ON THE ESTIMATION OF FIRE SUSCEPTIBILITY, FIRE EXPANTION AND POST-FIRE DAMAGE BASED ON THE INTEGRATION OF SATELLITE, METEOROLOGICAL DATA AND FORECASTS: THE EXPERIENCE OF FIRESAT PROJECT

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Italian National Research Council, IMAA C.da Santa Loja, Tito Scalo, Potenza, Italy

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Civil Protection of the Department of Infrastructure of the Basilicata Region

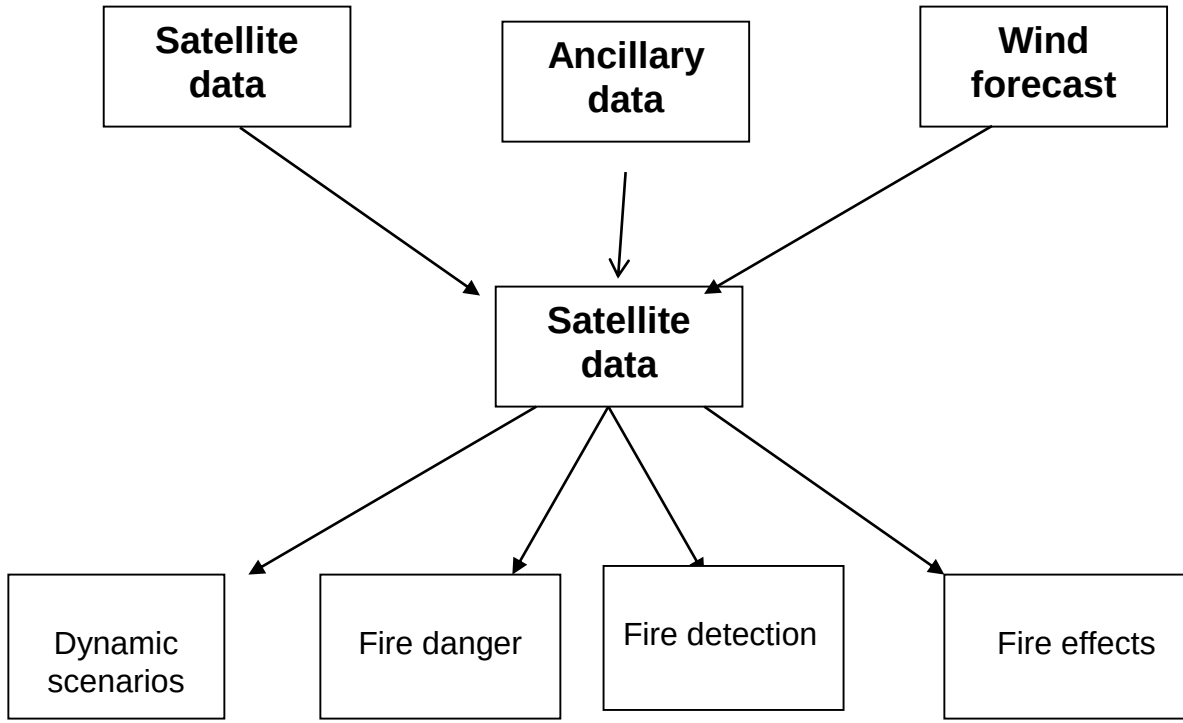
FOREST FIRE MONITORING OUTLINE

- ✓ FROM LAB TO OPERATIONAL APPLICATION
- ✓ FIRE SCUPETIBILITY ESTIMATION
- ✓ FIRE SEVERITY
- ✓ ESTIMATION OF FIRE IMPACT ON HYDROGEOLOGICAL RISK
- ✓ MULTISCALE AND MULTITEMPORAL ESTIMATION OF FIRE AND POST FIRE RISK
- ✓ (WEEKLY, MONTHLY, SEASONAL……) IN COOPERATION WITH SERV_FOR FIRE

FOREST FIRE MONITORING FROM SPACE

For additional info

Lasaponara et al . 2010 Monitoraggio satelliatere per la previsione del rischio di incendio pre operativa in Basilicata



Patent : **An Integarted system for Fire detection Patent prot. 408719 del 24 agosto 2009 sistema di lotta attiva agli incendi boschivi, n. 2008 A0016 (by lasaponara & Lanorte)**

FOREST FIRE MONITORING FROM LAB TO OPERATIONAL APPLICATION

FIRE MONITORING LAB

The methodologies adopted for the diverse phases of fire risk, damage estimation and post fire risk assessment, **evolved from the development and testing of prototype models and algorithms** (developed in the laboratories of CNR-IMAA) to **the pre-operational and operational applications**

FIRE MONITORING : OPERATIONAL USE

2008-2010 only based on the use of MODIS satellite data

2011-2013 later integrated with TM (for fuel mapping and damage estimation

2014-2016 further with meteorological data and forecast available for free (Meteo Model NOAA-GFS, 2014-2016), l

2017 later improved with the highest spatial resolution meteo forecast from Cosmo 5 (5 km)

2018-2019 and Cosmo 2 (km 2) made available by the National Civil Protection up

up to the use of Sentinel 1 and 2 along with manned and unmanned multispectral and thermal aerial surveys for selected study sits

National Research Council of Italy

Daily estimates of fire danger using multitemporal satellite MODIS data: the experience of FIRE-SAT in the Basilicata Region (Italy)

Focus In the recent years the Basilicata Region (Southern Italy) has been characterized by an increasing incidence of fire disturbance which also tends to affect protected (Regional and national parks) and natural vegetated areas. FIRE_SAT project has been funded by the Civil Protection of the Basilicata Region in order to set up a low cost methodology for fire danger/risk monitoring and fire effect estimation based on satellite Earth Observation techniques. To this aim, NASA Moderate Resolution Imaging Spectroradiometer (MODIS) , ASTER, Landsat TM data were used. The spectral capability and free of charge availability makes these data sets very suitable for daily monitoring of large areas.

FIRE SCUSCEPTIBILITY ESTIMATION

MODIS data were used to obtain variations in vegetation Greenness and moisture content,

Vegetation Greenness

RG = (ND0 - NDmn)/(NDmx - Ndmn) * 100

ND0 = highest observed NDVI value for the considered composite period which 8 days
NDmn = historical minimum NDVI value for a given pixel
NDmx = historical maximum NDVI value for a given pixel

Moisture Content MSI = R 1600/ R 820
where R 1600 and R 820 denote the MODIS Reflectance as acquired in the spectral bands 1600nm and 820 nm

Landsat TM data were used to obtain fuel types using supervised classification techniques and spectral analysis methodologies performed at sub-pixel level to map

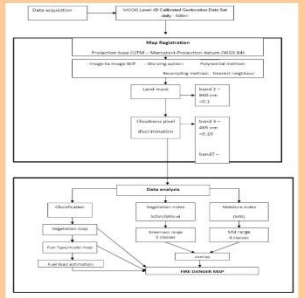
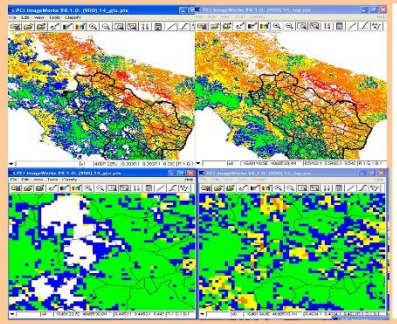
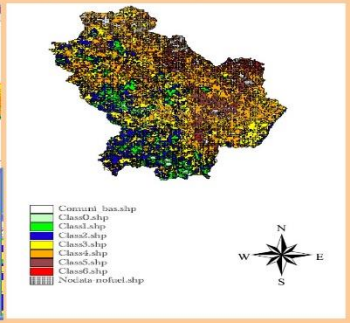


Fig. 1 Earth Observation Processing chain development





Reference
Telesca, L., Lasaponara, R.: Investigating fire-induced behavioural trends in vegetation covers. Communications in Nonlinear Science and Numerical Simulation, 13, 2018--2023(2008)

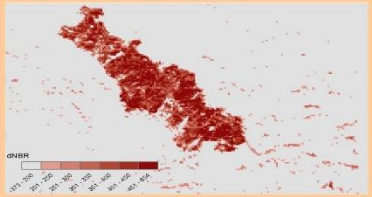
FIRE SEVERITY ESTIMATION

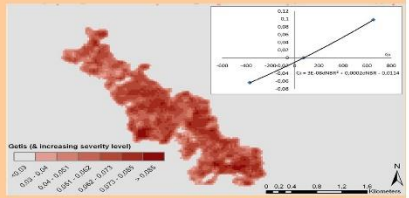
Traditional methods of recording fire burned areas and fire severity involve expensive and time - consuming field surveys. The available remote sensing technologies may allow us to develop standardized burn-severity maps for evaluating fire effects and addressing post fire management activities. This paper is focused on the multiscale characterization of burn severity using multisensor satellite data. To this aim, both MODIS (Moderate Resolution Imaging Spectroradiometer) and ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) data have been processed using geo-statistic analyses to capture pattern features of burned areas.
Even if in last decades different authors tried to integrate geo-statistics and remote sensing image processing methods used since now are only variograms, semivariograms and kriging We used geospatial indicators of global and local autocorrelation. Spatial statistics, such as Moran's I, Geary's C, and Getis-Ord Local Gi index (see Anselin 1995; Getis and Ord 1992), were used to measure and analyze the degree of dependency among spectral features of burned areas.
After fire, the spectral behavior of vegetation changes due to the consumption of fuel, the presence of ash, the reduced transpiration of vegetation and the increased surface temperature. All these effects increase the reflectance in mid-infrared and reduce of surface reflectance in near-infrared. We computed the following indices, which were processed using geospatial statistics :

NBR = (NIR – SWIR)/ (NIR +SWIR) (1)
Maps of the difference between pre and post-fire index (formula 2) and relative dNBR (see 3)
$dNBR = NBR_{prefire} - NBR_{postfire}$ (2)

$I_{NBR} = dNBR\ [abs\ (NBR_{prefire})]^{1/2}$ (3)

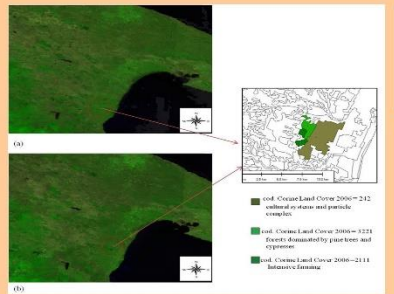
This approach enables the characterization of the pattern features of burned area and improves the estimation of burn severity

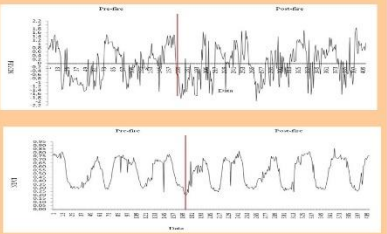


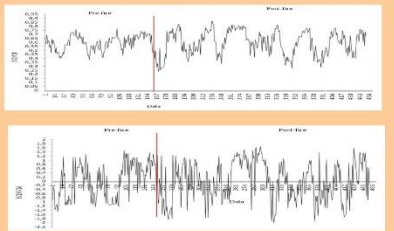


Reference
Lanorte, A., Danese M., Lasaponara R., Murgante B. "Multiscale mapping of burn area and severity using multisensor satellite data and spatial autocorrelation analysis" International Journal of Applied Earth Observation and GeoInformation, Elsevier, doi:10.1016/j.jag.2011.09.005 (2012)

FIRE RECOVERY ESTIMATION







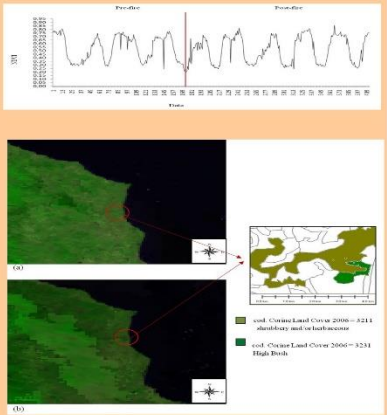
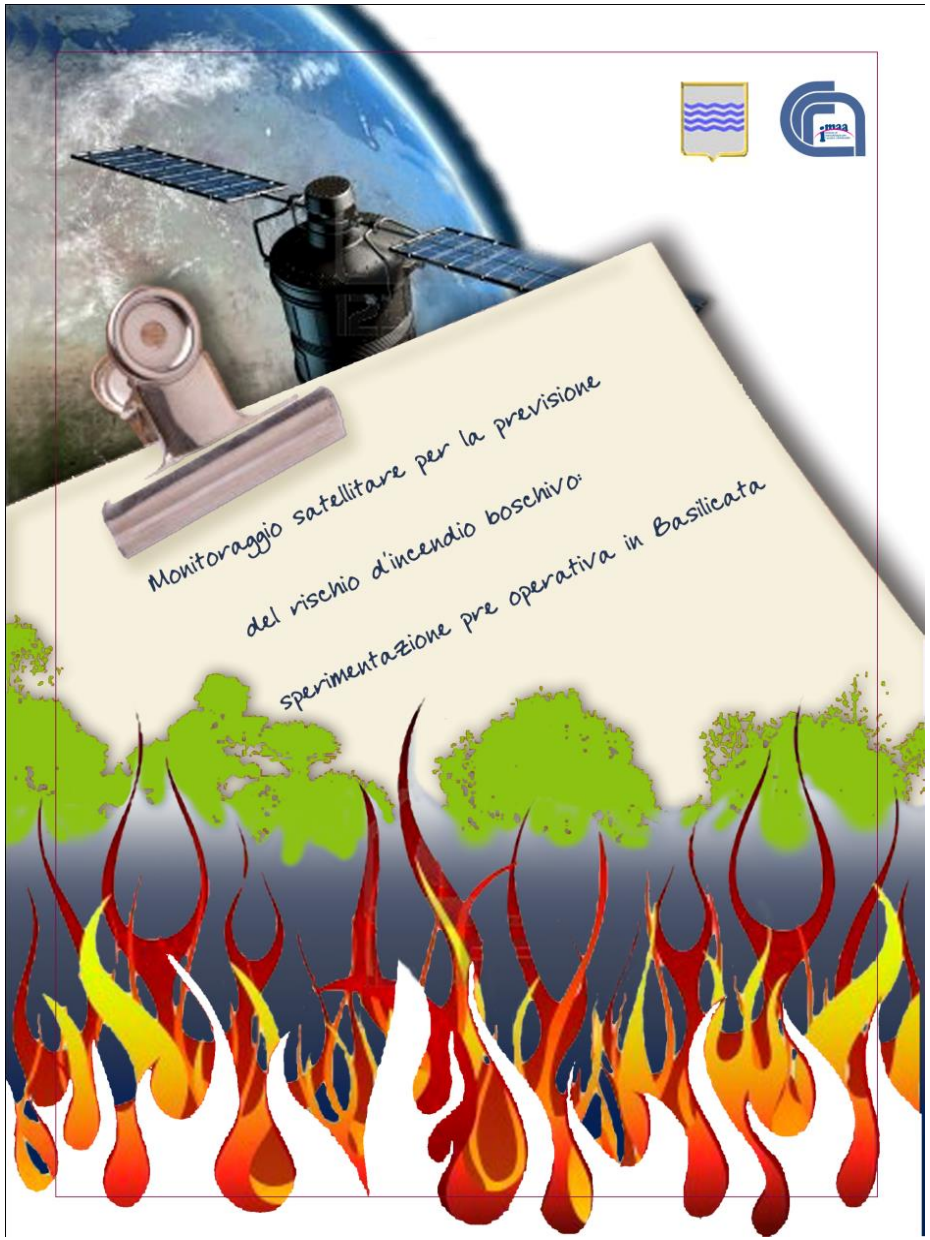


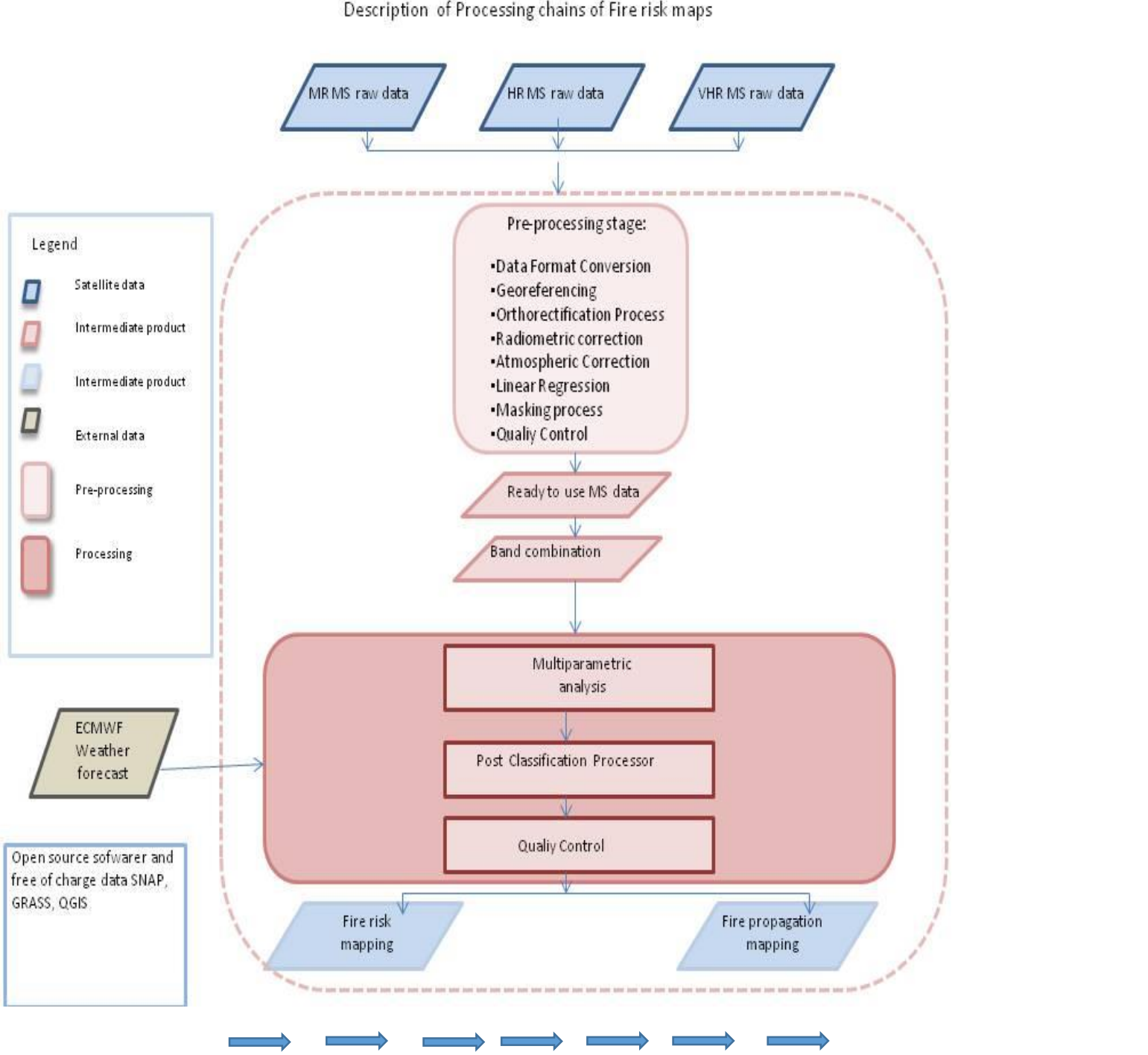
Fig. 1. (a) MODIS image (resolution 500m) of the Crotone site acquired on September 6, 2004 (before the fire); (b) MODIS image (resolution 500m) of the Crotone site acquired after the fire occurrence (September 22, 2004). On the right, CORINE land use land cover for the investigated pixels indicated by black arrows- Bottom NDVI and NDVI d for one pixel of the site

Fig. 2. Up Bottom Bottom NDVI and NDVI d for one pixel of Andiacesite
(a) MODIS image (resolution 500m) of the Andriace site July 11, 2003 (before the fire) (b) MODIS image (resolution 500m) of the Andriace site July 27, 2003 (after the fire). On the right, CORINE land use land cover for the investigated pixels indicated by black arrows .

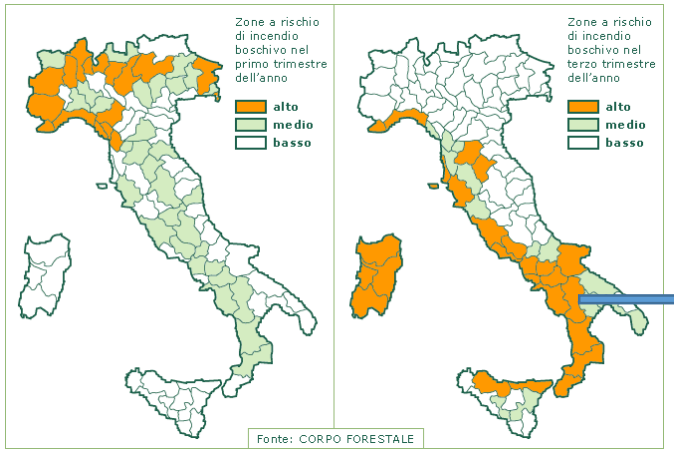
Reference
Telesca, L., Lasaponara, R.: Investigating fire-induced behavioural trends in vegetation covers. Communications in Nonlinear Science and Numerical Simulation, 13, 2018--2023(2008)

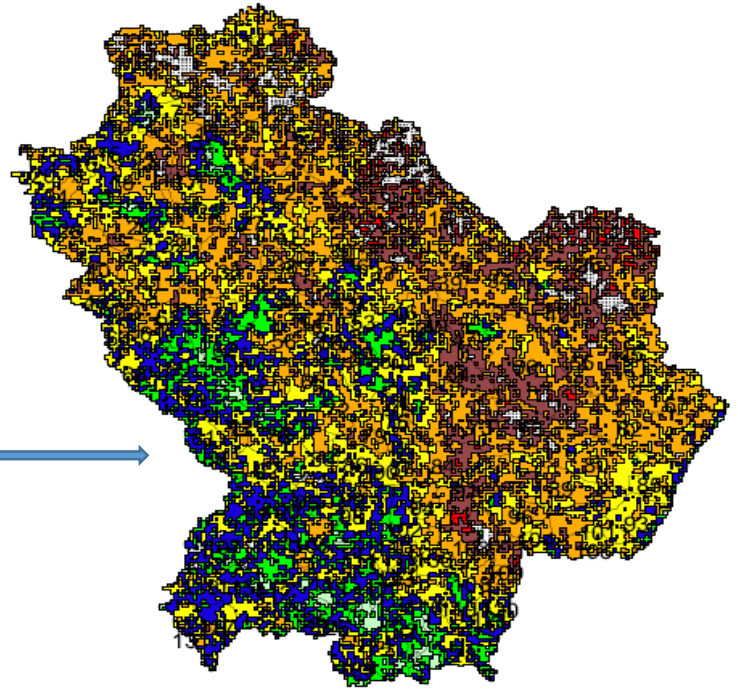


Lasaponara et al An Integrated system for Fire monitoring Patent prot. 408719 del 24 agosto 2009



Current information daily provided in the framework of FIRE-SAT project : pixel size 1Km, 250m improved to 30 m (for interface fires)

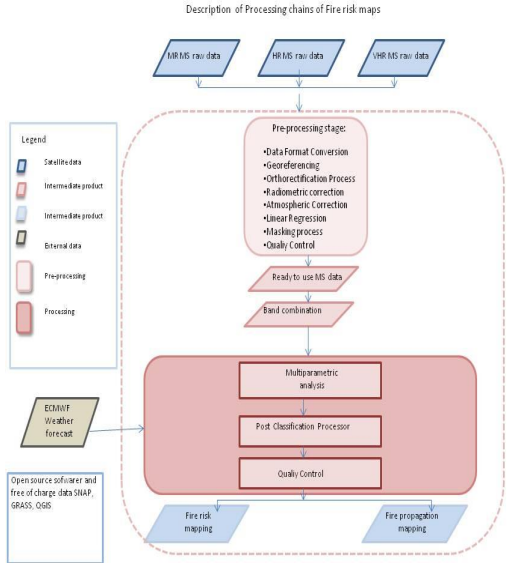


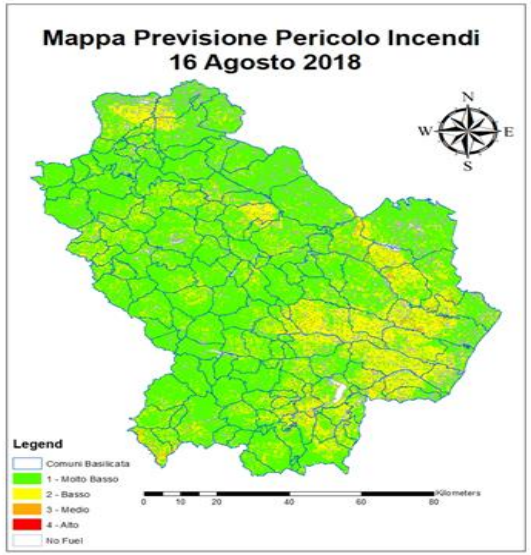


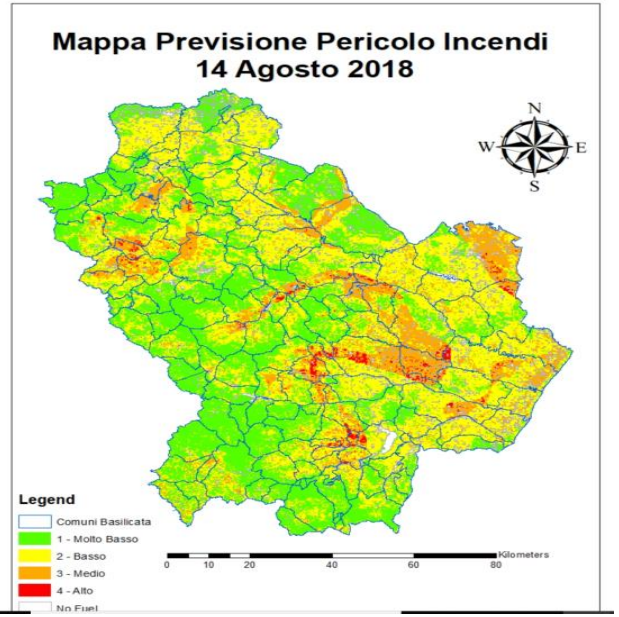
Comuni_bas.shp
Class0.shp
Class1.shp
Class2.shp
Class3.shp
Class4.shp
Class5.shp
Class6.shp
Nodata-nofuel.shp

N
W
E
S

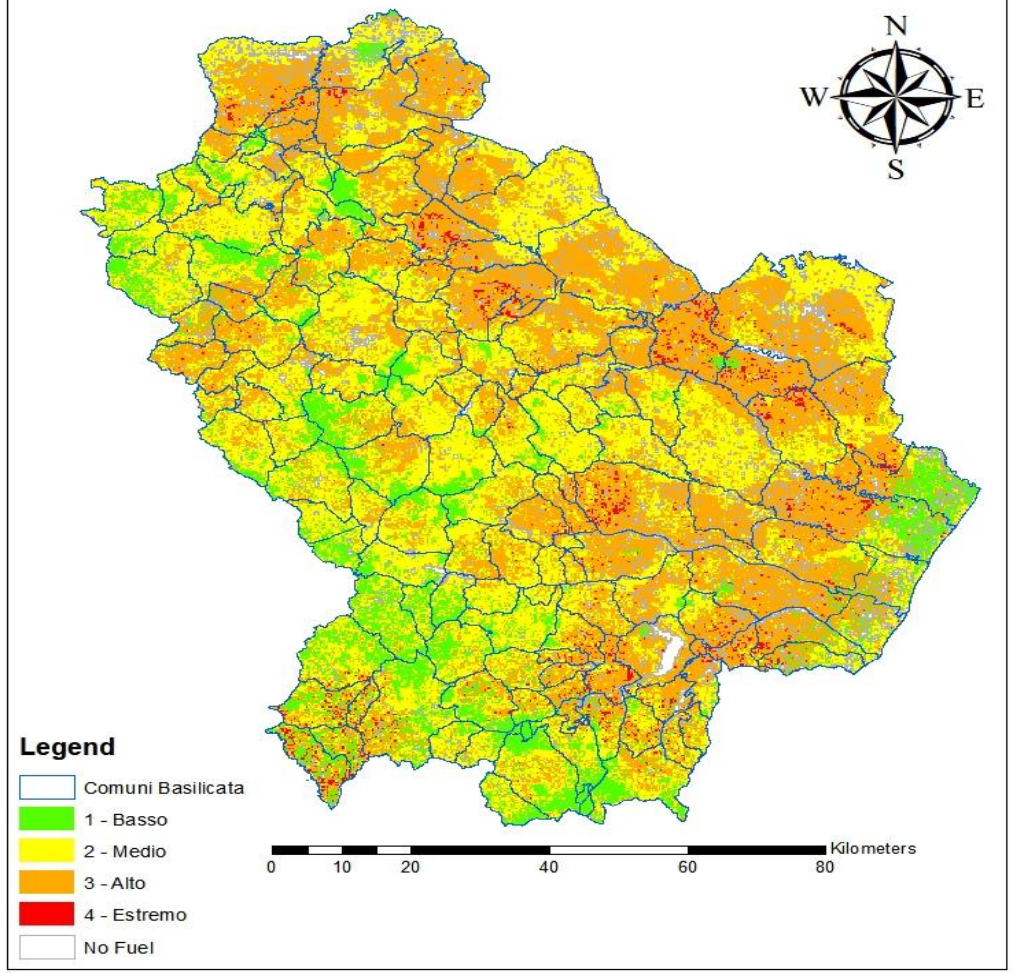
The daily fire risk methodology is based on the integration of satellite data with meteorological data and forecasts. The main novelty compared with the methodology already developed (and operationally used by the Protezione Civile of the Basilicata Region) The automatic processing of meteorological data and forecasting has twofold applications (i) the assessment of fire risk and (ii) the estimation of the expansion of fire perimeter using FIRESITE software







Mappa Previsione Pericolo Incendi
18 Settembre 2019



News - SERV_FORFIRE_ERA4 | ERA4CS - News | Protezione Civile Regio | www.protezionecivilebasilicata.it/protcivbas/home.jsp

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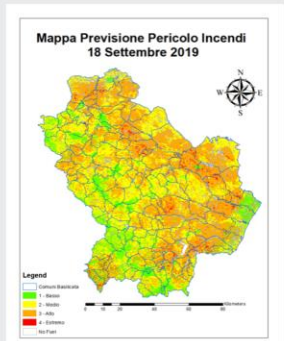
Pericolo incendi



Previsioni meteo

Bollettini di criticità Idro-Geologica

Avvisi di criticità Idro-geologica

Livelli fiumi monitorati

Contact Center
0971 668400

Email Certificata Ufficio
ufficio.protezione.civile@cert.regione.basilicata.it

Email Certificata Sala Operativa
sor.basilicata@cert.regione.basilicata.it

Email Sala Operativa
salaoperativa@regione.basilicata.it

News

Decretato "Periodo di Grave Pericolosità di incendi boschivi per l'anno 2019".

Con DPGR n. 106 del 25/06/2019 il Presidente della Giunta Regionale ha decretato il Periodo di Grave Pericolosità di incendi boschivi per l'anno 2019

Articoli

PROGRAMMA ANNUALE A.I.B. 2019

CON D.G.R. N.348 DEL 07 GIUGNO 2019, IN ATTUAZIONE DEL PIANO

Settore Appennino Calabro Lucano
Bollettino Valanghe

In Evidenza

settembre 2019

01 luglio 2016
APERTURA S.O.U.P.

lun	mar	mer	gio	ven	sab	dom
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

<< Precedente | Successivo >>

Area Riservata

Nome Utente
Password
Accedi

Modulo Richiesta Dati Idropluviometrici

Dati Pluviometrici CIGO

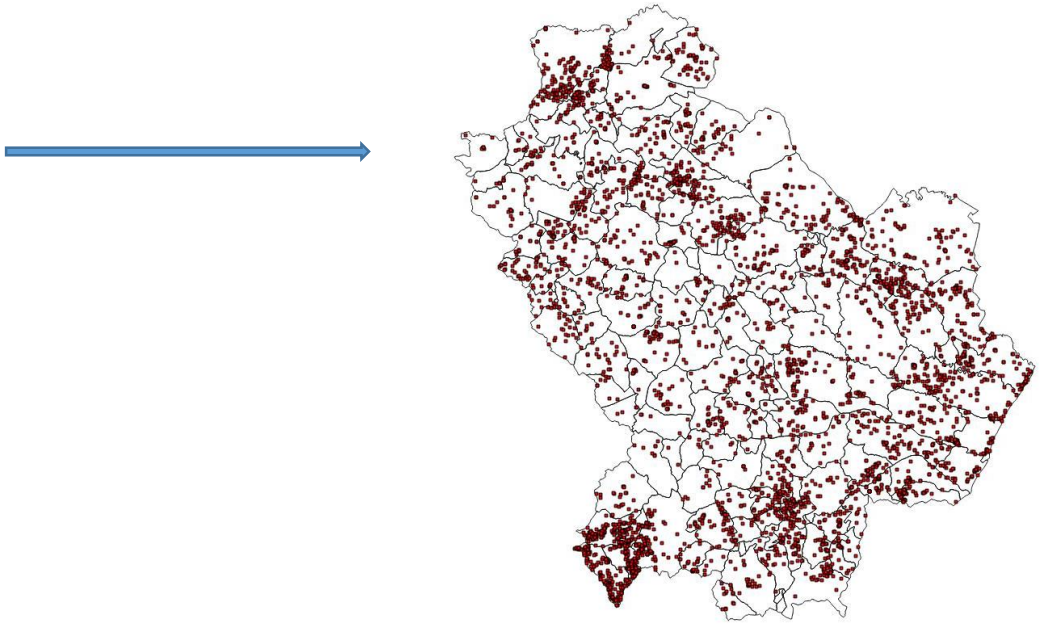
Scrivi qui per eseguire la ricerca

ITA IT 18:47 17/09/2019

Historical fire records (1996-2018)

Static variable/index

-Statistical Analysis of fire catalogue



-DTM (Slope, Aspect, Elevation);

-**Vegetazione -Fuel types/models**

-Burned areas

- Fire Regime

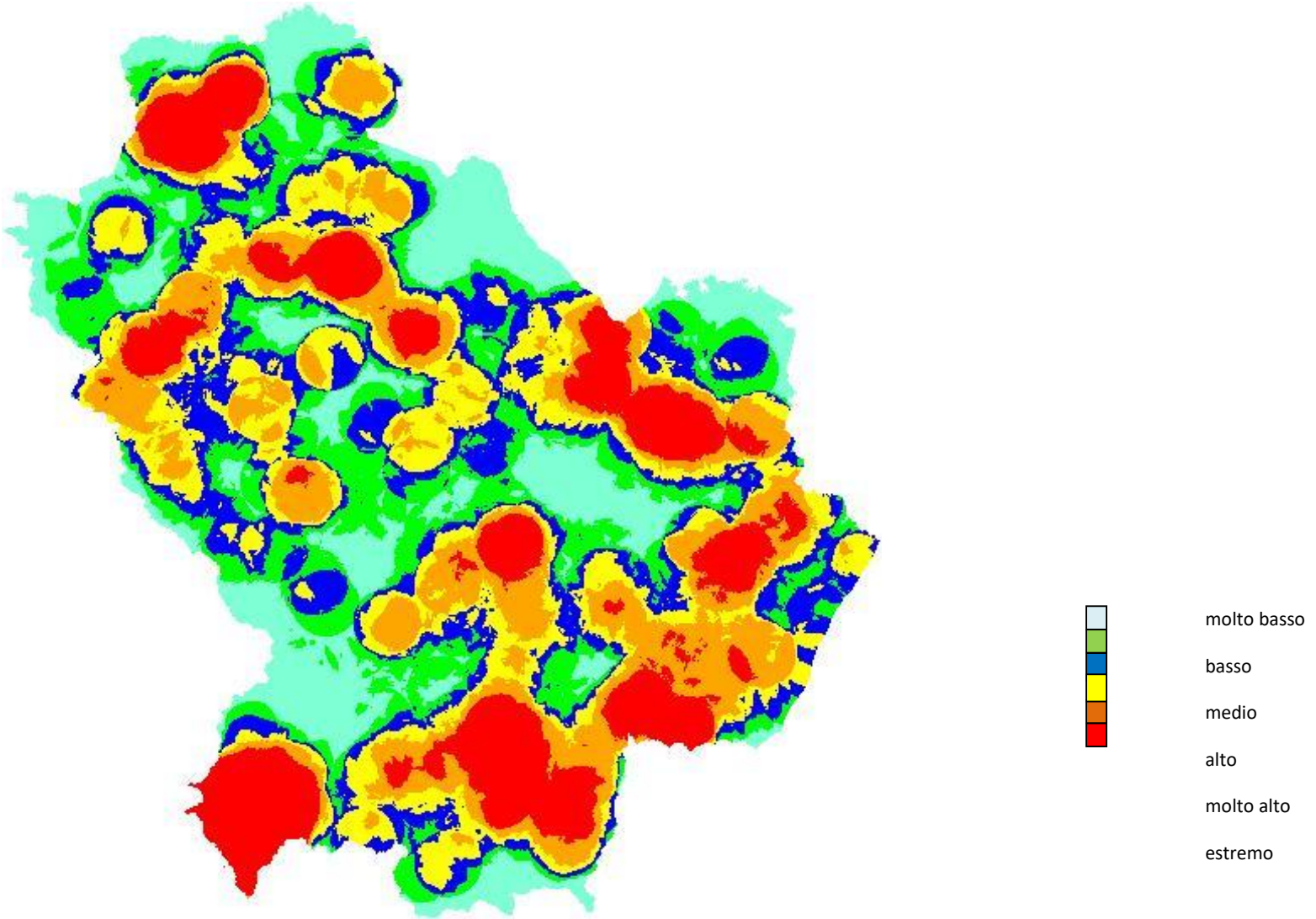
Human factors:
-(density of population, accessibility; antrophogenic activities

Dynamici Variabiles/Indices

- Meteorological : -temperature, - humidy, -Wind, -insolation, etc.

-**State of vegetation (moisture, stress)**

Static map based on the statistical analysis of the available fire catalogue



Static variable/index

-Statistical Analysis of fire catalogue

-DTM (Slope, Aspect, Elevation);

-**Vegetazione -Fuel types/models**

-Burned areas

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Human factors:
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Dynamici Variabiles/Indices

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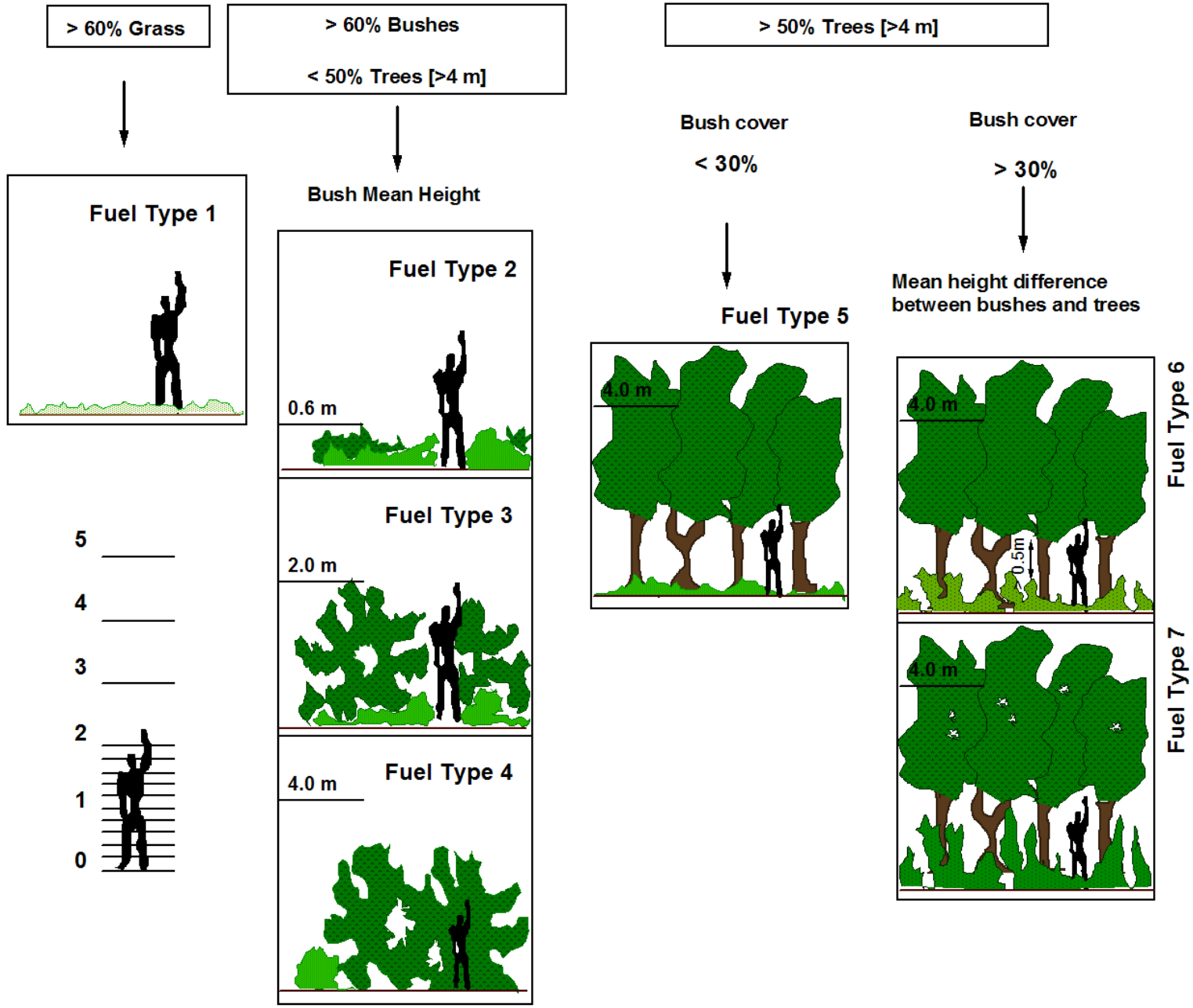
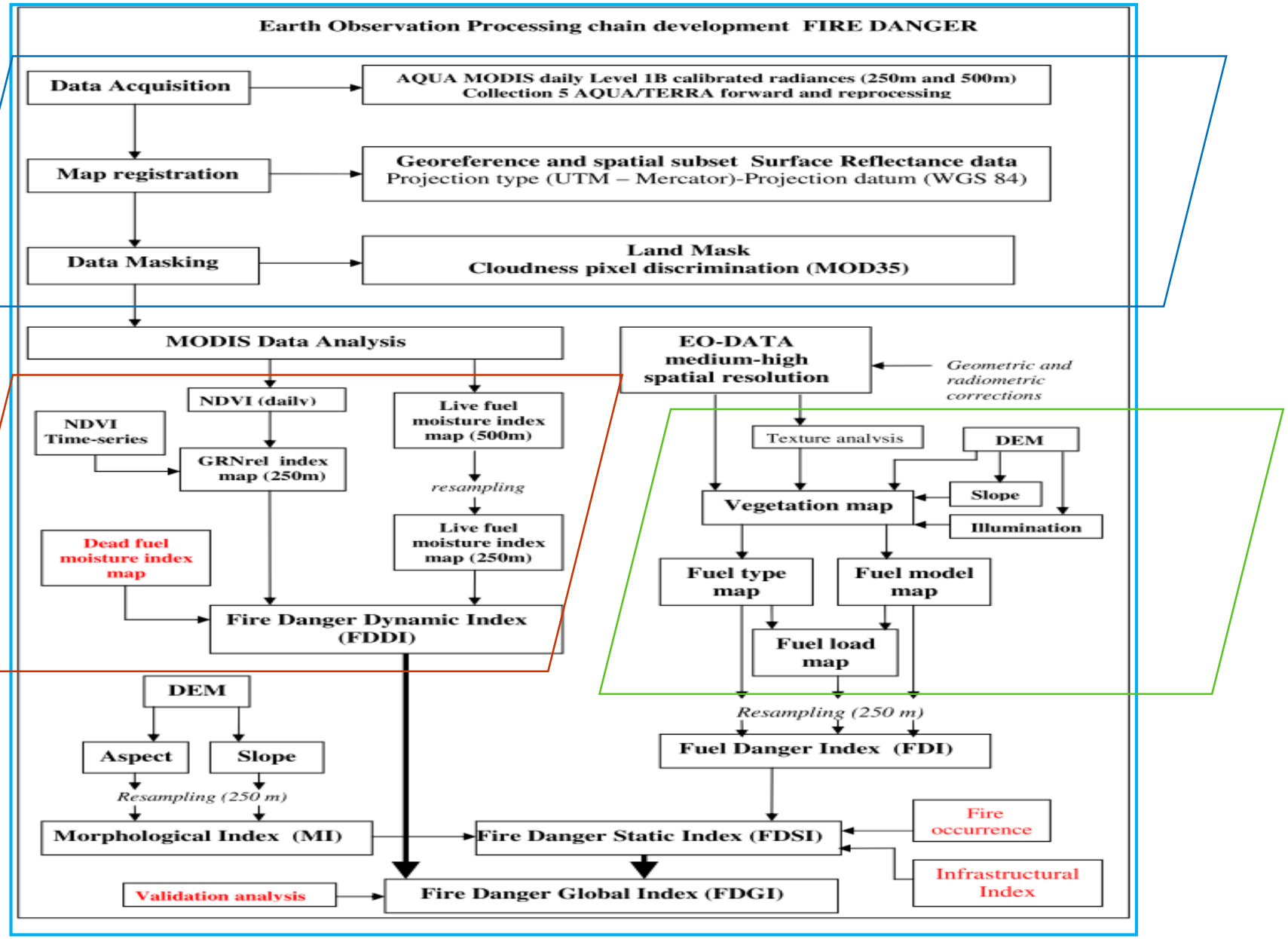
-**State of vegetation (moisture, stress**)

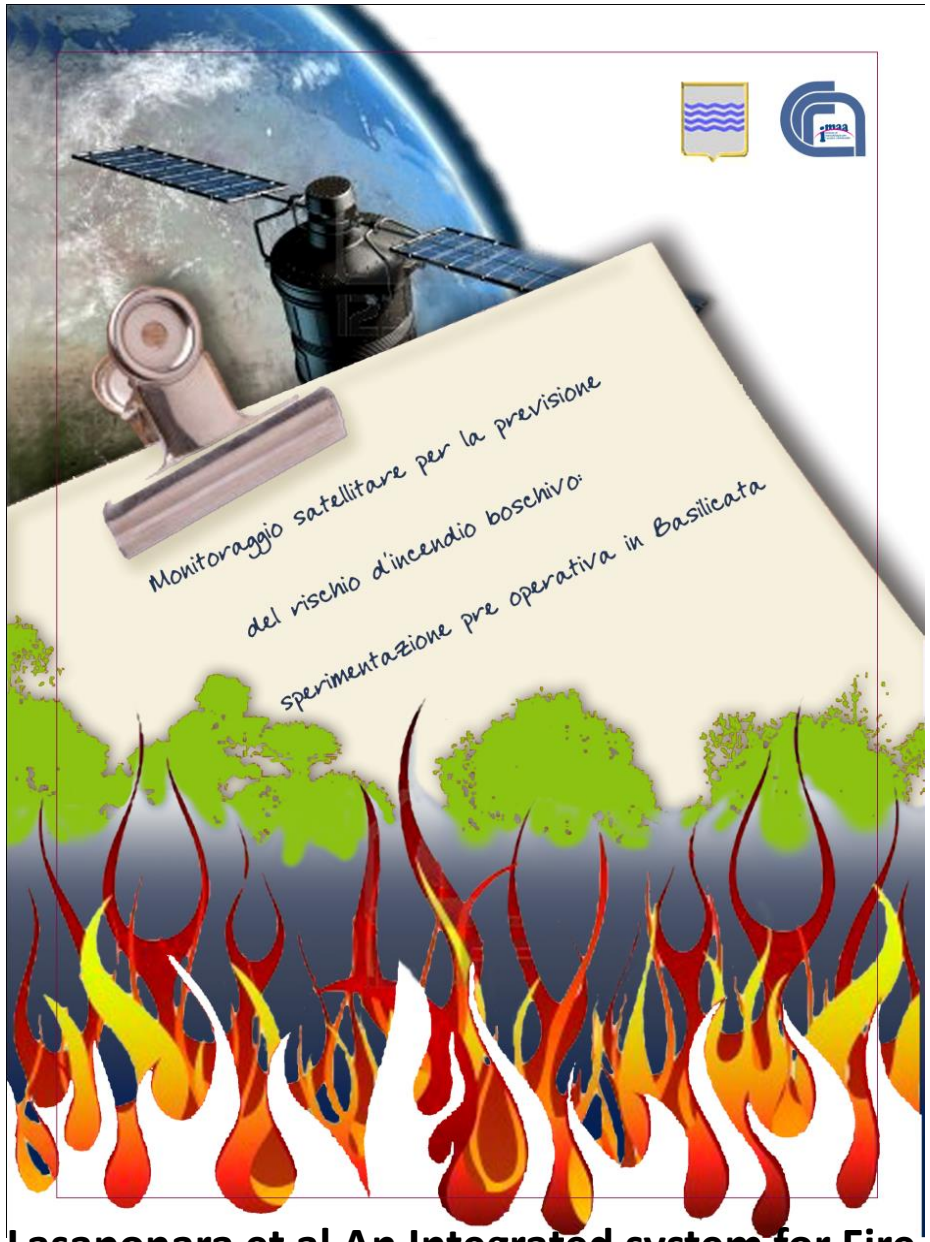

> 60% Grass
> 60% Bushes
< 50% Trees [>4 m]
> 50% Trees [>4 m]
Bush cover
< 30%
Bush cover
> 30%
Bush Mean Height
Mean height difference between bushes and trees
Fuel Type 1
Fuel Type 2
0.6 m
Fuel Type 3
2.0 m
Fuel Type 4
4.0 m
Fuel Type 5
4.0 m
Fuel Type 6
4.0 m
0.5m
Fuel Type 7
4.0 m
5
4
3
2
1
0

Fuel type classification developed for Mediterranean ecosystems in the framework of Prometheus project (Prometheus Project 1999)

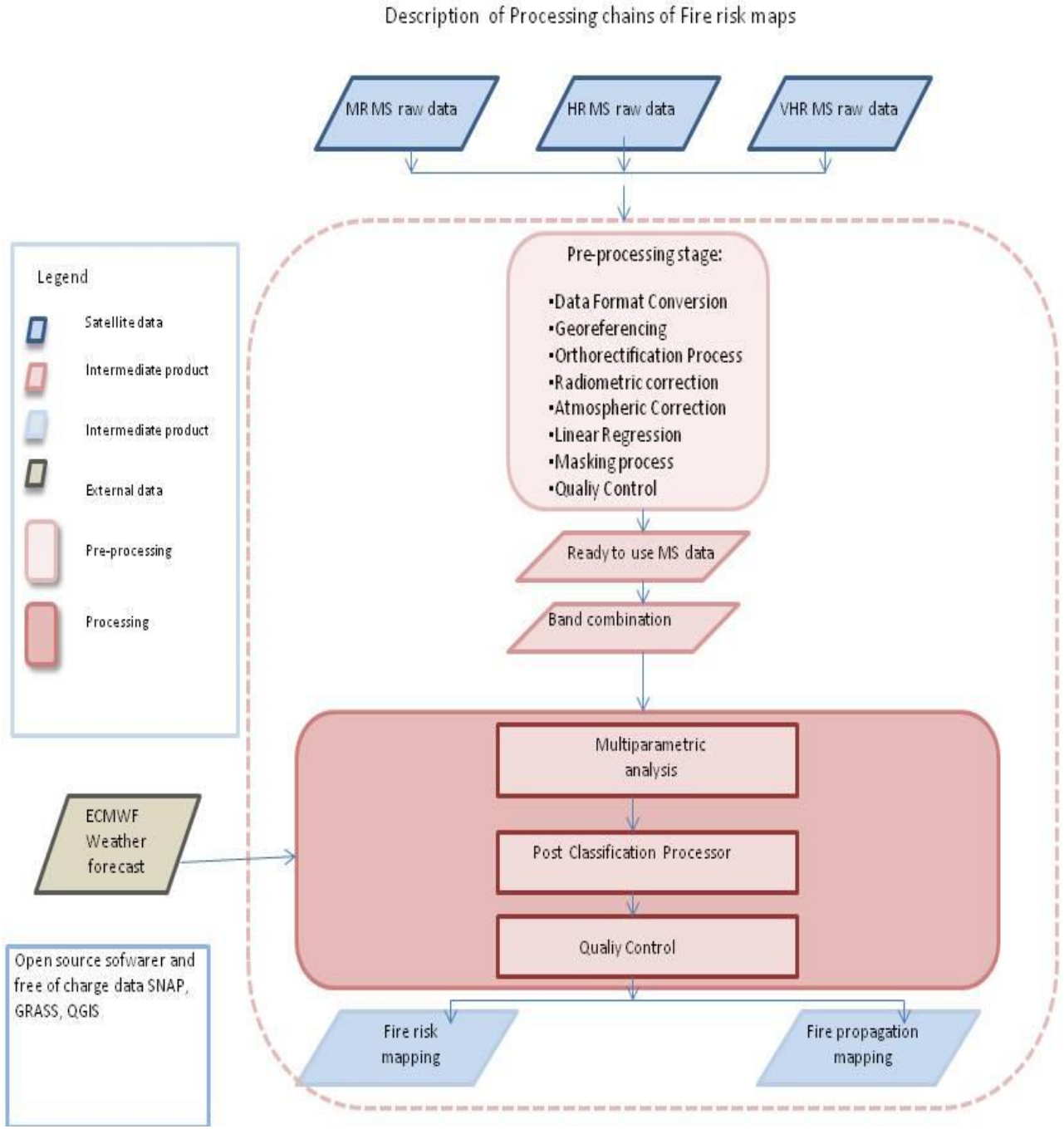
Fuel Type class	Fuel Type description in terms of percentage of cover	Fuel Type description in terms of vegetation typology
1	Ground fuels (cover >50%)	grass
2	Surface fuels (shrub cover >60%, tree cover <50%)	grassland, shrub land (smaller than 0.3–0.6 m and with a high percentage of grassland), and clear cuts, where slash was not removed
3	Medium-height shrubs (shrub cover >60%, tree cover <50%)	shrubs between 0.6 and 2.0 m
4	Tall shrubs (shrub cover >60%, tree cover <50%)	high shrubs (between 2.0 and 4.0 m) and young trees resulting from natural regeneration or forestation
5	Tree stands (>4 m) with a clean ground surface (shrub cover <30%)	the ground fuel was removed either by prescribed burning or by mechanical means. This situation may also occur in closed canopies in which the lack of sunlight inhibits the growth of surface vegetation
6	Tree stands (>4 m) with medium surface fuels (shrub cover >30%)	the base of the canopies is well above the surface fuel layer (>0.5 m). The fuel consists essentially of small shrubs, grass, litter, and duff (the layer of decomposing organic materials lying immediately above the mineral soil but below the litter layer of freshly fallen twigs, needles, and leaves; the fermentation layer).
7	Tree stands (>4 m) with heavy surface fuels (shrub cover >30%)	stands with a very dense surface fuel layer and with a very small vertical gap to the canopy base (<0.5 m)

Sviluppo di un modello *EO-based* per la stima del pericolo d'incendio



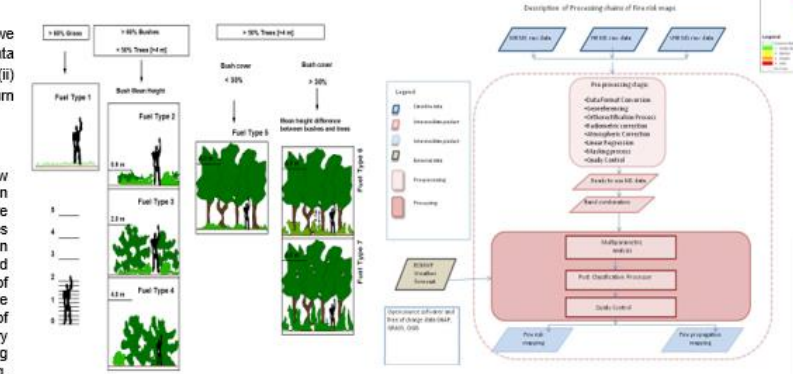


Lasaponara et al An Integrated system for Fire monitoring Patent prot. 408719 del 24 agosto 2009



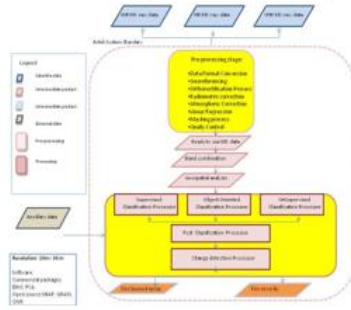
In this paper, we present and discuss the tools we devised for the protezione civile of the Basilicata region for the estimation of (i) fire susceptibility (ii) fire expansion, (iii) mapping of burnt areas and burn severity, landslides susceptibility after fire.

The central assumption underlying the testing of new approaches adopted is (i) the definition of an integrated methodology for the characterization of fire hazard capable of combining different techniques and (ii) the activation of profitable synergies between the various actors involved in the management and active firefighting processes. The integration of diverse fire hazard factors (among them the assessment of the presence, typology and status of fuels and their fire susceptibility) does provide very significant indications encompassing all the planning phase of forest fire monitoring: forecasting, prevention, active fight, damage assessment and post-fire damage and recovery.

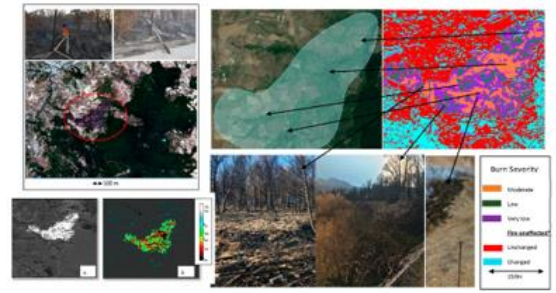


The fire risk methodology is based on the integration of satellite data with meteorological data and forecasts. The main novelty compared with the methodology already developed (and operationally used by the Protezione civile of the Basilicata Region) is the updated of the risk estimation based on the MODIS proxy indicators with the meteorological forecasting provided by the COSMO 5 and COSMO 2 model (respectively at 5 km and 2 km as obtained from ECMWF forecasting).
The automatic processing of meteorological data and forecasting has twofold applications (i) the assessment of fire risk and (ii) the estimation of the expansion of fire perimeter using FIRESITE software.

Burned areas, treated as geographic data, are characterized by inherent complexity. There are many indexes that could be derived from satellite data to find their delimitation and the areas with different fire severity inside of them. However, this multidimensionality and heterogeneity is difficult to manage in classic Geographic Information Systems, so, in the last years many works and methods were proposed in other application fields for visualization, dimensionality reduction and classification of this type of data. In the following figures bunt severity estimation is made using Sentinel 1 and sentinel 2 data by CNR-IMAA.



Automatic mapping of Burnt areas and Fire severity Piancardillo fires



Referenza: Lasaponara, B Tucci, L Ghermandi On Use of Satellite Sentinel 2 Data for Automat Mapping of Burnt Areas and Burn Severity. 2018 Sustainability 10 (11), 3889

Satellite ASTER Mapping of burned areas

Grottole – C.da Cacciatori – 18 agosto 2010 – 13.12 ha (di cui 9.51 ha wooded)

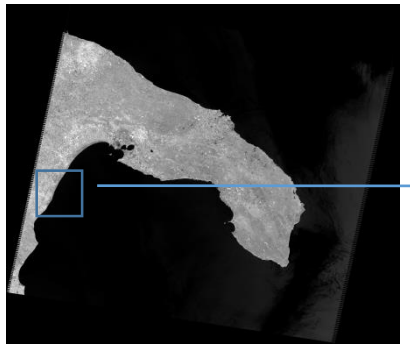
14 agosto 2010

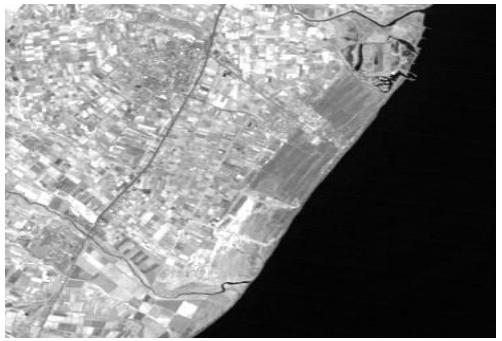
23 agosto 2010

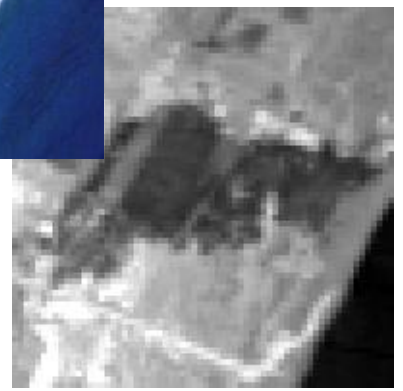
Fire management

Uso di dati satellitari LANDSAT-TM

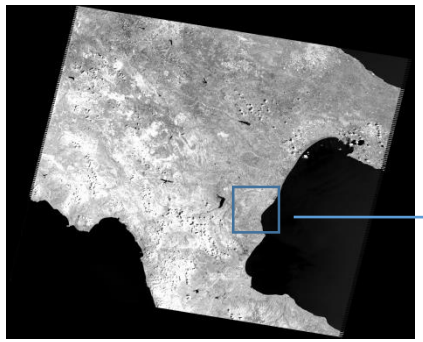
Incendio Policoro
20 luglio 2011
(82 Ha)





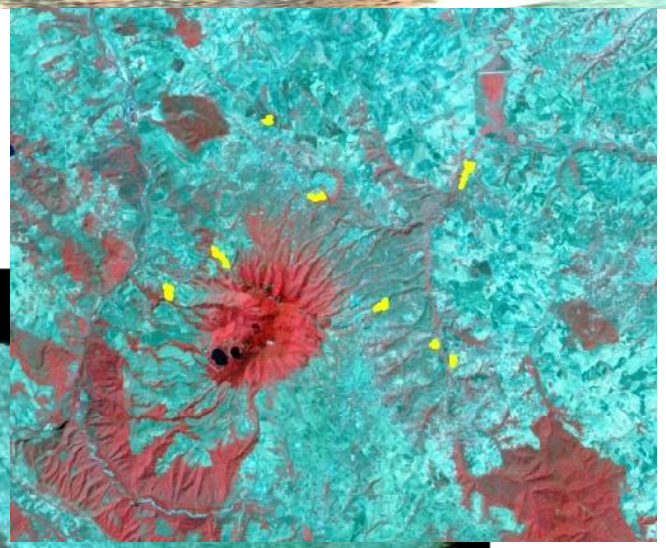


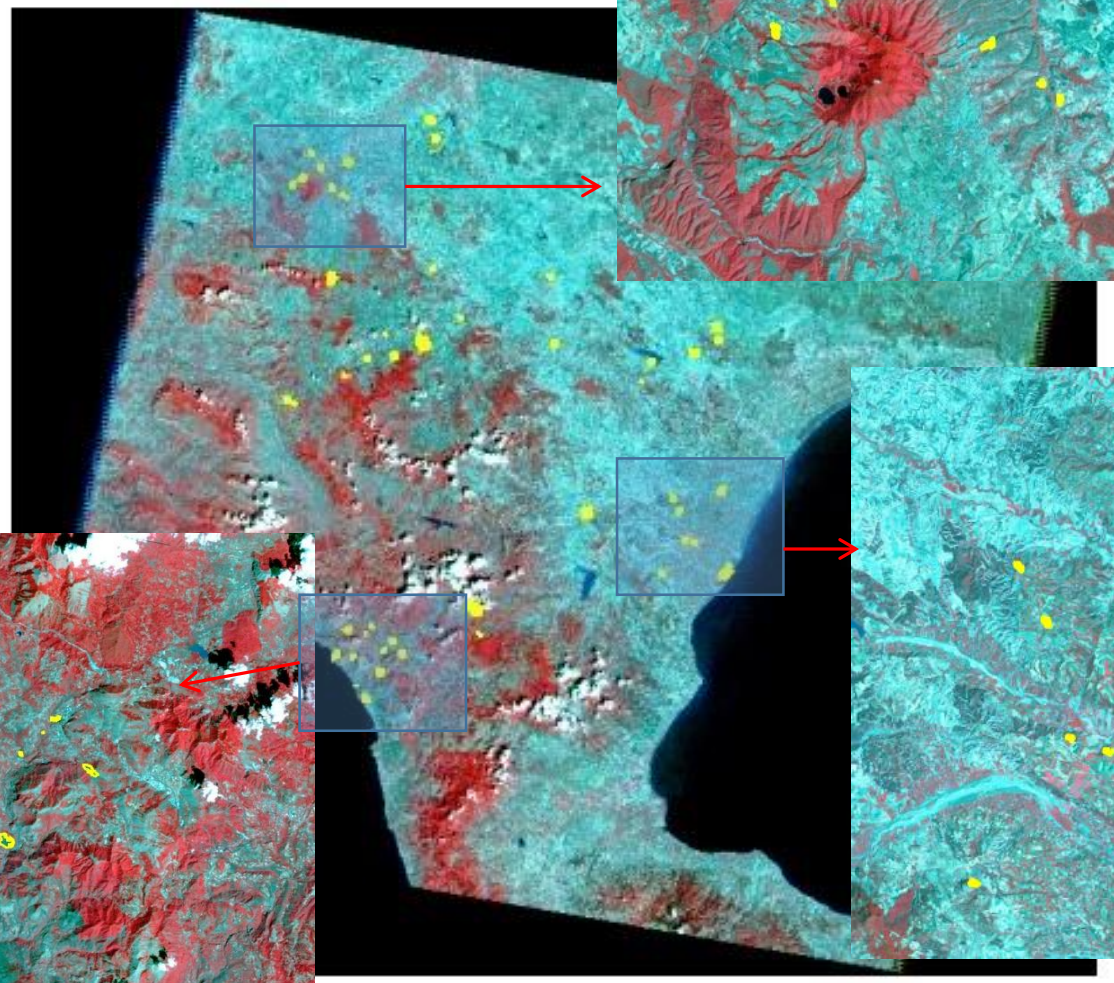
LANDSAT-TM 24 giugno 2011
(NIR)

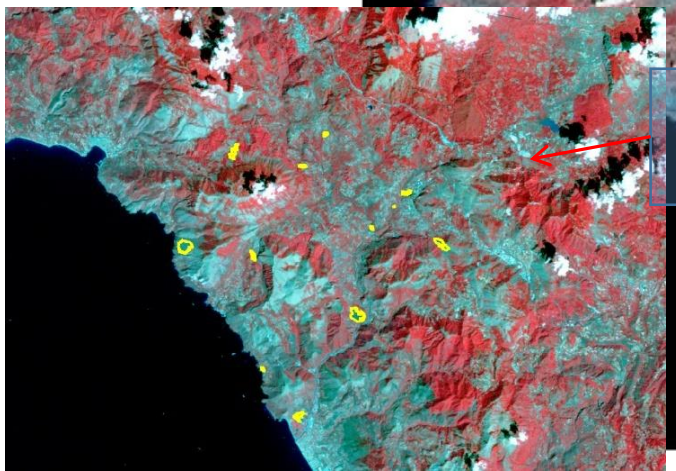


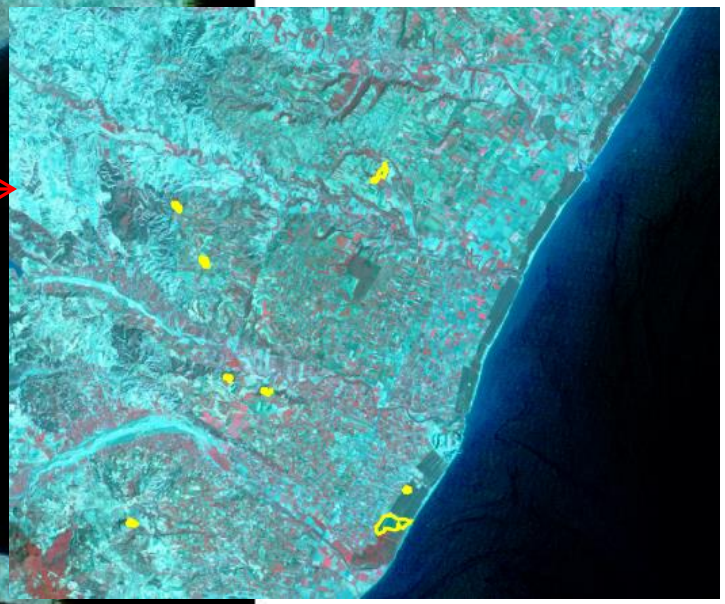
LANDSAT-TM 2 agosto 2011
(NIR)

Mappatura speditiva aree bruciate
Uso di dati satellitari LANDSAT-TM
(18 agosto 2011)

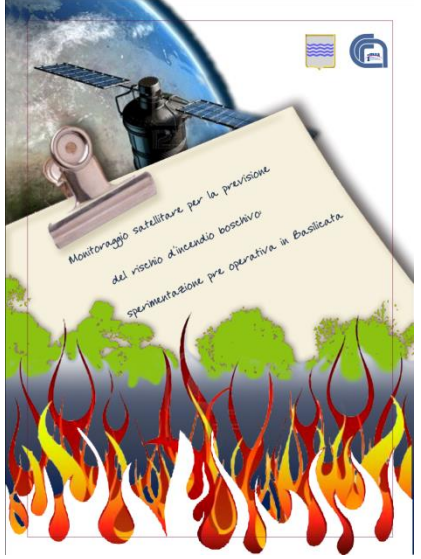


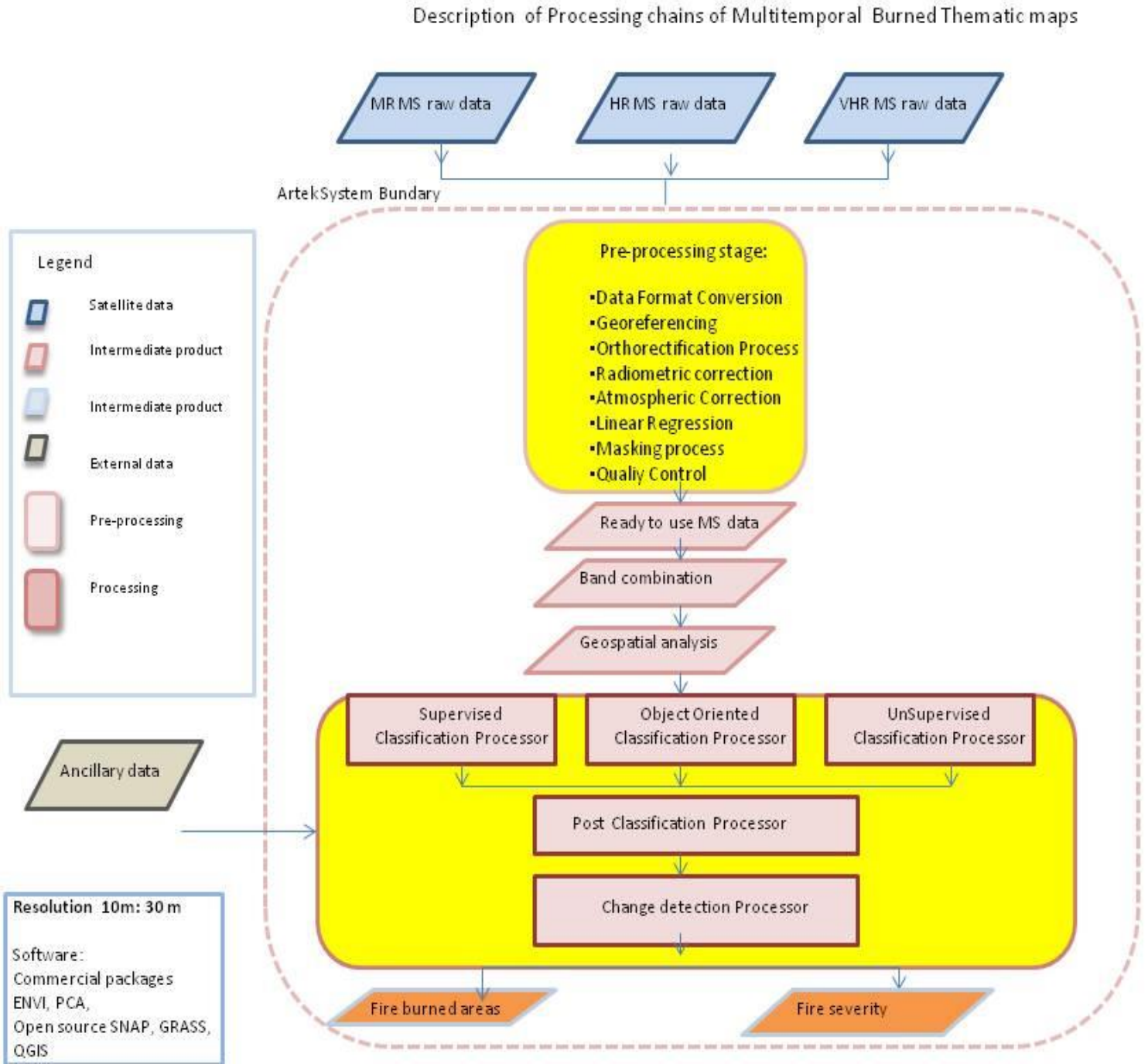






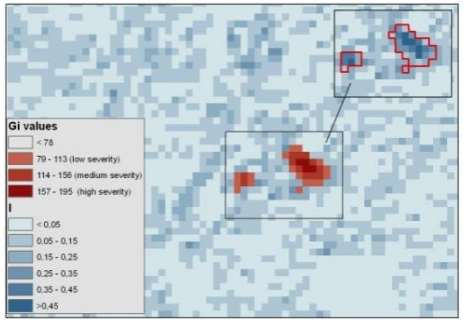
Fire management

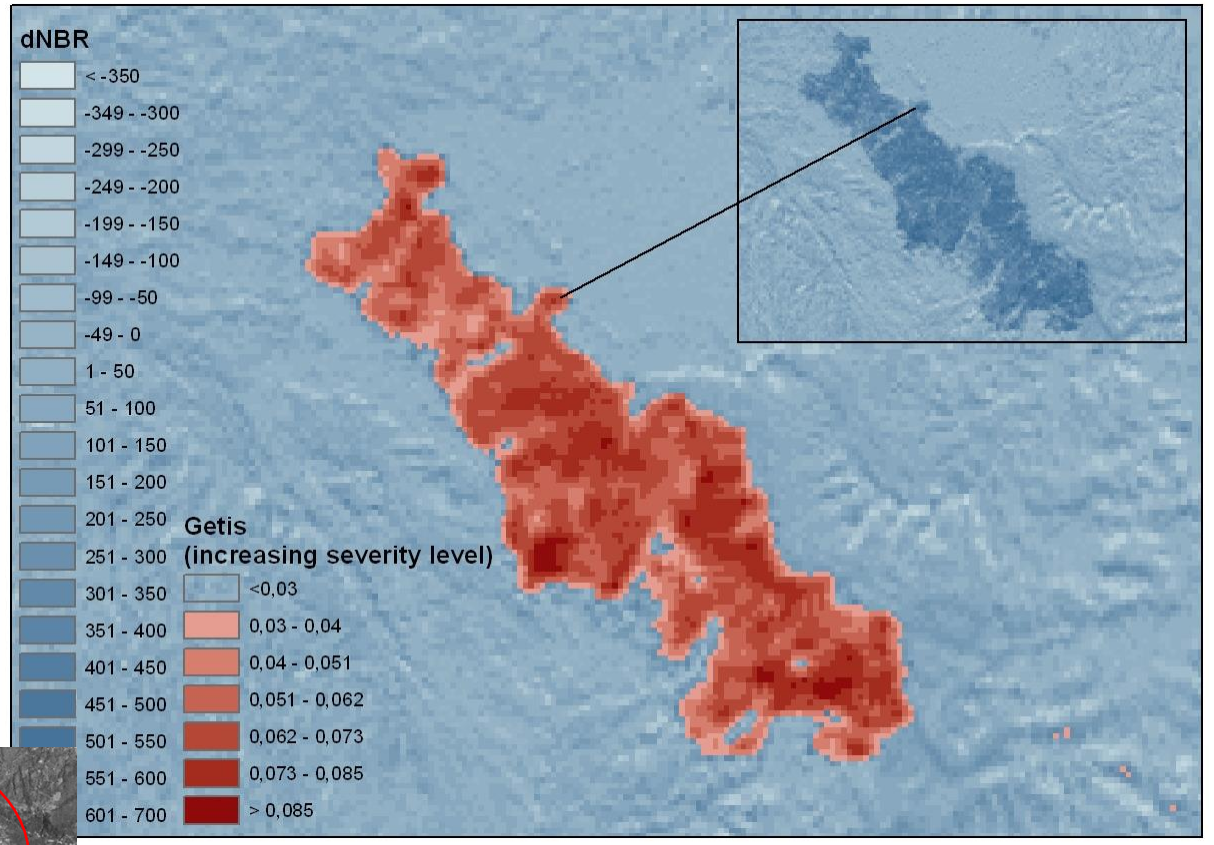


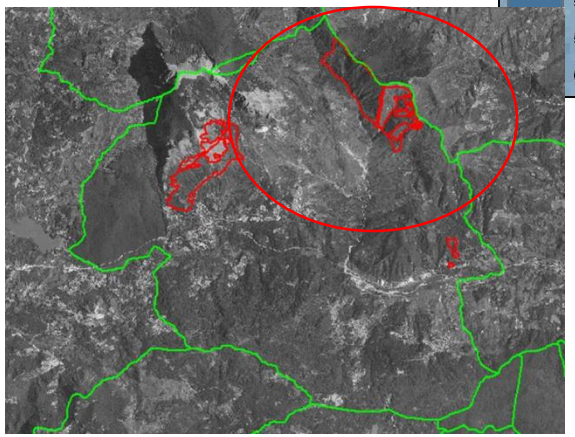


ALanorte, M Danese, **R Lasaponara, B Murgante Multiscale mapping of burn area and severity using multisensor satellite data and spatial autocorrelation analysis International *Journal of Applied Earth Observation and Geoinformation 20, 42-51***

Fire Severity map based on ASTER NBR Index







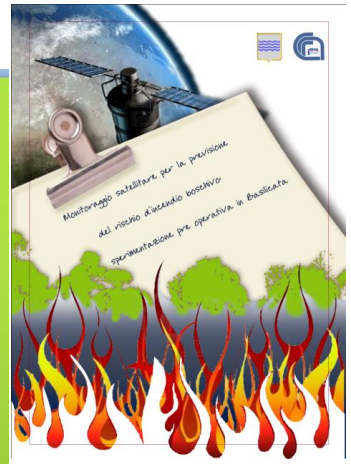
-Burned areas
-Dead Fuel load
-Geomorphological risk

FIRE SEVERITY – MARINA DI MARATEA 07-08-2016

Utilizzo di immagini Sentinel 2 ad alta risoluzione per lo studio della severità delle aree percorse dal fuoco.

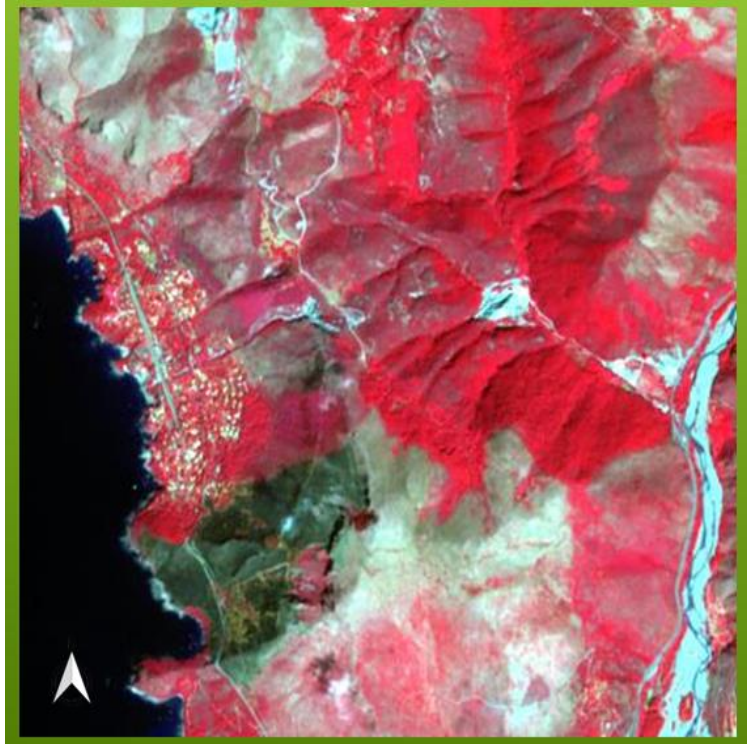
RGB pre-fire Sentinel 2

RGB post-fire Sentinel 2

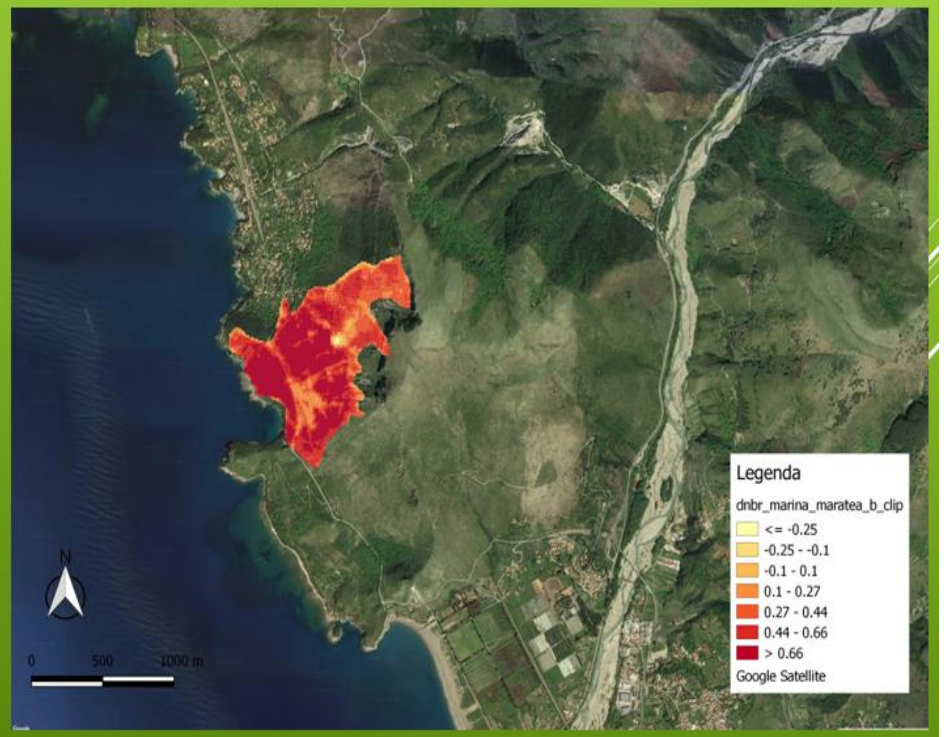


FIRE SEVERITY – MARINA DI MARATEA 07-08-2016

False Color Sentinel 2



Indice ΔNBR per la stima della severità



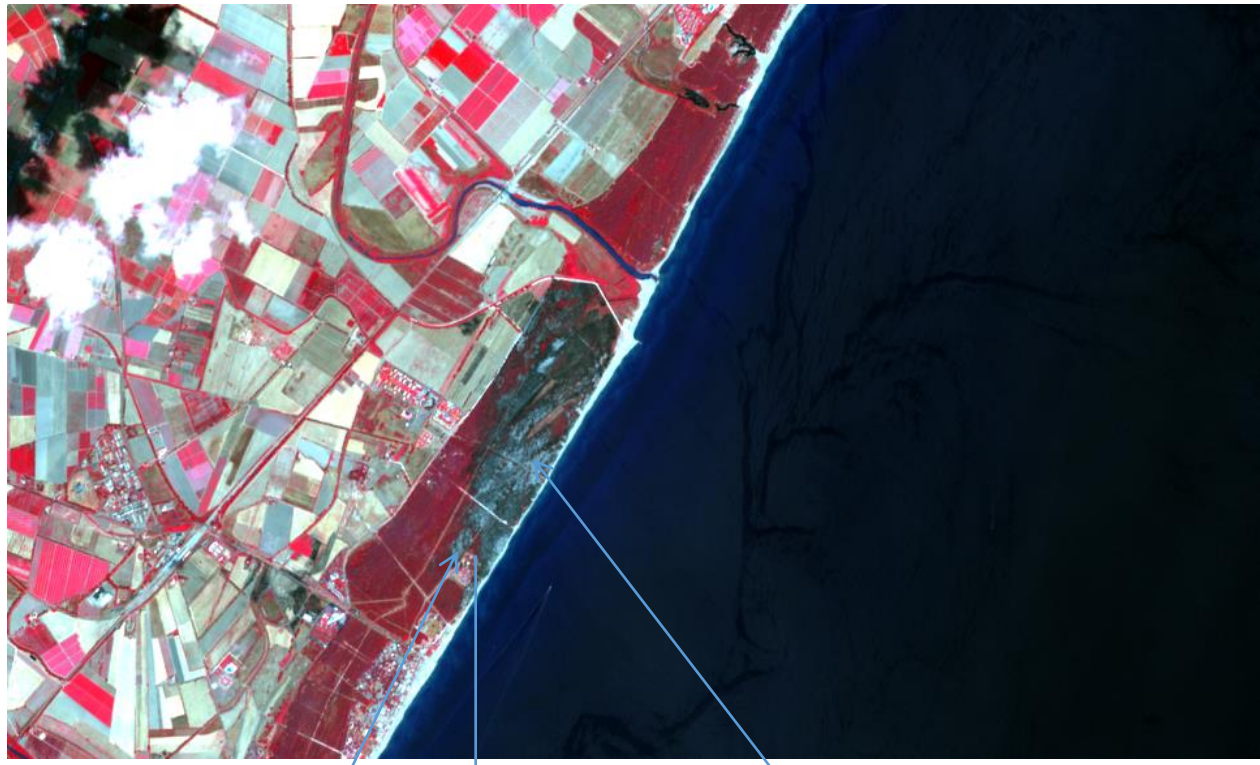
Work in progress
Sentinel 1 for burned area and fire severity

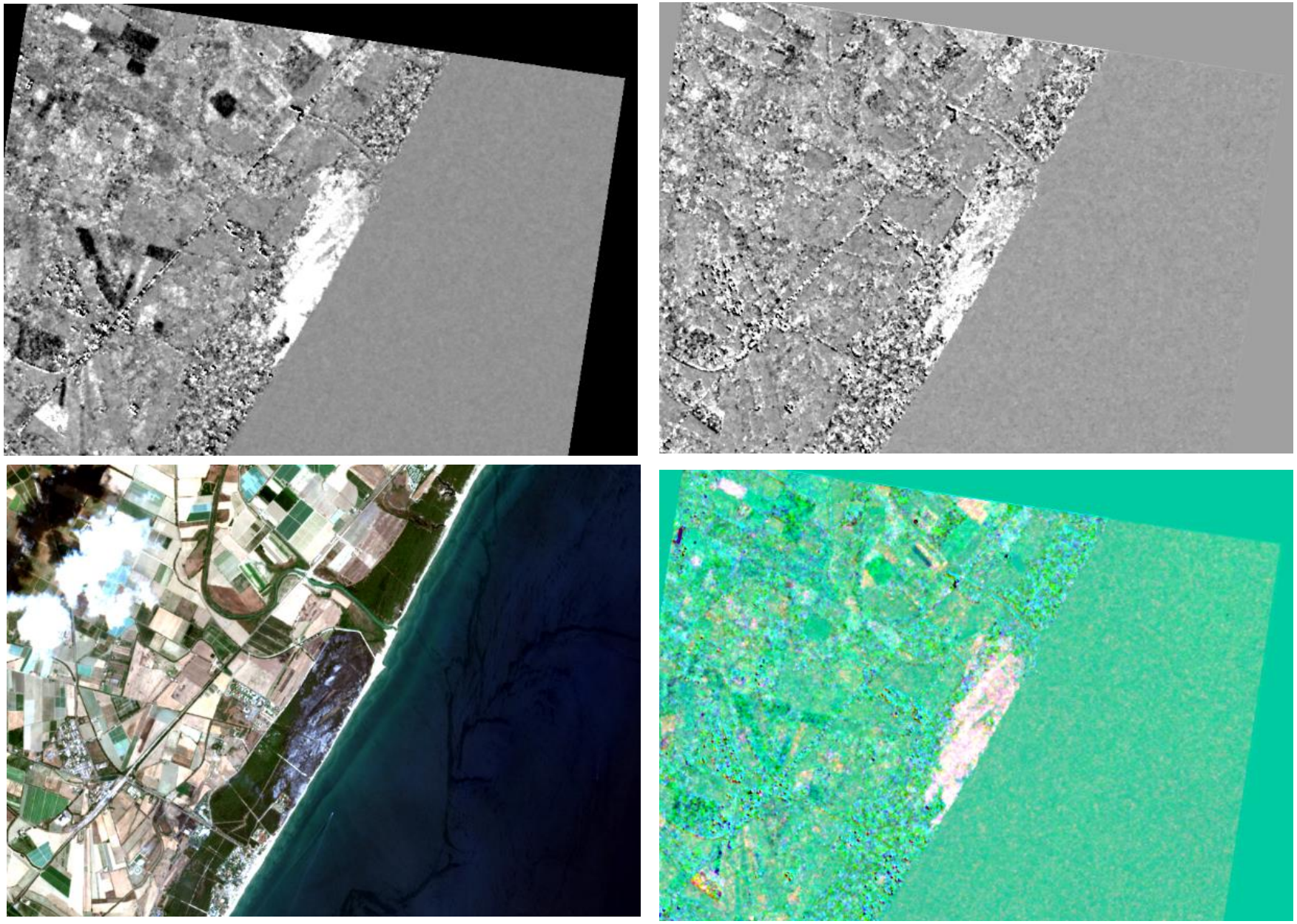
- RBR $_{xy}$ = Postfire average bascatter $_{xy}$ / Prefire average Backscatter $_{xy}$ (1)
- RBD $_{xy}$ = Postfire average bascatter $_{xy}$ - Prefire average Backscatter $_{xy}$ (2)
- RBR and RBD were calculated for each polarization (HH and HV) and using both (i) one pre and one post-fire image (acquired under dry conditions) and (ii) backscatter time averaged of pre and post-fire scenes.

Pre Fire date multi_image	Post-fire date multi_image
S1A_IW_GRDH_1SDV_20170607T045533_	S1B_IW_GRDH_1SDV_20170719T045504__
S1B_IW_GRDH_1SDV_20170613T045502_	S1B_IW_GRDH_1SDV_20170731T045505__
S1A_IW_GRDH_1SDV_20170619T045533_	S1A_IW_GRDH_1SDV_20170806T045536
S1B_IW_GRDH_1SDV_20170625T045503_	S1B_IW_GRDH_1SDV_20170812T045505__
S1B_IW_GRDH_1SDV_20170707T045503_	S1B_IW_GRDH_1SDV_20170824T045506_
S1A_IW_GRDH_1SDV_20170713T045535_	S1A_IW_GRDH_1SDV_20170830T045537__
Pre-Fire date single_image	Post-Fire date single_image
S1B_IW_GRDH_1SDV_20170707T045503_	S1B_IW_GRDH_1SDV_20170719T045504_

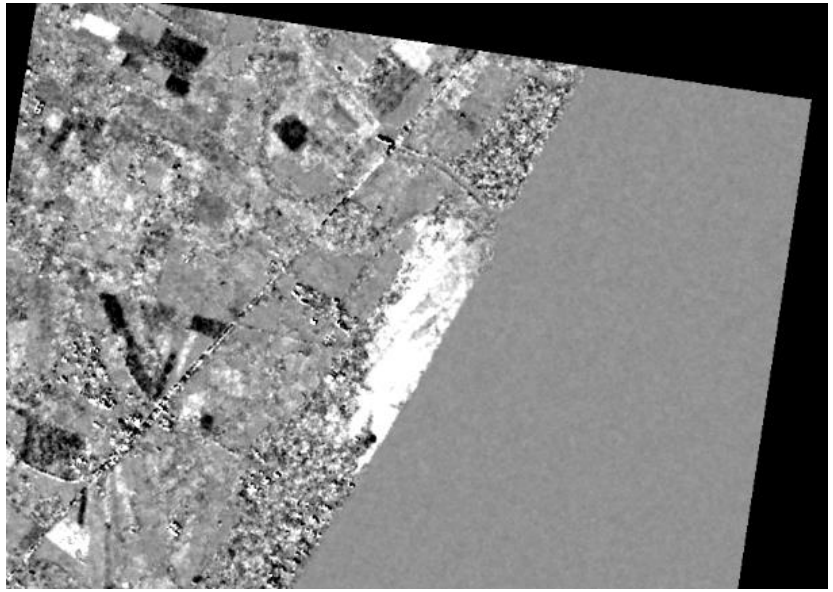
Table 1. The dates of satellite acquired before and after the fire in a Descending pass, by Sensor S1a and S1, in the VV,VH polarization with an incidence angle 30.6 °~46.3° and resolution at 20 x 22 m (in range x azimuth). The type of products used is GRDH

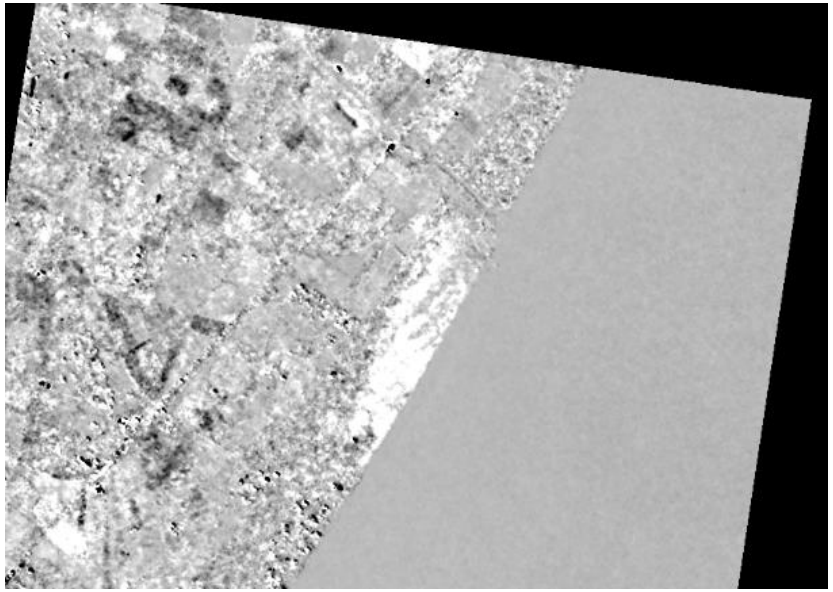
Metaponto Fire 13 July 2017

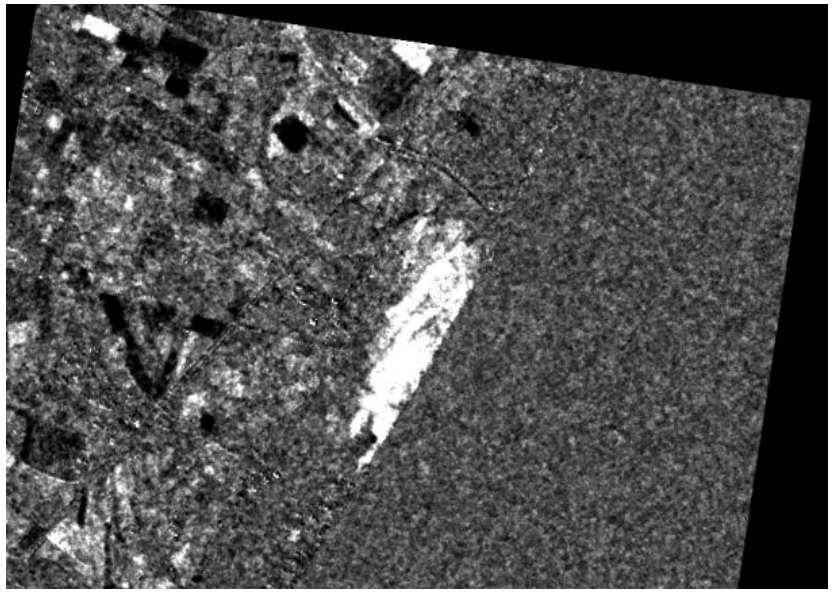


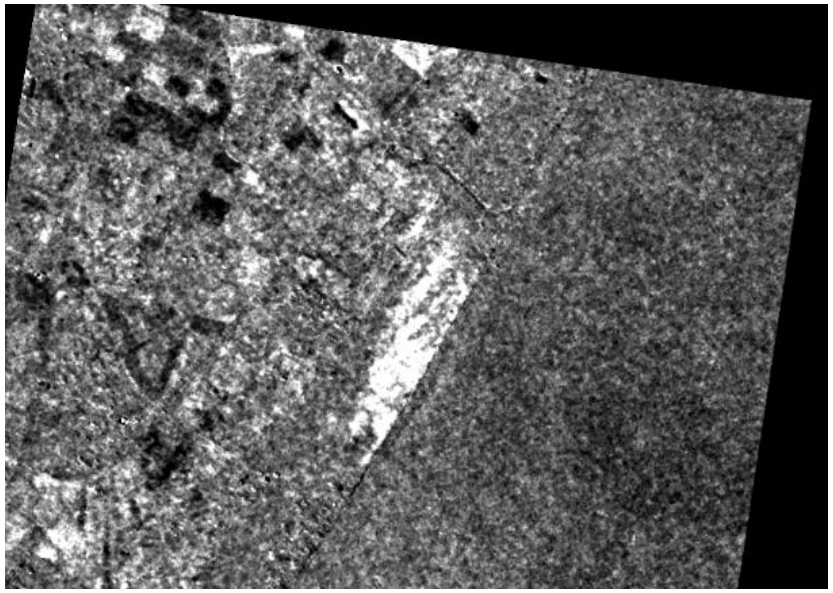


UP: RBD computed on the averaged scenes and on the single scenes, in left and right, respectively.
Bottom RGB of Sentinel-2 acquired after the fire occurrence and RGB composit of RBR_{VH} and RBD_{VV} and RBR_{VH} respectively



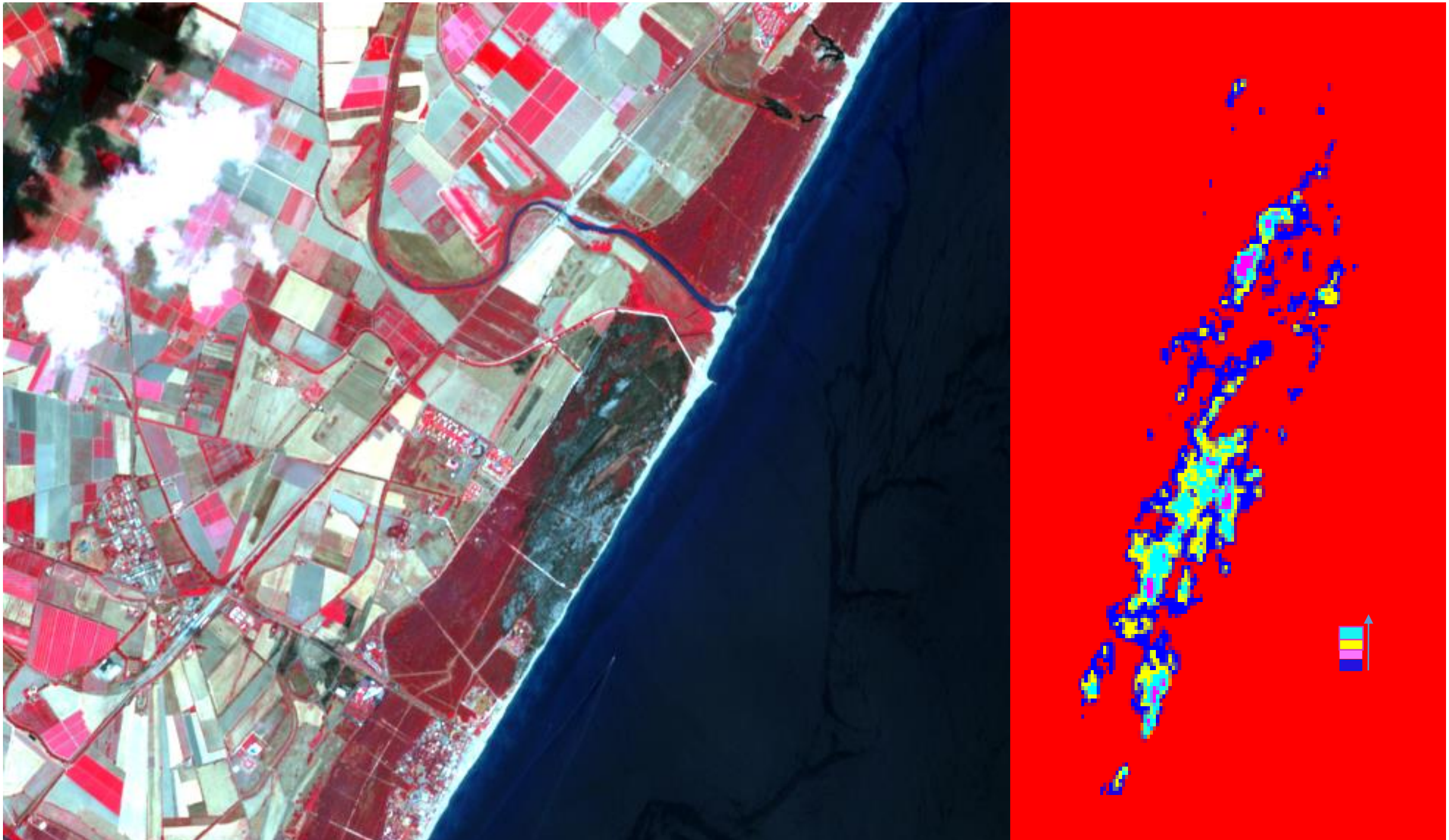






Up: Averaged **RBD** of pre and postfire as obtained from **VH and VV polarization, in left and right, respectively**.

Bottom Averaged **RBR** of pre and postfire as obtained from **VH and VV polarization in left** and right, respectively



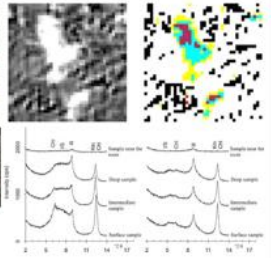
Burnt areas, fire severity and hydrogeological risk

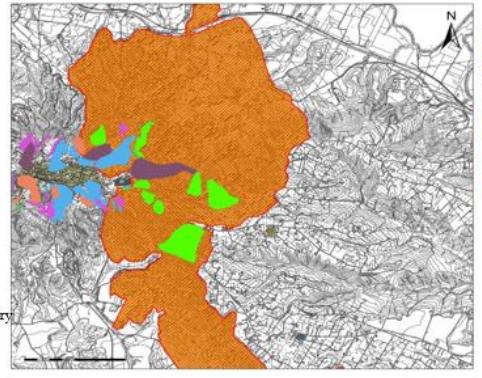
In this paper, we present outputs from research activities we conducted in the framework of the FIRESAT project (funded by the Office of Civil Protection of the Department of Infrastructure of the Basilicata Region) in the context of burn severity mapping addressed to the estimation of post fire damage mainly for the (i) assessment of the impact of fire on soil and hydrological risk and (ii) to support the definition of mitigation strategy.

At local scale, managers need to be aware of the impacts that fire can have on soil systems, and how these impacts can lead to undesired changes in site productivity, sustainability, biological diversity, and watershed hydrologic response. For this reason, the availability of reliable and timely information on fire affected areas and burn severity (and expected changes) is crucial to mitigate post fire damage and optimize strategies related to post fire damage management. The methodological approach devepoled for the Basilicata Region is based on (i) the estimation of fire severity using MODIS, TM and Sentiel 2 data, (ii) in situ analysis and (iii) the statistical investigations on the co occurrence between fire and landlside events. As an example, the Pisticci fire (2012) and below the maps for 2011 and 2012

As an example of the methodology herein the case study of the Pisticci fire (2012) is presented

In situ investigation and acquisition of samples for the laboratory analysis in the case of Pisticci Fire 2012

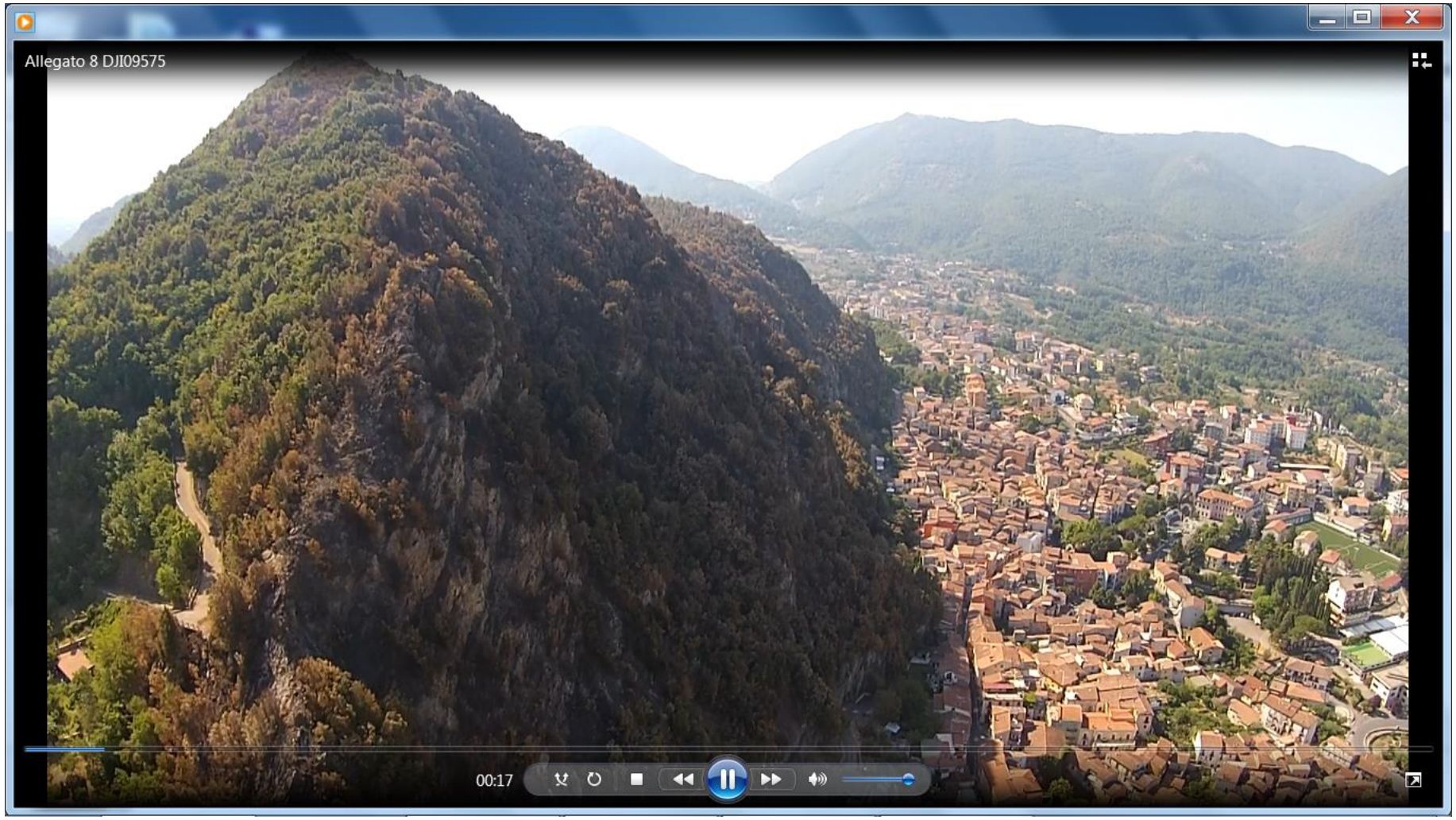




Orange burnt areas where we overlapped landslides occurred after the fire

Co-occurence of fires and landslides (orange dots in the figure) for 2011

Co-occurence of fires and landslides (red dots in the figure) as assessed for the 2012 events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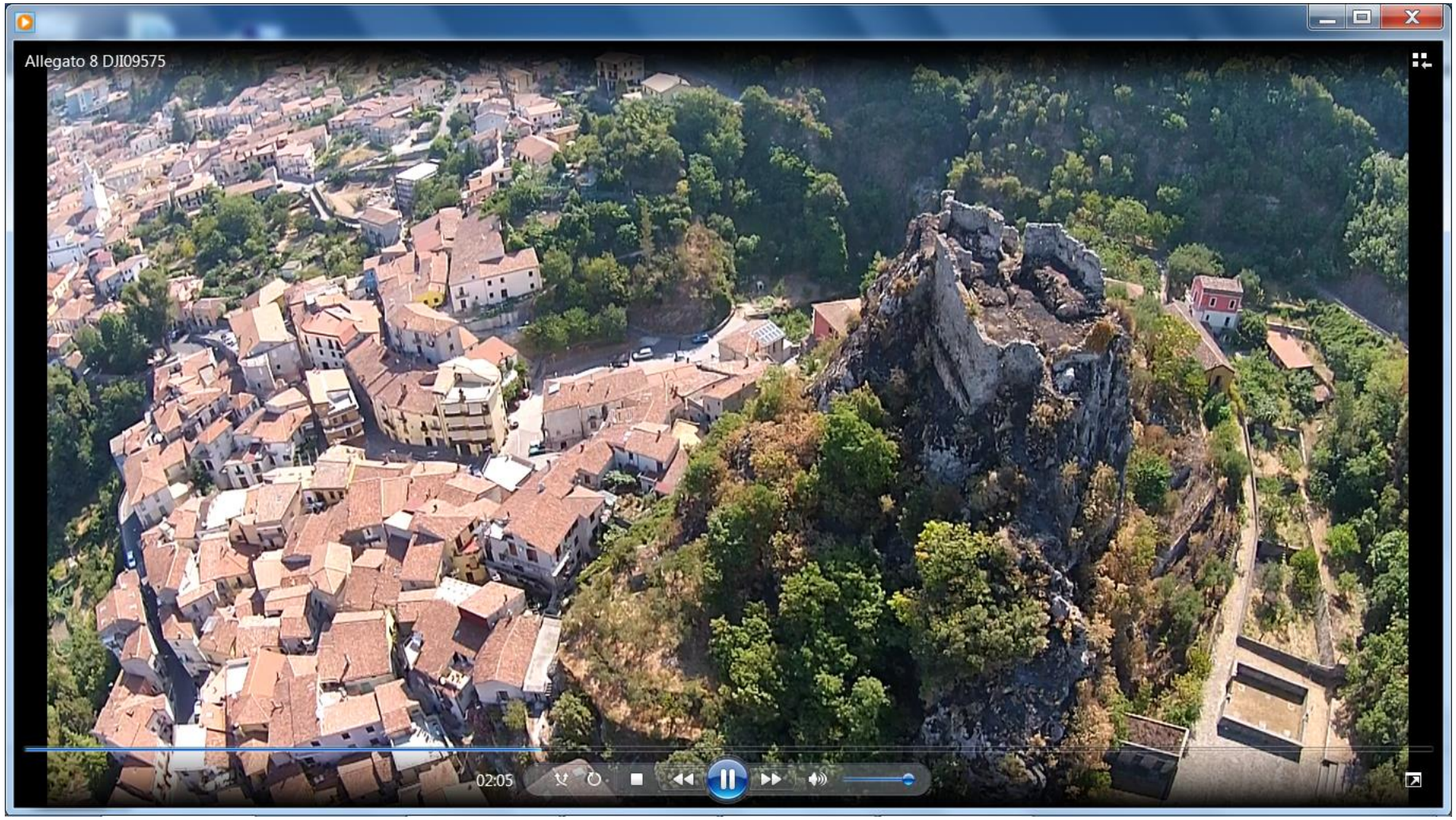
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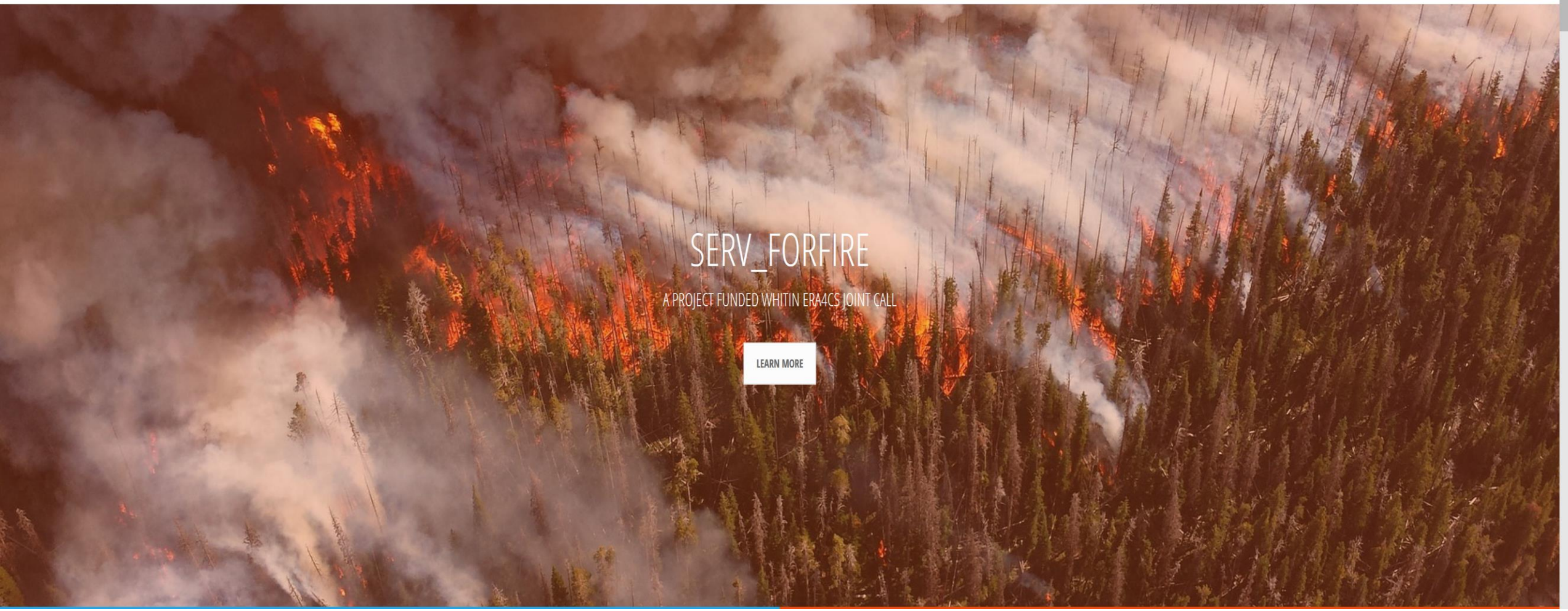
SERV_FORFIRE_ERA4CS

https://servforfire-era4cs.eu/

SERV_FORFIRE
INTEGRATED SERVICES AND APPROACHES FOR FIRE MONITORING

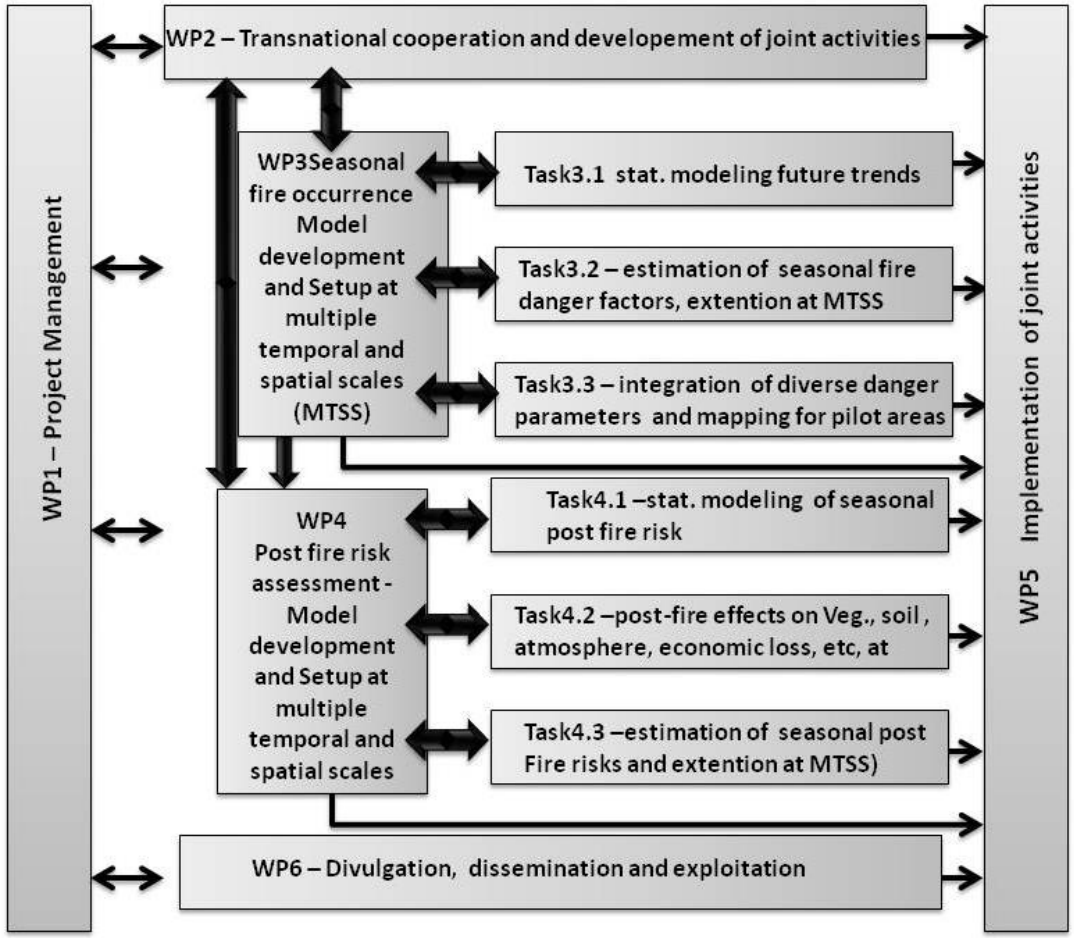
HOME THE PROJECT CASE STUDIES DISSEMINATION FIRE SEASON TRAINING ACTIVITIES NEWS MEETING AND EVENTS OTHER LINKS



Project details

Users involved in the project:

Acronym of end-user organization	Full name of end-user organization	Name of contact person	Email adress of contact person
DPC_Basilicata	Dipartimento di Protezione Civile della Regione Basilicata	Guido Loperte	guido.loperte@regione.basilicata.it
GEOCART SPA	GEOCART SPA	Raffaele Santangelo	r.santangelo@geocart.net
Comune di Lauria	Comune di Lauria	Gaetano Cantisani	llpp.lauria@rete.basilicata.it
UNIBAS	Università degli Studi della Basilicata	Mauro Fiorentino	mauro.fiorentino@unibas.it
CONICET-ECOTONO	Consejo Nacional de Investigaciones Científicas y Técnicas	Luciana Ghermandi	lghermandi@yahoo.it
Finnish Rescue Services, North Karelia	Finnish Rescue Services, North Karelia	Mika Viertola	mika.viertola@pkpelastuslaitos.fi
AVI	Regional State Administrative Agency, Northern Finland	Mika Kurvinen	mika.kurvinen@avi.fi
	Ministry of the		



THE PROJECT

"INTEGRATED SERVICES AND APPROACHES FOR ASSESSING EFFECTS OF CLIMATE CHANGE AND EXTREME EVENTS FOR FIRE AND POST FIRE RISK PREVENTION"

OBJECTIVES

The project was funded within ERA4CS Joint call with the purpose of creating an international collaborative community, expert in remote sensing soil and vegetation, risk management and mitigation for the fire and post fire risk management in Europe at climatic time scales.

SERV_FORFIRE aims at creating an international collaborative community, expert in remote sensing soil and vegetation, risk management and mitigation, to provide climate information along with decision makers and planning authorities

SERV_FORFIRE
FIRE MONITORING PROJECT

ERA4CS European Research Area for Climate Services

THE PROJECT

OBJECTIVES

The project aims at creating an international collaborative community, expert in remote sensing soil and vegetation, risk management and mitigation, to provide climate information along with decision makers and planning authorities in order to:

- Increase **efficiency of decision and policy makers authorities response**, to improve the preparedness level of our societies and to limit the high economic cost of climate variability impact on fire and post fire risks, **develop methods and procedures**within the framework of fire and post fire risk management in Europe at climatic time scales.
- Strengthen the science-policy-society nexus using a participatory approach, by improving operational or experimentally tested climate services in Europe, tailoring relevant information for decision and policy makers through a participatory and circular approach, capacity building user-based tools, specific training programs, dissemination activities.
- Increase the information regarding the **drought conditions on wildfire** and post fire risks management at climatic time scales for national and local authorities decision-making procedures and **planning activities**.
- Investigate **adaptation strategies and approaches** to deal with future fire occurrence.
- Collect scenarios on the effects of climate **change** on vegetation and **fire occurrence**.

PILOT AREAS

SERV_FORFIRE Joint Activities will take place in Pilot Areas which have been selected by the partners as more appropriate for this action.

A template has been created and filled in by the partners for the Pilot Areas which includes information about the responsible partner, the proposed activities, the availability and characteristics of the data sets and descriptive information, necessary for the organization of common activities.

The first version of the completed Pilot Areas Templates are presented below:

- Finland
  EASTERN FINLAND
- Greece
  EASTERN ATTIKA
- Italy
  BASILICATA REGION
- Italy
  TUSCANY REGION
- Czech Republic
  CZECH REPUBLIC

PARTNER

Consiglio Nazionale delle Ricerche
Dipartimento Scienze del Sistema Terra e Tecnologie per l'Ambiente Terra

DISSEMINATION

A continuous cooperation has been established by FMI team with the Finnish Rescue Services aiming at further development of fire danger forecasting services, including discussion about the services developed within SERV_FORFIRE.

SERV_FORFIRE was presented by the KNMI team at a national ERA4CS workshop in The Hague, on 4 April 2018. The audience consisted of staff from several Netherlands ministries that are involved in climate policies. Contacts were established with the Ministry of Justice and Security and with the Institute for Safety.

SERV_FORFIRE project was presented at the European Researchers' Night within BRAINCITIES project, held in Potenza, 28 September 2018.

WORK IN PROGRESS: Pm 10 FROM SATELLITE LANDSAT TM DATA AND ESTIMATION OF EMISSION