Consiglio Nazionale delle Ricerche

Remote Sensing, test cases and future developments at the test-site level

Palma Blonda, CNR-ISSIA.Bari –Italy

blonda@ba.issia.cnr.it

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

The problem: biodiversity loss

User requirements

- The *conservation status* report required by Art. 17 of the Habitats (92/43/EEC) directive is based on the new Standard Data Form (2011)
  - Range of habitat
  - Area covered by habitat type within range
  - Structure and functions
  - Future prospects
    - Reason for changes
    - ***Pressures/threats***

- *Users (i.e. management authorities) need*:
  - *Standardized method*
  - *Scale 1:5000 or finer*;
  - *Long-time data series* for monitoring changes
  - *Scientific support* to evaluate the impact of existing policies.

– **The Habitats Directive** (92/43/CEE): conservation status of ha and species (Art. 17)

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

EBV from GEO_BON

EXAMPLES OF CANDIDATE ESSENTIAL BIODIVERSITY VAR

EBV class	EBV examples	Measurement and scalability	Temporal sensitivity	Feasibility
Genetic composition	Allelic diversity	Genotypes of selected species (e.g., endangered, domesticated) at representative locations.	Generation time	Data available for many species and for several locations, but little global systematic sampling.
Species populations	Abundances and distributions	Counts or presence surveys for groups of species easy to monitor or important for ES, over an extensive network of sites, complemented with incidental data.	1 to >10 years	Standardized counts under way for some taxa but geographically restricted. Presence data collected for more taxa. Ongoing data integration efforts (Global Biodiversity Information Facility, Map of Life).
Species traits	Phenology	Timing of leaf coloration by RS, with in situ validation.	1 year	Several ongoing initiatives (Phenological Eyes Network, PhenoCam, etc.)
Community composition	Taxonomic diversity	Consistent multitaxa surveys and metagenomics at select locations.	5 to >10 years	Ongoing at intensive monitoring sites (opportunities for expansion). Metagenomics and hyperspectral RS emerging.
Ecosystem structure	Habitat structure	RS of cover (or biomass) by height (or depth) globally or regionally.	1 to 5 years	Global terrestrial maps available with RS (e.g., Light Detection and Ranging). Marine and freshwater habitats mapped by combining RS and in situ data.
Ecosystem function	Nutrient retention	Nutrient output/input ratios measured at select locations. Combine with RS to model regionally.	1 year	Intensive monitoring sites exist for N saturation in acid-deposition areas and P retention in affected rivers.

Multi-temporal and LIDAR Images for:

1) Habitats as proxies

2) LC/LU and changes; veg. height

3) Bio-geo physical variables

FP7: **BIO_SOS** (www.biosos.eu) and **MS.MONINA** (http://www.ms-monina.eu/home)

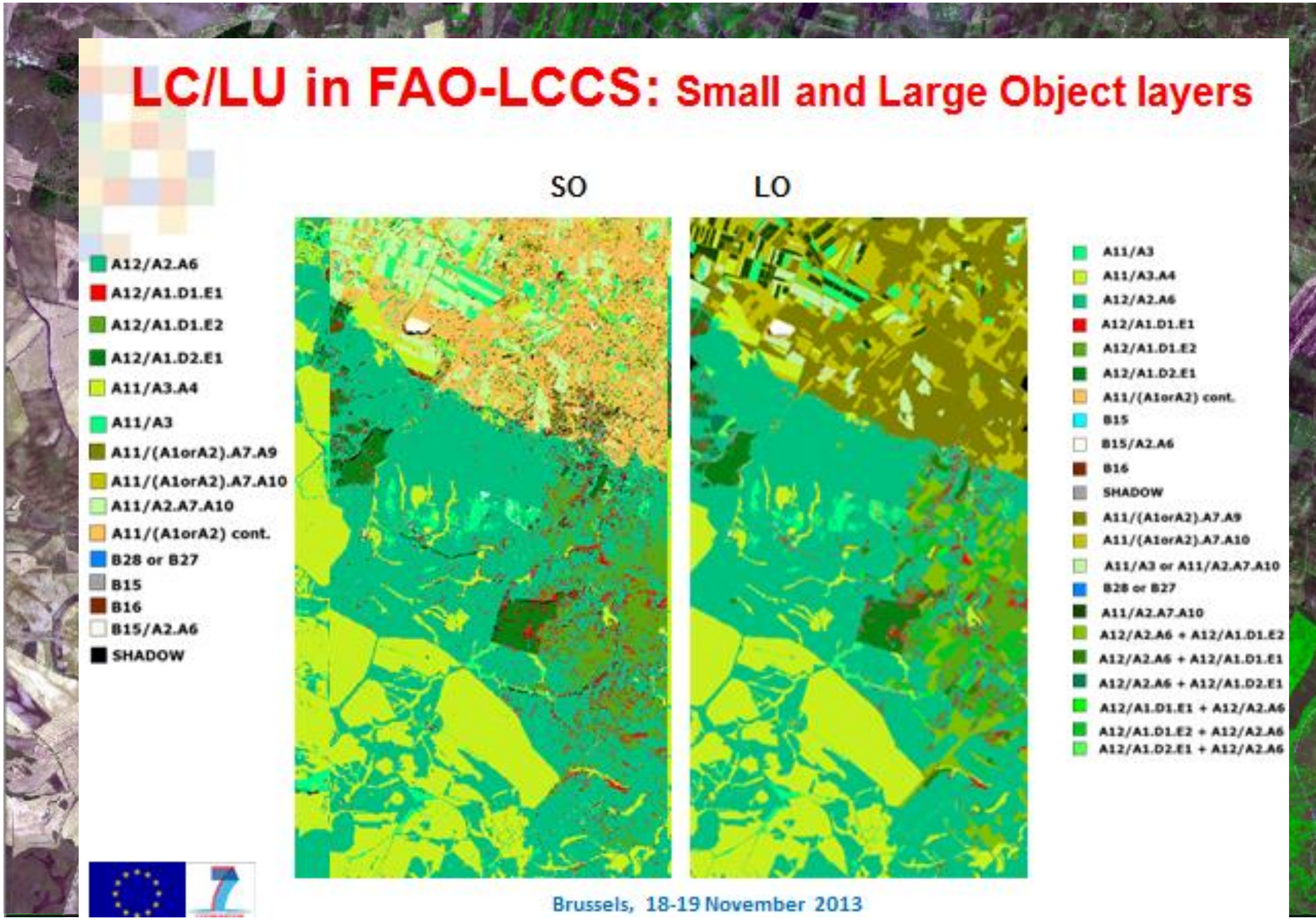
Habitat maps: *expert knowledge to fill the gaps between different domains*

Peak of Biomass (April-May)
PoB

Post peak (October)
PostPoB

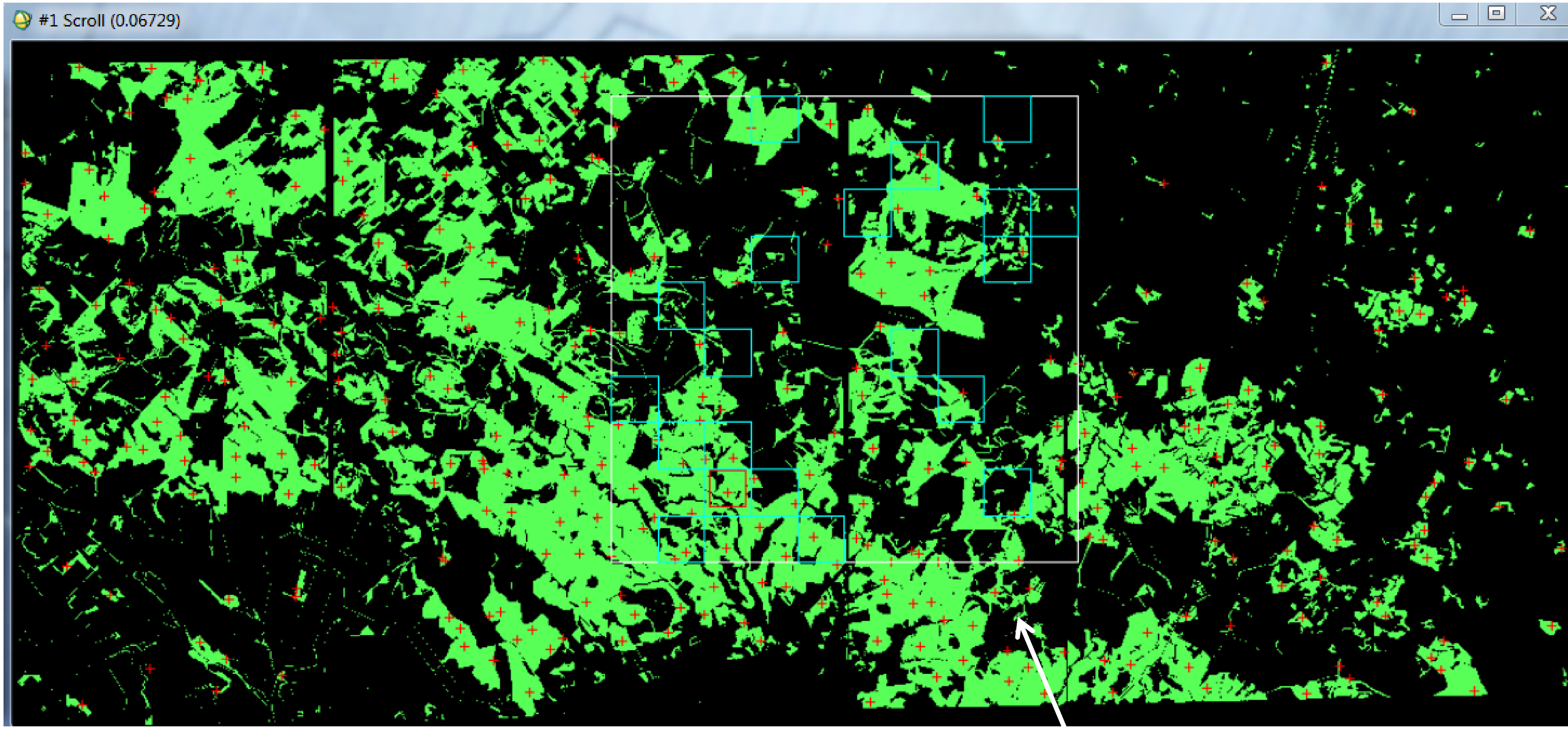
Pre Peak (January)
PrePoB

Dry Season (July)
DS



www.biosos.eu

Output product: habitat 62A0.
Murgia Alta(I) about 33km*15km (485 kmq)



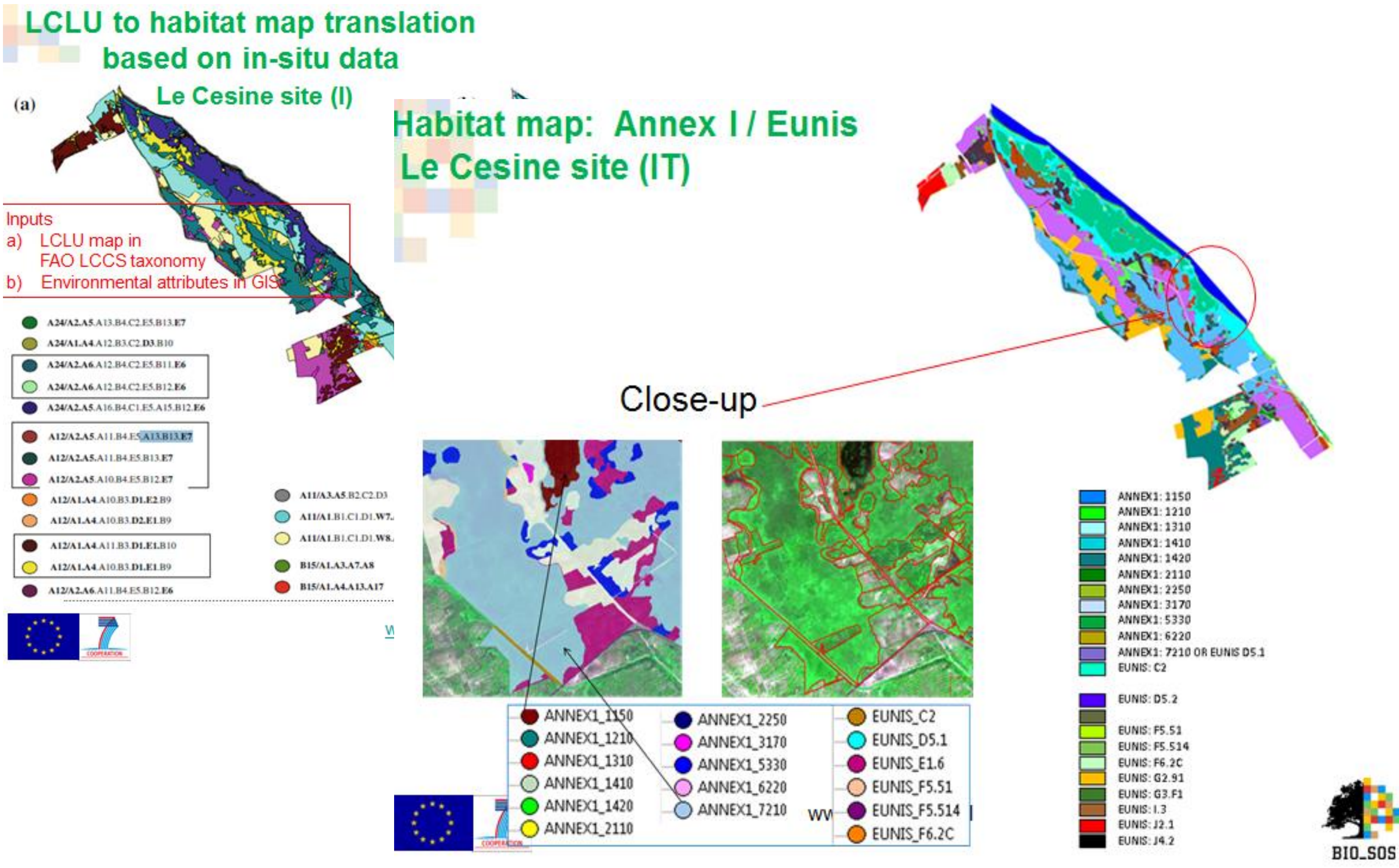
LCCS MAP	OA%	error%
SO classification	84.0%	0.07%
LO classification	84.4%	0.08%

can be extracted from the grassland strata

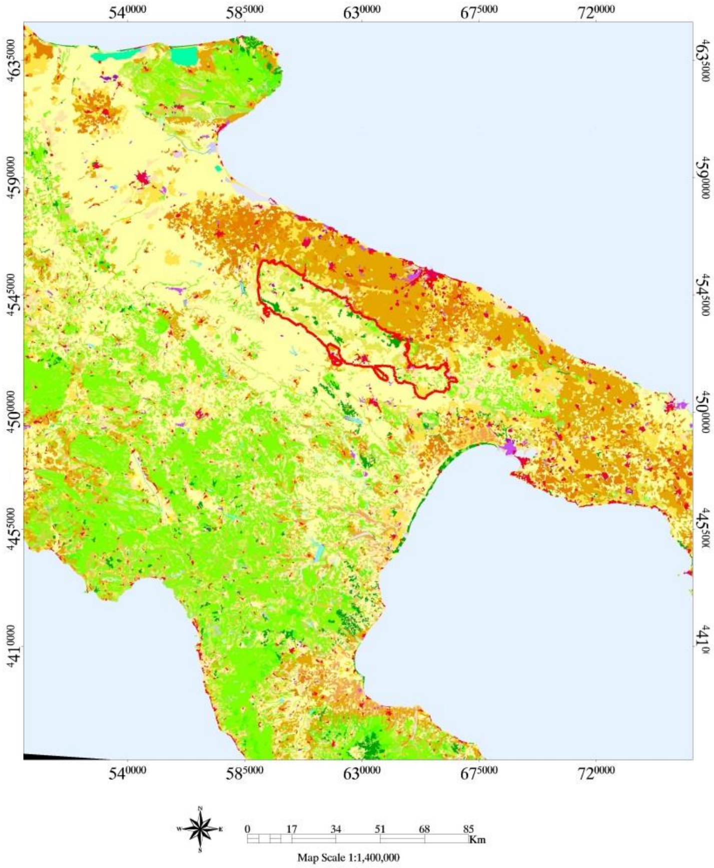
10km x10km validation grid

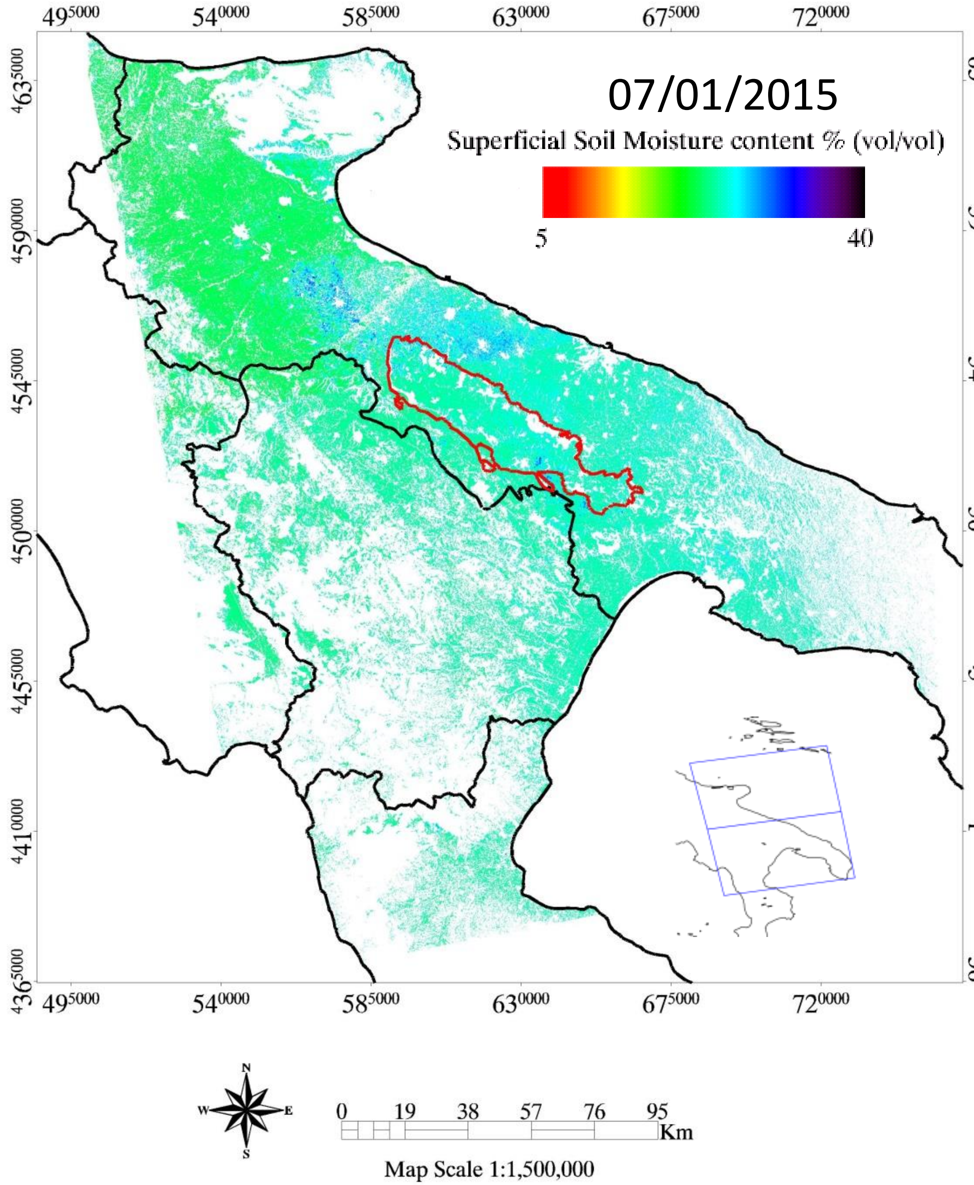
This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 641762

Habitat maps: *expert knowledge to fill the gaps between different domains*



Superficial soil moisture from Sentinel 1
(CNR_ISSIA)

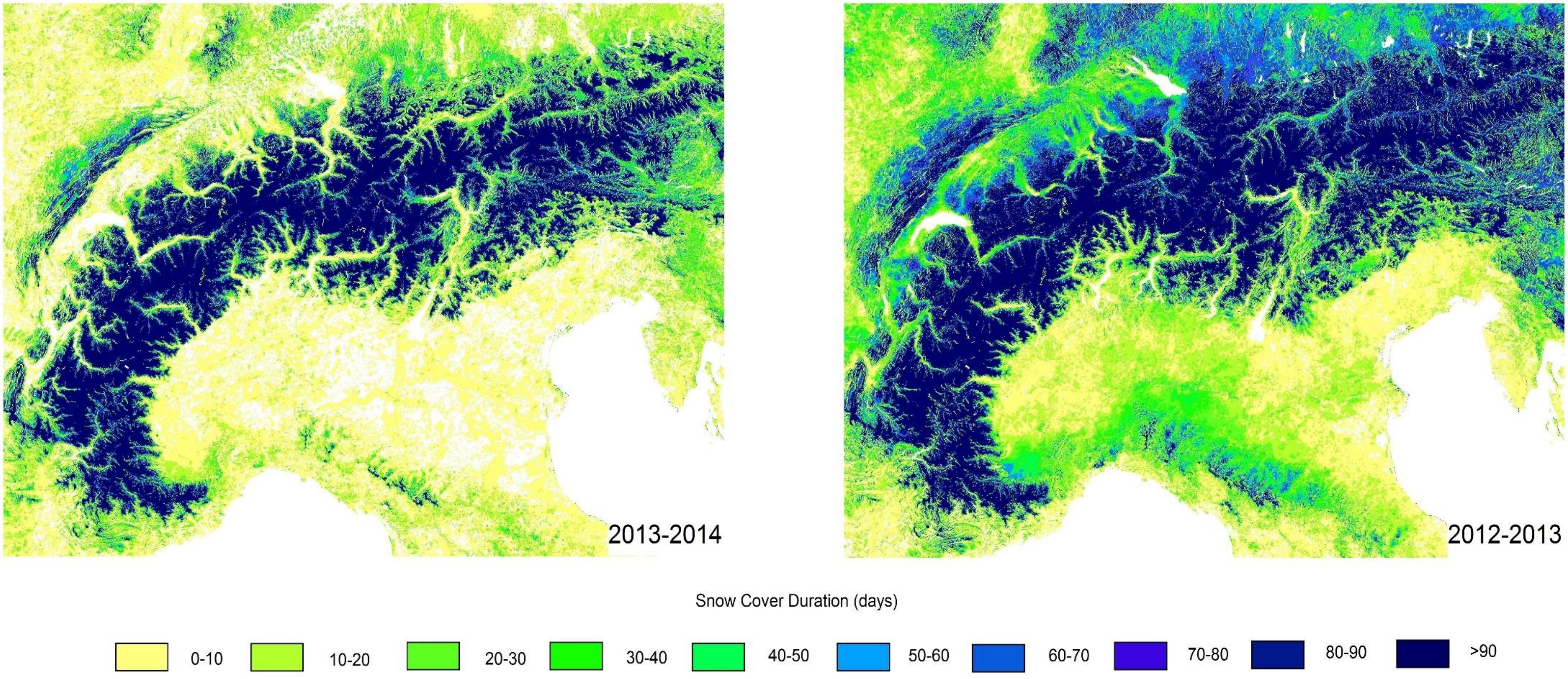




☐ Agricultural areas (CORINE)

Snow Cover Duration (credits:EURAC)

The Snow Cover Duration (SCD) have been calculated as number of snow days during the hydrological year for each pixel.



Reccommendations: EO and in-situ data

"The evolution of ecosystems properties over time can be described using simple math. response functions and the better these functions can be described, the grater insight ecologists can draw about ES dynamics"
(Kennedy at al., 2014; Front Ecol. Env. 12 (6))

- **Actually abrupt changes of state can mainly be detected at VHR (<4m): only *step functions can be provided.***
- **Sentinels (10-30-60m) data can improve the approximation of such functions.**
- **But for detecting changes and trends archive data are needed**

mapping): **an updated EU-CORINE map will be provided in 2015: can we solicit the collection of in- situ data according to different taxonomies for facilitating taxonomy translations?**

- *<u>Protocols for accuracy-uncertainty estimation</u>*

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

Recommendation: activation of the ESA DATA Wharehouse 2014-2020 for Biodiversity and ES monitoring from SPACE

ESA UNCLASSIFIED - For Official Use

esa

esrin

Via Galileo Galilei
Casella Postale 64
00044 Frascati
Italy

DOCUMENT

Copernicus Space Component Data Access Portfolio: Data Warehouse 2014 - 2020

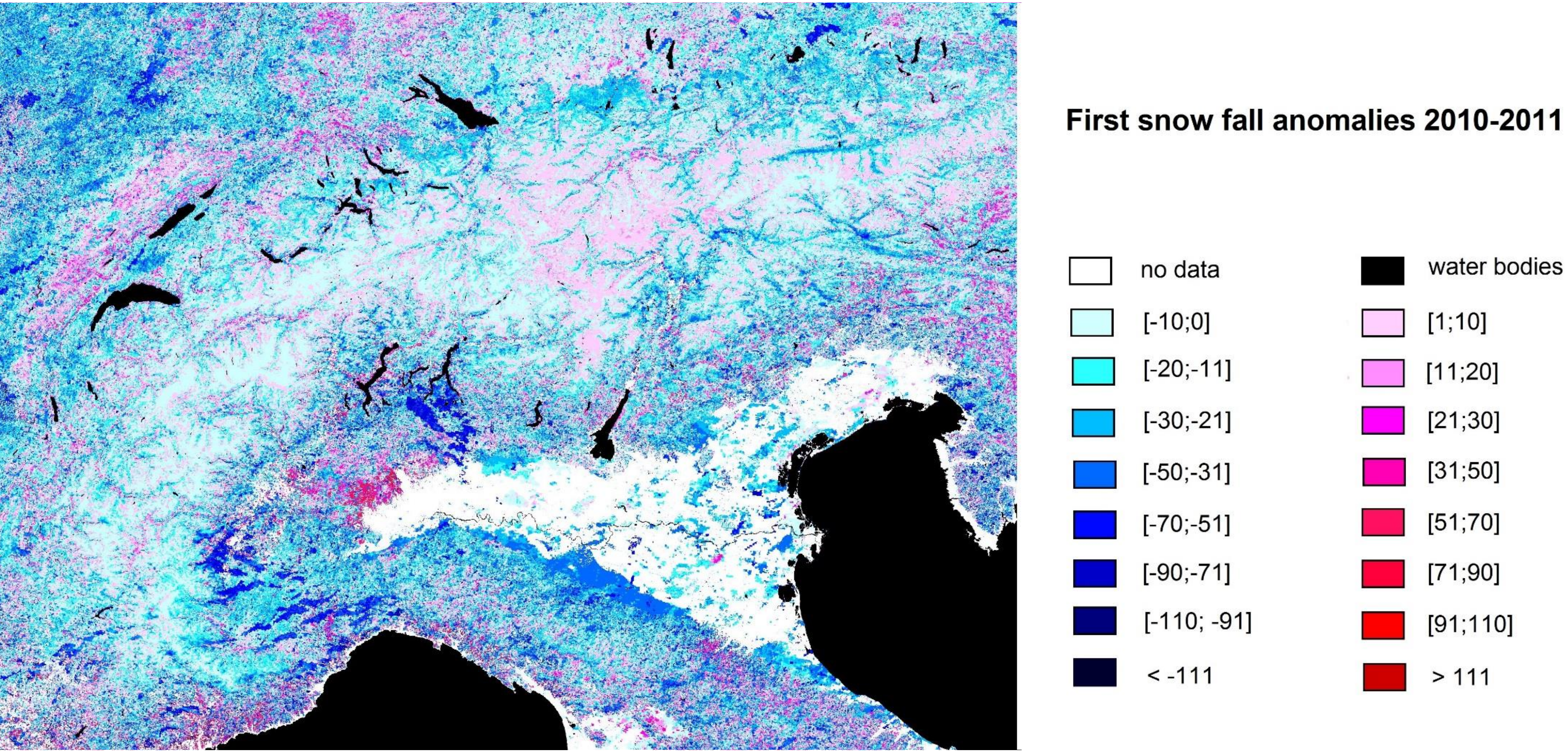
CSC data access

person falling within (1) or (2), such as a contractor of a public authority;
- Any research and academic organisation;
- Contractors of such entities.

This p
Union's Horizon 2020 research and innovation programme under grant agreement No 641762

Snow anomalies (credits:EURAC)

The anomalies of first snow fall (FSF) day and last snow day (LSD) have been calculated for all hydrological years (1st October - 31st September of the following year) from 2002 to 2014 as difference between the average value over all years and the yearly value of FSF/LSD of each pixel.



Canopy water content (SAR) (credits:CESBIO)

Availability: N/A

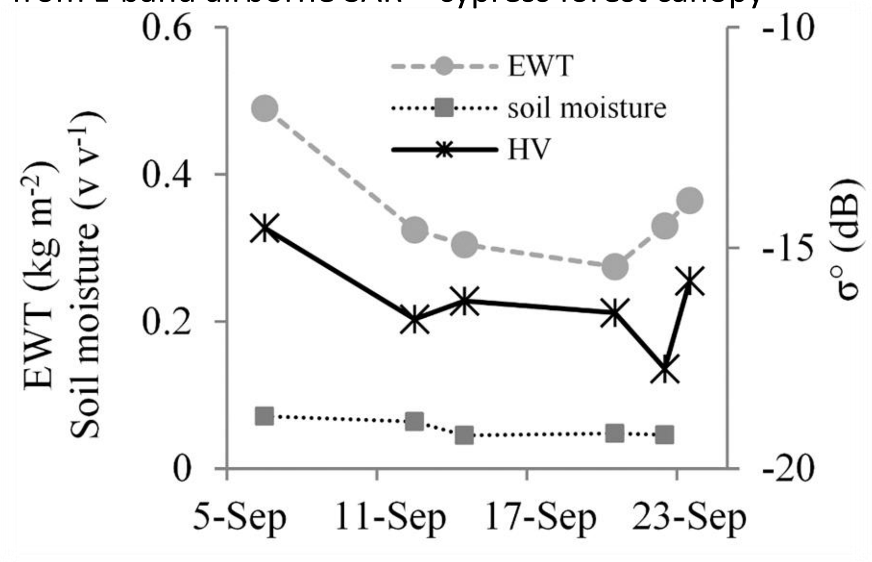
Proposed sensors: Sentinel 1

Method: time series analysis (pending further development and calibration using in situ data @ Montado and Peneda-Geres PAs)

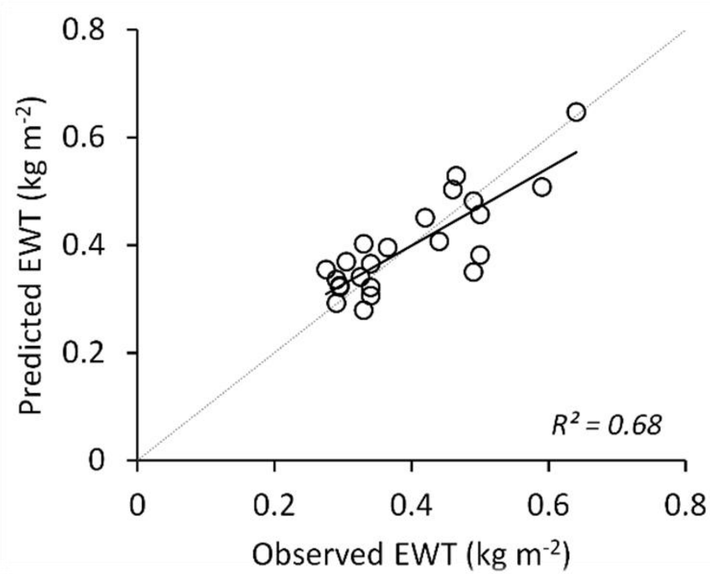
Product characteristics: 50-100m resolution

<u>Example in Australia with airborne SAR (PLIS):</u>

Temporal trend of SAR and Equivalent Water Thickness (EWT) from L-band airborne SAR – cypress forest canopy



EWT retrieval (empirical modelling)



Tanase, et al., 2015, IJWF (in press)

LC and habitat maps: *expert knowledge to fill the gaps between different domains*

WorldView2 (WV2) *Pre_P1 (March)*
B7,5,2 (NIR1, Red, Blue)

WV2 Peak_P1 (July)
B7,5,2 (NIR1, Red, Blue)

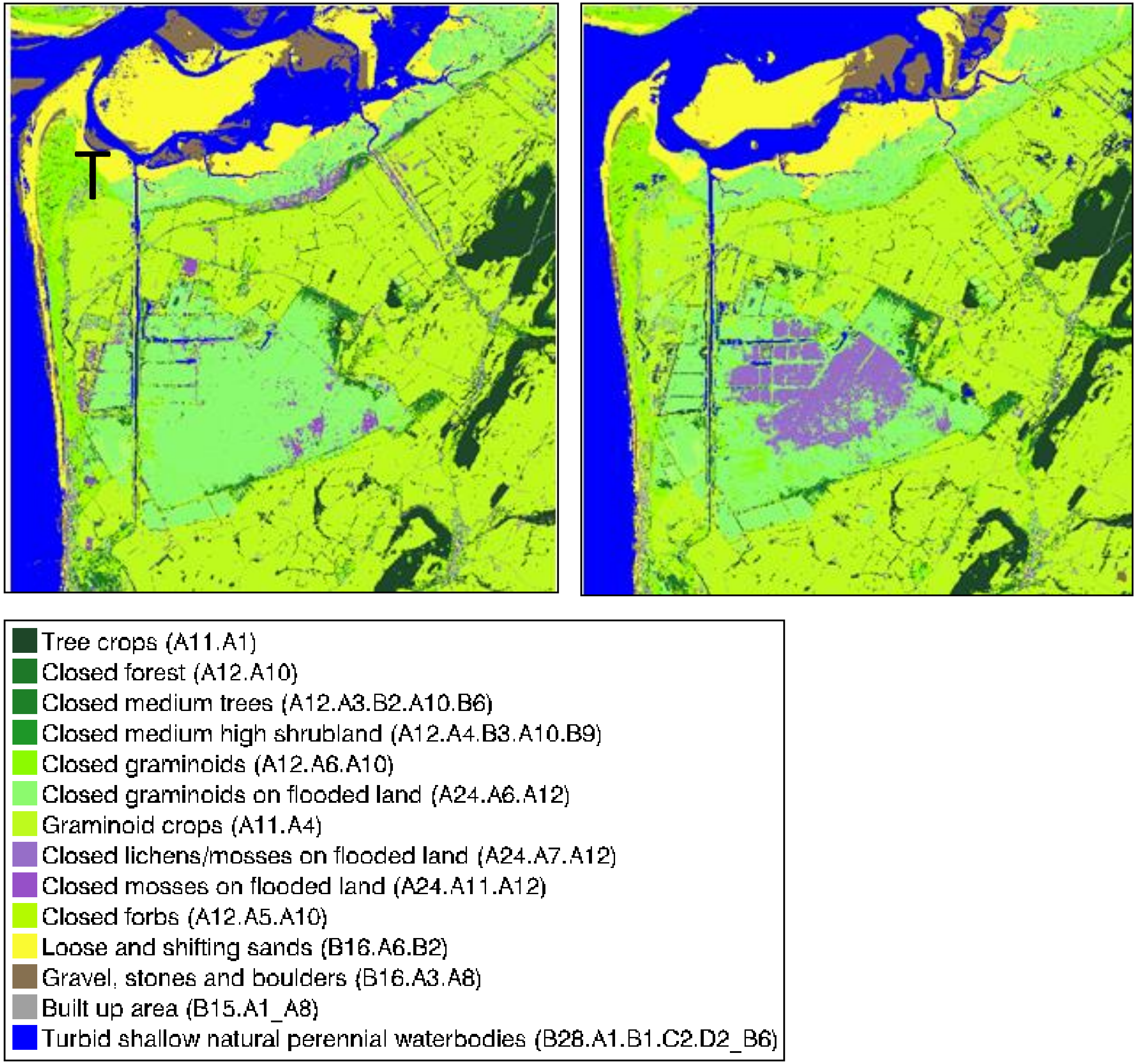
Port Bog, Southern WALES

WorldView-2 Time-series **(UNSW)**

WV2 Pre_P2 (March)
B7,5,2 (NIR1, Red, Blue)

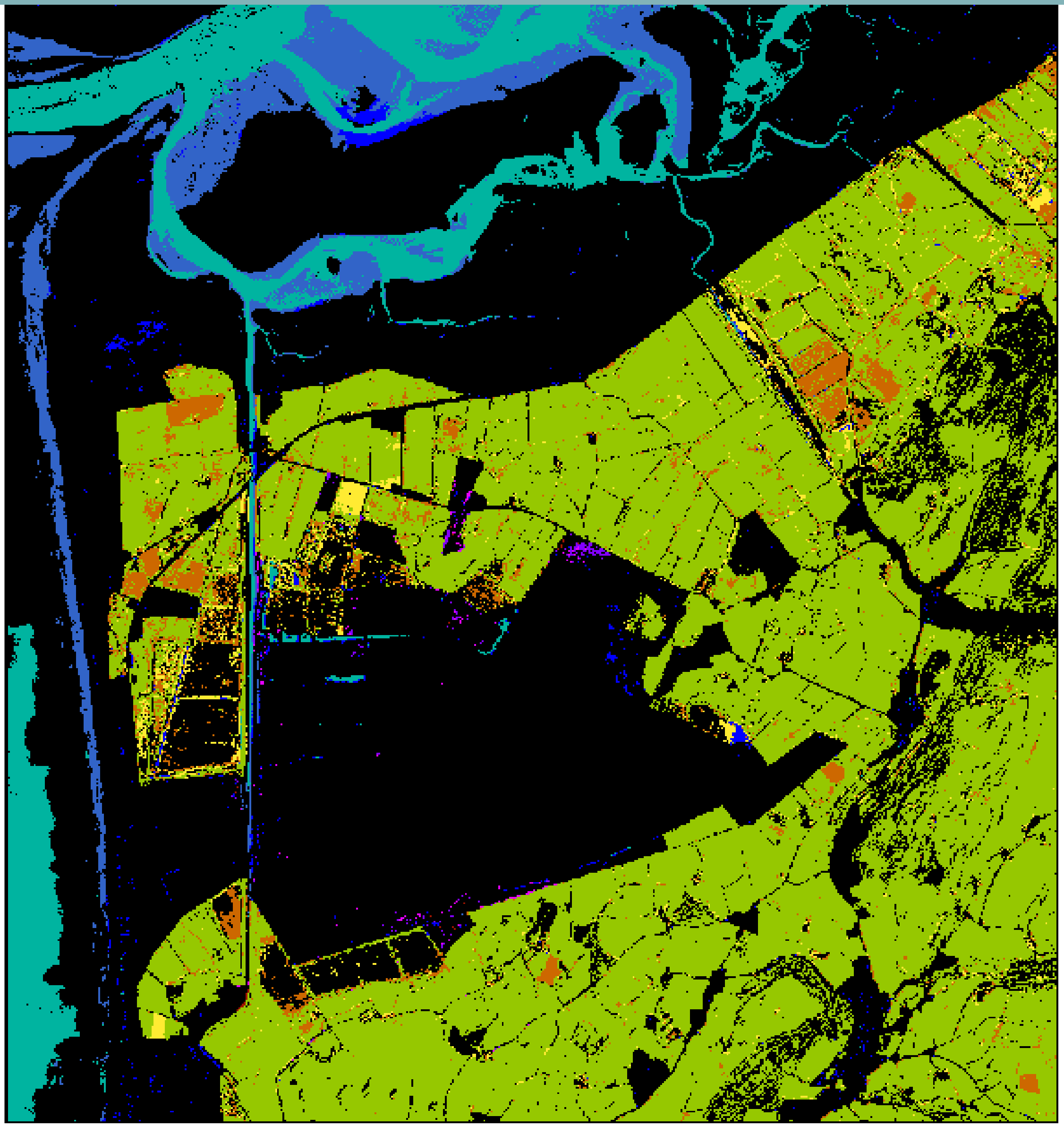
WV2 Peak_P2 (July)
B7,5,2 (NIR1, Red, Blue)

LC maps: *expert knowledge to fill the gaps between different domains*



L4 classification for T1 (left) and T2 (right)

LC change map: *expert knowledge to fill the gaps between different domains*



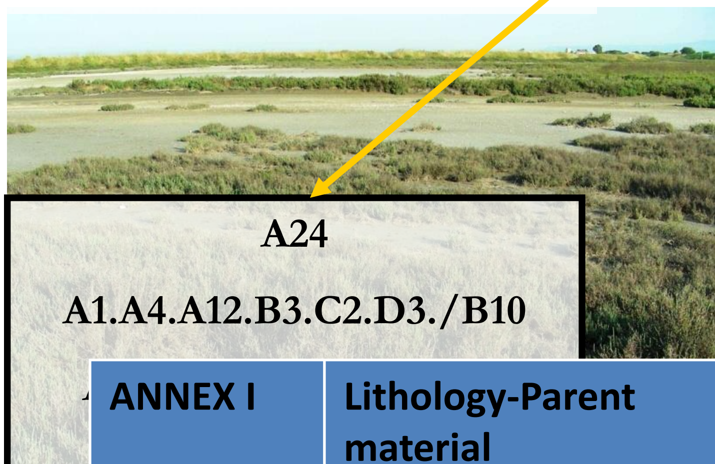
Change events

- Flooding
- Tidal inundation
- Turbidity
- Agricultural expansion
- Agricultural decline
- Cropping
- Deforestation
- Woody shrub decline
- Encroachment of shrubs onto grassland

CLC3

4.2.1 - Salt marshes

Annex I 1420



A24

A1.A4.A12.B3.C2.D3./B10

A24

A2.A6.A12.B4.C2.E5/B11.E6

Perennial closed tall grasslands on temporarily flooded land

ANNEX I	Lithology-Parent material	Soil sub-surface aspect	Water quality	Floristic attribute
1410	Unconsolid- Clastic sedimentary rock - Sand	Solonchaks	Brakish/Saline water	Juncus spp.; Carex spp
7210	Calcareous rock - Calcarenite	Histosols	Fresh/Brakish water	Cladium mariscus