FireHub

A Space based Fire Management Hub

Institute of Astronomy,

Astrophysics, Space

Applications & Remote Sensing

National Observatory of Athens

SERVICE OVERVIEW

*In the framework of the BEYOND (**B**uilding a Centre of **E**xcellence for Earth **O**bservation based monitoring of **N**atural **D**isaster) project, we have developed an operational EO based fire management service. The service consists of three pillars: the real-time fire detection and fire monitoring application, the large scale Burnt Scar Mapping during and after wildfires, and the fire smoke dispersion forecasting tool.* **Access via: http://ocean.space.noa.gr/FireHub**

SERVICE HIGHLIGHTS

❖ *Innovation:* **integration** *of space technologies with geospatial information and meteorological data*

❖ **Unique products**: *real time fire monitoring at medium resolution on a 5 minutes basis, and diachronic mapping and damage assessment of all forest fire events in Greece for the last 30 years*

❖ *Qualification of the service within several EC,* **Copernicus**/*GMES & ESA projects, accredited with a* **Technology Readiness Level 9**

❖ *Great* **scalability** *potential: transparent fully automatic processes allowing the transferability of the applications to other climatic and geographic zones in Europe*

❖ *The service has been integrated into the Global Fire Monitoring Center that belongs to the International Strategy of UN for Disaster Reduction*

❖ **Operational** *exploitation in the Greek Forest Fire Management Center of the Fire Brigade, on a 24/7 basis*

❖ **Rapidly expanding User base**: *more than 500 independent connections at a daily basis (institutional users)*


Fire over Chios Island (Greece) on the 18th of August 2012, (from http://earthobservatory.nasa.gov)

NEEDS

❖ Timely fire detection to provide a Situation Awareness Picture to the Fire Brigade to effectively deploy available resources

❖ Mapping of burnt areas for damage and deforestation assessment, relief activities, carbon balance estimations, statistical analyses, fire and soil erosion risk and urban planning

❖ Forecasting of 2-d and 3-d fire smoke dispersion and organic matter concentration, to anticipate public health issues and obstruction of visibility

INFRASTRUCTURE CAPACITY

- ❖ Satellite receiving stations for MSG-SEVIRI, EOS AQUA/TERRA, NPP, METOP, NOAA-AVHRR
- ❖ Computer Cluster and Databases
- ❖ NOA fully automatic and validated algorithms and processing chains
- ❖ Mirror site for the Sentinel satellite data acquisition, established at NOA premises
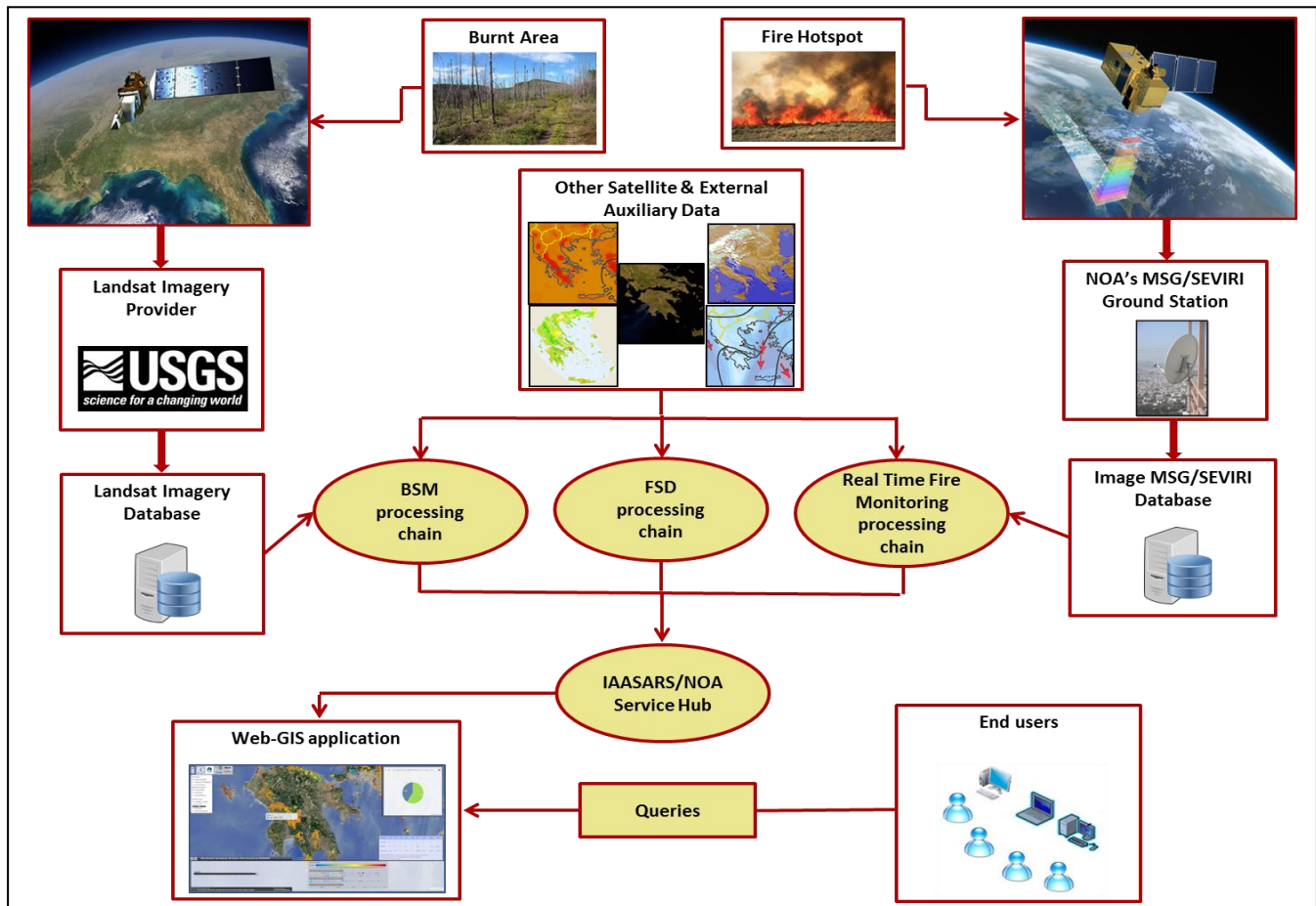

Architecture of the FireHub.

BURNT SCAR MAPPING (BSM) APPLICATION

The fully automatic application is used for rapid and seasonal mapping of burnt areas, exploiting High and Very High resolution satellite imagery. The diachronic BSM uses any available multispectral image data such as the entire USGS Landsat imagery archive over Greece of the last three decades. The service offers the possibility to visualise:

(1) The annual burnt areas in the period 1984 to 2013
(2) A single map layer depicting the areas affected for the last 30 years
(3) The number of times a certain area has been affected by fires
(4) Information and statistics on the impact of forest fires to the natural and built environment at prefecture, regional and country level
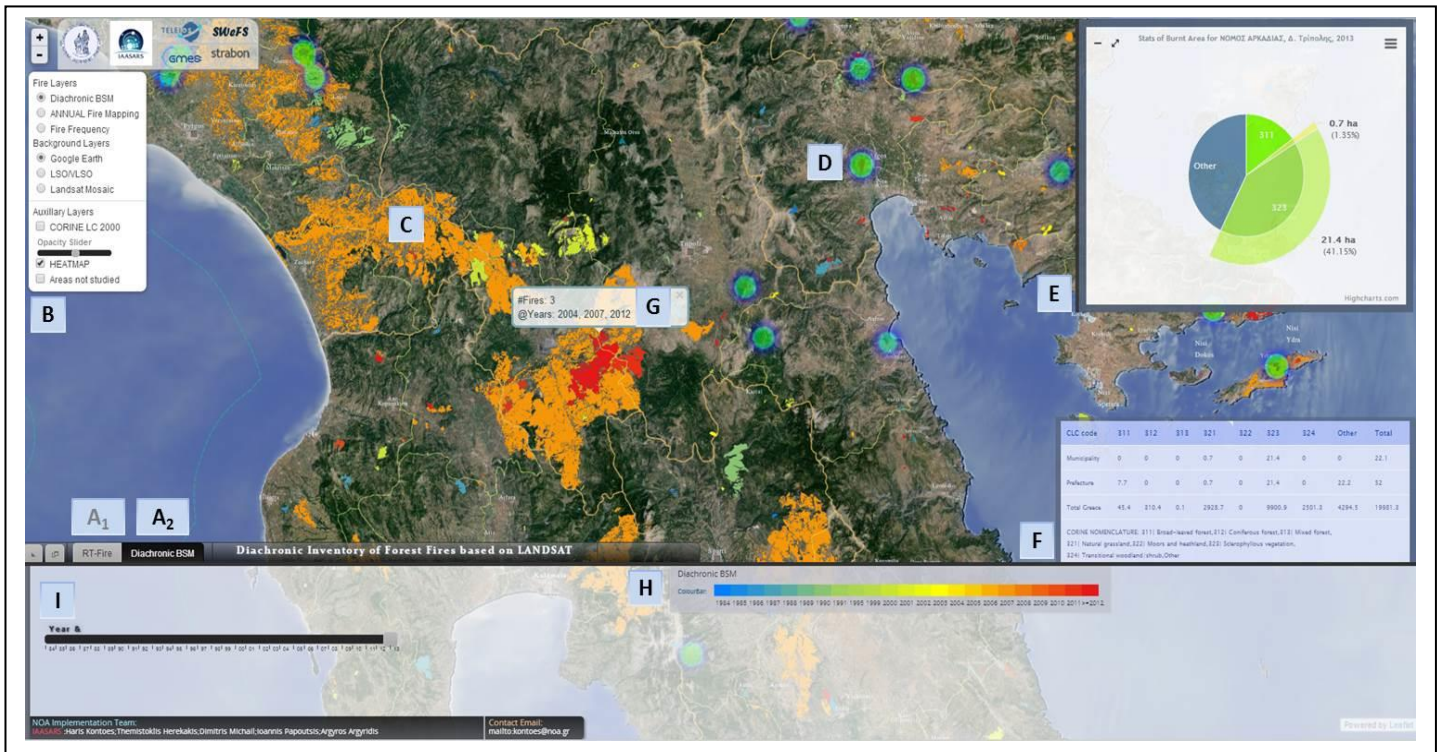
The BSM Web-GIS application. (A₁) Real-time Fire tab, (A₂) Diachronic BSM tab, (B) Options for choosing between different data layers, (C) Precise Burnt area polygons with their detailed geometry (perimeter and area), (D) Heat maps depicting the concentration of burnt areas over the region/country, (E) Statistical analysis of burnt areas and affected vegetation types, (F) Table depicting the diverse vegetation types burnt at municipality, prefecture and country level, (G) Information on fire occurrences over the same area in the last 30 years, (H) Colour legend assigning different color to each year (1984-2013) and (I) Slider for querying the year of interest.
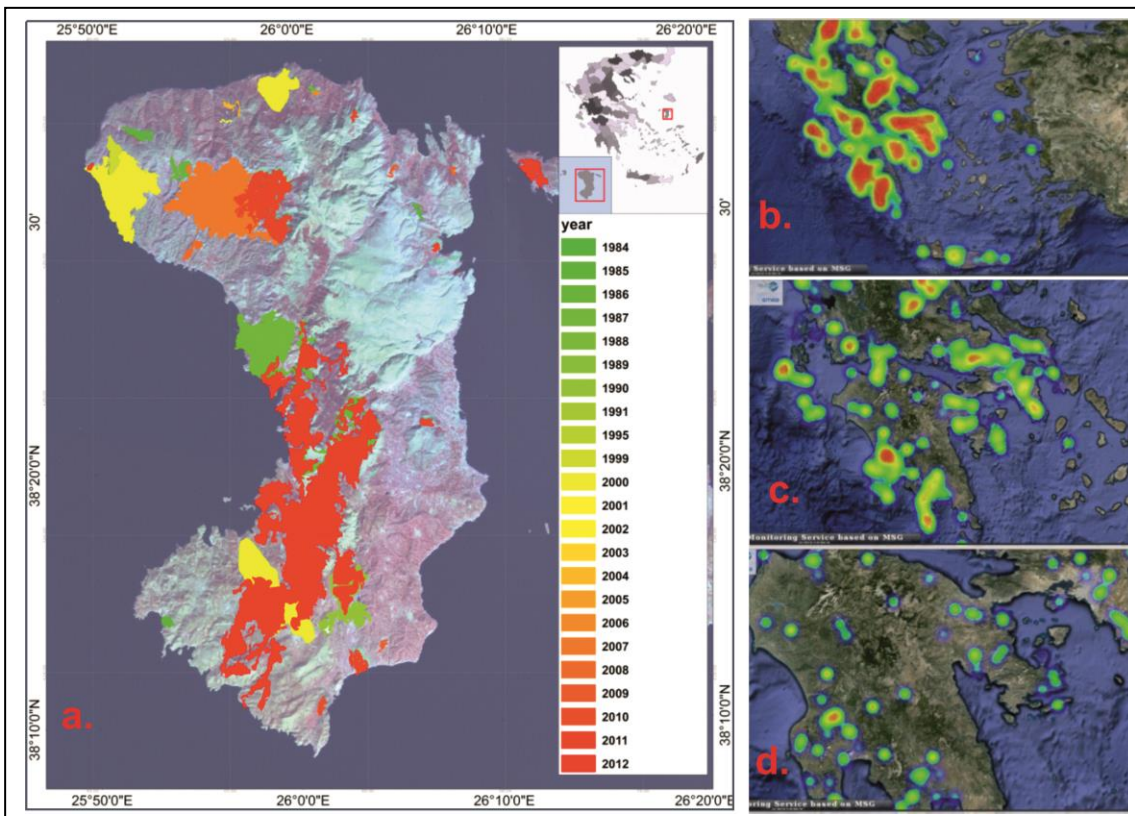
(a) Diachronic BSM over the Island of Chios from 1984 to 2012, (b, c and d) Heat mapping of burnt areas, at different zoom levels
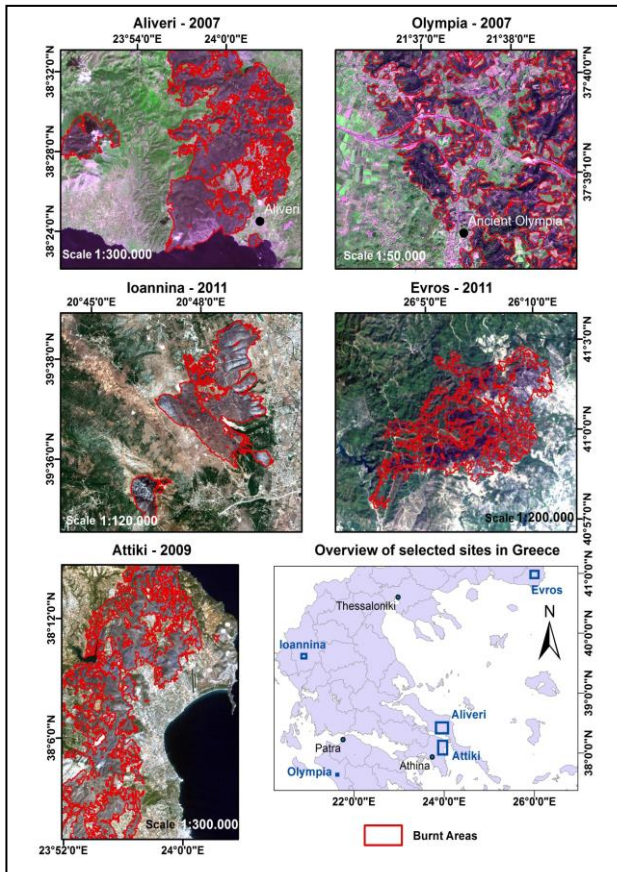
BSM mapping for critical sites over Greece.

REAL TIME FIRE MONITORING APPLICATION

Since 2007, the application ingests every 5 minutes a new satellite acquisition, from the Meteosat satellites, and provides:

(1) Early detection of fires and definition of the ignition point,

(2) Real time monitoring at a 500x500 m resolution cell,

(3) Retrieval of any observed past fire event, with information on fire start and end time

(4) Animations of the fires' evolution in time

The system accounts for wind direction and speed, area's morphological characteristics, elevation zones, and fuel data. The 3.5 km spatial resolution of the MSG SEVIRI sensor is downscaled to a 500 m wide cell, with the use of in-house algorithms.
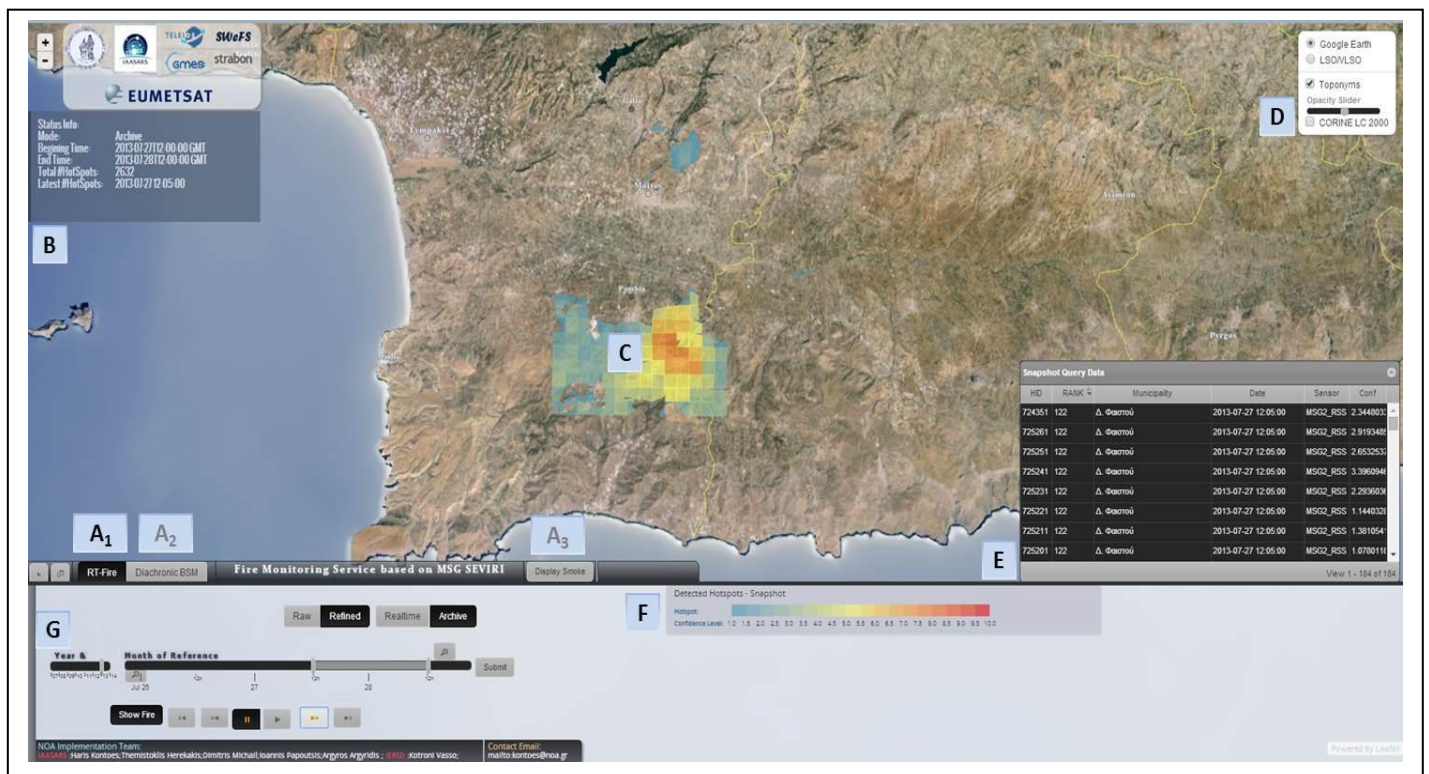

The Real Time Fire Monitoring Web-GIS application. (A$_1$) Real-time Fire tab, (A$_2$) Diachronic BSM tab, (A$_3$) Smoke Dispersion tab, (B) Information on the active fires, (C) A snapshot of the monitored active fire, (D) Selection and visualization of different background layers, (E) Query data table with metadata of the observed fire, (F) Colour bar representing the confidence levels of a fire, and (G) Time query sliders.

FIRE SMOKE DISPERSION (FSD) APPLICATION

The FSD application is invoked any time a new fire is detected through the Fire Monitoring service. An automatic procedure is triggered and dispersion of the fire smoke is computed using the Lagrangian dispersion model FLEXPART driven by WRF-ARW meteorological output at a resolution of 4×4 km over Greece. The whole application is operationally running on a 24/7 basis and the final products include forecasting of smoke dispersion over Greece.

(Up) Dispersion of fire smoke on August 26, 2007, depicted on a MODIS scene acquired at 09:30 UTC, and (Right) the forecasted smoke dispersion using the FLEXWRF model at 09:00 UTC.
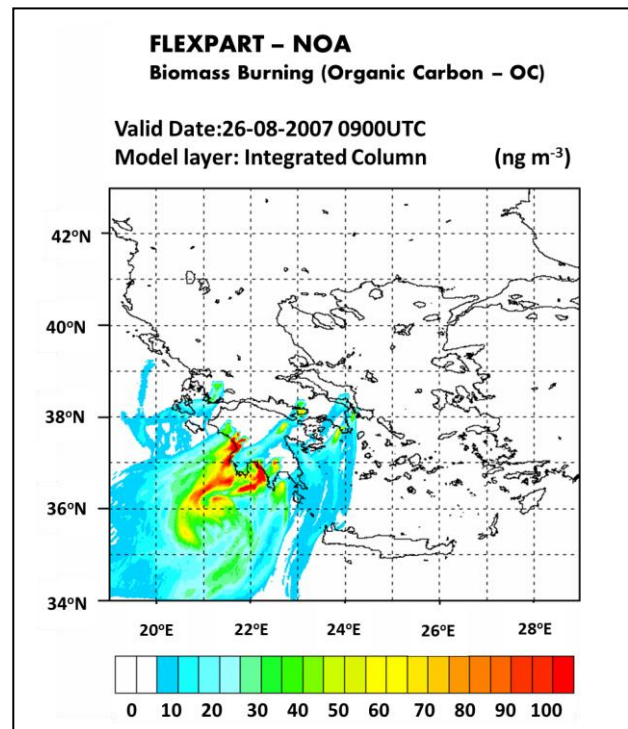
MAIN END USERS

- Fire Brigade
- General Directorate for Civil Protection
- Ministry of Environment, Energy and Climate Change
- Forestry services, Public and Local Authorities
- Hellenic Telecommunications Organization (OTE S.A.) and other private entities
- Research community and individual citizens

MARKET PENETRATION

- Business-to-business services (e.g. business continuity management)
- Mobile applications industry
- European citizens to support transparent environmental governance & awareness

AUXILIARY GEO-INFORMATION

- Background geo-spatial map layers: Google Earth, Landsat mosaic, and High resolution Orthophotos provided by the National Cadastre and Mapping Agency S.A.
- CORINE Land Cover-2000.
- OpenStreetMap data

ACCESS TO SERVICE

http://ocean.space.noa.gr/FireHub
(Please use Mozilla Firefox or Google Chrome)

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