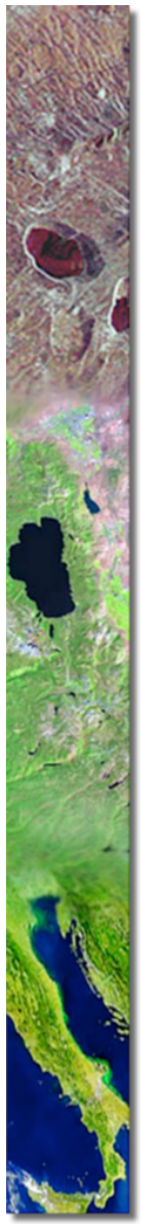


GEO-K s.r.l., Via del Politecnico
1, 00133, Rome, Italy
Ph.: +39 06 9418 8571,
cosimo.putignano@geok.it

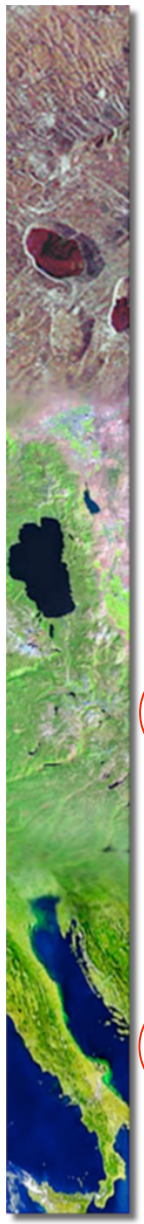
Earth Observation Laboratory
PhD Program in GeoInformation
DISP - Tor Vergata University

TERRASAR-X IMAGING FOR UNSUPERVISED LAND COVER CLASSIFICATION AND FIRE MAPPING

Authors:

A.Burini, ***C. PUTIGNANO***, *F. Del Frate, M. Lazzarini, G. Licciardi, G. Schiavon, D. Solimini, F. De Biasi, P. Manunta*

Aims



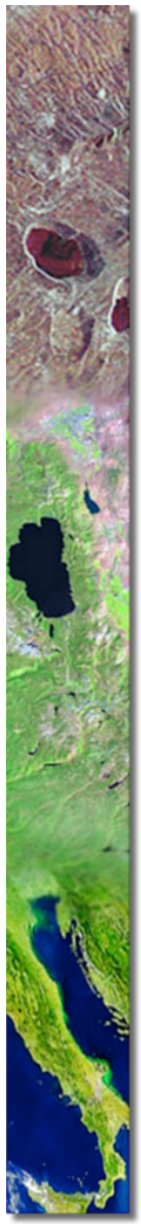
- to understand the main textural features of the X-band radar backscattering from various kinds of surfaces
- to assess the potential of images acquired by X-band space borne radars:

case studies:

1. *IN MAPPING FIRE SCARS* → Greece

2. *IN CLASSIFYING SUBURBAN/AGRICULTURAL LAND COVER* → Italy

Method



Novel unsupervised neural network algorithm:

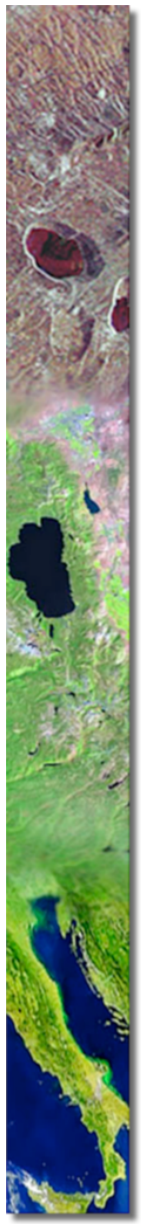
Textural Self-Organizing Map (TexSOM)

Textural object +

Shape object +

Radiometric layers =

TexSOM Unsupervised Classification



Application to fire scars mapping

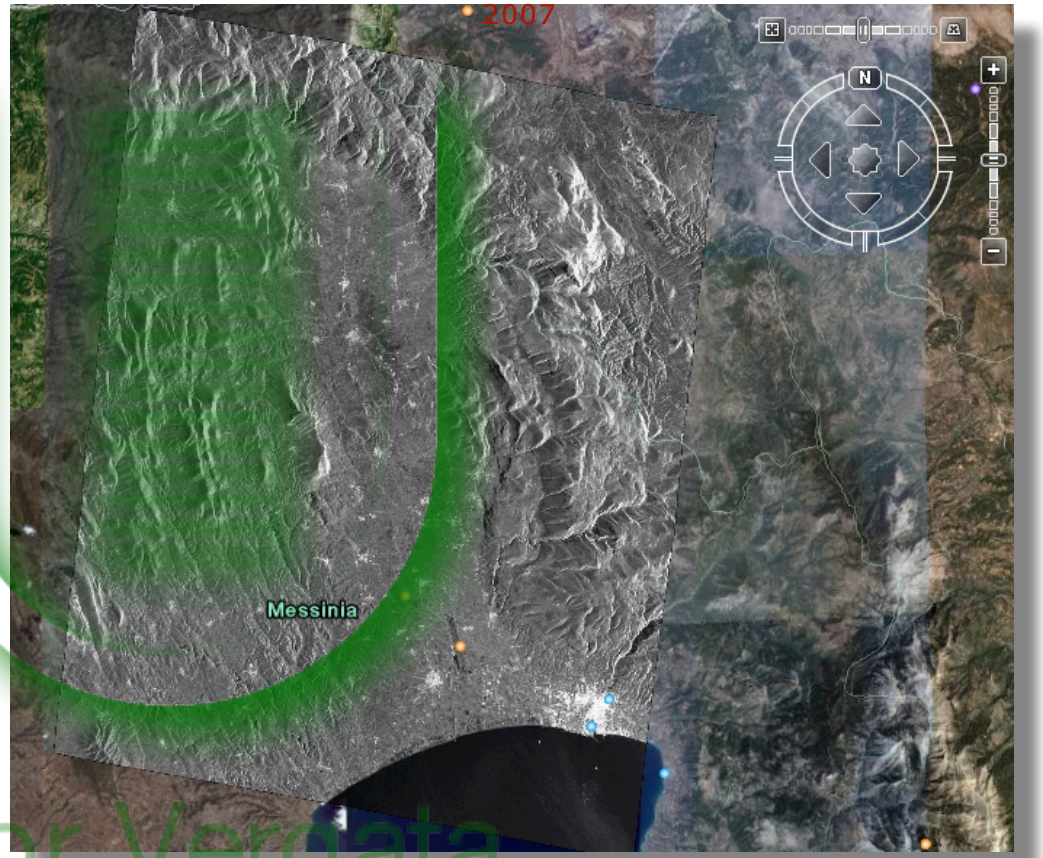
Geoinformation

Tor Vergata

1st Area and Data Description: Greece

polLayer>**HH**
orbitDirection>**DESCENDING**
lookDirection>**RIGHT**
polarisationMode>**SINGLE**
productType>**MGD_SE_SM_S**
projection>**GROUNDRANGE**

3 September 2007

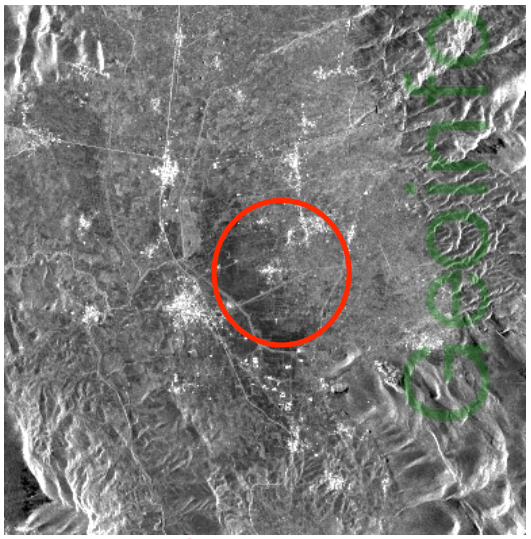


Near Range

Region of Kalamata in the Peloponnese Peninsula, Greece, where extremely severe fires, which caused the death of at least **60 people**, burned hundreds of homes and compelled thousands of people to run away, had occurred just a few days before the satellite overpass

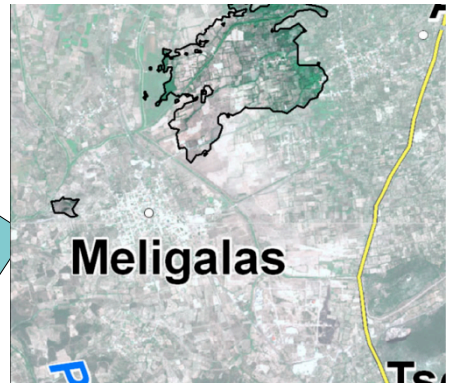
Fire Scars

The fire scars have first been identified with the help of Landsat images on ESA web site:
http://earth.esa.int/ew/fires/Greece_Peloponnesus_fires aug07/



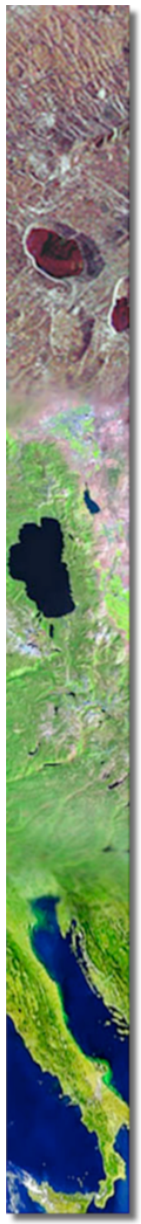
TerraSAR-X, HH

Landsat TM



TerraSAR X HH

Unsupervised Algorithm Description



Object layers computed from HH backscattering intensity image

1) **Automatic Segmentation**

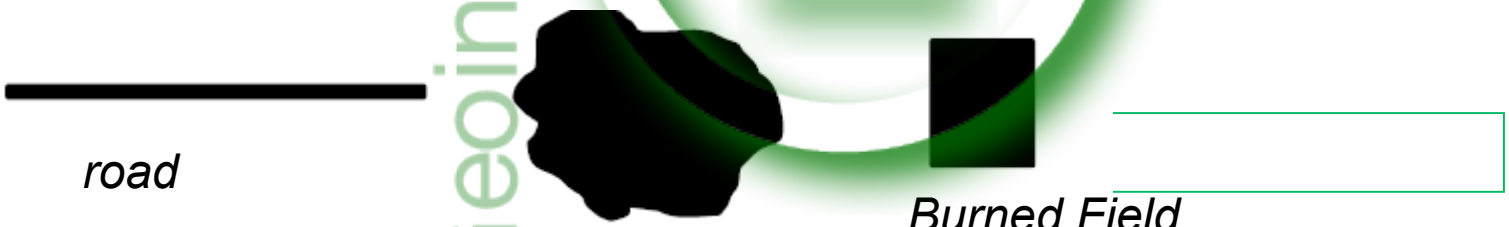
2) **Shape and Textural Features calculation and optimization**

3) **SOM** Classification

Automatic Segmentation

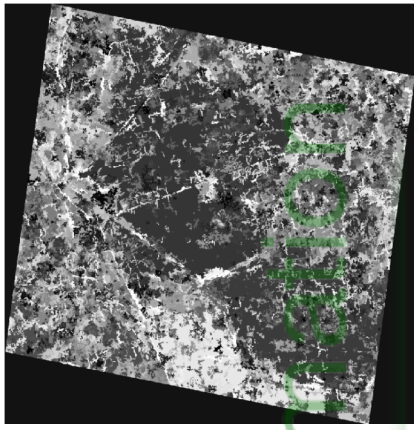
By automatic segmentation **partially independent object** layers are computed

Why Objects??

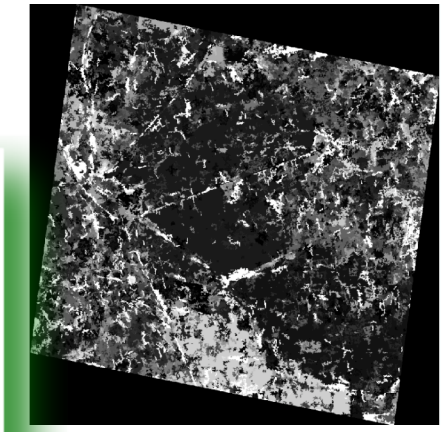


Same pixel value, but different **object value**

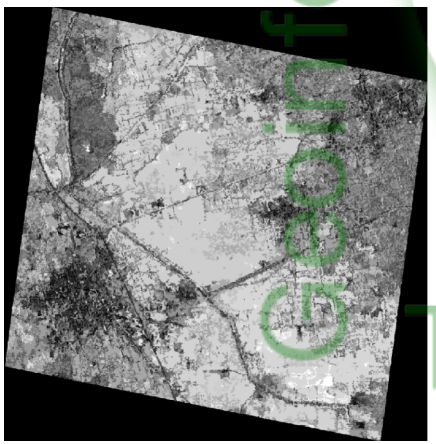
Object layers



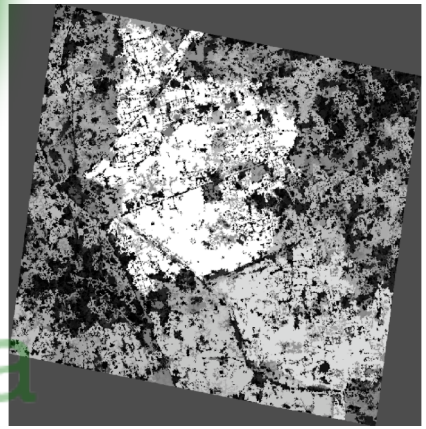
Asymmetry



Lenght_on_Width



Mean



Shape_index

TexSOM Scheme

BACKSCATTER

OBJECTS

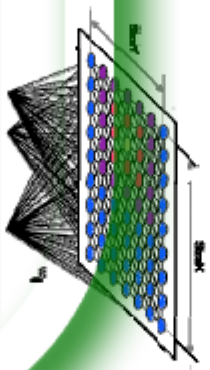
HH

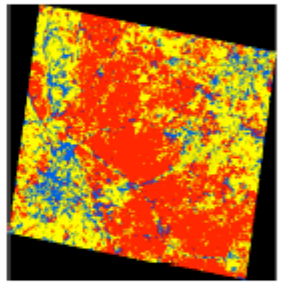
Asymmetry

Lenght_on_Width

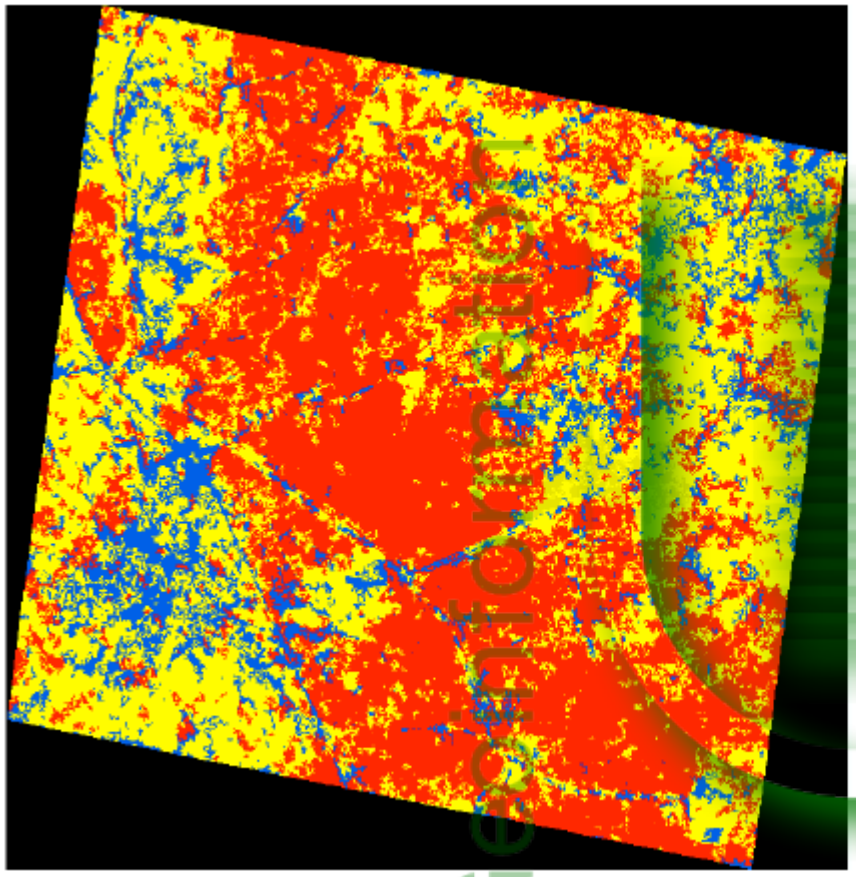
Mean

Shape_index



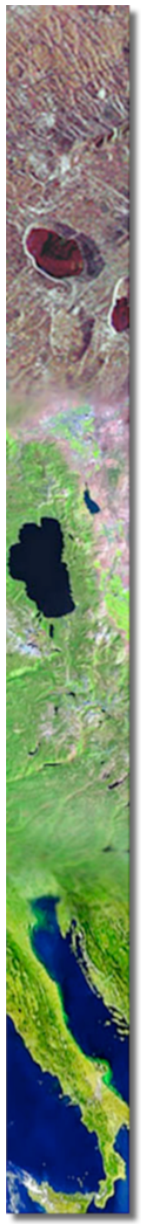


Classification result



Crops
Urban
Burned Areas

NO POST-CLASSIFICATION FILTER!!
Urban areas and streets are CRITICAL
for firefighting



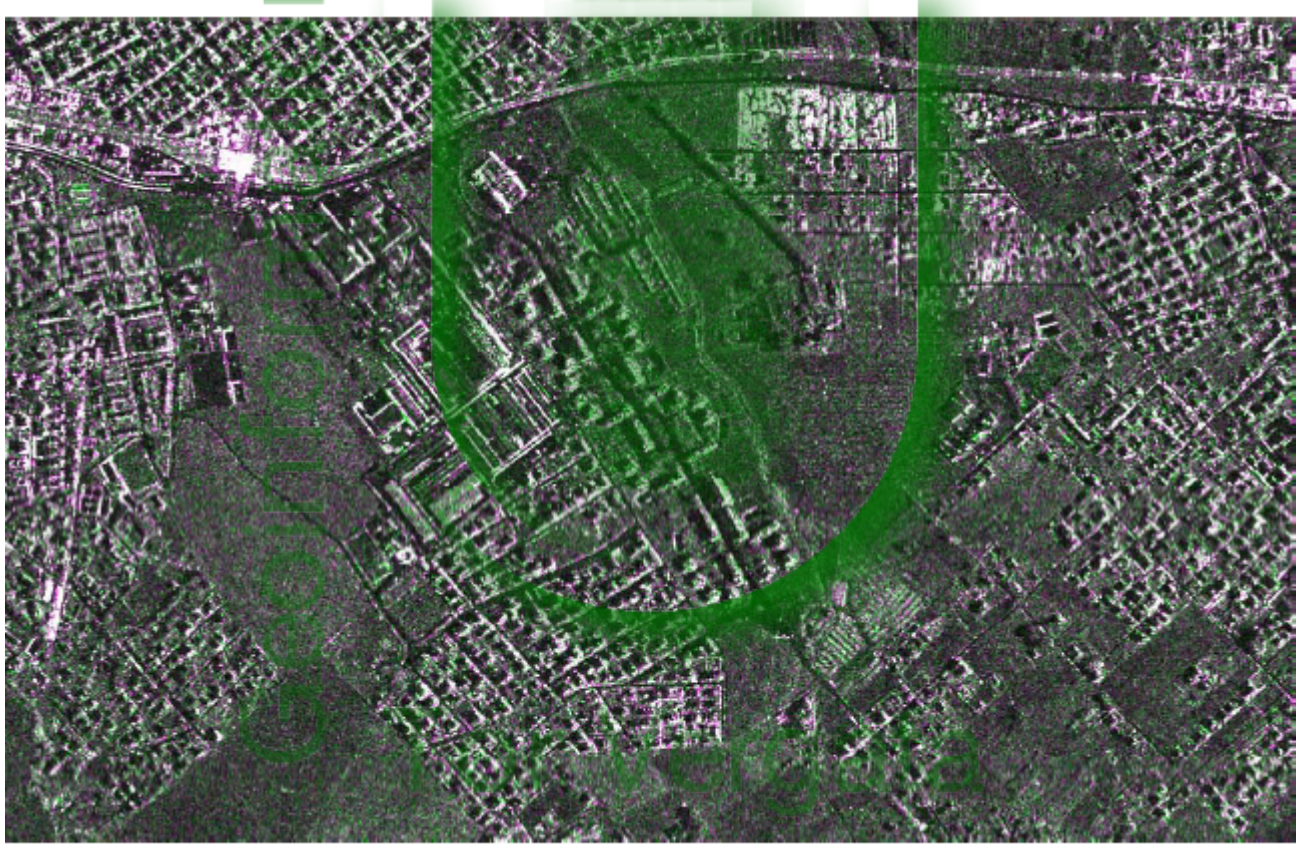
Application to sealing maps

Geoinformation

Tor Vergata

2st Area and Data Description: Italy

TexSOM classification applied to dual polarization TerraSAR-X acquisitions on the Tor Vergata, Rome, test site



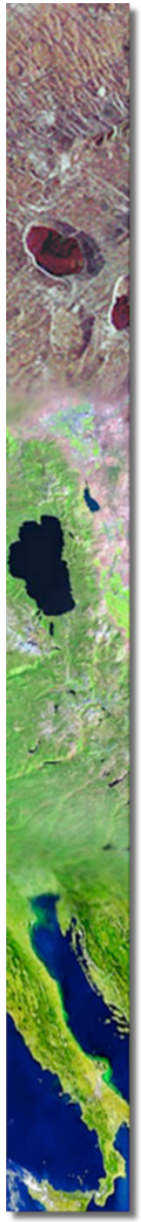
R,B= HH; G=VV

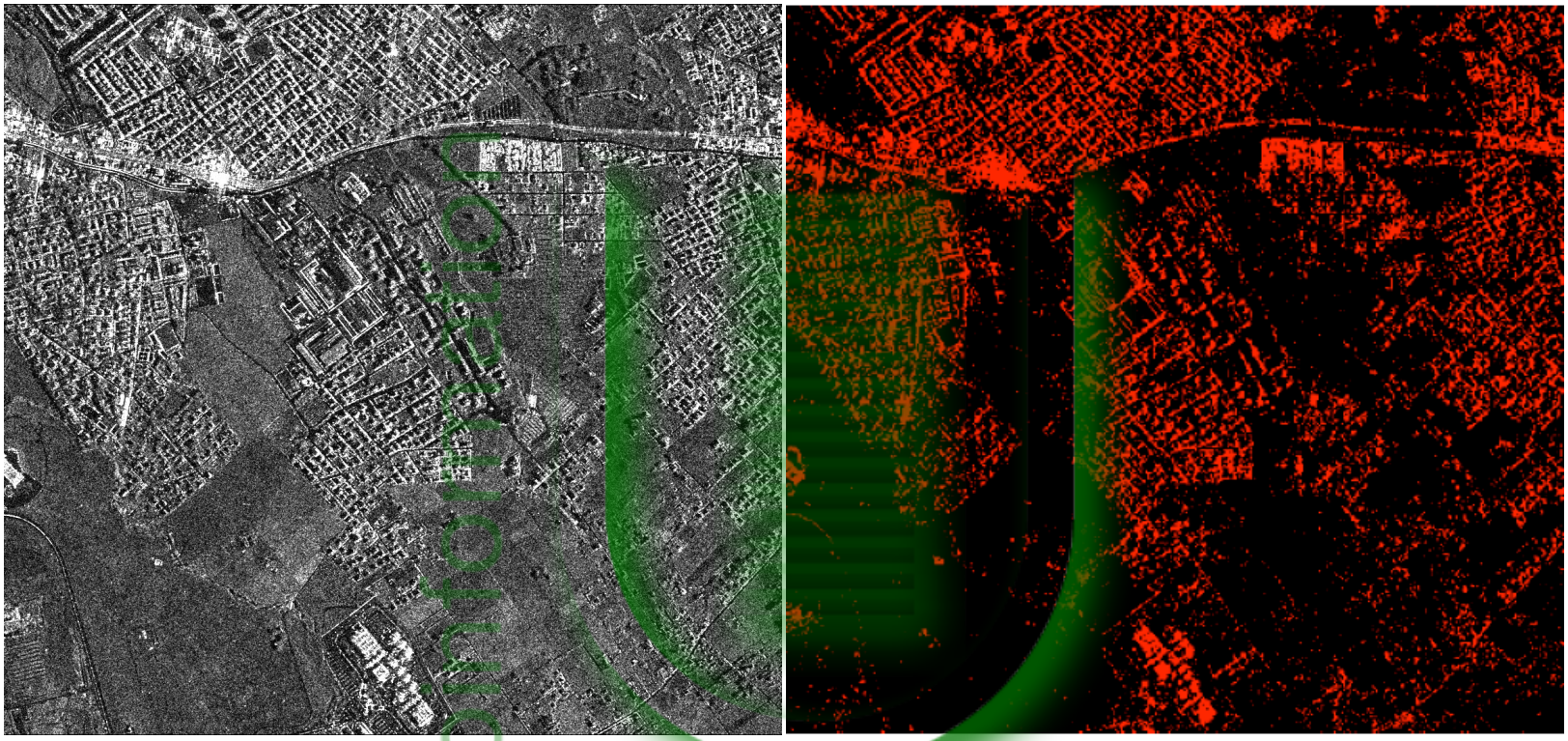
Textural, shape and raster layers combination

	R	G	B
Co_occ_Contrast_HH	1		
Co_occ_Contrast_VV			1
HH_09			3
Occ_data_Range_HH		1	1
Occ_Mean_HH		3	
Occ_Mean_VV	1	1	
VV_09	3		

Textural layers derived from HH and VV images

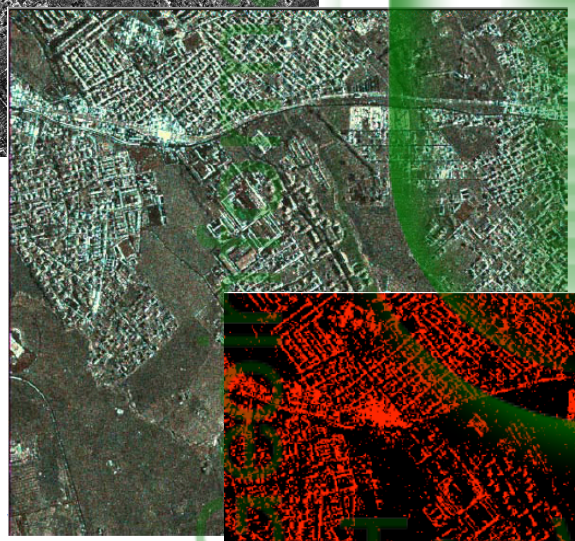
Sealing Map

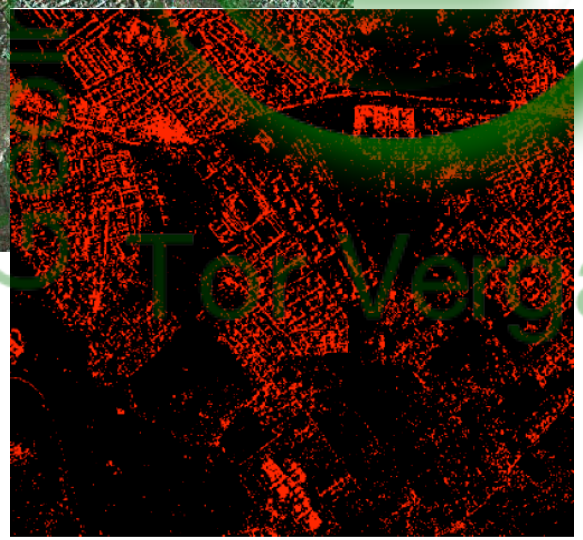




Sealing map generated by TexSOM

Sealing Map





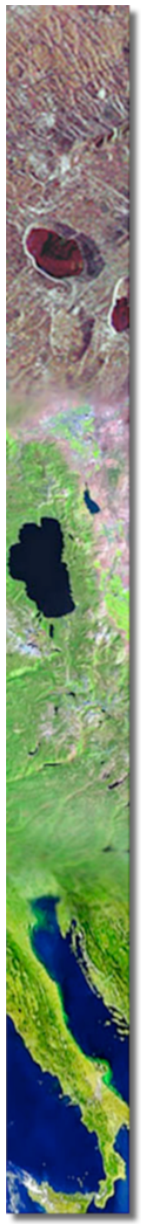
Overall Accuracy = 86.95%

Kappa Coefficient = 0.71

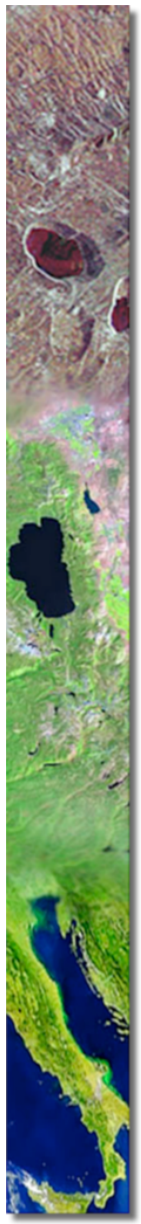
Ground Truth (Percent)

Class	Unsealed	Sealed	Total
Unsealed	82.50	2.15	59.28
Sealed	17.50	97.85	40.72

Conclusions



- TerraSAR-X data used to produce both fire scar and sealing maps.
- A set of object layers extracted from the backscattering intensity image used to implement TexSOM (Texture SOM) for unsupervised classification.
- TexSOM fed by texture layers provide fire scars and sealing maps.
- Both results are relevant to the management of a fire event. Distance of fire from urban areas and fire extension are important for planning firefighting.
- Smoke in the most active and changing burning areas limits the use of optical observations.
- The short revisit-time SAR constellations will offer the means of acquiring data vital for actions in severe fire emergencies.



Thank you for your attention

GEO-K s.r.l., Via del Politecnico 1, 00133, Rome, Italy
Ph.: +39 06 9418 8571,
cosimo.putignano@geok.it

www.geok.it

Earth Observation Laboratory
PhD Program in GeoInformation
DISP - Tor Vergata University

www.disp.uniroma2.it/earth_observation/