

Fabrizio Ferrucci

The Open University, United Kingdom

Universita' della Calabria, Italy

Territorial Fires and Satellite Early Warning: the TALED project

(Telecommunic**A**tion, **L**ocalization and real time **E**nvironment **D**etection)



Problem Statement 1

- Fire incidents in outdoors:
 - Forest fires
 - Waste fires
 - Hazmat Fires



Problem statement 2

- ✓ In forest firefighting, the current coordination structure presents three main issues that can be solved by combining TLC-GNSS-EO technologies. They are:
 - Lack of coordination in alarm collection and dissemination
 - Lack of in-field coordination during emergencies
 - Need for improved efficiency of water bombing

- ✓ In Italy, a fourth issue is associated to law enforcement at the level of potential institutional users (Municipalities, mainly small-sized, and Mountain Communities), concerning the
 - Lack of in-house capacity for mapping burnt areas, managing “fire cadastres” and enforcing the national law on forest firefighting.

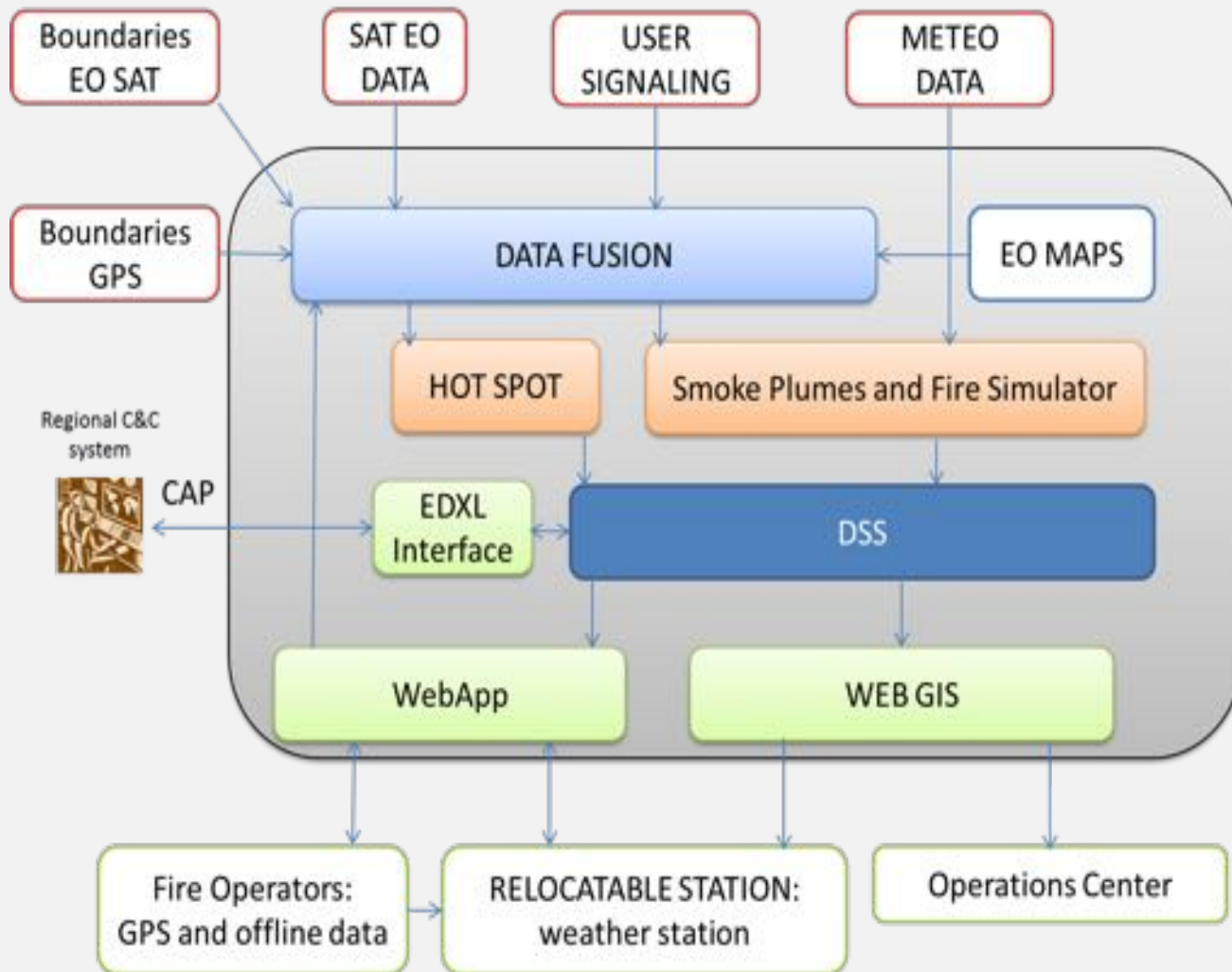
Main User Requirements

Notes

- Acquire and prioritize HS data from all available NRT spaceborne products in the ROI
- Operate 24/7 with timeliness comparable to that of distress call services
- Ensure communication in zones not covered by wireless networks.
- Ensure RT location and tracking of operators
- Acquire NRT local weather data from fixed and mobile stations
- Use standard protocols (REST Web-Service, MQTT Queue, JMS Queue, ATOM, e.g.)
- Acquire information from local data source(s)
- Store or store-and-forward data
- Fully unsupervised mapping of HR/VHR burn scars
- Locate and track the mobile device

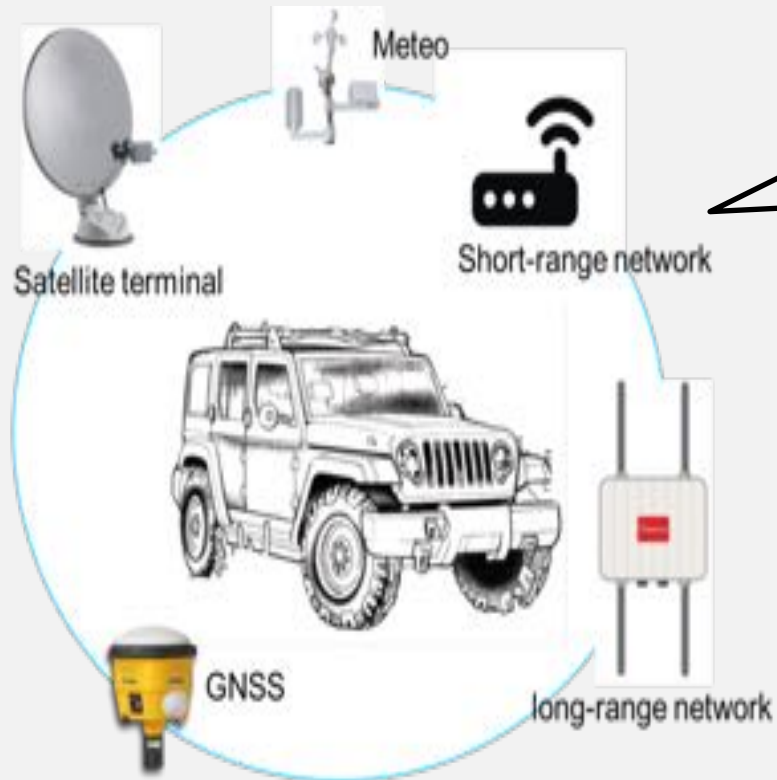
Notes

Architecture



Data and TLC

Relocatable Unit

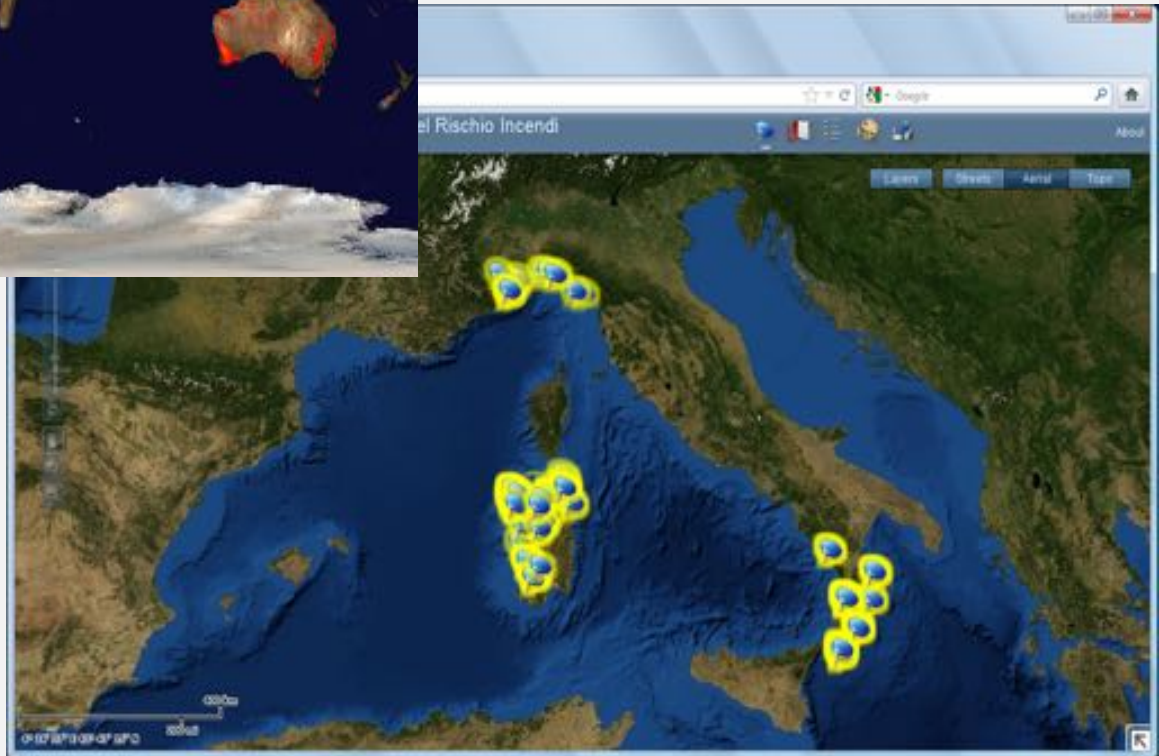
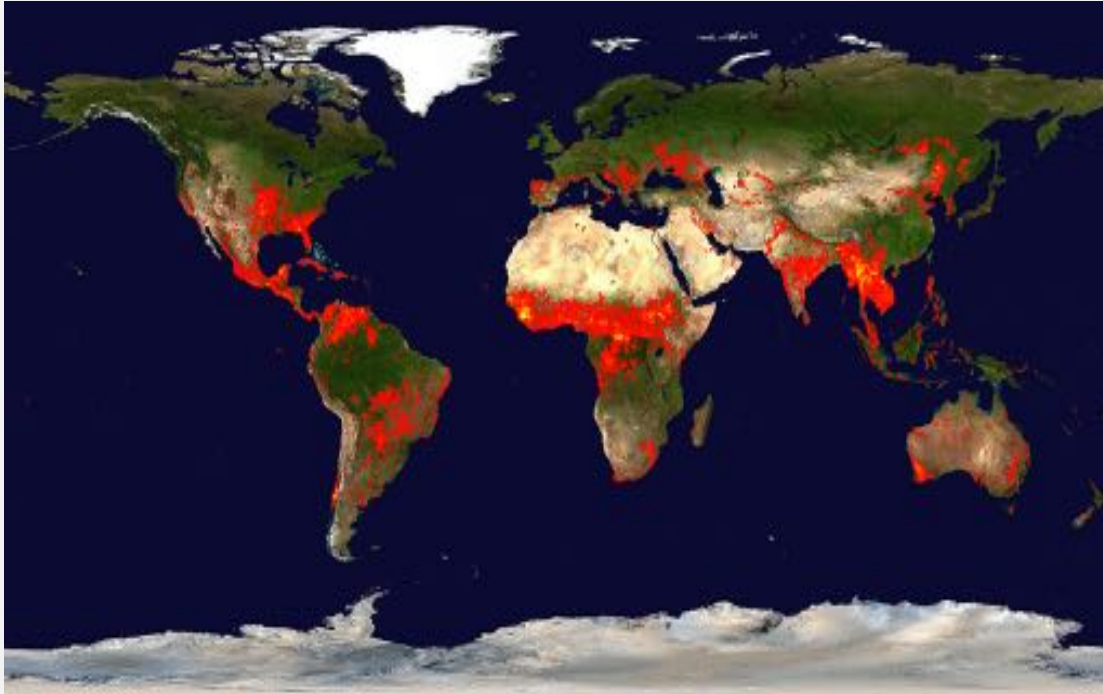


Field Operators

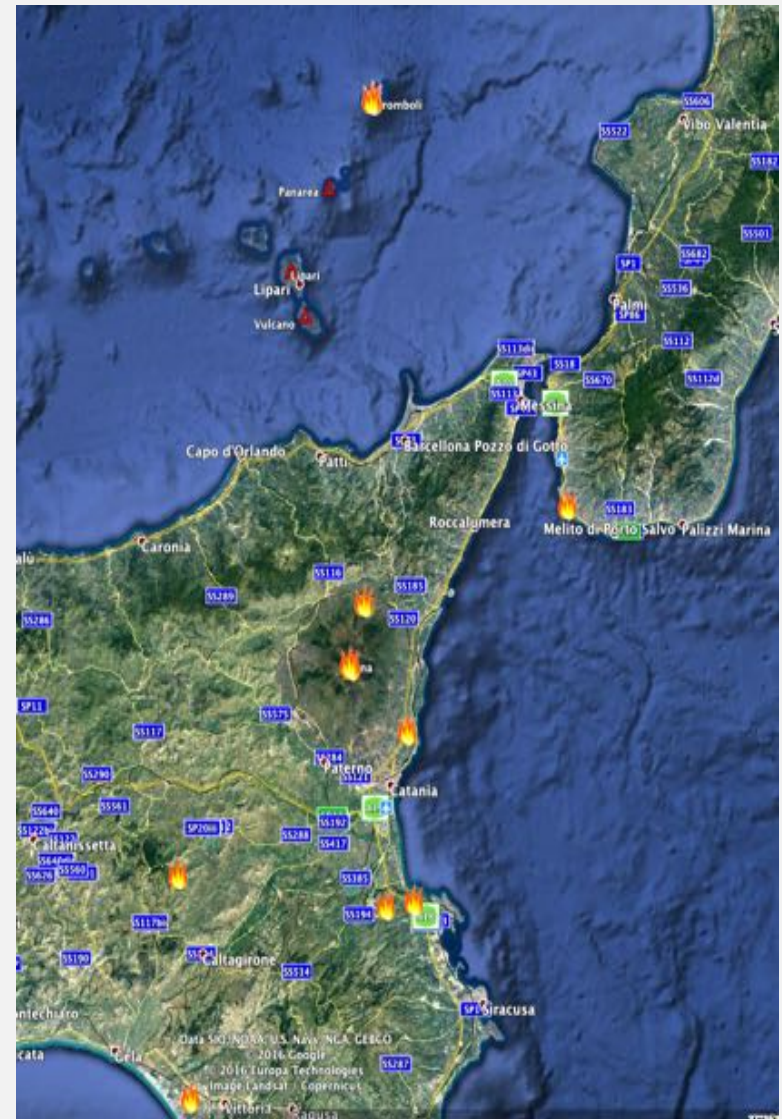
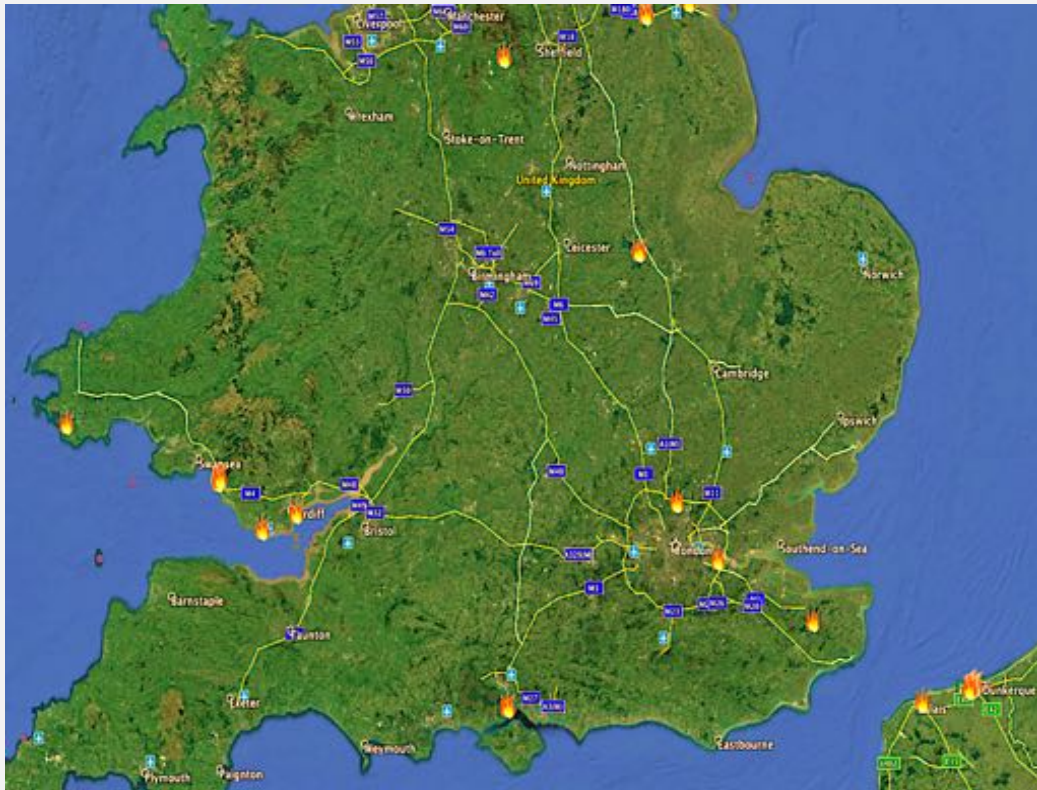


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Tactical Monitoring of Fires (FIRMS-EOSDIS, Eumetsat, more)

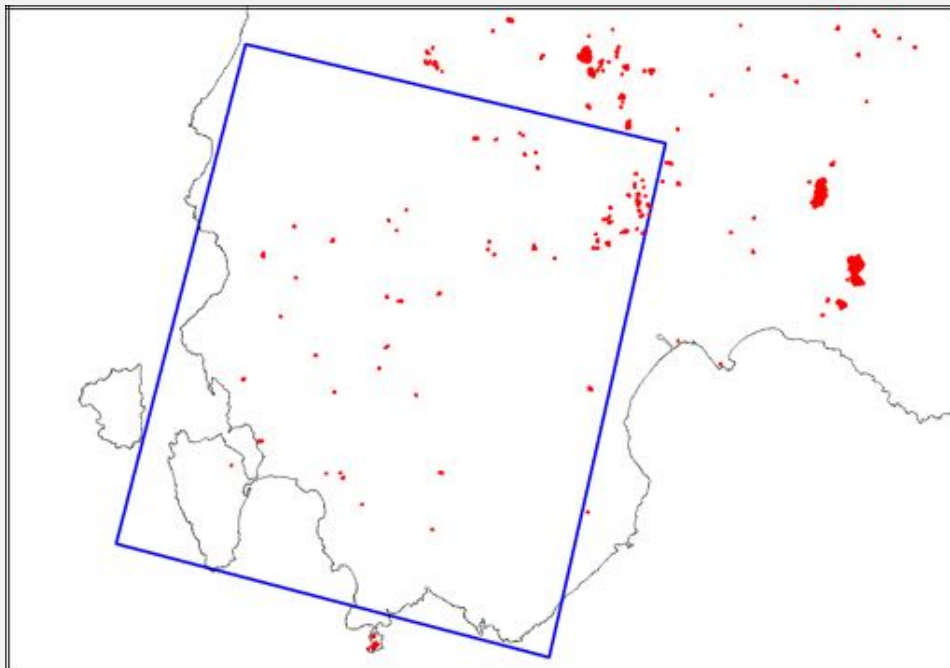


NRT Regional fires by FIRMS (VIIRS, last 48 hours)



HR BS mapping capacity (2013) vs. EFFIS

EC FP7 PREFER – SW SARDINIA TEST SITE



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BS 20130418-20130607

BS 20130607-20130623

BS 20130623-20130709

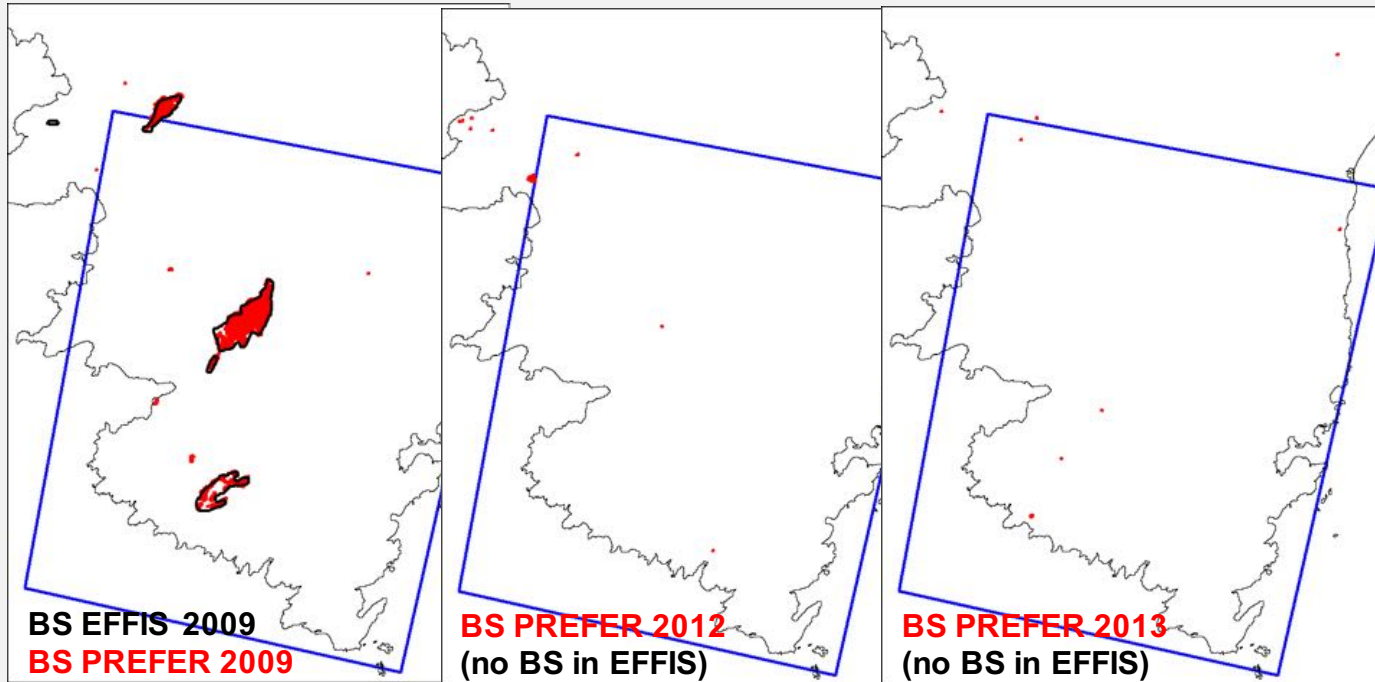
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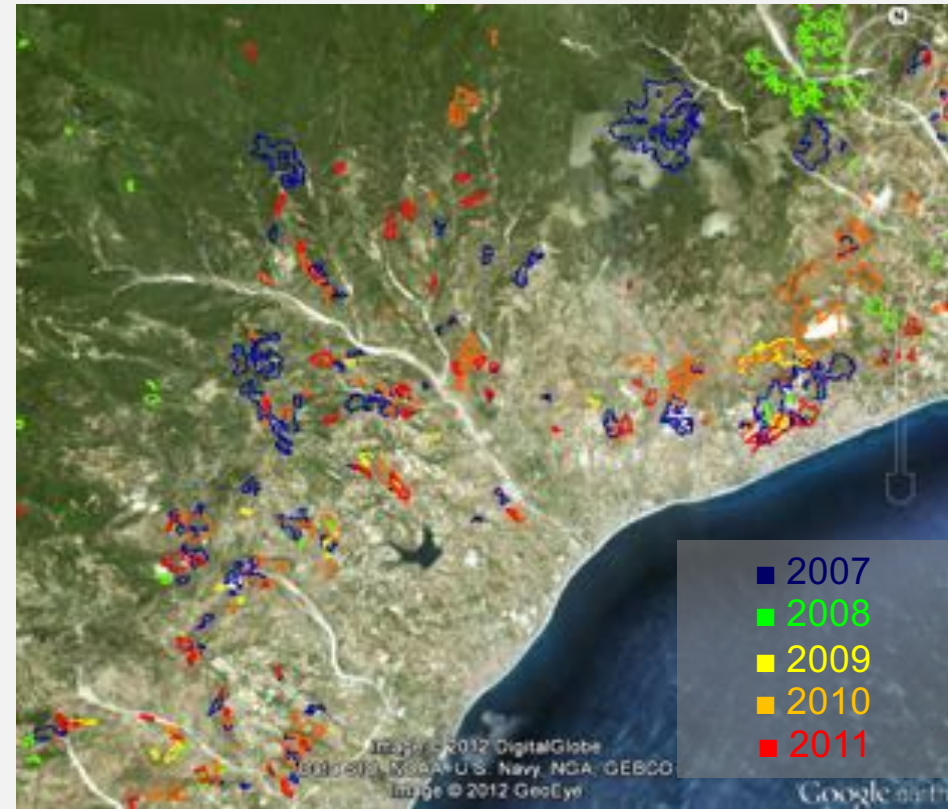
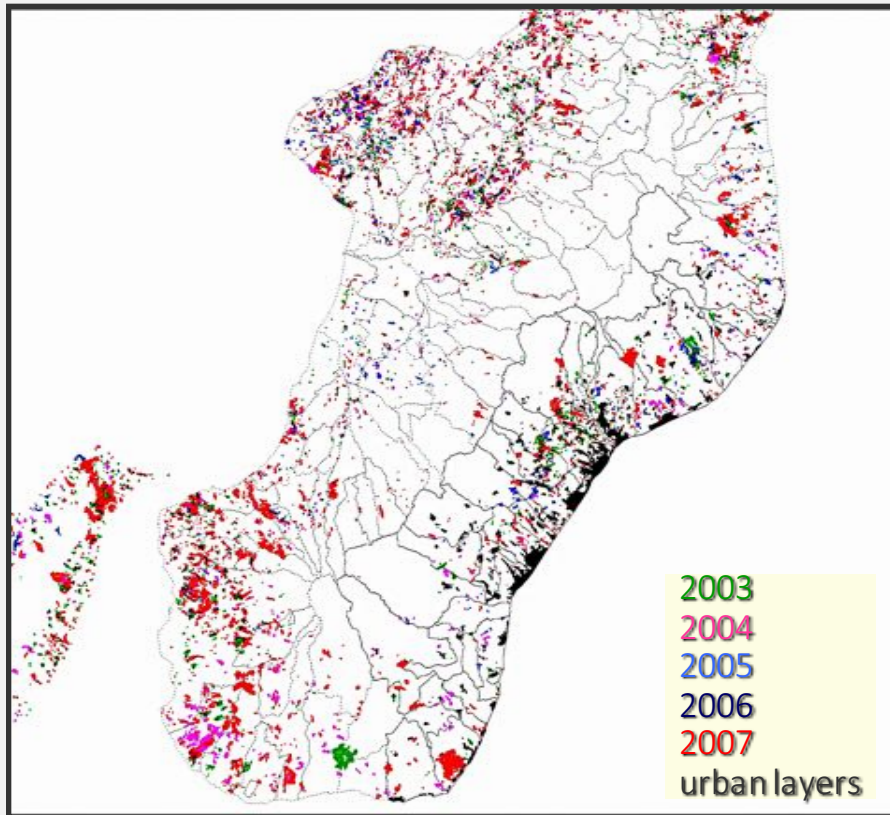
HR BS mapping capacity (2013) vs. EFFIS

EC FP7 PREFER – CORSICA TEST SITE



Calabria
APF 1/25.000-1/40.000
RegCal 2003-2007
SIGRI 2007-2011

HiRes BS Mapping



BS by VHR 1/2000 optical data vs. GPS

- **Kompsat 2 footprint**
- **WorldView footprint**
- **BS 1/2.000**

Sardinia
APF 1/2.000 SIGRI 2011



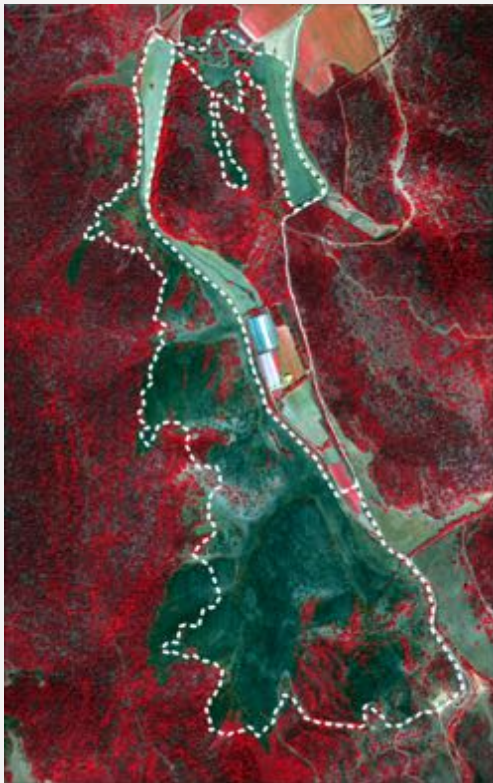
Kompsat-2 2011-08-30
(fire 46 days old)

BS HR

■ GPS

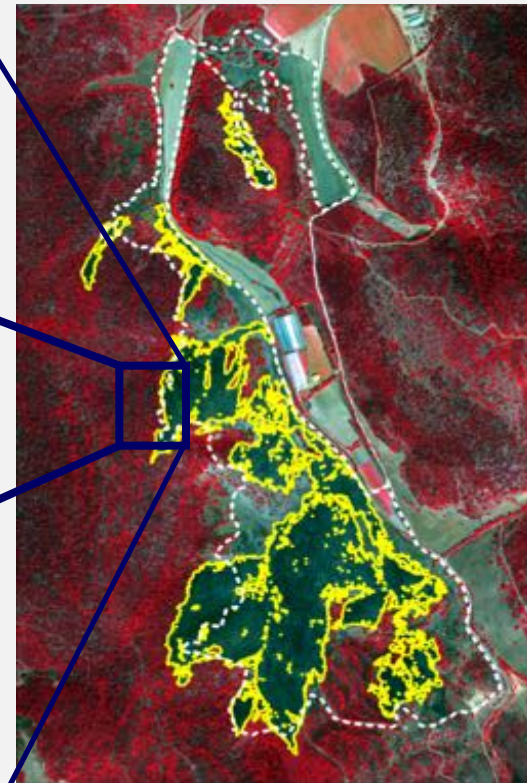
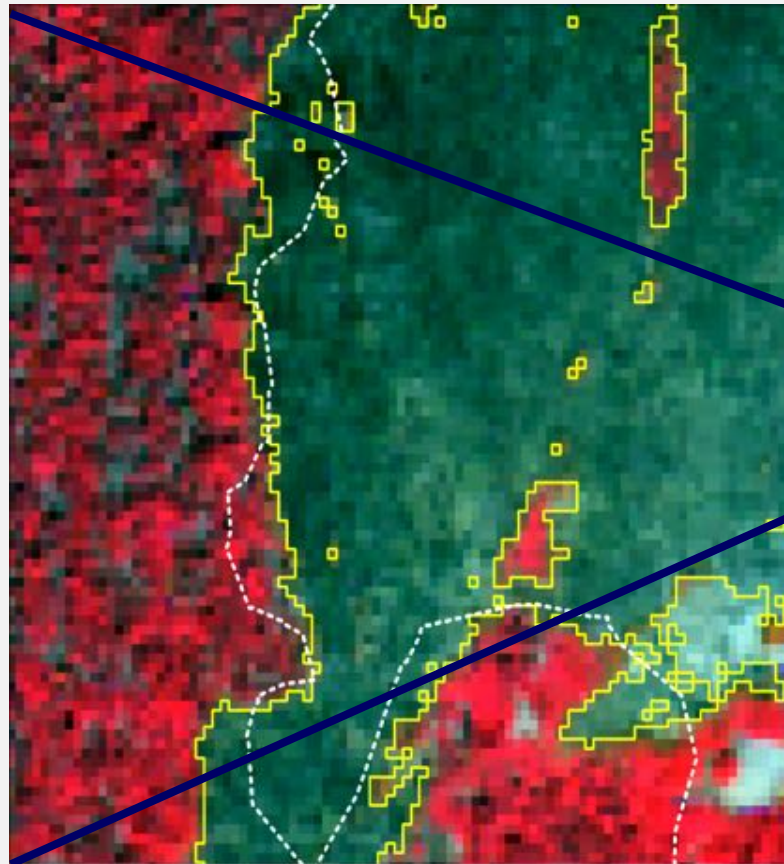
■ BS
1/2.000

BS by VHR 1/2000 optical data vs. GPS



WorldView 2011-08-19

■ GPS on 50 days old (48 ha) fire



WorldView 2011-08-19

■ GPS

■ BS 1/2.000



Urban Fires



July

August

September 2007

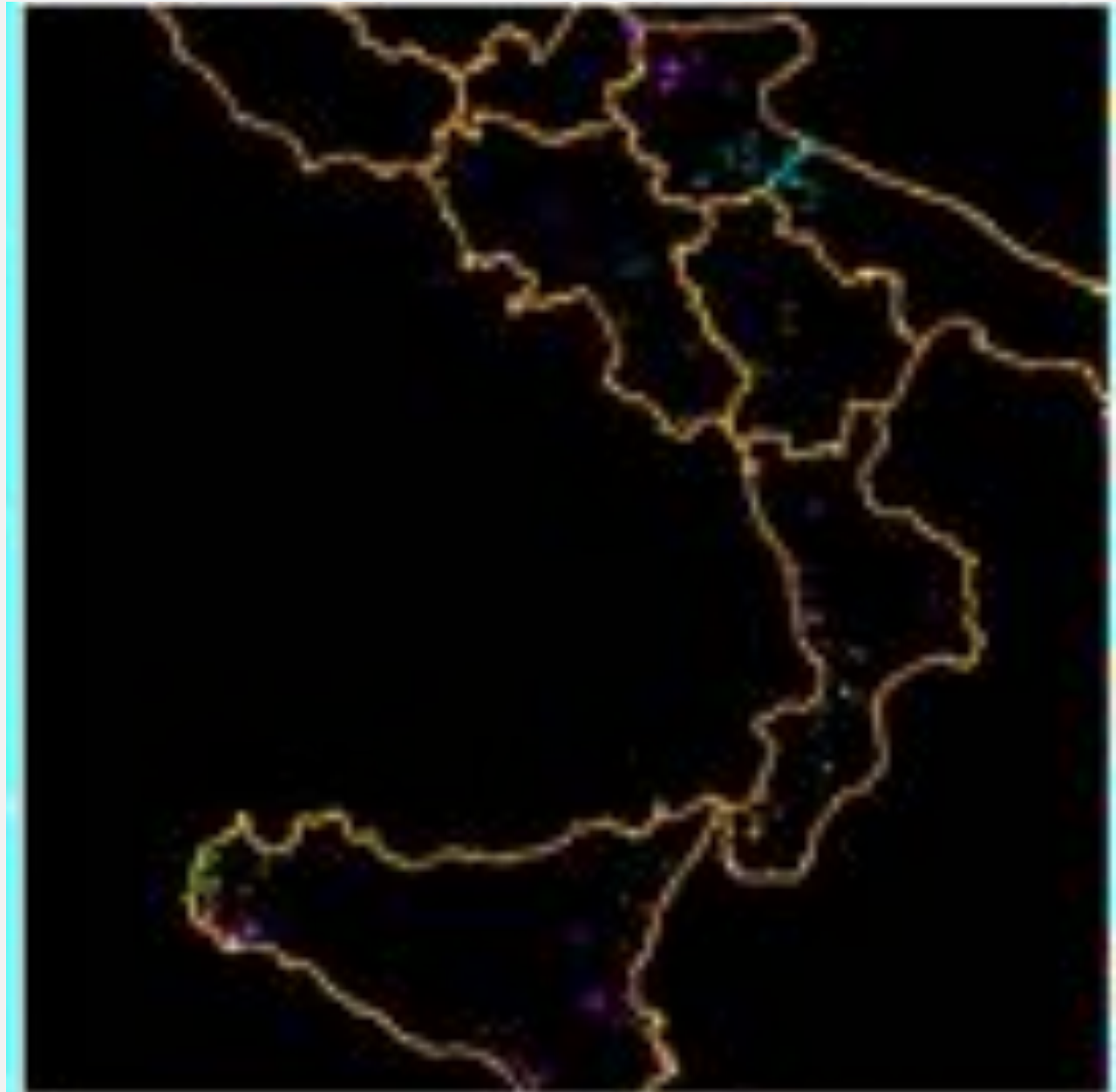
HR BS S2A

Southern Italy

From 2017-03-29
to 2017-06-04

22	(permanent crops)
244	(agro-forestry)
31	(forests)
32	(scrub)
333	(sparse)

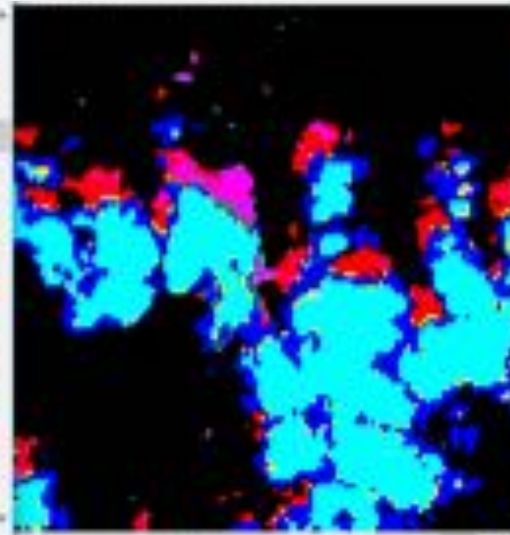
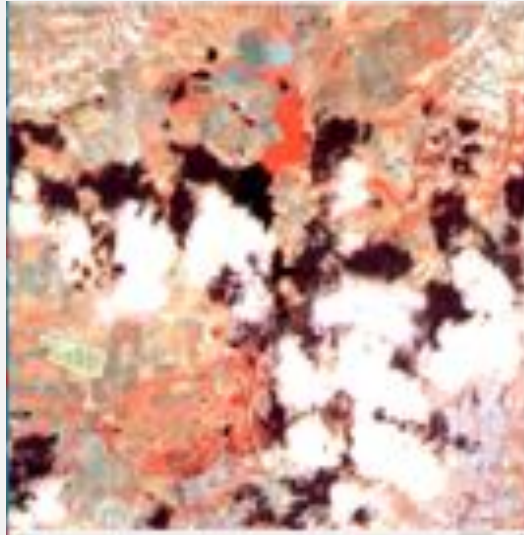
With CLC limitation



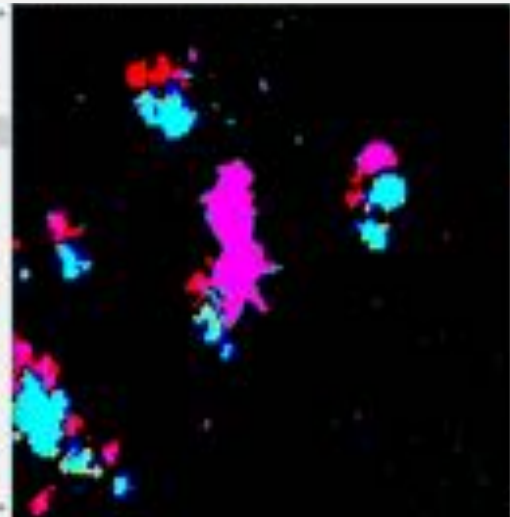
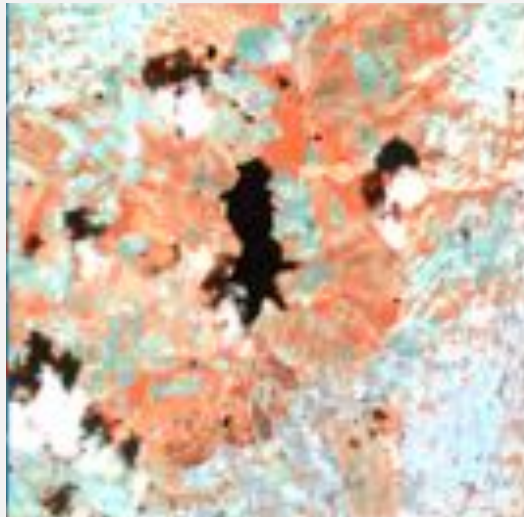
Unsupervised (pre)processing 1

Sentinel 2A

- Clouds
- Shadows
- Cirrus
- Water bodies



S2A 2017-05-08



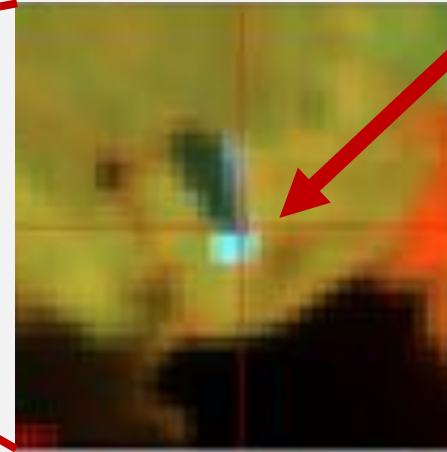
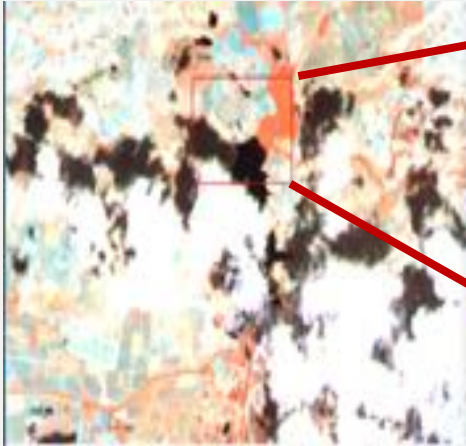
S2A 2017-05-28

Unsupervised processing 2

Sentinel 2A

- Hot Spot detection and characterization

S2A 2017-05-28
RGB: NIR/SWIR1.7/SWIR2.2



Hot spot pixels



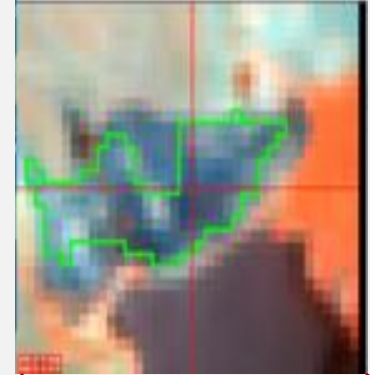
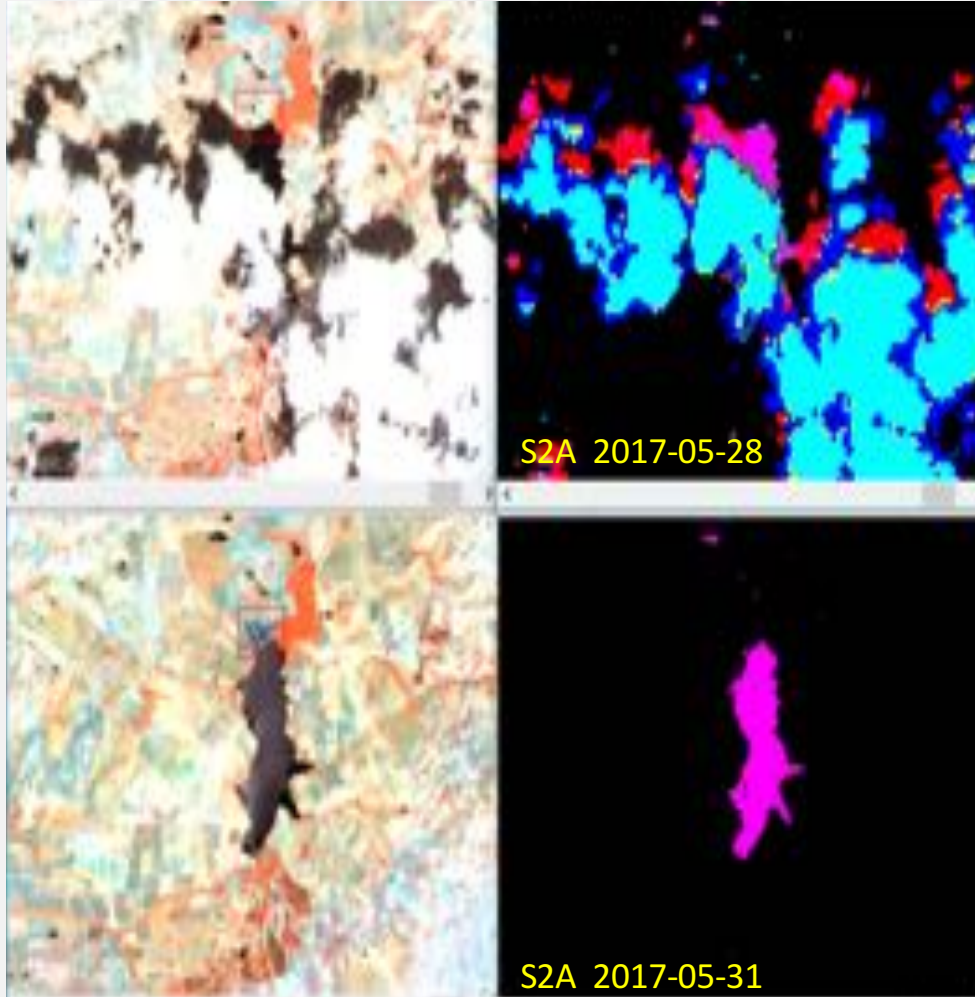
Hot spot pixels

S2A 2017-05-28
Channel SWIR 2.2

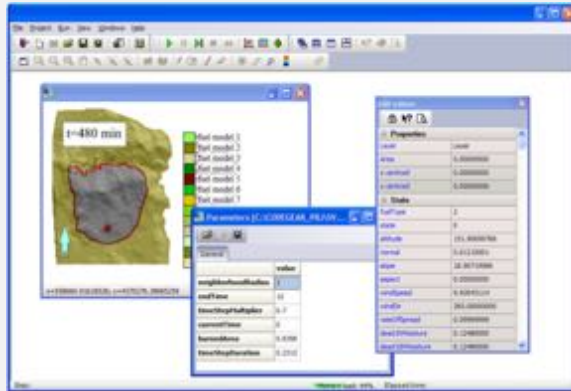
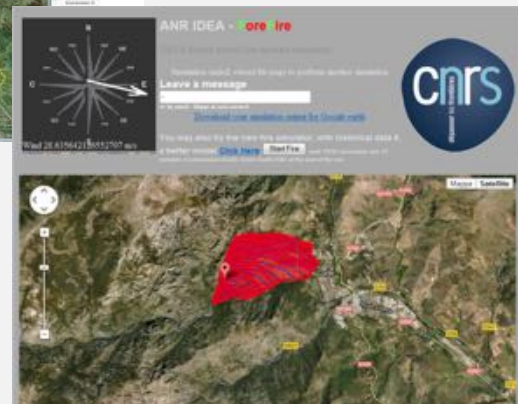
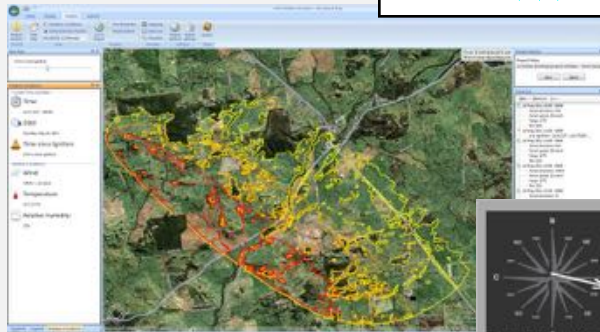
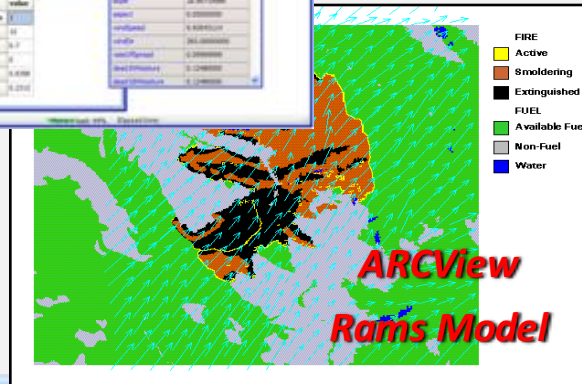
Unsupervised processing 3

Sentinel 2A

- ✓ Burn Scar detection and contouring

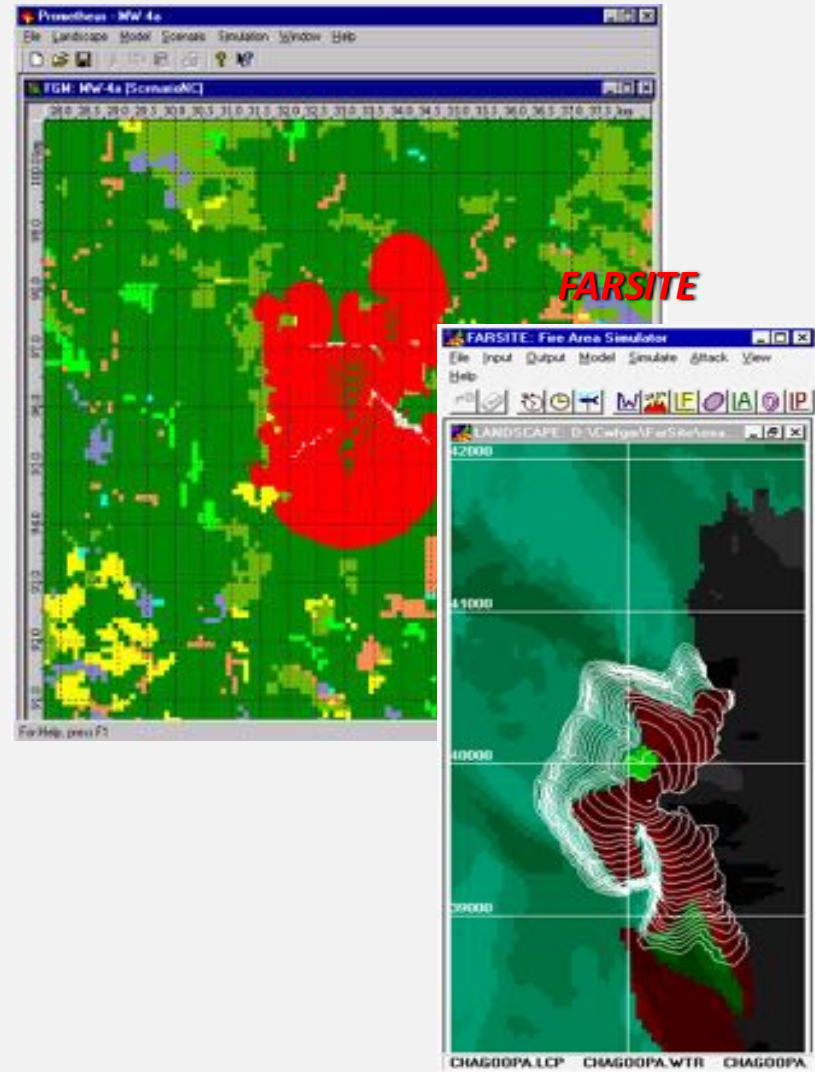


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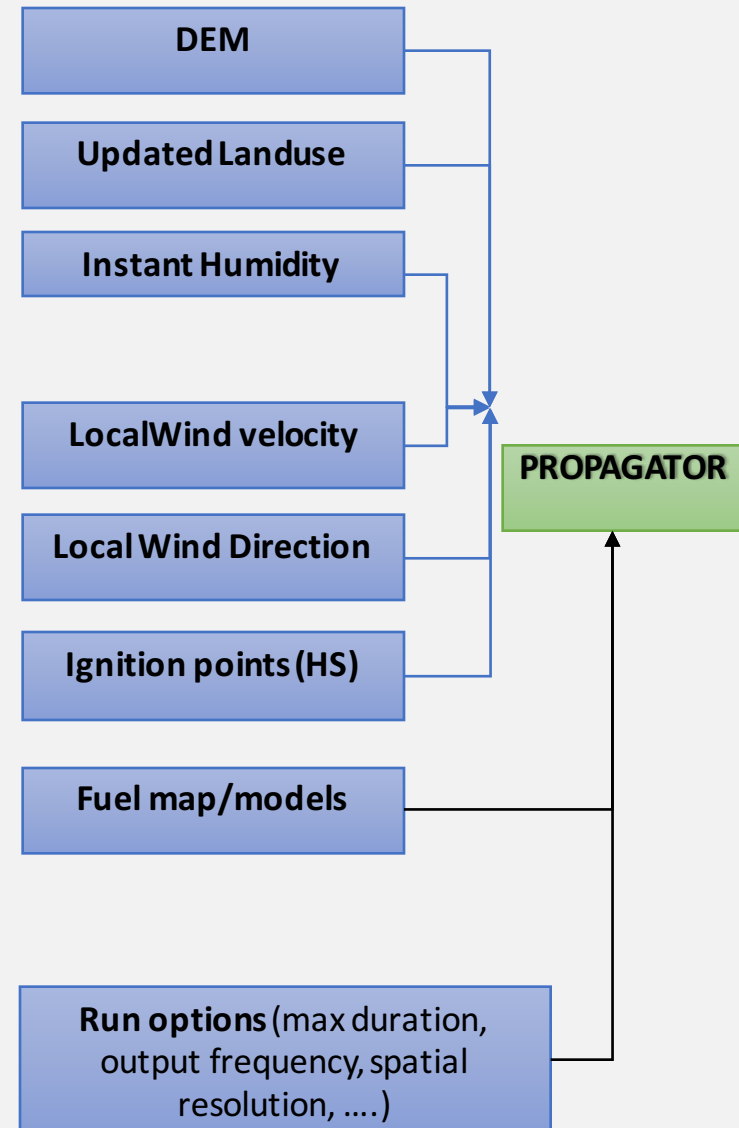
***CALFire***

Vectorial

Prometheus



Output in Google Earth™



In conclusion

- ✓ Antennas and TLC-GNSS field units undergoing tests
- ✓ Unsupervised end-to-end BS process (MyME procedure) thoroughly tested with HR and VHR payloads
- ✓ No development foreseen with propagators
- ✓ Thorough testing of HS planned
- ✓ Plumes and aerosols by HYSPLIT and FLEXPART
- ✓ Business model(s) before plans - pros and cons
- ✓ Quantitative water bombing improvement currently studied