

SPOT4 (Take Five) experiment

Sentinel-2 Simulations for the Monitoring of Water Resources of the Merguellil Watershed and Kairouan Plain (Tunisia)

First Results

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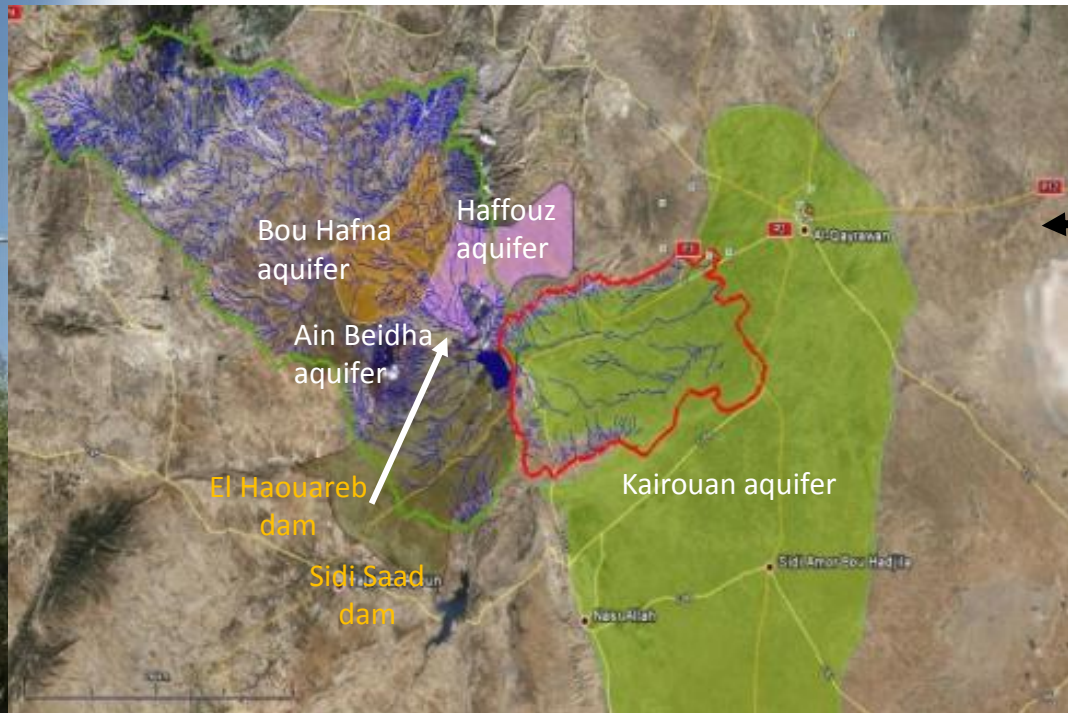
Plan

- Context
- Objectives
- Imagery Dataset
- Land use and biophysical variables field acquisition
- Monitoring of small reservoirs



The Merguelil Watershed and the Kairouan plain

Context




Central Tunisia

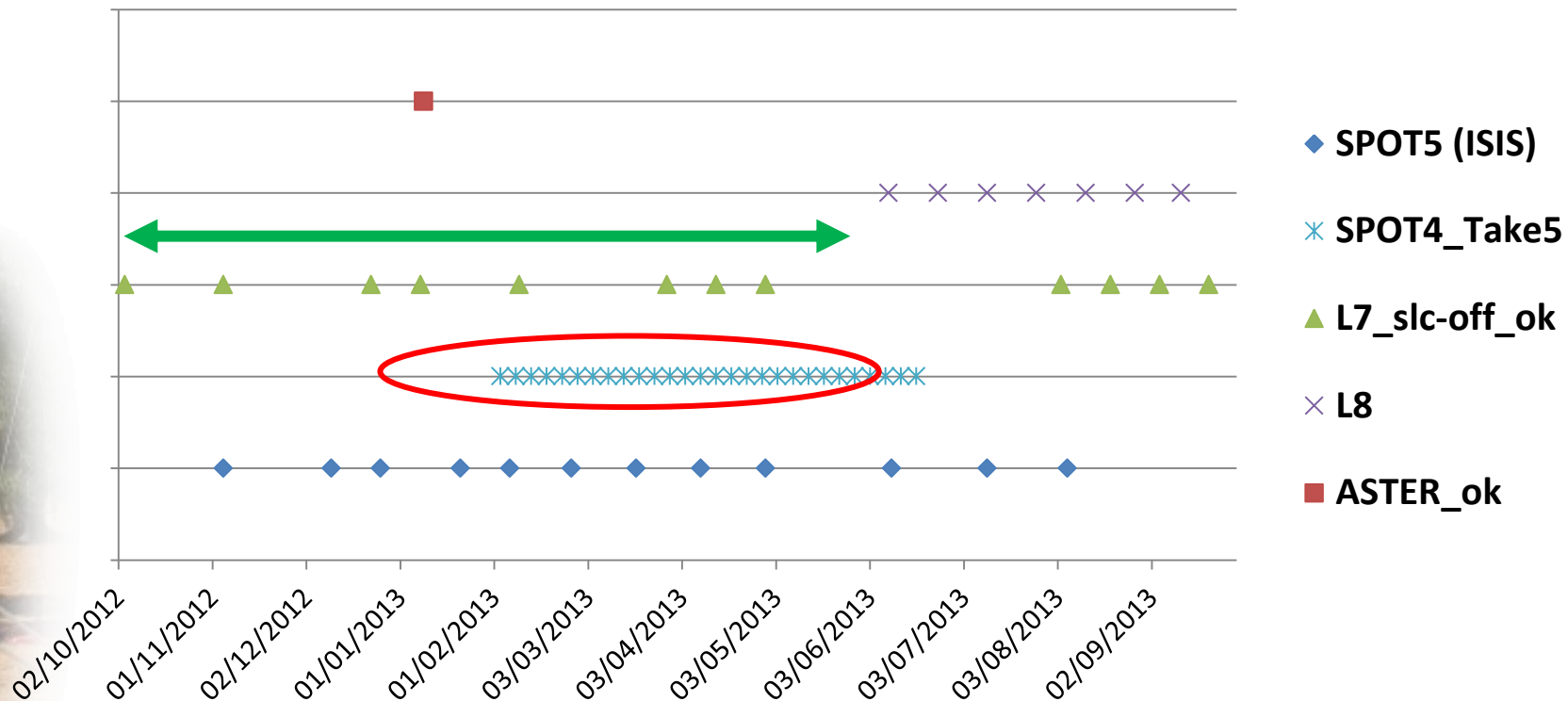
**Semi Arid
climate**

- Avg. Annual rainfall 300mm
- ETP 1600 mm
- 1400 km²
- An important agricultural area
- 10000 wells and deep boreholes

Typical South Mediterranean Issues: Agricultural intensification, resource depletion, competition with other uses

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1. **Spatialized water budget** related to groundwater interactions
 - ✓ Land Cover mapping
 - ✓ Evapotranspiration modeling and quantification of groundwater abstraction.
 2. **Monitoring of small upstream reservoirs** and influence on distribution of water resources and water availability for users

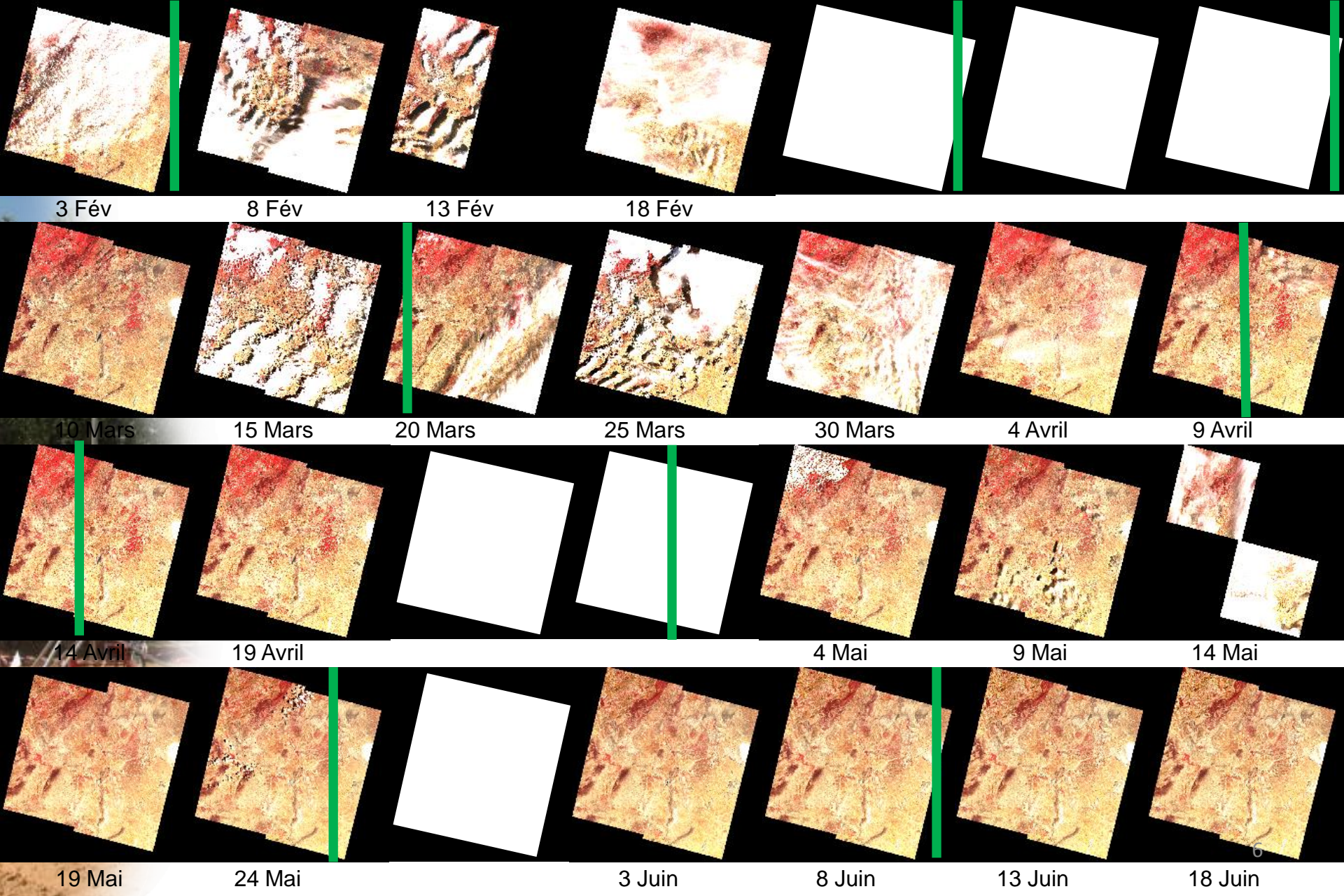
High Spatial Resolution dataset acquired during the 2012-13 Agricultural Season



SPOT4 (Take Five) and clear SPOT5 acquisitions

Imagery

SPOT 5 = Green bars (ISIS-CNES)



Radiometric measurements

Calibration

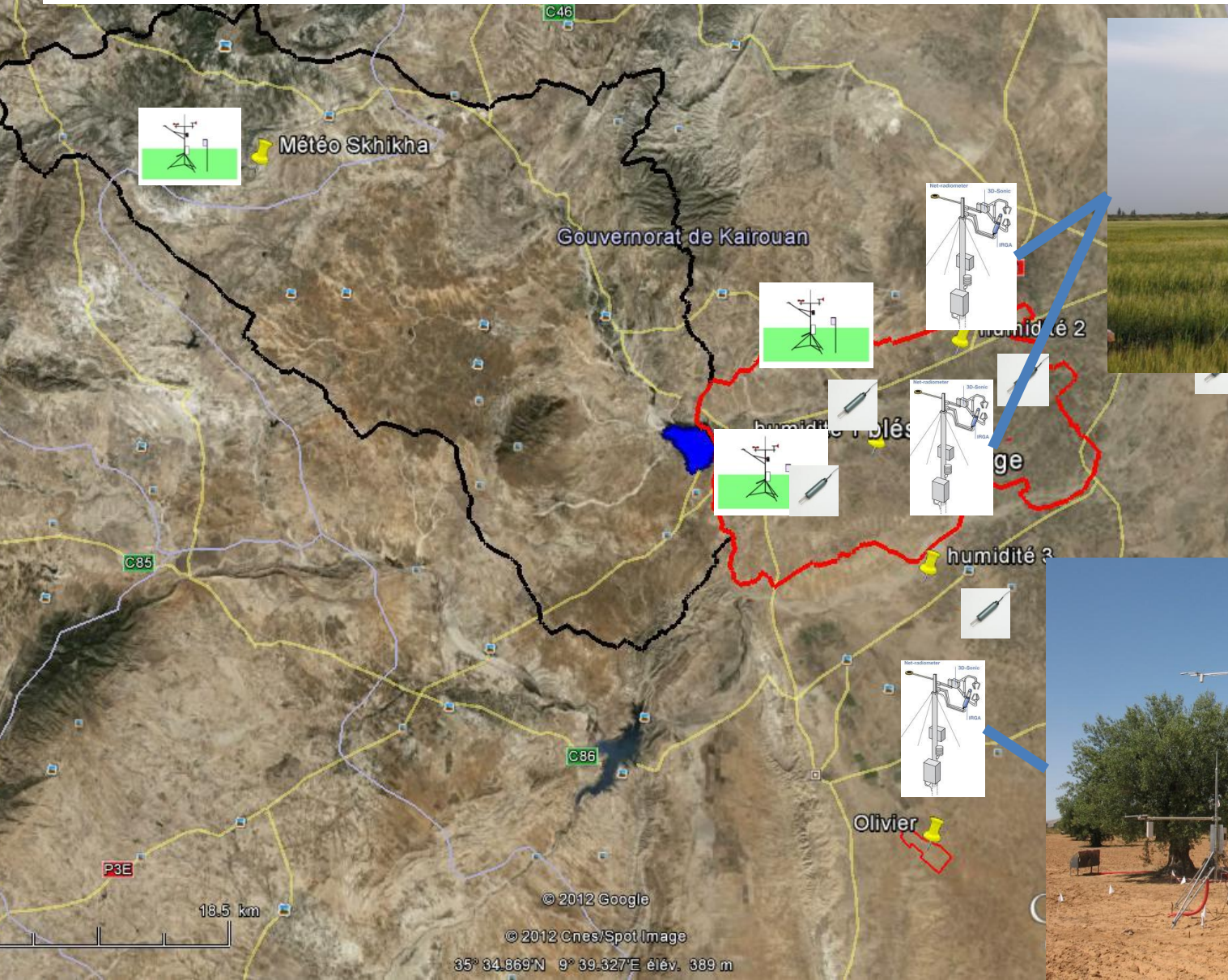
- AERONET photometer (Ben Salem site)
- + microtops punctual measurements



Validation

- NDVI continuously measured on a wheat plot over a season (NDVI-sensor)
- CROPSCAN hand-held radiometer measurements on various land surfaces (pseudo invariants and annual vegetation)

Field measurements : weather, fluxes, soil humidity



Field Campaigns

- **Land Cover Field Campaign**

200 plots with cereals, vegetables

- **Biophysical Parameters**

LAI, Vegetation Height, Biomass, Yield on 20 Cereal plots

- **Irrigation groundwater Abstraction**

Field survey of four Farmer associations

Direct Measurements on some wells

The 2012-2013 season was dry

191 mm rainfall from Oct 2012 to June 2013 compared to an annual average of 300 mm

=> No dry-cultivated cereals

Cloudy months of February/March

=> Only 2 clear images during the first two months of SPOT4-Take5

=> First Take5 image acquired when cereal biomass is already at its peak

=> It will not be feasible to test the contribution of high temporal frequency images in Land Cover mapping and in spatialised water budgeting

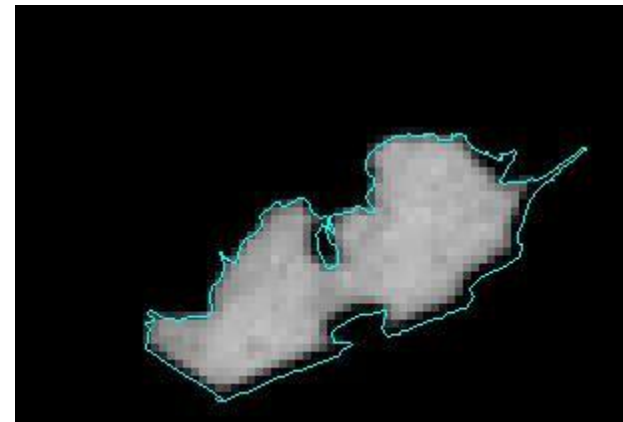
=> The attempt to estimate Yields is also compromised

Field measurements

- 1) Continuous monitoring on 4 small reservoirs
 - Rainfall, stage, groundwater
 - DGPS levelling to build 3D model of reservoir and stage-surface relations



- 2) Three campaigns of DGPS contours on 6 small reservoirs



- 3) 4 flow gauges and over 20 rainfall gauges across the upper catchment¹¹

- Water detection on 50 small reservoirs
- Thresholding NDWI with field surface data (DGPS contours and stage loggers) from 6 small reservoirs. Estimating flooded surface & volume on other reservoirs
- Calibration of NDWI with field data was restricted by both the reduced number of available images and of lakes flooded (14 out of 50).
- Flood dynamics may only be studied/modelled on a handful of lakes and at a much lower temporal resolution than intended.