣ ΚΑΙ
ΠΡΟΣΤΑΣΙΑΣ ΤΟΥ ΠΟΛΙΤΗ
ΓΕΝΙΚΗ ΓΡΑΜΜΑΤΕΙΑ ΠΟΛΙΤΙΚΗΣ ΠΡΟΣΤΑΣΙΑΣ
ΑΡΧΗΓΕΙΟ ΠΥΡΟΣΒΕΣΤΙΚΟΥ ΣΩΜΑΤΟΣ
-199-

ΚΑΤΑΣΤΑΣΗ ΔΑΣΙΚΩΝ ΠΥΡΚΑΓΙΩΝ

01-08-2013

ΣΥΝΤΟΝΙΣΤΙΚΟ ΕΠΙΧΕΙΡΗΣΙΑΚΟ ΚΕΝΤΡΟ
ΥΠΗΡΕΣΙΩΝ ΠΥΡΟΣΒΕΣΤΙΚΟΥ ΣΩΜΑΤΟΣ

Α/Α	ΠΥΡΙΚΗ ΥΠΗΡΕΣΙΑ	ΔΗΜΟΣ - ΚΟΙΝΟΤΗΤΑ	ΧΡΟΝΟΛΟΓΙΑ				ΚΑΜΜΕΝΗ ΕΚΤΑΣΗ (Στρέμματα)						ΠΡΟΣΩΠΙΚΟ					ΜΕΣΑ								
			ΕΝΑΡΞ	Μ.ΕΛ.	ΕΛΓΧ.	ΚΑΤΑ	ΔΑΣ.	Δ.Ε.	ΑΛΣ.	Χ.Ε.	ΚΑΛ.	Γ.Ε.	Υ.Κ.	Π.Υ	ΠΕΖ	ΕΘΕ	ΣΤΡ	Α.Δ.	Π/Ο	ΟΤΑΒΥΤ	ΜΗΧΕΛΙ	ΑΦΣ	ΑΦΡ	ΑΦΓ		
1		Δ. ΣΑΜΟΥ	21-07	23-07	30-07	01-08		600																		
154504	Π.Υ. ΣΑΜΟΥ	ΑΚΡΩΤΗΡΙ ΖΩΟΔΟΧΟΥ ΠΗΓΗ	15:15	09:15	09:20	08:00							20	46	60			7	20			1	4			
2		Δ. ΧΙΟΥ	25-07	26-07	29-07		1100			100		100	6					3								
154682	Π.Υ. ΧΙΟΥ	ΑΓ. ΙΣΙΔΩΡΟΣ-ΠΙΤΥΟΣ	11:25	19:05	20:50								45	22	100	10		15	5	6		1	5			
3		Δ. ΣΕΡΙΦΟΥ	25-07	26-07	30-07	01-08				300																
154696	Π.Υ. ΕΡΜΟΥΠΟΛΗΣ	ΣΚΛΑΒΟΓΙΑΝΝΗ	15:20	11:35	07:30	19:30							2	9				1					1	2		
4		Δ. ΣΕΡΙΦΟΥ	26-07	28-07	30-07	01-08				1000																
154772	Π.Υ. ΕΡΜΟΥΠΟΛΗΣ	ΑΓΙΑ ΜΑΡΙΝΑ	21:00	18:10	07:30	19:35							13	9							1	1		1	6	
5		Δ. ΡΟΔΟΥ	27-07	31-07				35000				3000	80													
154787	Π.Υ. ΡΟΔΟΥ	ΙΣΤΡΙΟΣ	16:10	11:30									100	34				39	7	3	5	5	8			
6		Δ. ΠΡΕΣΠΩΝ	29-07	29-07	01-08	01-08				50																
154896	Π.Υ. ΦΛΩΡΙΝΑΣ	"Μπέλα Βόδα"	17:15	23:00	07:00	14:00												8								
7		Δ. ΒΟΡΕΙΑΣ ΚΥΝΟΥΡΙΑΣ	30-07	30-07	31-07	01-08		165				0														
154921	Π.Κ. ΑΣΤΡΟΥΣ	Ορεινή Μελιγού- Κοδέλες	11:35	21:00	17:00	18:00							34	14				14	2	2			3	2		
8		Δ. ΡΗΓΑ ΦΕΡΑΙΟΥ	31-07	31-07	01-08	01-08																				
154987	2ος Π.Σ. ΒΟΛΟΥ (ΒΙΠΕ)	Αγ. Αθανάσιος	13:10	18:40	07:00	00:00							16	17				7								
9		Δ. ΚΙΛΕΛΕΡ	31-07							20		80														
155032	1ος Π.Σ. ΛΑΡΙΣΑΣ	Δ. Δ. ΜΥΡΩΝ	23:50										2					1								
10		Δ. ΚΙΛΕΛΕΡ	01-08									50														
155038	1ος Π.Σ. ΛΑΡΙΣΑΣ	-	01-08			07:25							2					1								
11	Δ.Π.Υ. ΗΡΑΚΛΕΙΟΥ	Δ. ΧΕΡΣΟΝΗΣΟΥ	01-08							110			3					1								
155044	Π.Κ. ΧΕΡΣΟΝΗΣΟΥ	Πεδίο Βορσός	01-08		19:30								18	12				7	3			1				
12	Δ.Π.Υ. ΛΑΡΙΣΑΣ	Δ. ΦΑΡΣΑΛΩΝ	01-08			01-08						30														
155053	Π.Κ. ΦΑΡΣΑΛΩΝ	Δ. ΦΑΡΣΑΛΩΝ	14:05			14:45							2					1								
13		ΧΑΛΚΙΔΟΝΟΣ	01-08	01-08		01-08			1	0.5		30														
155055	6ος Π.Σ. ΘΕΣΣΑΛΟΝΙΚΗΣ	ΧΕΡΟΧΩΡΙ	14:20	16:47		19:00							4					2								
14	Π.Υ. ΓΥΘΕΙΟΥ	Δ. ΚΥΘΗΡΩΝ	01-08										28	24				12	2	6						
155060	Π.Κ. ΚΥΘΗΡΩΝ	Κοιμινίκια- Αγία Ελέσα	15:23										28	24				12	2	6				2		
15		Δ. ΚΙΑΚΙΣ	01-08	01-08	01-08	01-08				10	5	50														

Fire Validation Log files



- 1) 25-30% of the detected fires are reported 10 -15 minutes earlier than Fire Brigades logs**
- 2) 60% of the detected fires, are reported in the first ~15 minutes after the ignition time stamp reported in the Fire Brigade logs**
- 3) All the larger fires than the 112ha are completely detected without any omission**
- 4) Smaller fires, that are in the range of [4.7ha - 112 ha] are 50% detected**
- 5) The smallest detected fire has been of the order of 4.7 ha**
- 6) The omitted fire detections, are summing up to the 5,8% of the total Burned Area. Omissions are caused mainly due to, a) cloud cover, b) fire intensity (e.g. small fires – small burned areas), c) area topography, and d) fuel characteristics (e.g. less vegetative areas, pasture lands, sparse vegetation resulting in low fire intensities)**
- 7) The 82-85% of the 500mx500m cells which are assigned a high fire occurrence probability that is in the range of [6, 10], are located in the Burned Area Polygons**



Future Updates

Real time integration of active fire and burned area evidences, as soon as they are depicted (captured) on the scenes of polar satellite systems acquired on the BEYOND X-/L-band acquisition station (EOS, NPP, NOAA/AVHRR, METOP)

Real time integration of in-field crowd source evidence (e.g. fire locations, and ignition points) returned from the Fire Brigade teams during crisis

Ingest the additional bits of evidence in an assimilation process for deriving more accurate FIREHUB assessments (fire occurrences)

Use mobile platforms for informing about the fire occurrences in addition to the web platform

Expand the FIREHUB concept to other hazards (Floods, & EQs)

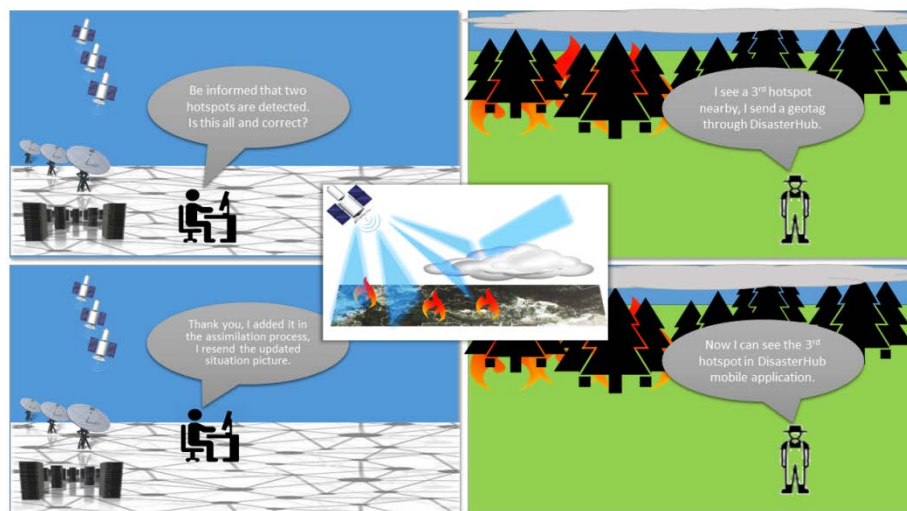
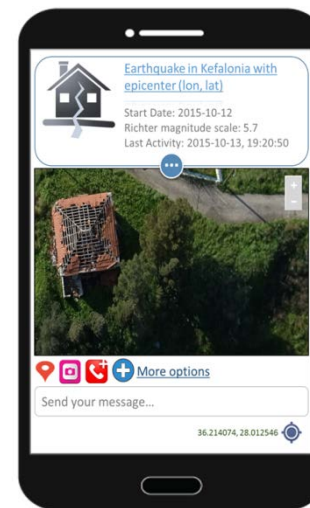
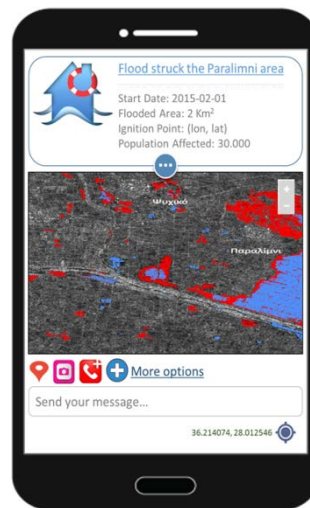
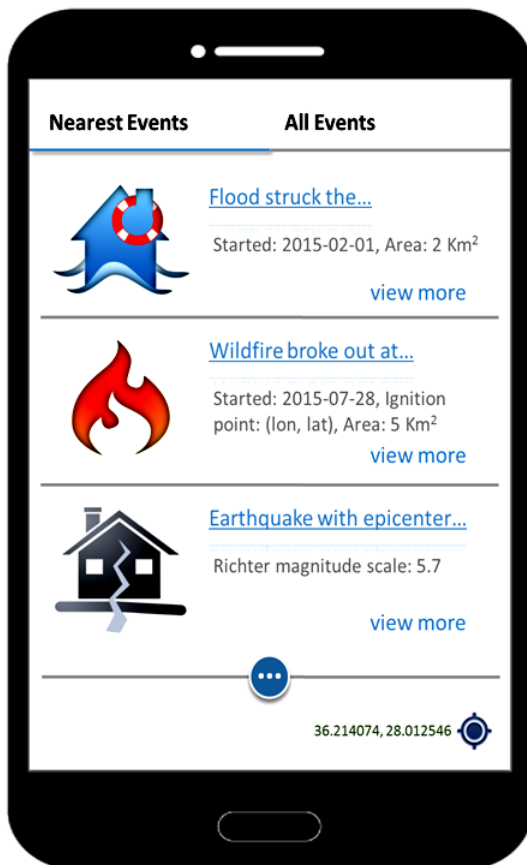


DisasterHub

A mobile application for enabling crowd generated data fusion in Earth Observation disaster management services



DisasterHub





FireHub

A Space based Fire Management Hub





Thank you for your attention!

For more information

ocean.space.noa.gr/FireHub