

# MERGUELLIL (Tunisia)

JECAM/GEOGLAM Science Meeting

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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)

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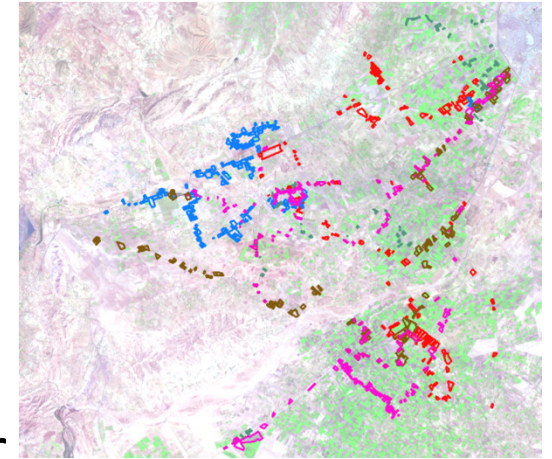
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# Earth Observation (EO) Data Received/Used

- **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



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# 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