

# MERGUELLIL (Tunisia)

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# Site Description

- **Merguellil basin**, central Tunisia, near Kairouan
- **Landscape**: plain (100 masl, 3000 km<sup>2</sup>)
- **Texture**: clayed to sandy soils (Fluvisols /arenosols)
- **Drainage**: Well to moderately well
- **irrigation**: drilling
- **Land use**: wheat and barley in winter, melon, tomato, chili in summer +orchards (olive, almond, orange groves)
- **Field size** : typically 1 to 4 ha
- **Climate**: Semi-arid mediterranean climate (P 250mm/y, ETO 1500 mm/y)
- **Irrigation** for cereals, vegetables and some orchards, dry cereals and olive trees.



# Project Objectives

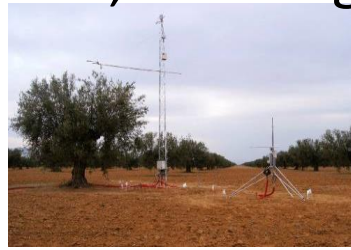
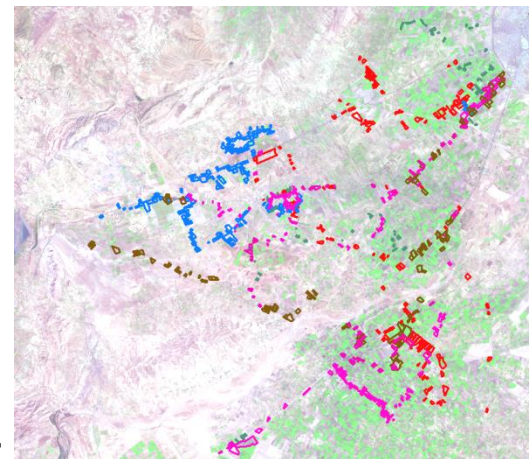
- **Crop identification and Crop Area Estimation** using multitemporal NDVI data (high and low resolution data)
- **Crop Condition** : monitoring of crop and irrigation water requirements, FAO-56 method, NDVI time series and water budget (farmers and irrigated perimeter)
- **Crop Stress** : monitoring with thermal image
- **Soil Moisture**: using microwave data, as input in models
- **Yield Prediction** : empirical prediction with NDVI, model
- **Crop Residue, Tillage** : VIS, MIR remote sensing indices
- **Soil hydrodynamic properties**: multitemporal remote sensing (MIR, TIR,  $\mu$ wave)

# Earth Observation (EO) Data Received/Used

- **SPOT 5:** SPOT Image/CNES, 7 /ISIS prog. (atmospheric parameters from photometer)
- **SPOT 5 Take-5:** April to Sept /5j : 24, processing using MACCS chain, similar to level 2A sentinel-2, CNES/CESBIO, Pole THEIA), used
- **Landsat 7:** USGS/JECAM, 10, radiance
- **Landsat 8:** USGS/JECAM, 19, processing using MACCS chain, to be evaluated
- **TerraSAR:** DLR, 7, SAR dual polar., used
- **COSMO SkyMed :** 5, used
- **MODIS;** VIS-MIR, TIR

# In situ Data

- **Crop types validation** : random sampling of fields, 3 campaigns in 2015 (75 to 150 plots)
- **Soil roughness and moisture validation** on bare soil plots (SAR validation in winter, 20p.)
- **Vegetation characteristics**: height, LAI, f.cover, biomass (15 cereals plots, 1 campaign/month, January to May)
- **Energy budget**: flux tower on irrig. chilies and rainfed olive grove
- **Integrated sensible flux**: X-LAS scintillometer transect (4km)
- **5 meteorological stations, 8 soil moisture probes** (5, 40cm), photometer Aeronet, thermal rad, PRI... => remote transmission
- **Monthly irrigation**: daily vol., 3 managers + 30 farmers



**JECAM**

Joint Experiment for Crop Assessment and Monitoring

**GO** GROUP ON  
EARTH OBSERVATIONS

# Collaboration

- Tunisian Institute of Agronomy (INAT), CESBIO and G-EAU french labs /IRD
- The two JECAM sites in north Africa (this site +TENSIFT) are continuously communicating and are answering jointly to some calls (+ links with OSR site in France)
- They are both involved in a joint project called AMETHYST funded by the French research agency (ANR). Other funding for student and senior exchanges between Tunisia, Morocco, Algeria and France (PHC program).

# Results

- **Crop water budget monitoring** with high resolution and high repetitivity remote sensing data to improve  $f_c$  and  $K_{cb}$  with the SAMIR tool to improve water use
- **Instantaneous estimates of evapotranspiration** with thermal data (MODIS, Landsat), single vs dual source
- **Estimates of irrigation volumes with the SAMIR tool** (Satellite Monitoring Irrigation) at plot and perimeter scale (SPOT5-Take5 images)
- **Soil water monitoring using microwave** (2m resolution)
- **Wheat and barley Yield estimates** based on VIS-NIR and SAFY model (LAI input from satellite data)

# Research Plans for Next Growing Season

- Will you hold the course, or modify the approach?

The time series of SPOT5-Take5 is currently in used to evaluate the future Sentinel-2 /10 days in 2016 and /5days in 2017 to improve :

- (1) more general and robust method to discriminate crops,
  - (2) water consumption estimation and irrigation with SAMIR tool
- Using of Medium resolution (MODIS) and assimilation of Thermal (Landsat8) and radar to improve soil water budget control

- Do you anticipate using the same type/quantity of EO data next year? Y/N