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WATER4EVER

Optimizing water use in agriculture to preserve soil and water resources

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Water JPI

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Consortium

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Instituto de Engenharia e Sistemas de Computadores, Tecnologia e Ciência

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Context

- Agriculture is by far the largest consumer of diverted water;

- Inefficient practices result in high water and nutrient surpluses (N and P) that are transferred to water bodies through diffuse processes;

- Farmers deal with water at the plot scale, not easily perceiving the effects of agriculture practices in downstream water bodies;

- Water agencies deal with water at the catchment scale, usually without detailed information of agriculture practices;

- Models are the necessary interdisciplinary tools required to optimize irrigation and fertilization practices and to link spatial and temporal scales;

Objectives

- To develop an automatic irrigation and fertilization **Decision Support System** based on online data and forecast models;
- To develop **new strategies** based on optical sensors installed on fixed and mobile ground, drone and satellite platforms for continuous **crop monitoring**;
- To improve **soil process-oriented models** for irrigation water and fertigation management;
- To **connect plot and catchment scale models** to quantify the effect of local agriculture practices on downstream water availability and quality;

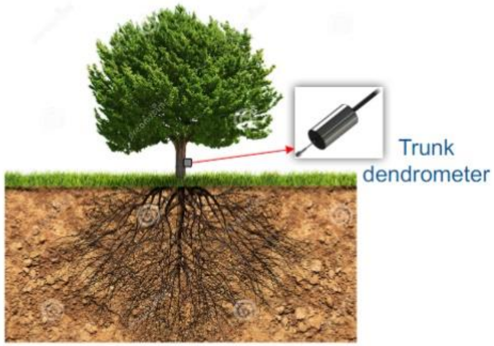
Case Studies

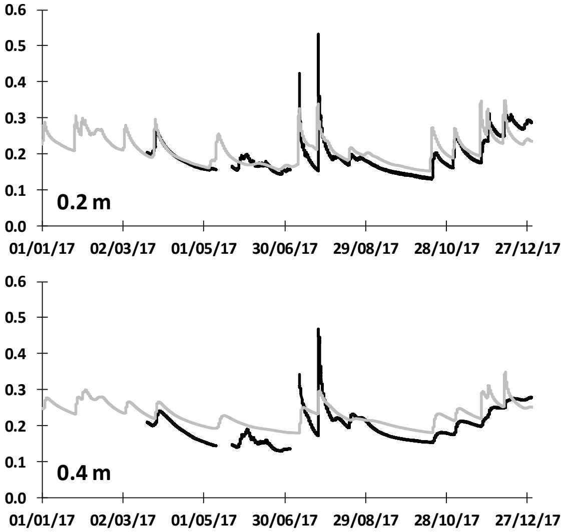
10 agricultural fields (5 catchments) fields in Portugal, Spain, Italy and Turkey

Field activities

1 Development of regulated deficit irrigation strategies for improving irrigation water use and fruit quality of woody crops

Use of sensors (soil moisture probes, dendrometers) and vadose zone model (MOHID-Land) for defining RDI strategies aimed at improving irrigation water use and quality of fruits (citrus, peaches, grapes).

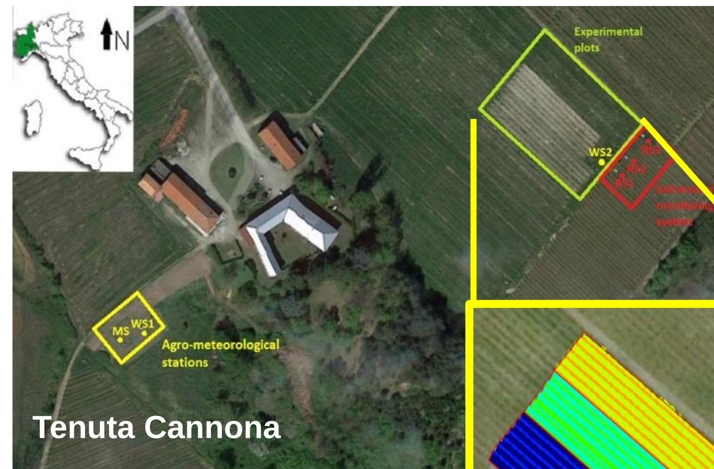




Field activities

2 **Development of strategies for minimizing runoff and soil erosion of non-irrigated hillslope vineyards**

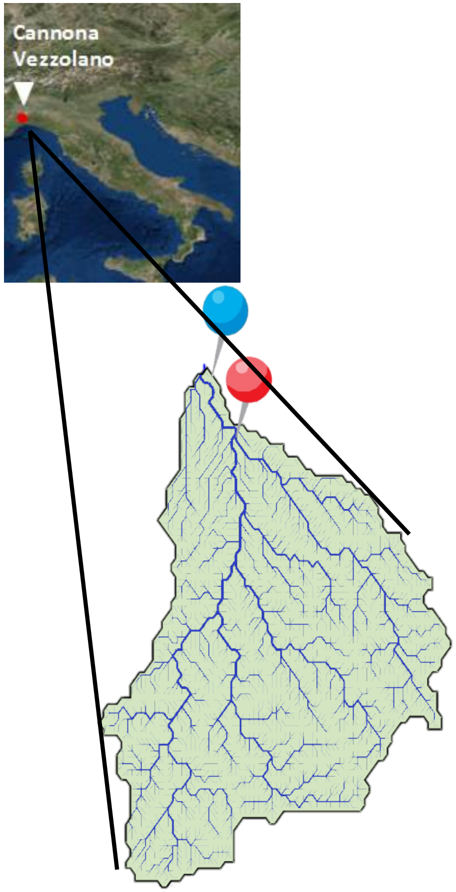
Plot scale measurements

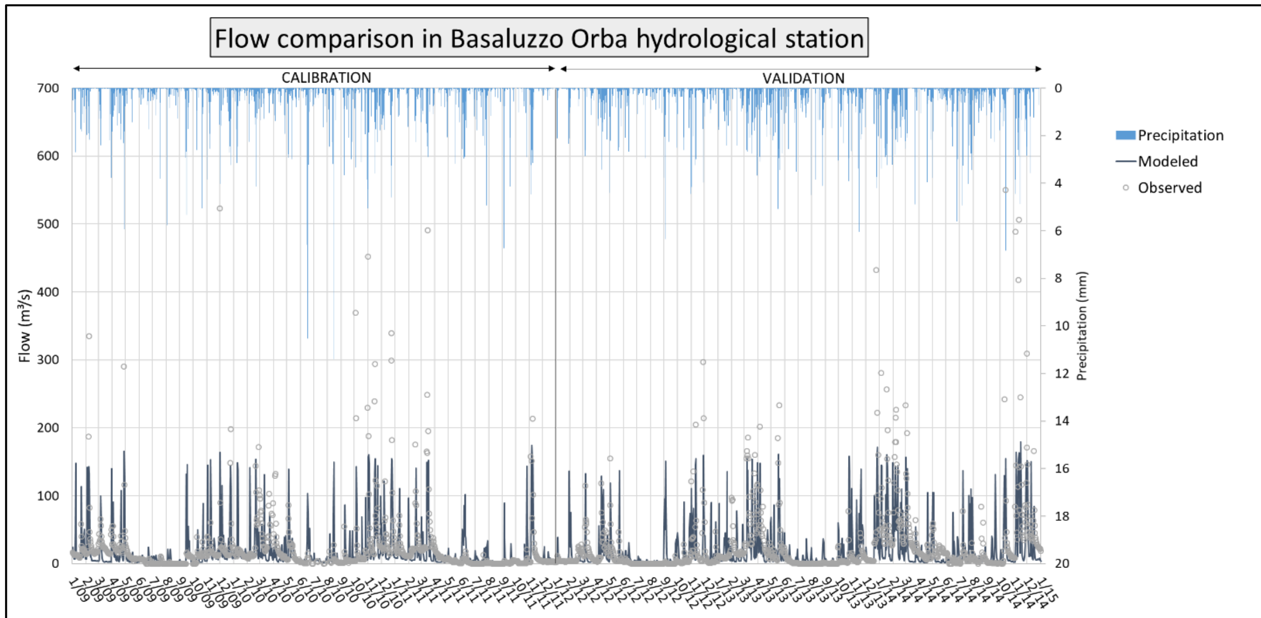


Combining plot scale measurements and MOHID-Land to assess the impact of soil cover and tillage on runoff and soil erosion.

Catchment scale activities

3 Modelling watershed hydrological processes





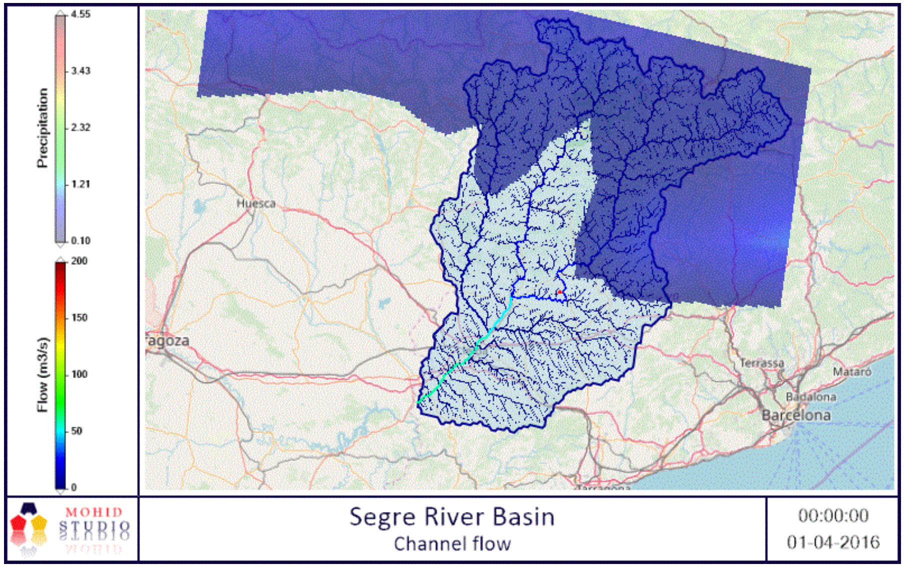
Example for Orba catchment, Italy

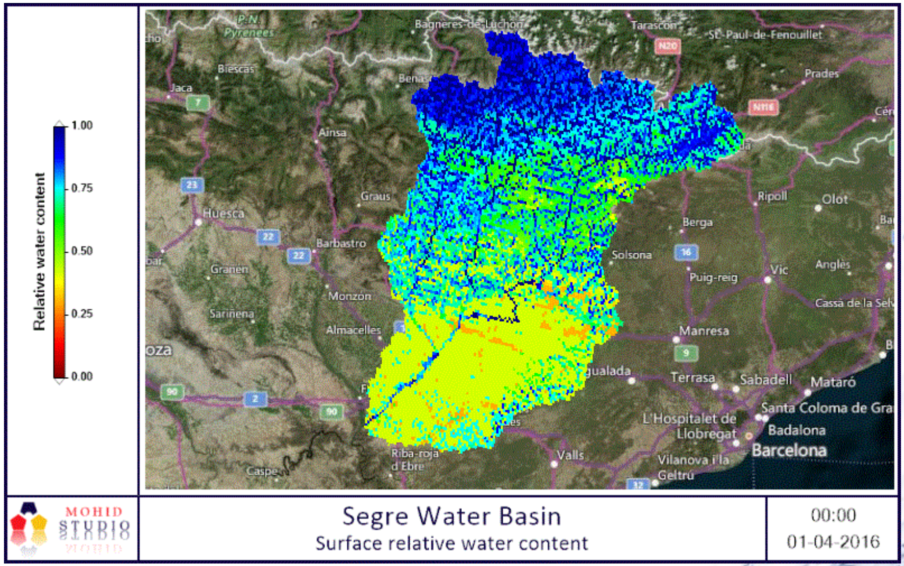
Model inputs (EU-SoilHydroGrids, CLC maps, ERA5 weather data from ECMWF)

Catchment scale activities

3 **Modelling watershed hydrological processes**

Flow | **Soil moisture**



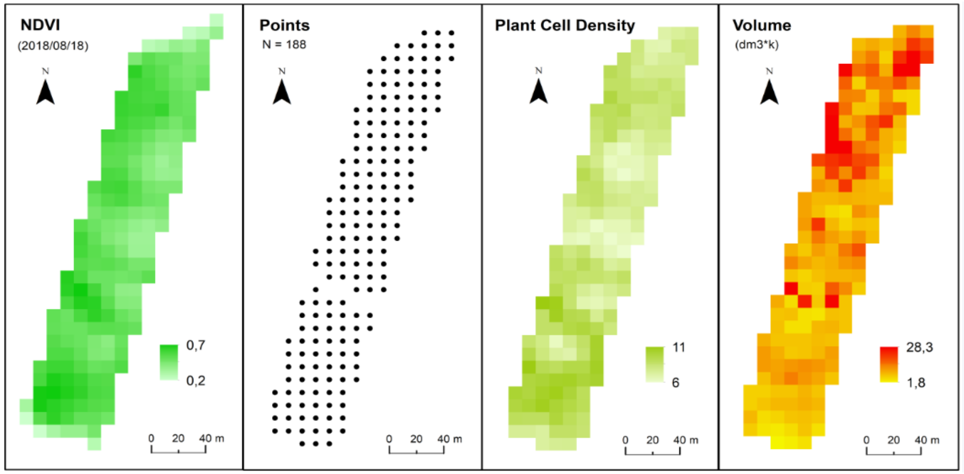


Example for Segre catchment, Spain

Calibration/validation by comparing modelled and measured streamflow, sediment and nutrient in public monitoring stations.

Remote sensing

4 New integrated sensors for mapping crop productivity

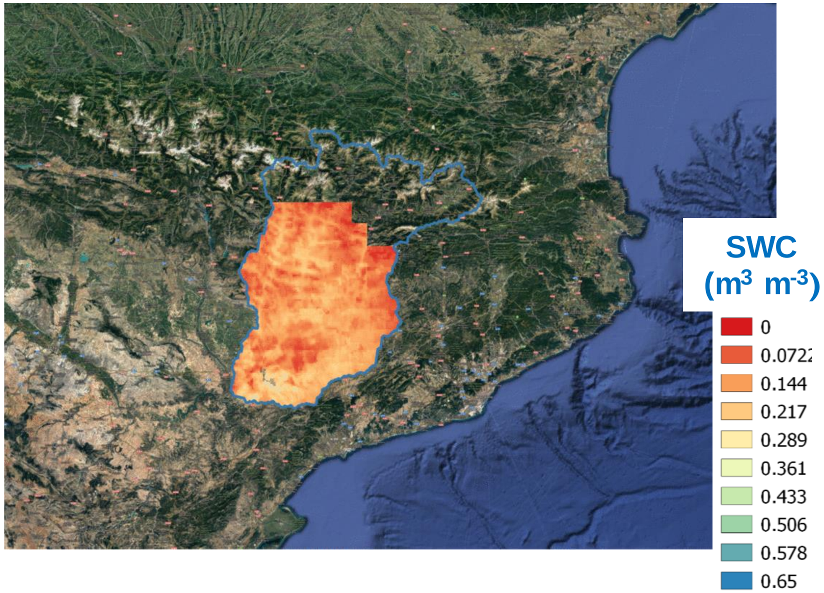


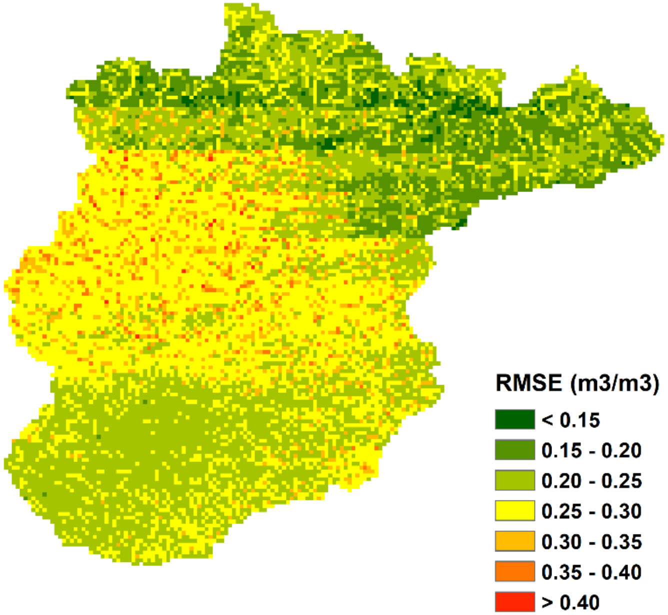
A 2D LIDAR sensor attached to low cost IoT module (AgIoT module) located inside the harvesting machine to estimate crop stress and fruit volume.

Sensor being tested in mandarin and grapefruit trees in southern Spain this summer.

Remote sensing

5 Soil moisture maps at 1km resolution

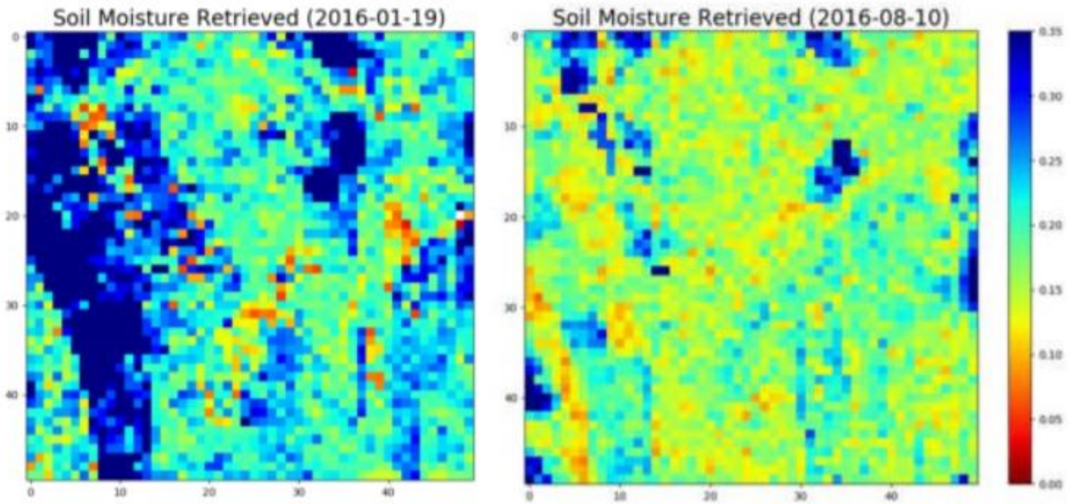




SM products for all case studies using the DISPATCH algorithm → **Comparison with surface layer outputs from MOHID-Land (example for Segre catchment, Catalonia)**

Remote sensing

6 Soil moisture maps at 100 m resolution

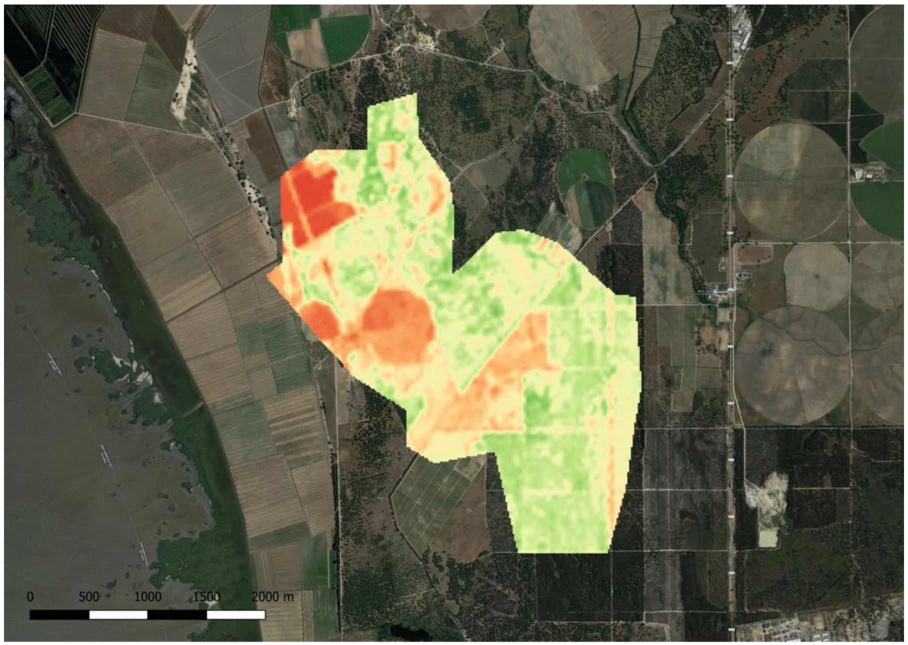


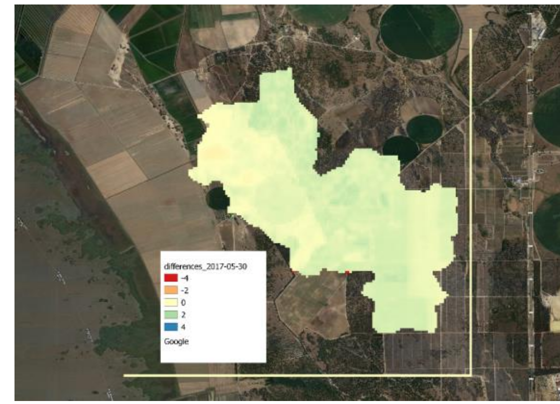
These maps combine the 10m resolution synthetic-aperture radar (SAR) images from Sentinel 1 with the 10 m resolution normalized difference vegetation index (NDVI) computed from Sentinel 2 images, averaged into 100 m cells.

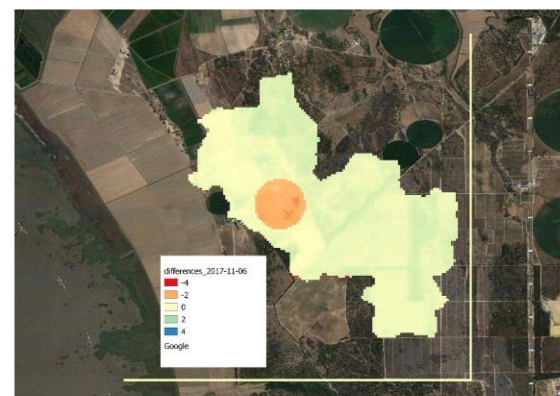
→ **Comparison with surface layer outputs from MOHID-Land (ongoing)**

Remote sensing

7 **LAI and NDVI maps at 30m resolution**







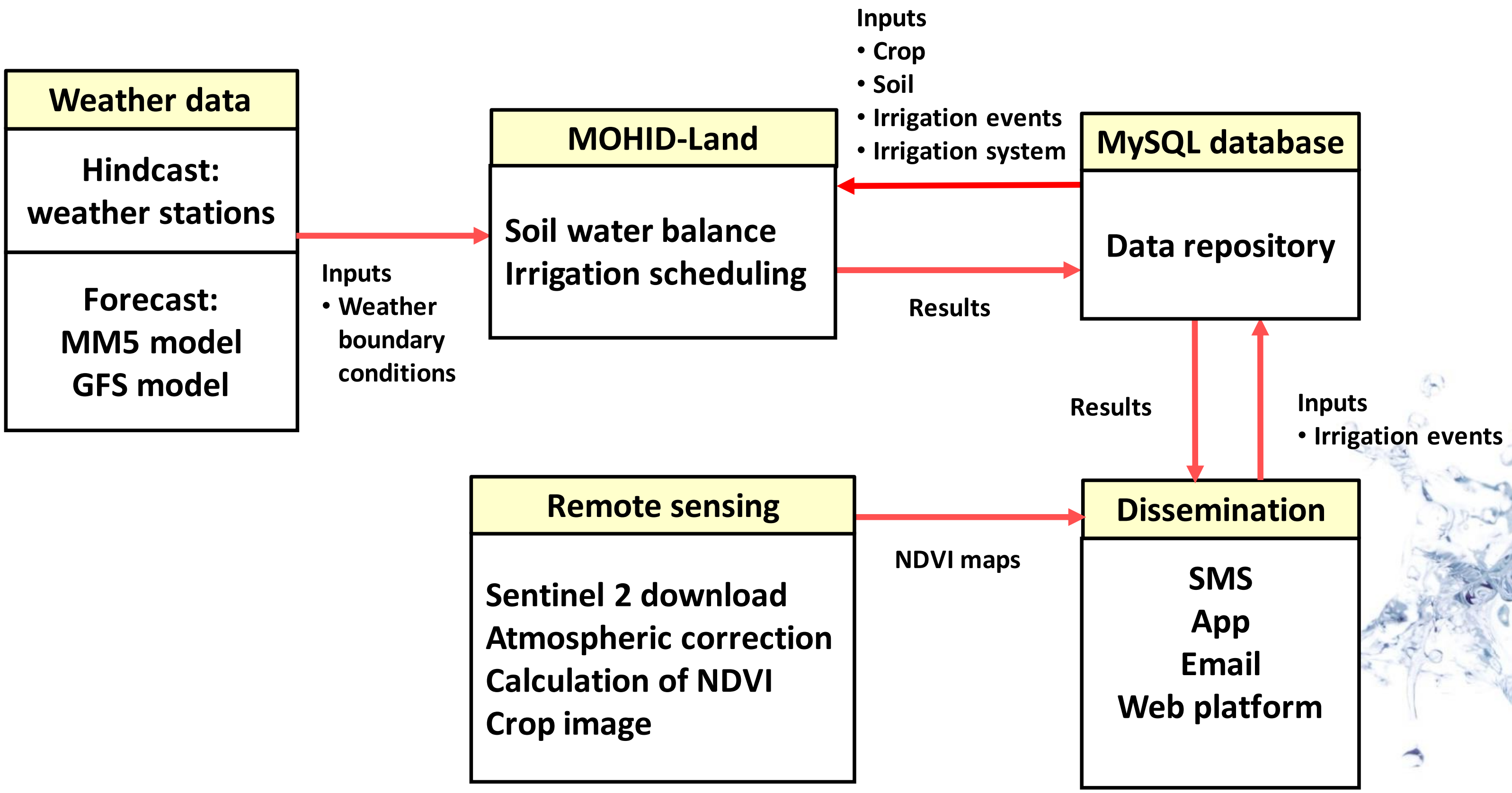
LAI and NDVI maps computed from Landsat 8 sensor → **Comparison with surface layer outputs from MOHID-Land (example for Lezíria, Portugal)**

Decision Support System

8

IrrigaSys: A web-based irrigation decision support system based on open source data and technology

http://irrigasys.maretec.org/



Please check the following presentations for more details on WATER4EVER activities

D1867 | EGU2020-9995 | Highlight

High-resolution soil moisture retrieval using a Neural Network approach from Sentinel-1 SAR data

Qi Gao, Maria Jose Escorihuela, Nemesio Rodriguez-Fernandez, Olivier Merlin, and Mehrez Zribi

D1868 | EGU2020-11408

Multispectral reflectance vegetation indices are highly sensitive to water stress in grapefruit trees

Pablo Berrios, Abdelmalek Temnani, David Pérez, Ismael Gil, Susana Zapata, Manuel Forcén, Tiago B. Ramos, Filipe N. Santos, Juan Antonio López Riquelme, and Alejandro Pérez-Pastor

D1873 | EGU2020-9488

IrrigaSys – a decision support system for irrigation management in the Sorraia Valley region, Portugal

Lucian Simionesei, Tiago B. Ramos, Jorge Palma, Ana R. Oliveira, and Ramiro Neves

D1882 | EGU2020-16459

Use of Mohid-Land to model water balance for implementation of deficit irrigation in vineyards

Giorgio Capello, **Marcella Biddoccu**, Lucian Simionesei, Tiago Ramos, Ana Oliveira, Nuno Grosso, Pritimoy Podder, Danilo Rabino, Giorgia Bagagiolo, and Ramiro Neves

D1884 | EGU2020-18284 | Highlight

Machine Learning-based inference system to detect the phenological stage of a citrus crop for helping deficit irrigation techniques to be automatically applied.

Manuel Forcén, Nieves Pavón Pulido, David Pérez Noguera, Pablo Berríos Reyes, Alejandro Pérez Pastor, and Juan Antonio López Riquelme

More information

http://water4ever.eu/