

Remote Sensing in ECOPOTENTIAL

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Presenting the work of CNR, UNSW, EURAC, CSIC, UFZ,
DLR, ESL, CERTH, FORTH, BGU, CSIR, ISPRA, UAB, EAA, TdV,
Deltares, Starlab, MLU, UPS, UNS



Offerings

What is possible with Remote Sensing?

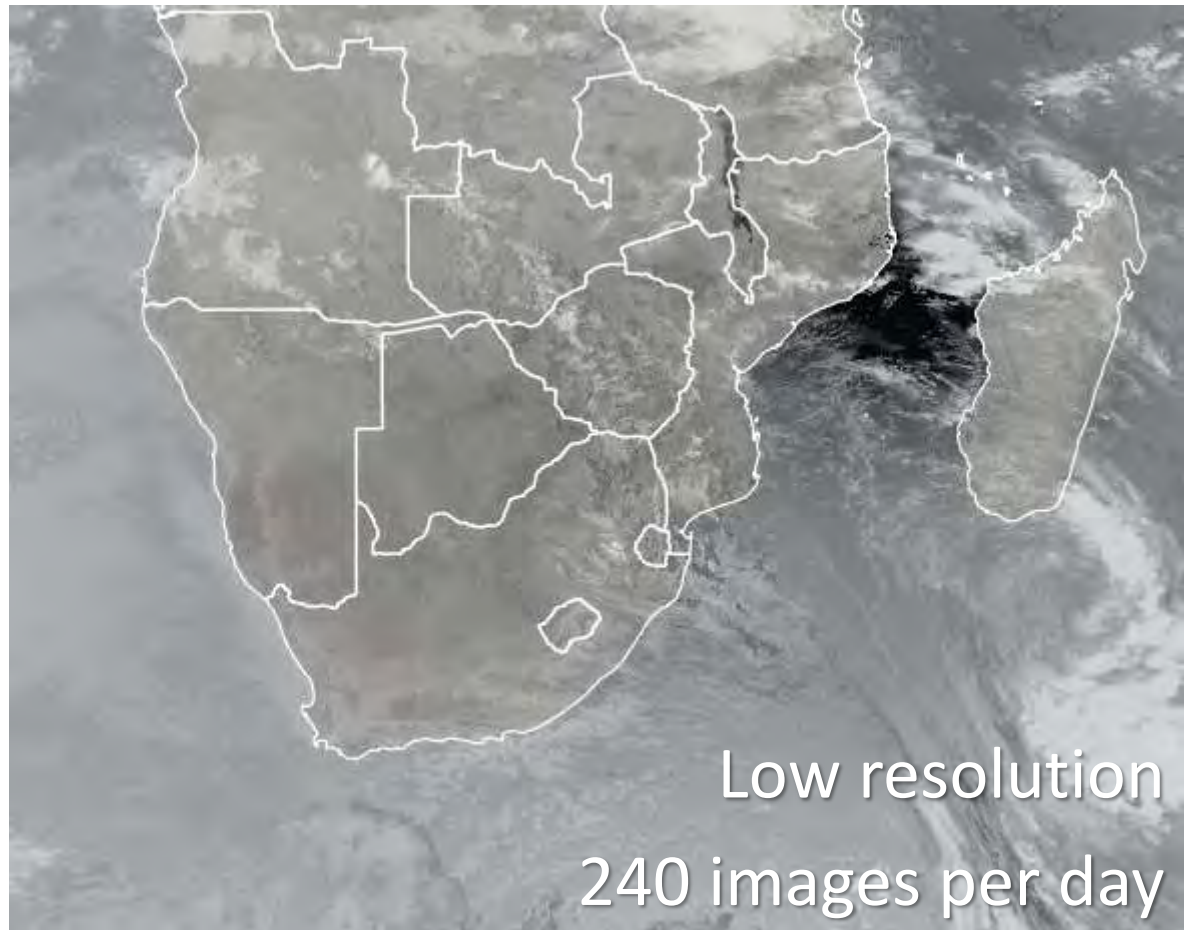


This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

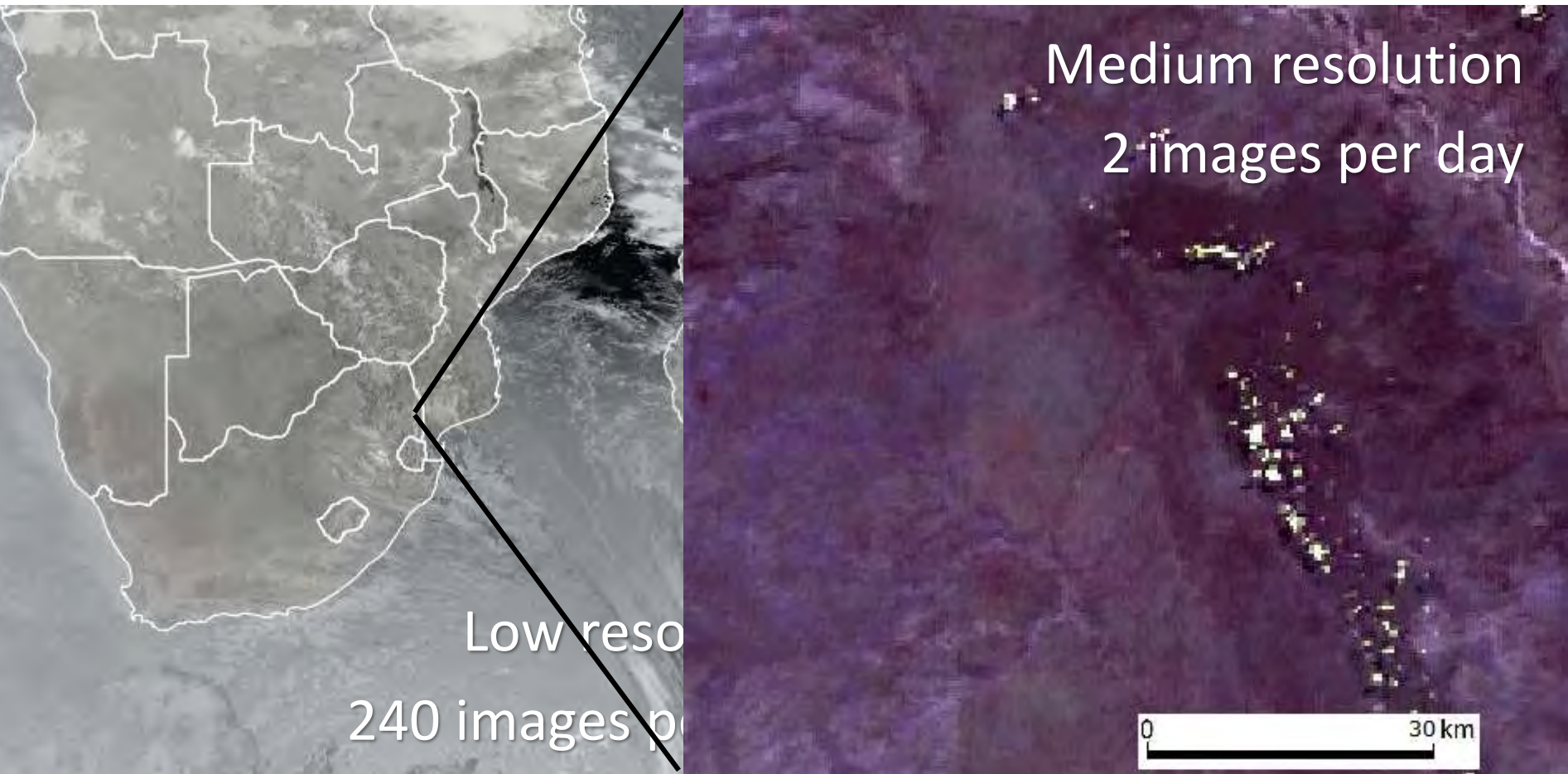


SPACED Workshop: Using Earth Observations to Protect Natural Landscapes. Brussels 10.01.2018

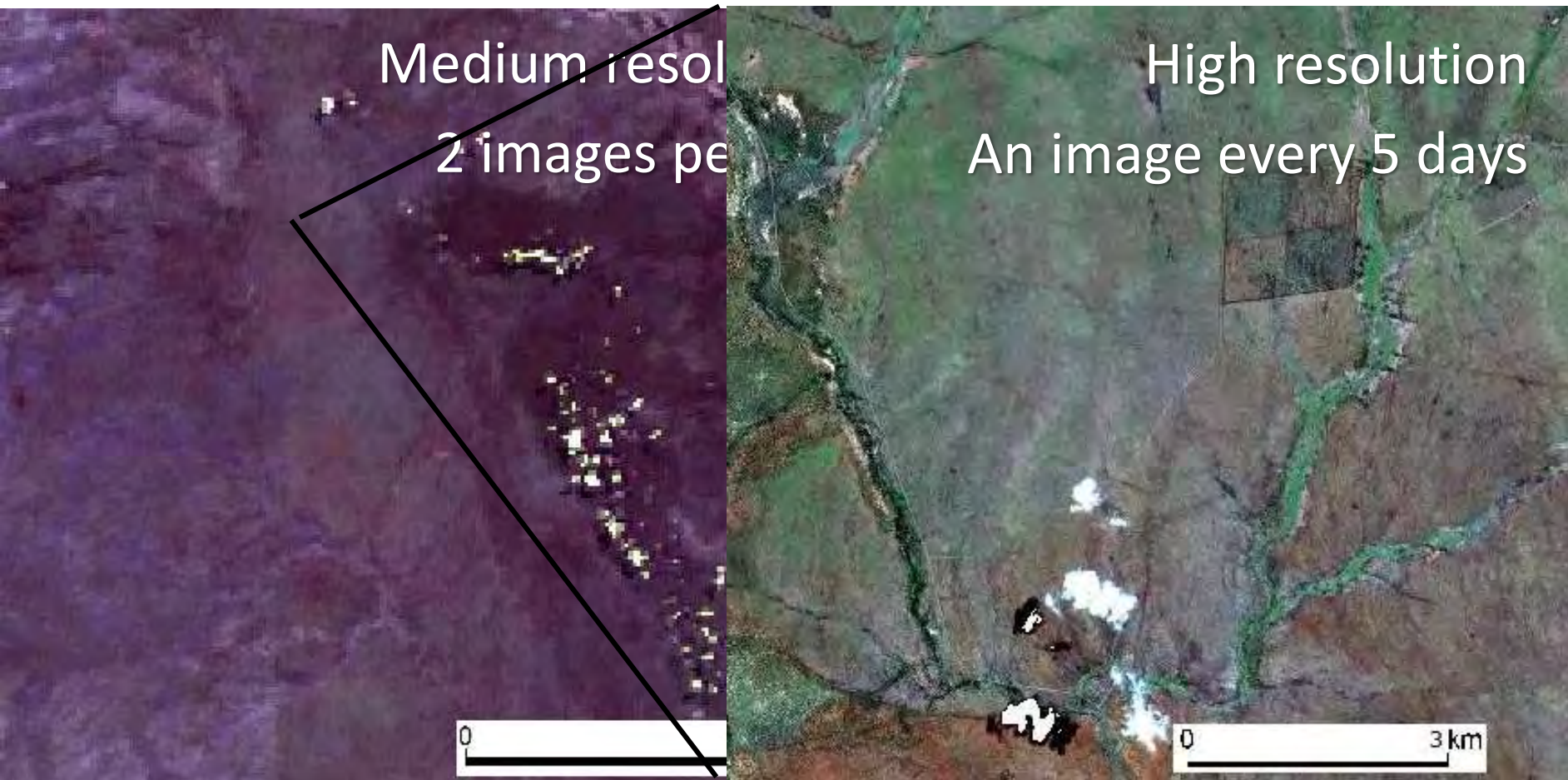
Remote sensing resolutions



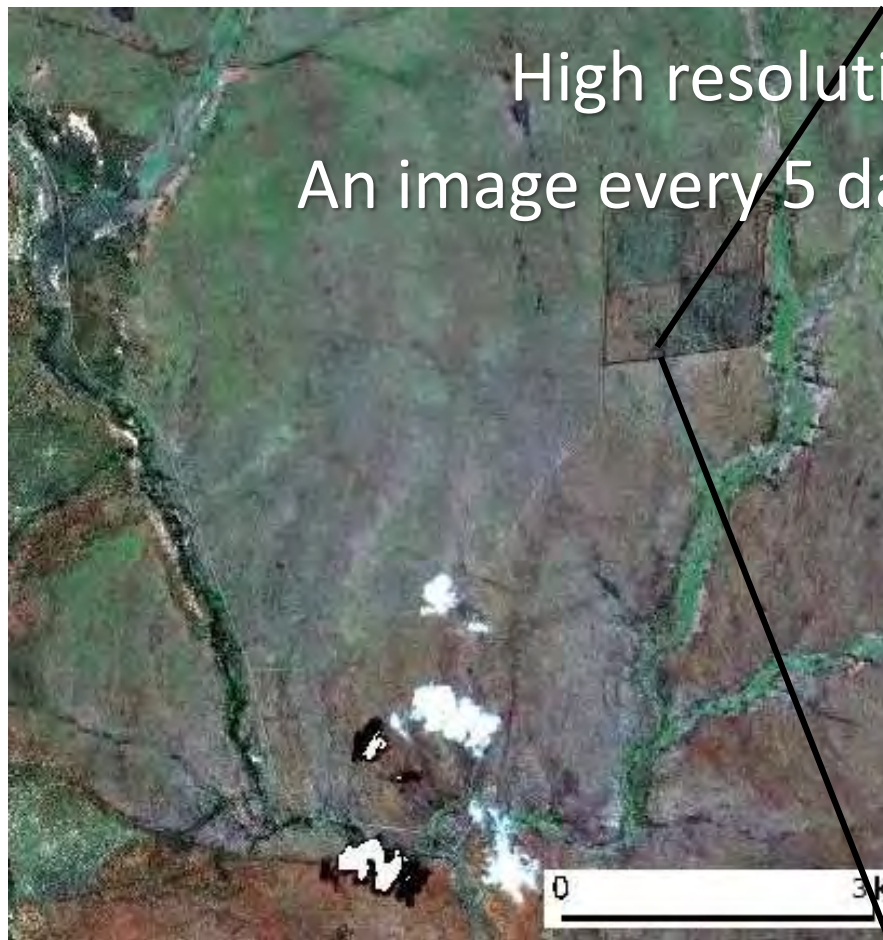
Remote sensing resolutions



Remote sensing resolutions



Remote sensing resolutions



Remote sensing resolutions

Spatial

Temporal

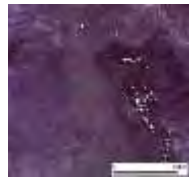


Low

Region

Very high

Real time



Medium

Forest

High

Phenology

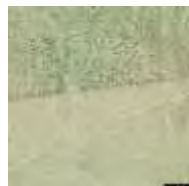


High

Patch

Medium

Season



Very high

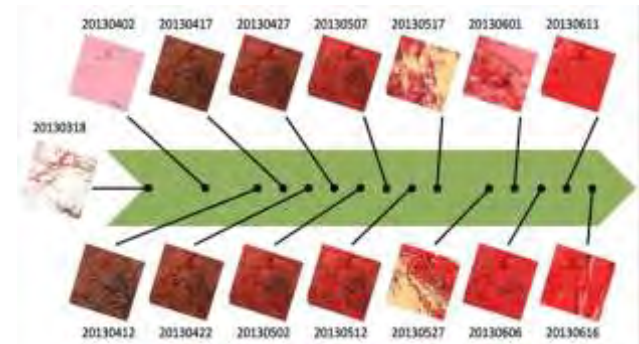
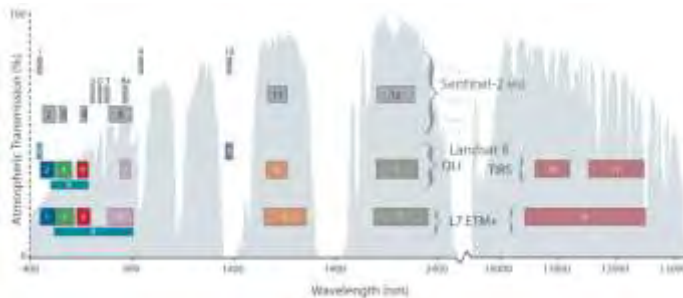
Plant

Low

Status



Much more than imagery



The **multispectral** and **multitemporal** nature of the data allows deriving EO data products that are the essential variables needed for characterizing the ecosystem and biodiversity

Products

Leaf area index

Biomass

NDVI, EVI

Fragmentation

Disturbance

Gross Primary

Vegetation

Vegetation

Phenology

Fire occurrence

Normalized Burn Ratio

Tree cover density

Surface Soil Moisture

Spectral Soil Quality Index

Surface Albedo

Land Surface Temperature

Sea Surface Temperature

Digital Elevation Model

Bare Ground

Slope...

composition
classification

idity

d

macrophytes

Organic matter

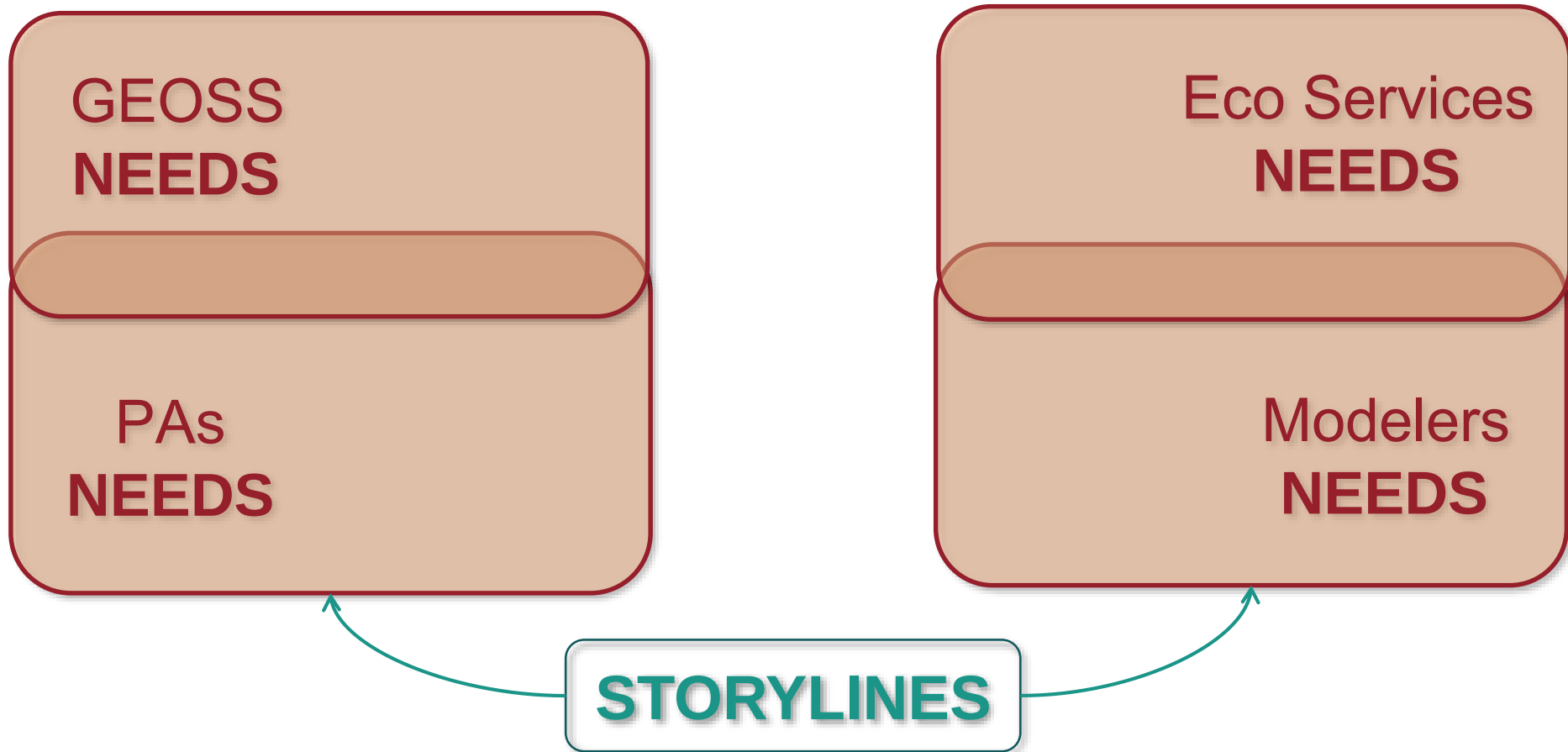
Chlorophyll a



Needs

What do PA managers want?

Target audiences



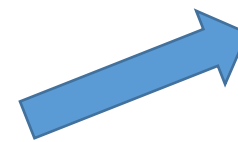
Co-design process based on the storylines

Mountain

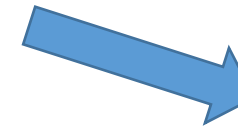
Arid

- Interviews
- Workshops
- Training

Coastal and Marine

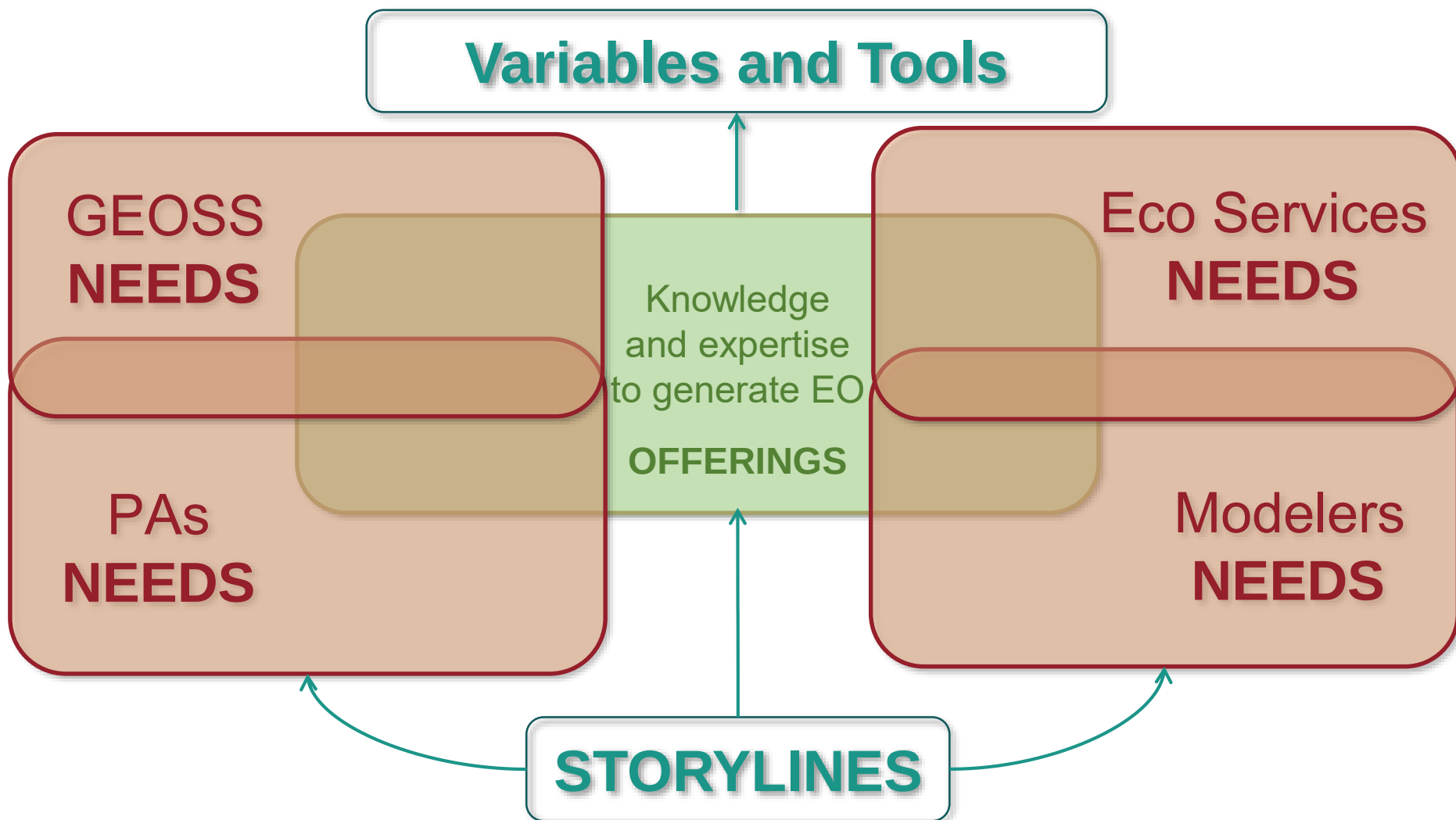


Variables
useful for PA



Tools for RS
big data analytics

Harmonize

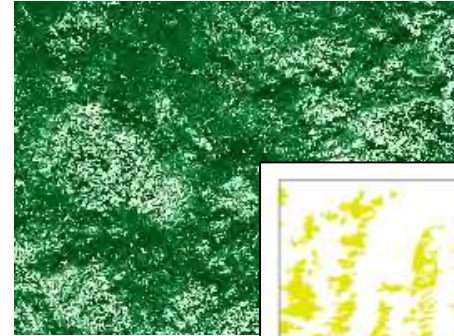


Variables useful for PA

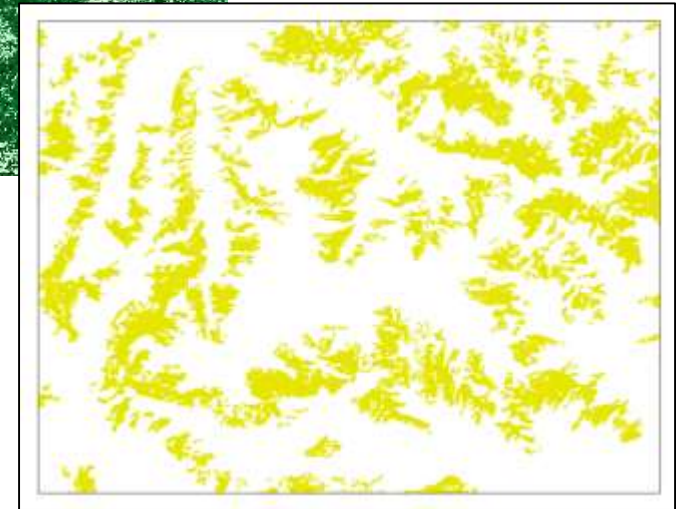


Life forms

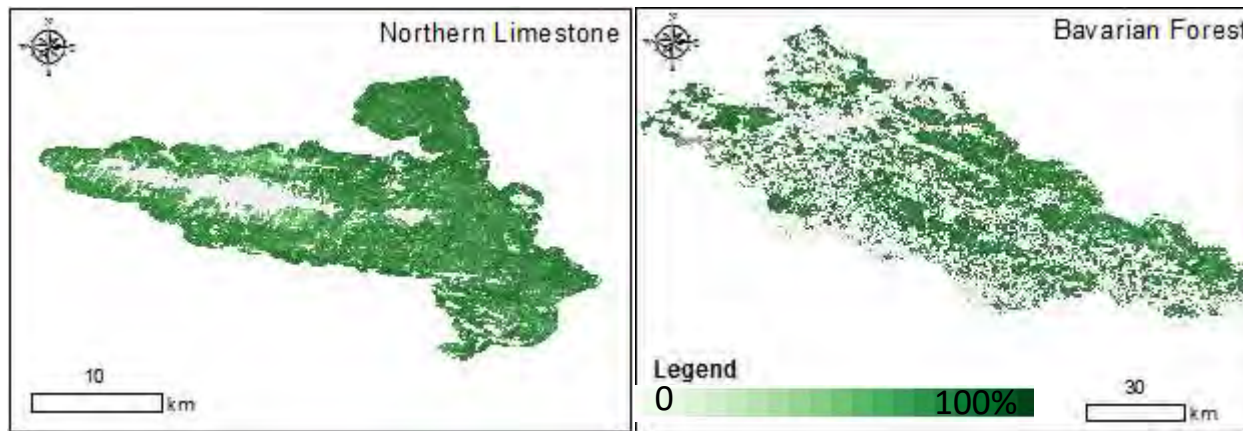
- Lichen retrieval
- Semi natural and natural grassland maps



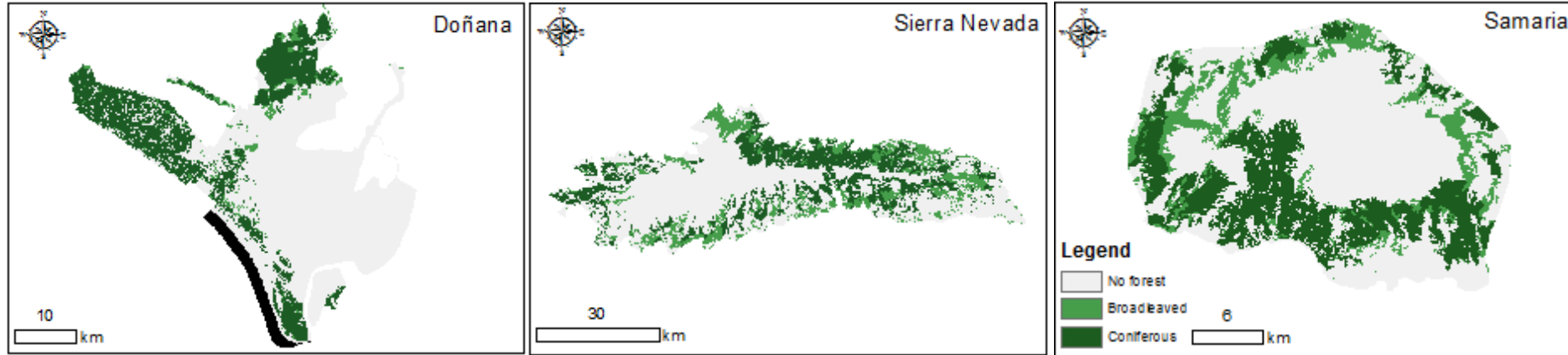
Lichens



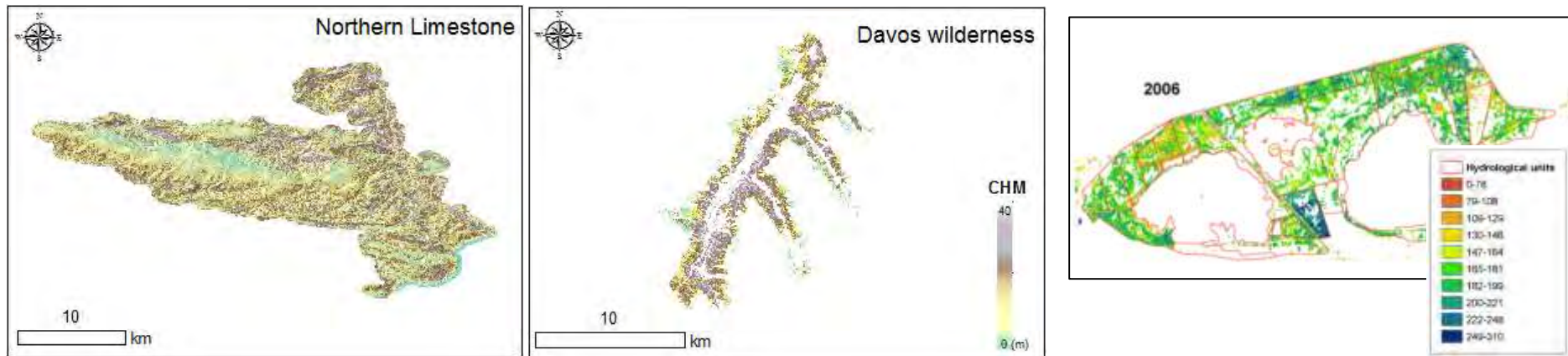
Tree cover density



Leaf type



Vegetation height & above ground biomass

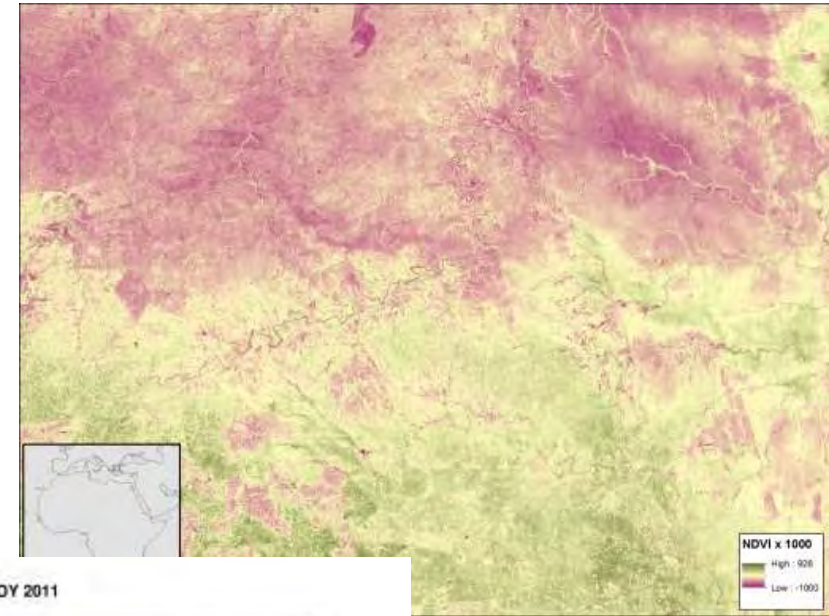


• Canopy height model

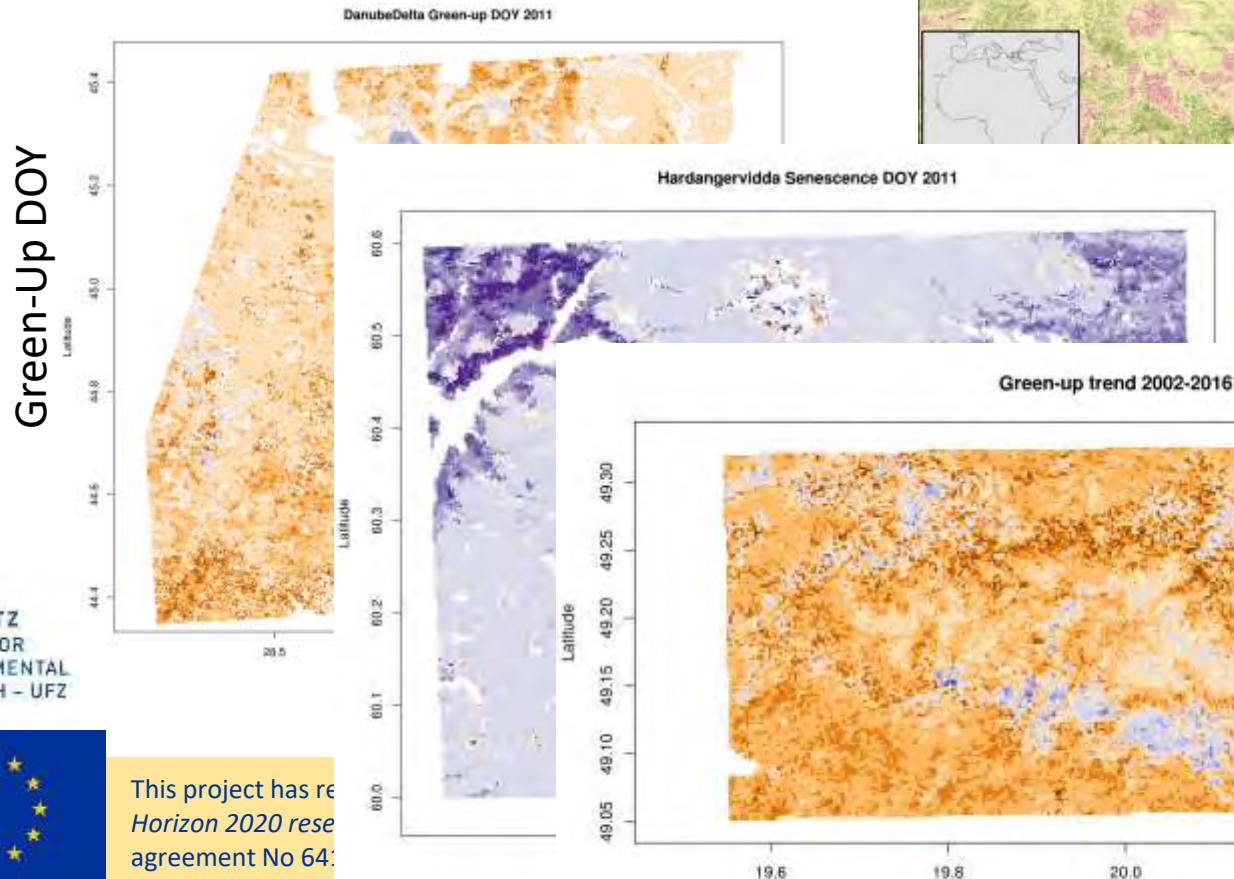
• Green reed height

Vegetation phenology

- NDVI /EVI
- Phenological metrics

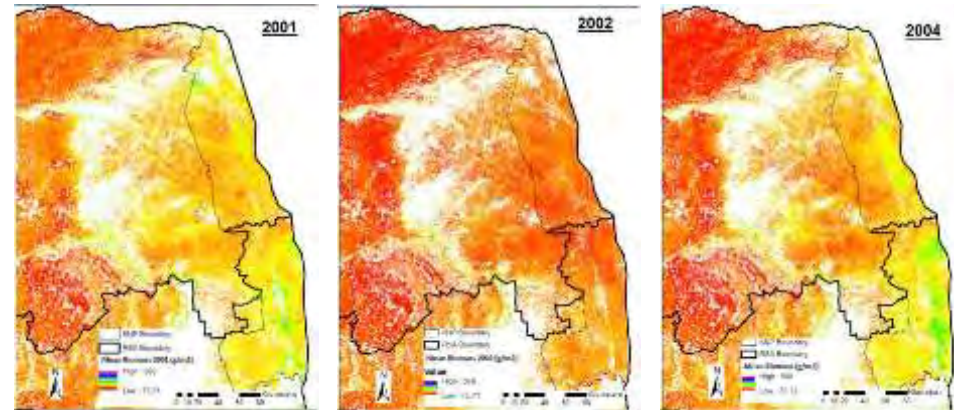


Senescence DOY

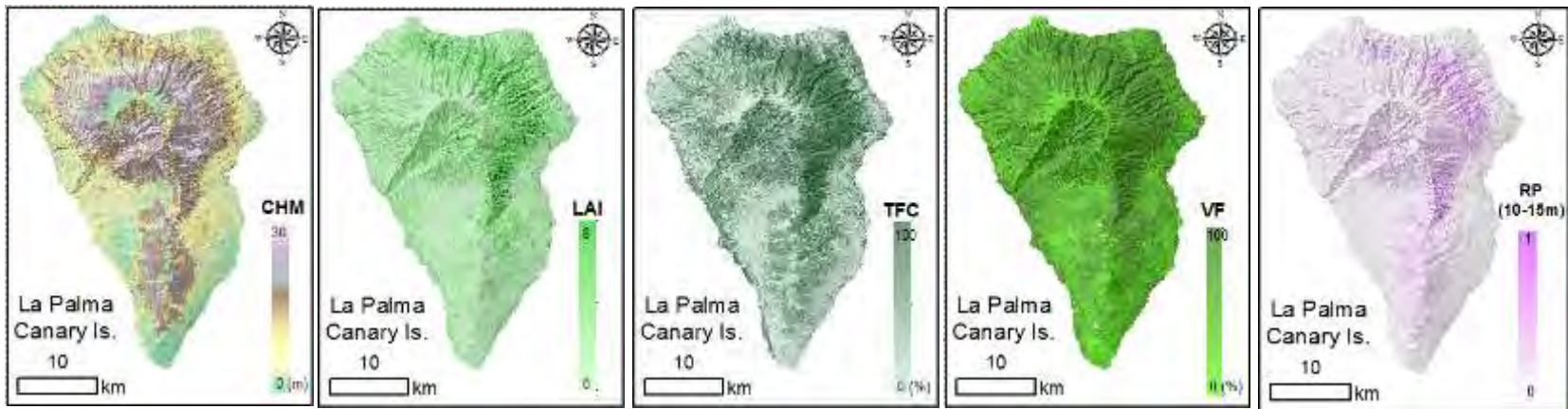


Phenological trends

Herbaceous biomass



Lidar based vegetation metrics



Canopy height model

Leaf area index

Tree fraction cover

Vegetation fraction

Return proportion (10-15 m strata)

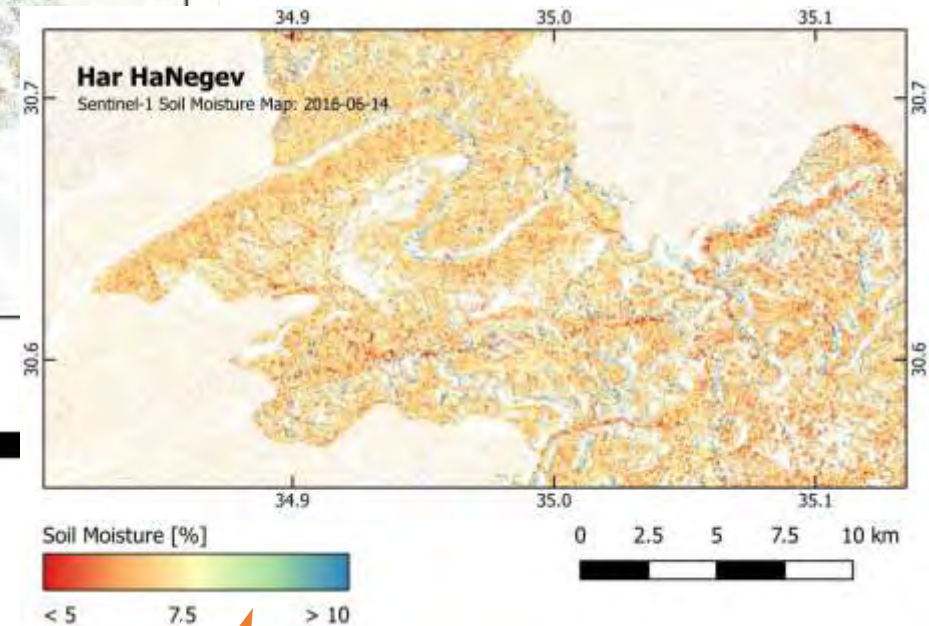
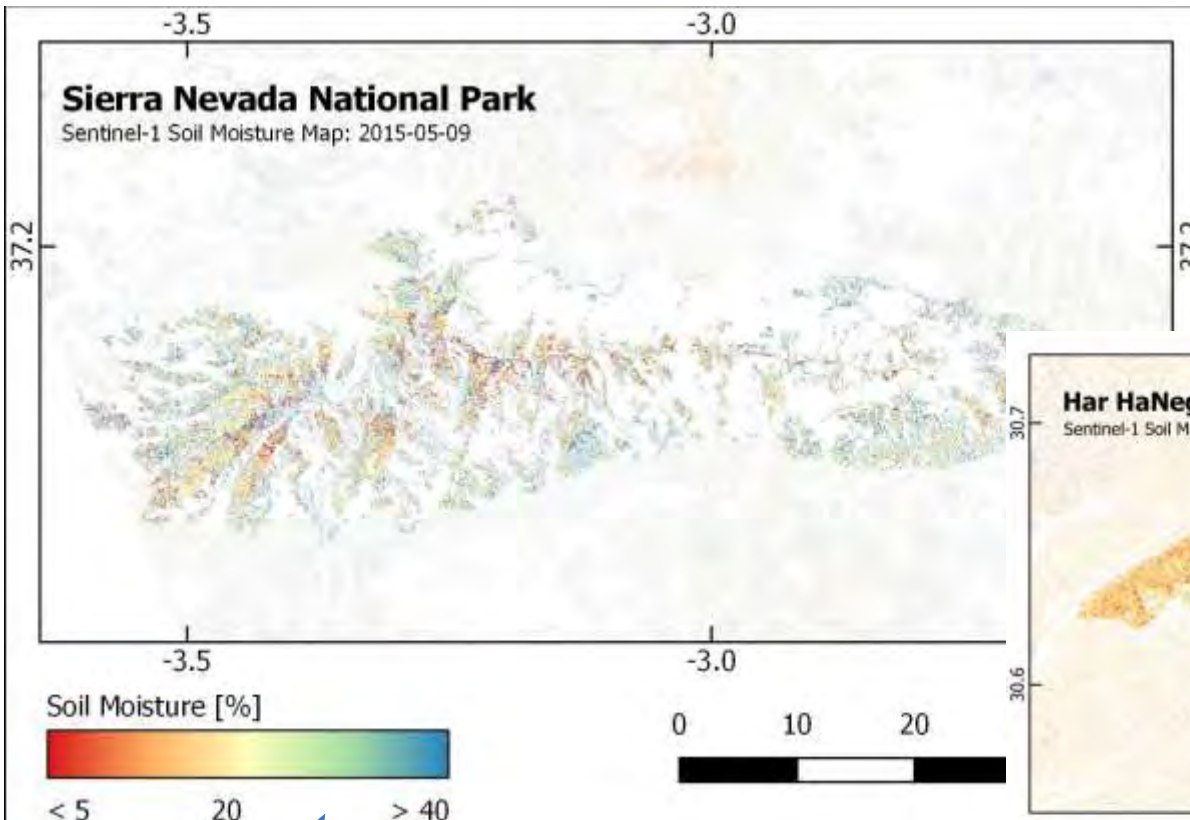
Land surface temperature

http://rslab.gr/downloads_lst.html



Available for Data download for any Protected Area –from 2000 to present at 1km pixel size

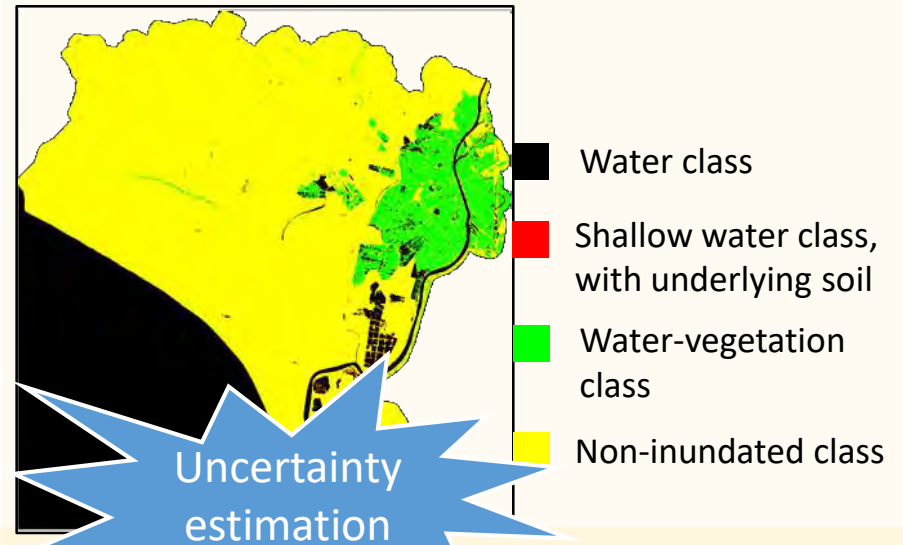
Soil moisture



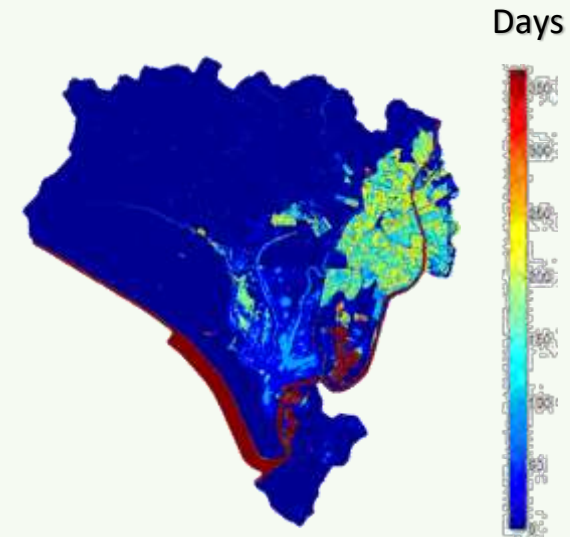
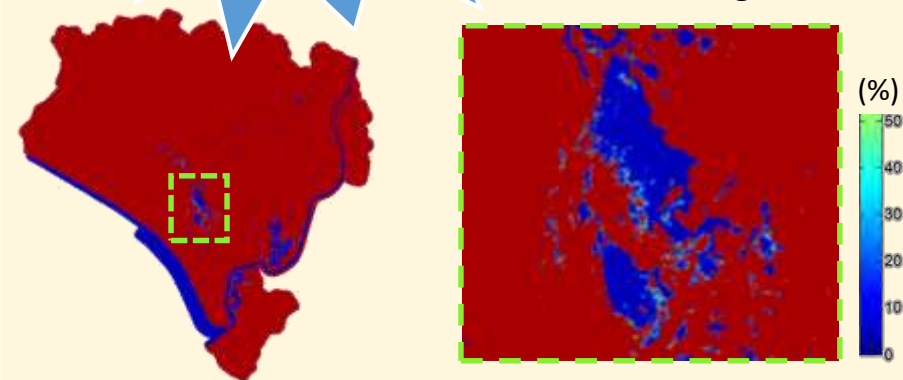
Mountain

Arid

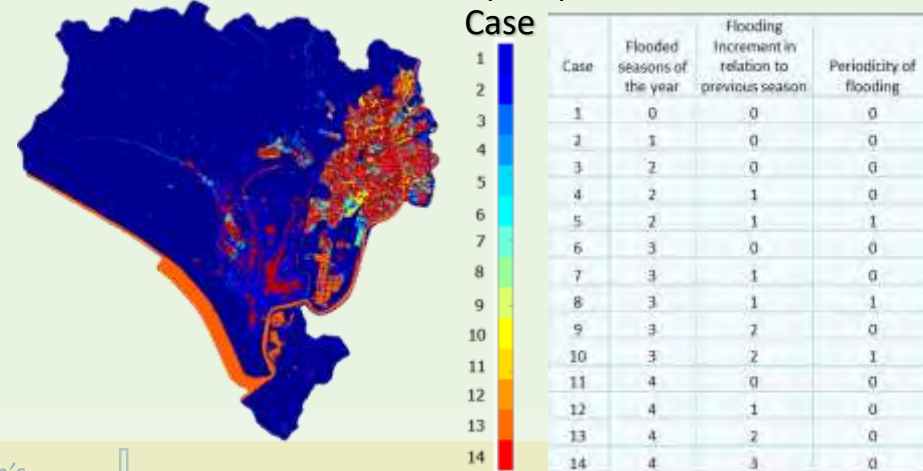
Water masks & hydroperiod



extracted using Sentinel2



Seasonality map

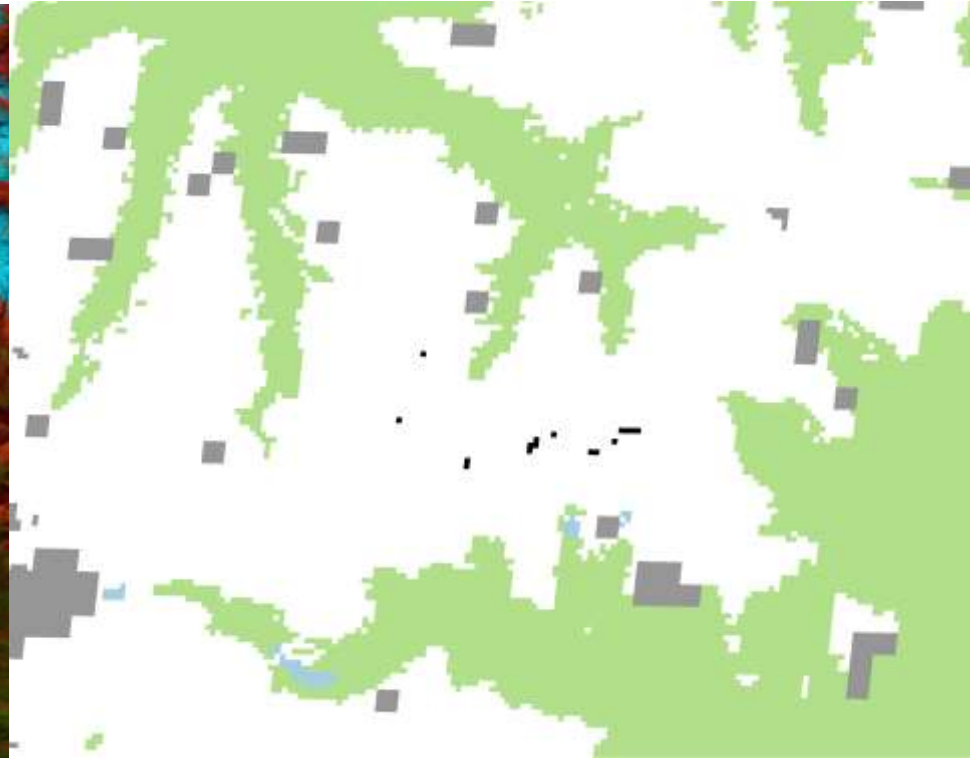


Snow cover



15-May-2016 Gran Paradiso

Sentinel-2 (snow is seen in blue)
R: SWIR (B12) G: NIR (B8) B: Green (B3)



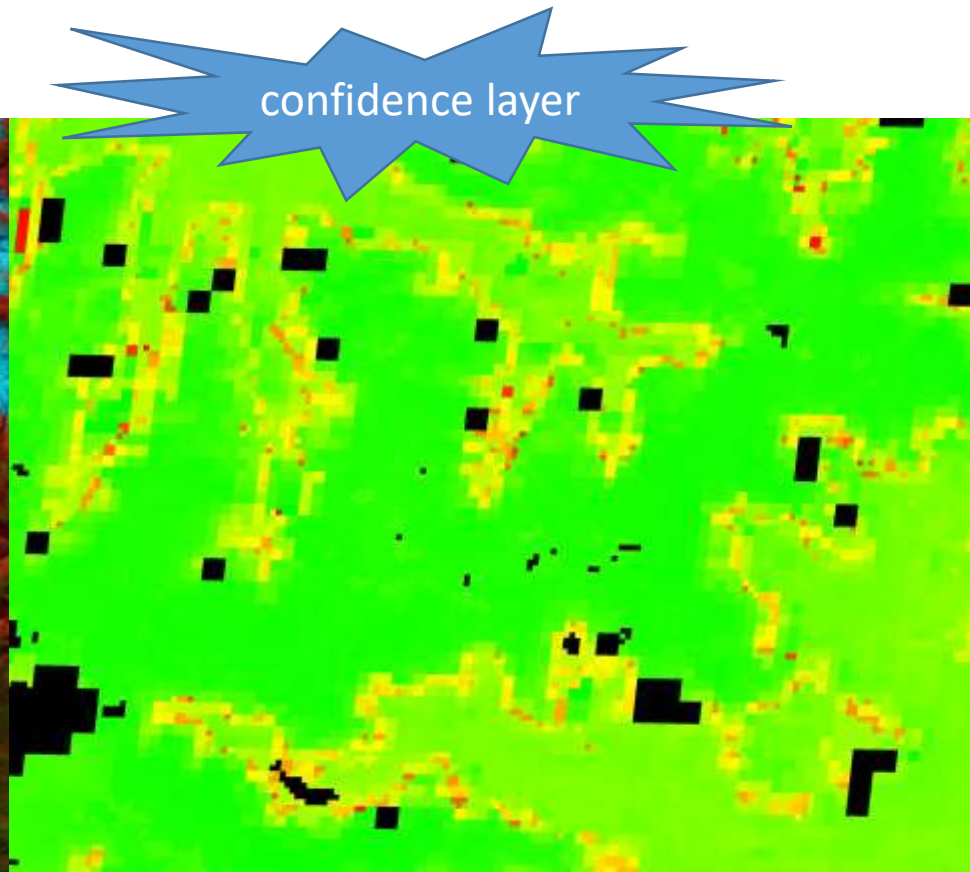
Snow map EURAC 250 m (**MODIS**)

 snow	 cloud
 snow free	 no data

Snow cover



15-May-2016 Gran Paradiso



Snow map EURAC 250 m

Sentinel-2 (snow is seen in blue)
 R: SWIR (B12) G: NIR (B8) B: Blue (B3)

low confidence → high confidence no data

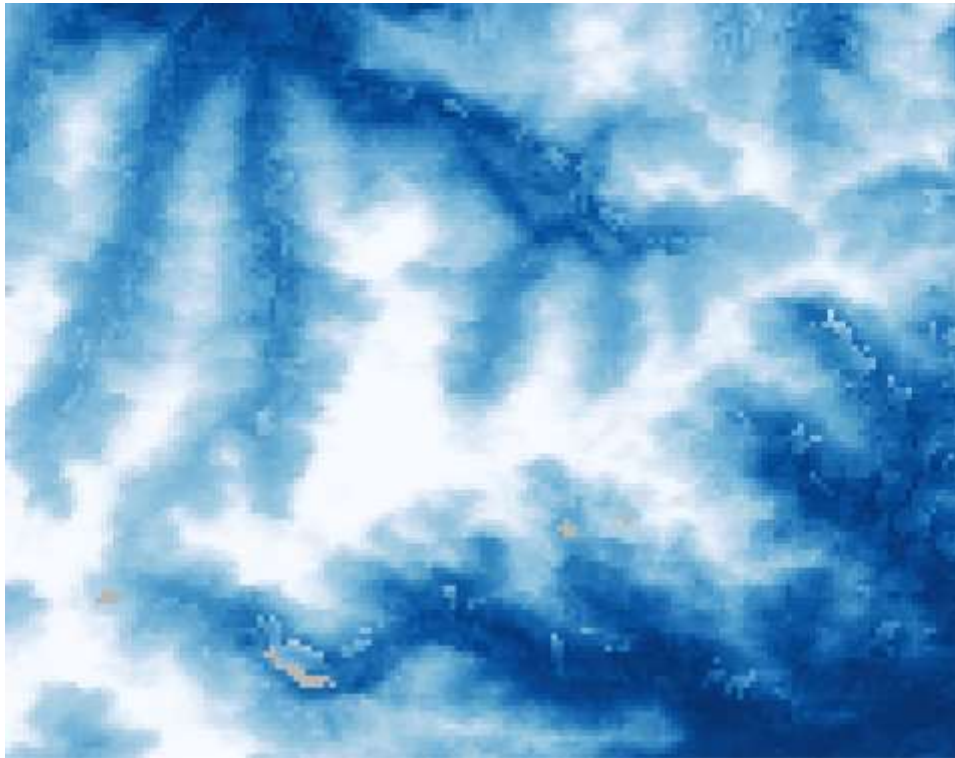


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Snow cover duration

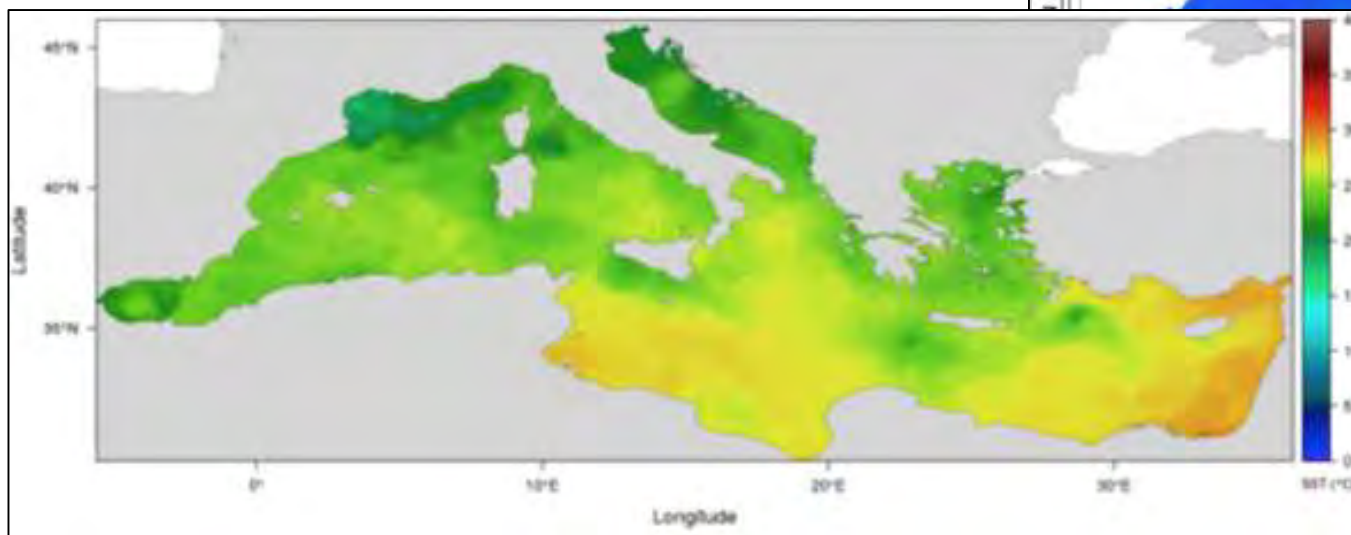
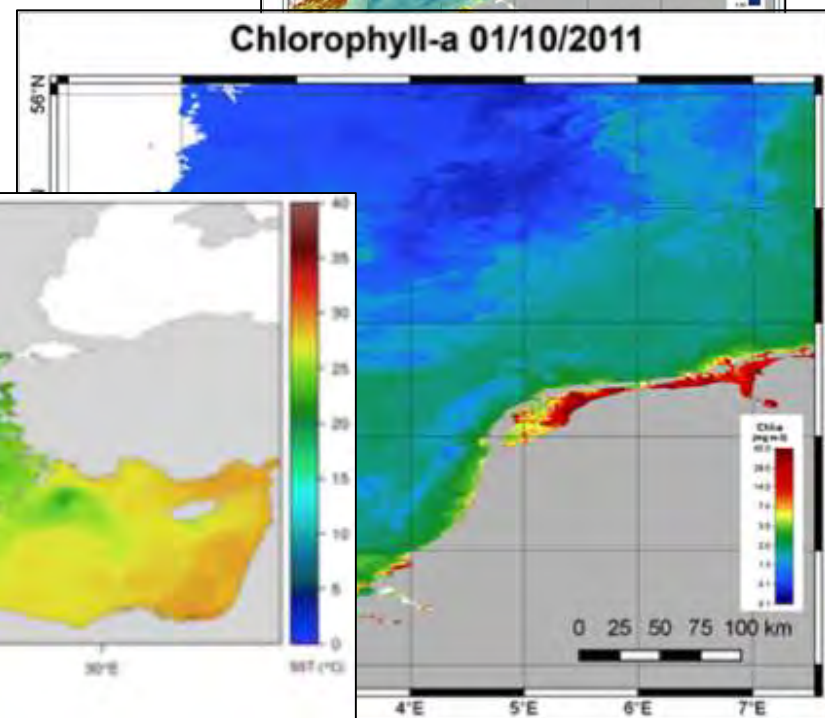
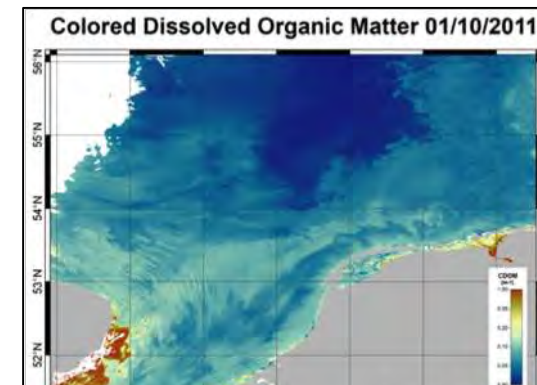


1-oct-2006/30-sep-2007
(from MODIS)
Gran Paradiso

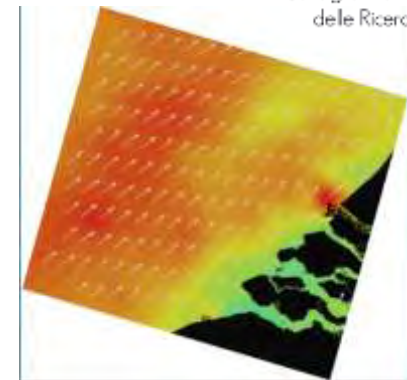
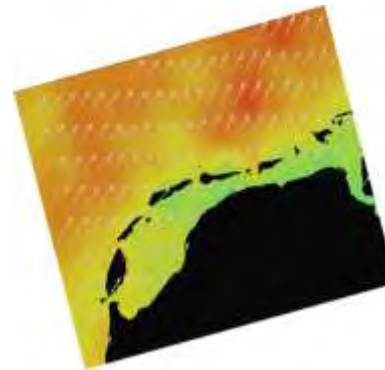
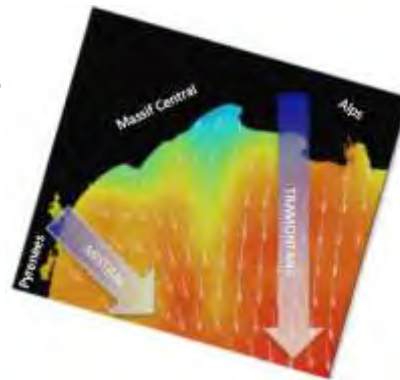
Ocean color products

- Colored dissolved Organic Matter
- Chlorophyll *a*

Sea Surface temperature



Wind fields



Shore line detection



- c. Water mask
- Land
- Sea
- Uncertainty areas
- d. Shoreline image

a. Sentinel-1 VV image (10x10 m pixel size)

b. Sentinel-1 VH image (10x10 m pixel size)

Murgia Alta
Sentinel 2, 2016-08-07

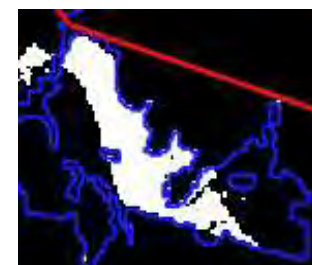
1:10.000



T₁ data



T₂ data



Change image

Change due to fires



T₁ data



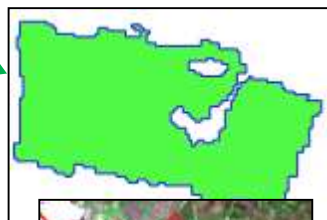
Change

**Change
natural g**



T₁ data

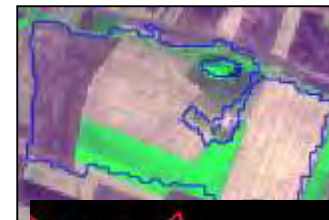
to cultivated



T₂ data



T₂ data



Change image

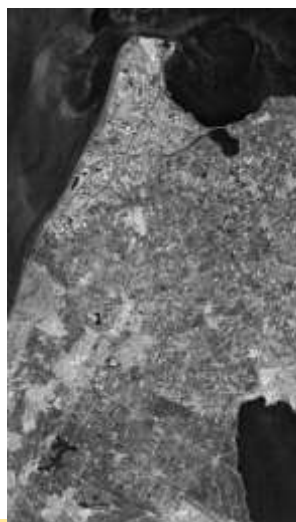
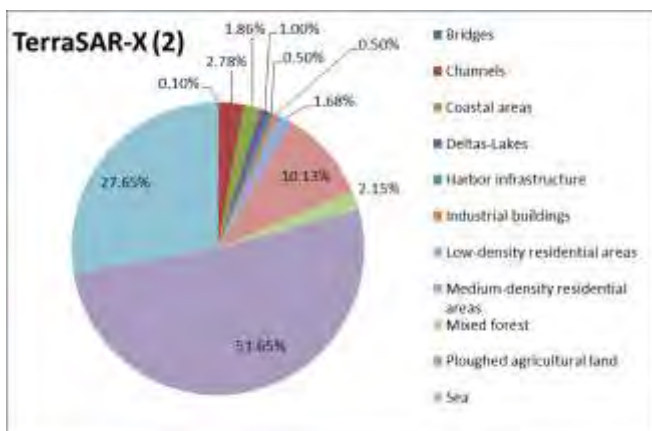
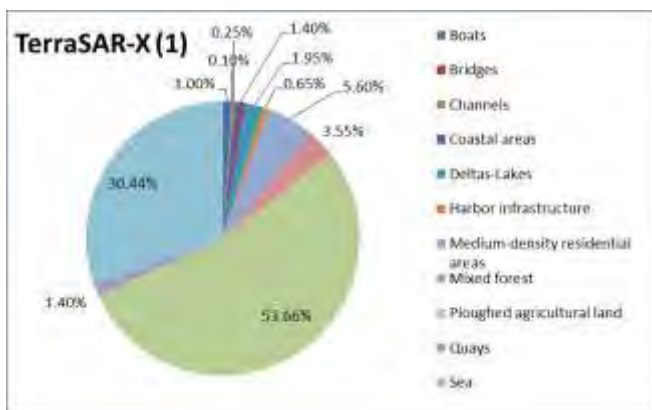


Change image

**Change due to fires
and to cultivated
area**

Errors at time T₁ data can be detected

Data Mining based on patterns (with SAR)



Div

- Boats
- Bridges
- Channels
- Coastal areas
- Deltas-Lakes
- Harbor infrastructure
- Medium-density residential areas
- Mixed forest
- Ploughed agricultural land
- Quays
- Sea

or

ap areas
be
tural land

LCCS-2 Classification, Camargue



Comprehensive legends associated with the FAO land cover classification scheme

	Bare Soil and other Unconsolidated materials		Needleleaved Closed Shrubland (thicket)		Tidal Area (Surface Aspect: Sand)
	Broadleaved Deciduous Closed Shrubland (thicket)		Needleleaved Closed Trees		Turbid Deep to Medium Artificial waterbodies
	Broadleaved Deciduous Closed Trees		Needleleaved Open (40-65%) Shrubland (thicket)		Turbid Deep to Medium Natural Perennial waterbodies (Flowing)
	Broadleaved Deciduous Open (40-65%) Shrubland (thicket)		Needleleaved Open (40-65%) Trees		Turbid Deep to Medium Natural Perennial waterbodies (Standing)
	Broadleaved Deciduous Open (40-65%) Trees		Non Built Up area		Turbid Deep to Medium Natural waterbodies (Flowing)
	Clear Deep to Medium Natural Perennial waterbodies (Flowing)		Open (15-40%) Forbs on Flooded land		Turbid Deep to Medium Natural waterbodies (Standing)
	Clear Deep to Medium Natural Perennial waterbodies (Standing)		Open (15-40%) Graminoids on Flooded land		Turbid Shallow Artificial waterbodies
	Clear Deep to Medium Natural waterbodies (Flowing)		Open (15-40%) Herbaceous vegetation on Flooded land		Turbid Shallow Natural Perennial waterbodies (Flowing)
	Clear Deep to Medium Natural waterbodies (Standing)		Open (40-65%) Forbs on Flooded land		Turbid Shallow Natural Perennial waterbodies (Standing)
	Clear Shallow Artificial waterbodies		Open (40-65%) Graminoids		Turbid Shallow Natural waterbodies (Flowing)
	Clear Shallow Natural Perennial waterbodies (Flowing)		Open (40-65%) Graminoids on Flooded land		Turbid Shallow Natural waterbodies (Standing)
	Clear Shallow Natural Perennial waterbodies (Standing)		Open (40-65%) Herbaceous vegetation		Unconsolidated materials
	Clear Shallow Natural waterbodies (Flowing)		Open (40-65%) Herbaceous vegetation on Flooded land		Urban areas
	Clear Shallow Natural waterbodies (Standing)		Open (40-65%) Shrubland (thicket)		
	Closed Forbs on Flooded land		Open (40-65%) Trees		
	Closed Graminoids		Permanently cropped area with Irrigated Graminoid crops		
	Closed Graminoids on Flooded land		Permanently cropped area with Irrigated Tree crops		
	Closed Herbaceous vegetation		Permanently cropped area with Large sized field of Irrigated Graminoid crops		
	Closed Herbaceous vegetation on Flooded land		Permanently cropped area with Large sized field of Rainfed Graminoid crops		
	Closed Shrubland (thicket)		Permanently cropped area with Medium sized field of Irrigated Graminoid crops		
	Closed Trees		Permanently cropped area with Medium sized field of Rainfed Graminoid crops		
	Consolidated materials		Permanently cropped area with Rainfed Graminoid crops		
	Forbs on Flooded land		Permanently cropped area with Rainfed Tree crops		
	Graminoid crops		Permanently cropped area with Small sized field of Irrigated Graminoid crops		
	Graminoids on Flooded land		Permanently cropped area with Small sized field of Irrigated Tree crops		
	Herbaceous vegetation on Flooded land		Permanently cropped area with Small sized field of Rainfed Graminoid crops		
	High density Urban areas		Permanently cropped area with Small sized field of Rainfed Tree crops		
	Industrial and Other areas		Rainfed Herbaceous crops		
	Irrigated Herbaceous crops		Rainfed Shrub crops		
	Irrigated Shrub crops		Roads		
	Large sized field of Irrigated Herbaceous crops		Scattered Urban areas		
	Large sized field of Rainfed Herbaceous crops		Small sized field of Irrigated Herbaceous crops		
	Linear Built Up area		Small sized field of Irrigated Shrub crops		
	Loose and Shifting sands		Small sized field of Rainfed Herbaceous crops		
	Low density Urban areas		Small sized field of Rainfed Shrub crops		
	Medium density Urban areas		Sparse Forbs on Flooded land		
	Medium sized field of Irrigated Herbaceous crops		Sparse Graminoids on Flooded land		
	Medium sized field of Rainfed Herbaceous crops		Tidal Area (Surface Aspect: Sand)		



Tools for big data analytics

How to produce big data

Before good RS variable is produced...

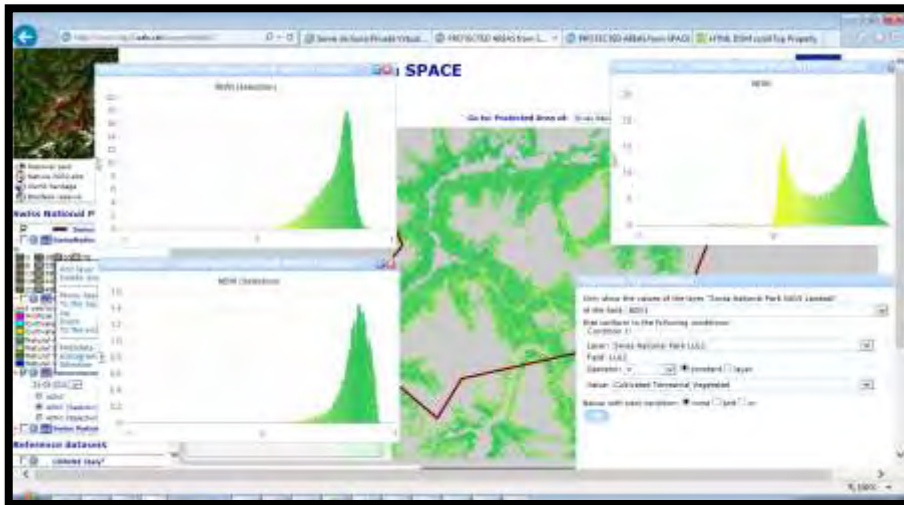
- Many processes need to be executed:
 - Data gathering
 - Geometric correction
 - Radiometric correction
 - Algorithm execution
 - Data quality assessment
 - Metadata
- Automation of these process is challenging:
 - Some processes are available as services for ESA or Copernicus
 - Others are implemented in the Virtual Lab & Sandbox



How to use big data variables easily

- The procedure of download + GIS is becoming impractical
- Alternative:

Discover, visualize, select, query and test in the map browser



maps.ecopotential-project.eu

Once the result is acceptable

Execute big data processes in the cloud



<http://vlab.geodab.eu/>





Thanks

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