EGU General Assembly 2022

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Analysing water quality variability at the Algerri-Balaguer irrigation district (Ebro River basin, Spain)

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session HS6.8 – *'Innovative technologies using remote sensing data for water management applications'*

The Irrigation and Drainage monitoring by remote sensing for Ecosystems and Water resources management project

CESBIO

IDEWA

PRIMA
PARTNERSHIP ON RESEARCH AND INNOVATION IN THE MEDITERRANEAN AREA

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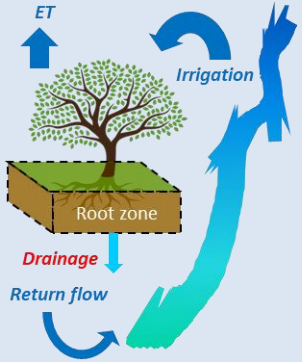
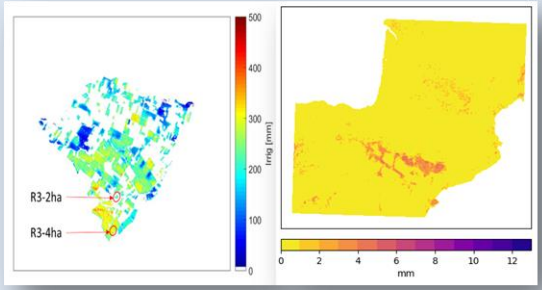
Vegetation index | Evapotranspiration | Soil moisture | Water quality index

Multi-spectral EO data



Drainage | Evapotranspiration

Field measurements



Multi-scale modeling

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Objectives

❖ **Develop a multi-source methodological approach (i.e., in situ data collection, modeling, and satellite-data processing) to assess the clorophyll-a (Chl-a) and total suspended matter (TSM) multi-temporal variability in the Ebro river basin**

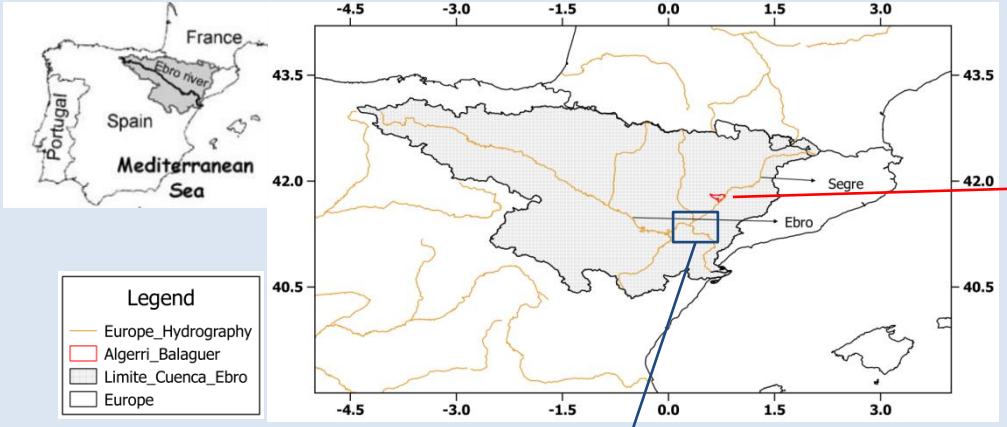
1. **Generate** a locally-tuned version of **Sentinel 2A/B-MSI Chl-a/TSM model** by using a dataset of radiometric and in situ Chl-a/TSM measurements;

2. **Export** such customized Chl-a/TSM models **to Landsat8-OLI** (Landsat9-OLI2) data through an intercalibration procedure;

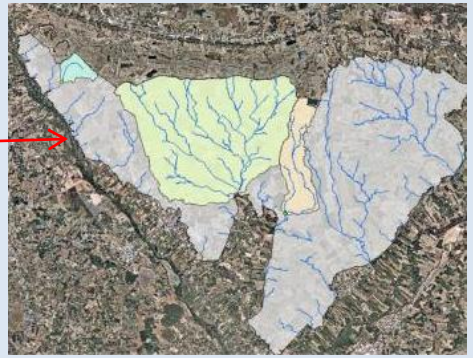
3. **Generate long-term Chl-a/TSM maps** based on a multi-year (2014-2022) MSI-OLI combined dataset to **assess the variability over the study area**.

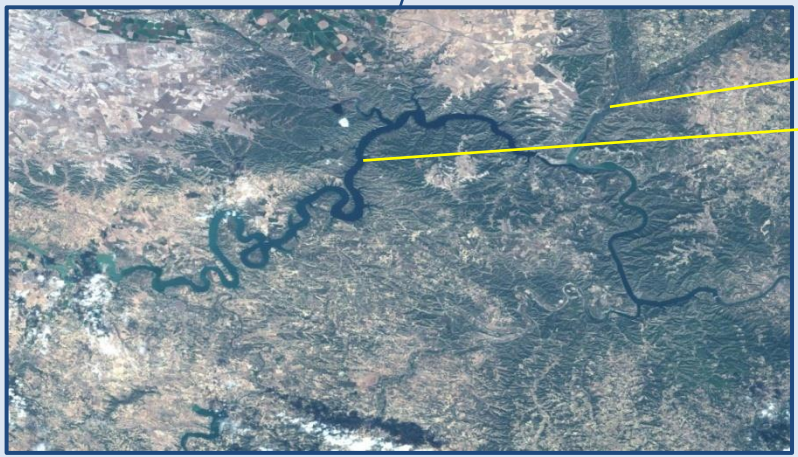
Study Area: Ebro-Segre confluence (Ebro basin, Northeastern Spain)

Ebro basin



Algerri-Balaguer district



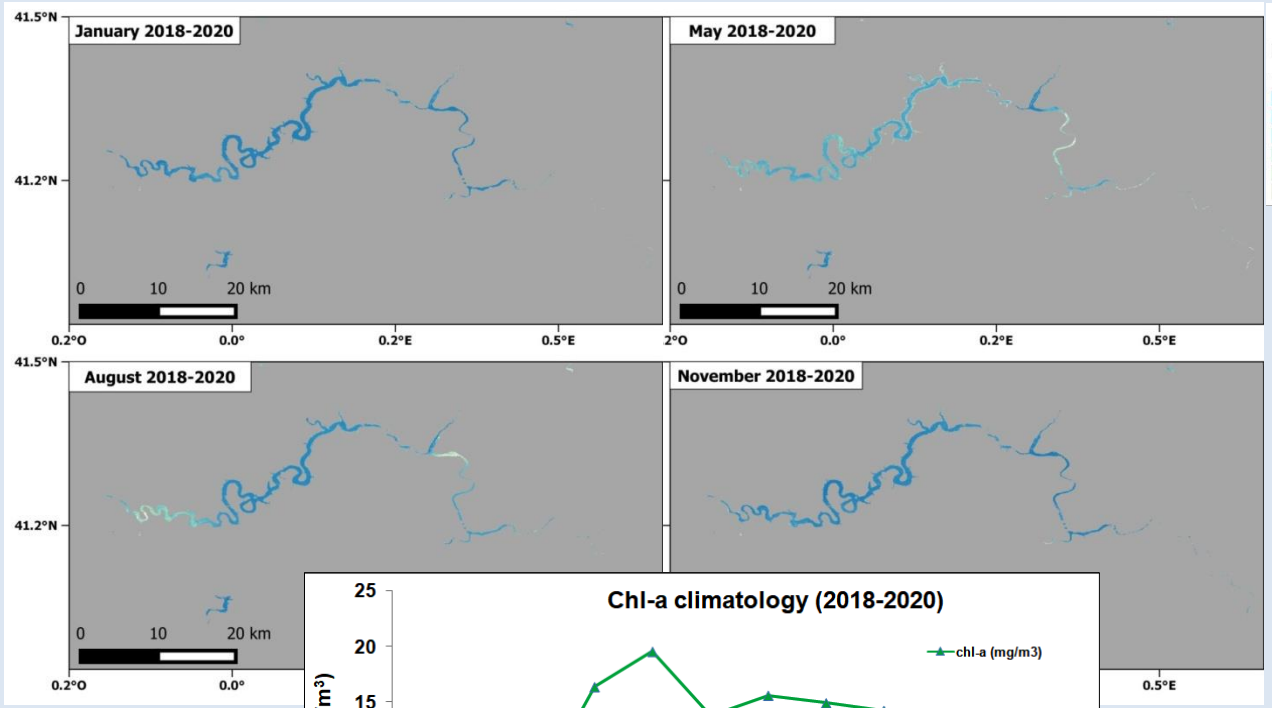


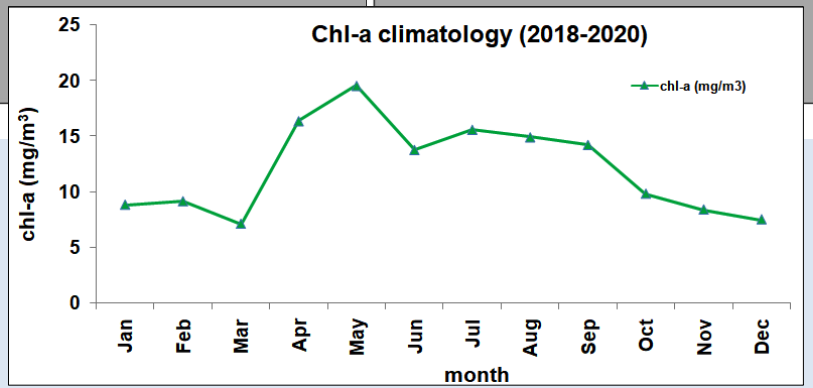
Study area: Ebro-Segre rivers confluence

Segre river

Ebro river

S2-MSI Preliminarly results: 3-year (2018-2020) Chl-a climatology





Chl-a based on Normalized Difference Chlorophyll-a Index **(NDCI)**

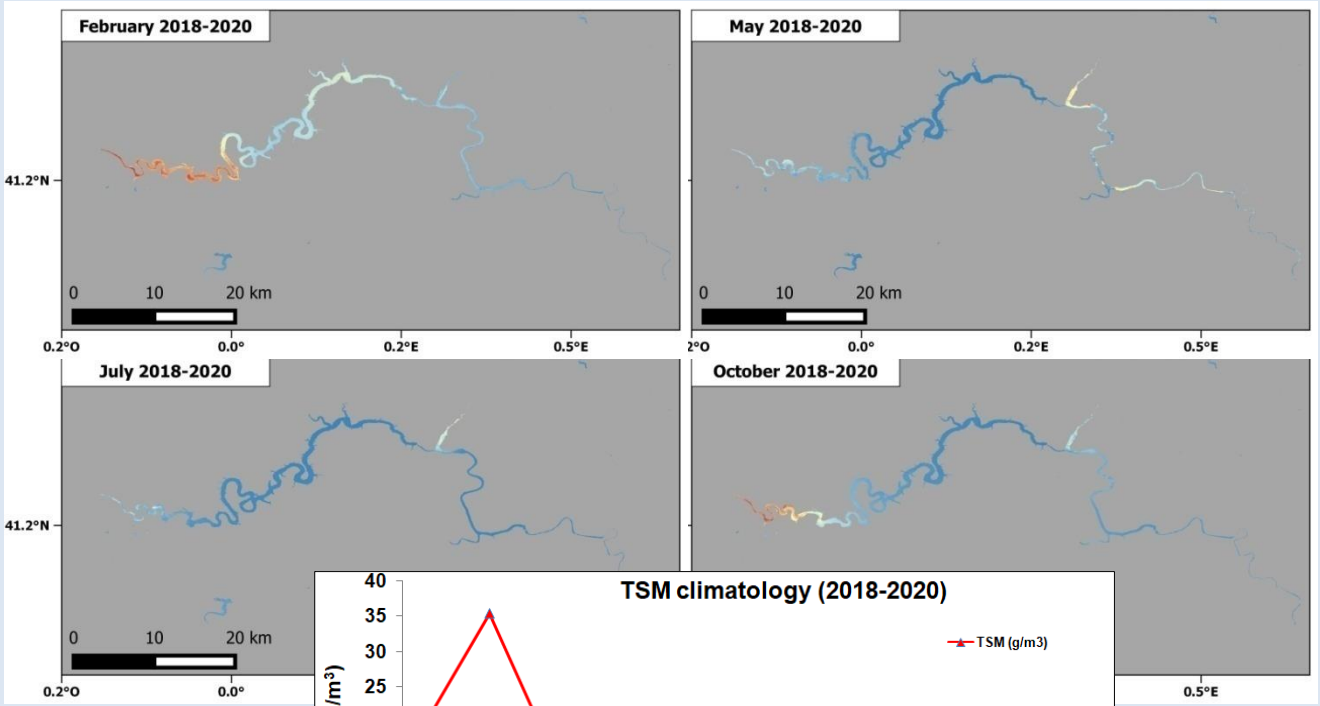
$$Chl-a \propto \frac{[\rho NIR(704) - \rho VIS(665)]}{[\rho NIR(704) + \rho VIS(665)]}$$

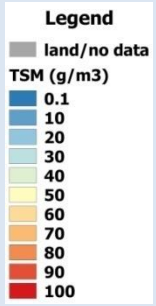
Mishra et al. 2012

Chl-a increase in spring-summer

- low flow and high water residence time;
- meandering zone;
- high nitrates due to agricultural inputs

S2-MSI Preliminarly results: 3-year (2018-2020) TSM climatology

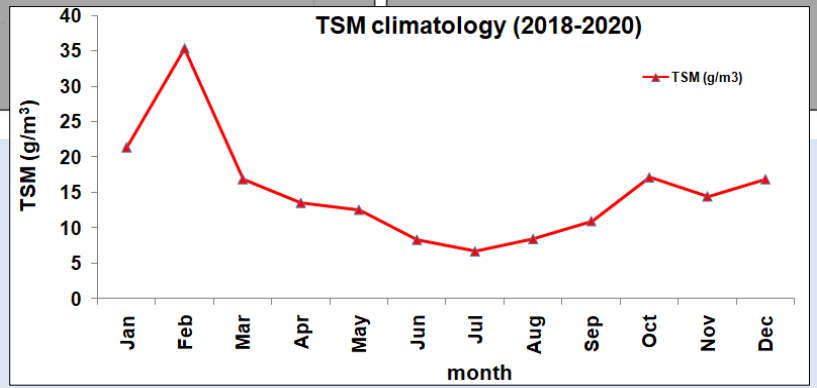




TSM based on RED **(665 nm) band via the Nechad algorithm**

$$\mathrm{TSM} = \frac{A_p(\lambda) \times \rho_w(\lambda)}{1 - \frac{\rho_{w(\lambda)}}{C_p(\lambda)}}$$

Nechad et al. 2016

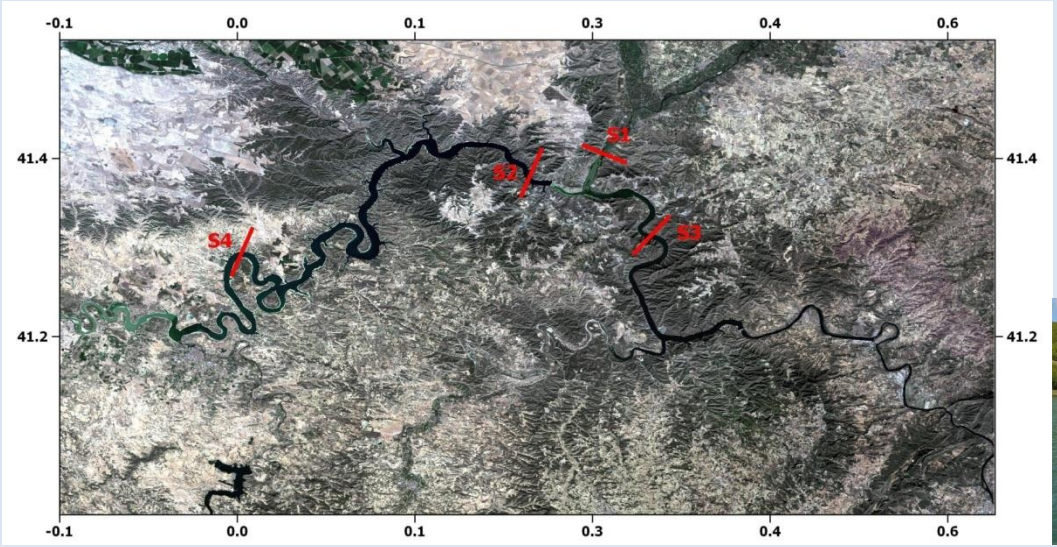


TSM peak in winter (February)

- influence of hydrological forcing (river discharges) on the TSM seasonal variability

On-going activities: in-situ measurement campaings

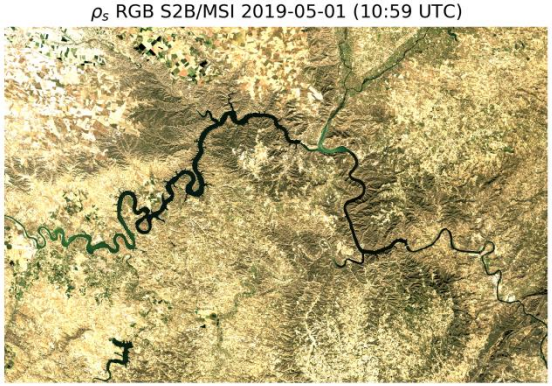
Plan of in situ data collection



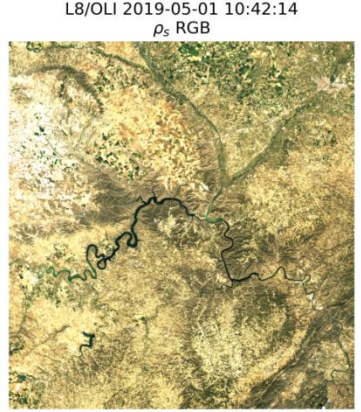
- sub-surface (0–1 m depth) water samples for lab analysis;
- above-water radiometric measurements by a portable spectroradiometer;
- seasonal campaigns are planned within the 2022-2023 year

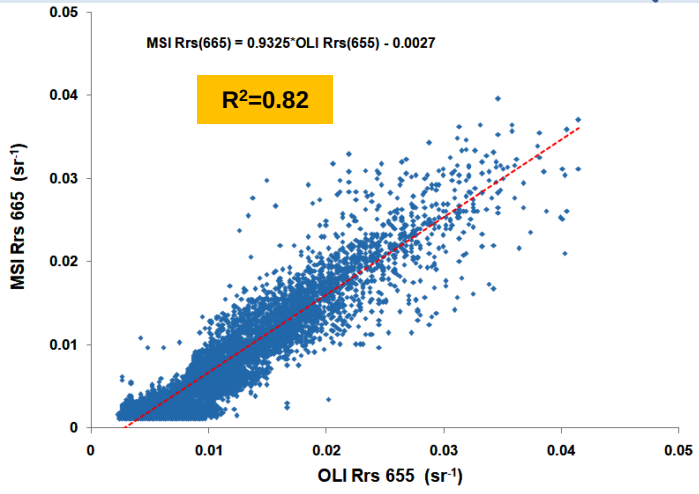
Cal/Val activities for a locale scale tuning of the standard Chl-a/TSM algorithms

On-going activities: MSI-OLI inter-calibration procedures



- suitable spectral configuration (i.e. RED bands – MSI Rrs 665 vs OLI Rrs 655 nm);
- near simultaneous MSI-OLI overpasses (~ 17 min) with similar atmospheric and water conditions;





➢ exportability of MSI-based Chl-a/TSM models to OLI data

➢ MSI-OLI combined dataset for Chl-a/TSM seasonal and interannual analyses

THANKS FOR YOUR ATTENTION

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