

TENSIFT (Morocco)

JECAM/GEOGLAM Science Meeting

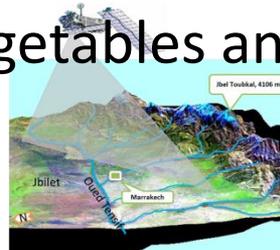
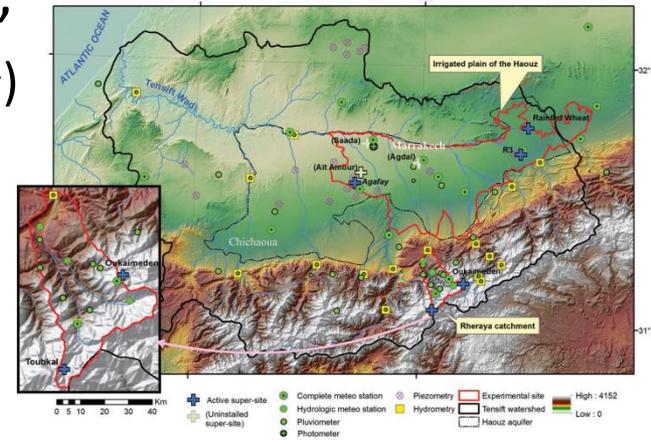
Brussels, Belgium

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Site Description

- **Tensift basin:** Central Morocco, 24000km²,
- **Landscape:** Haouz plain (~500 masl, 6000 km²)
- **soil texture:** various, mainly sandy clay loam (Fluvisols)
- **Drainage:** moderately well, irrigation, dam and drilling
- **Land use:** cereals (wheat, barley, vineyards, fodder beet), olive groves (irrigated), orange, apricot... orchards
- **Field size:** 0.5 to 40 ha (irrigation: gravity and 10% drip)
- Semi-arid mediterranean **climate** (P 240mm/y, ETO 1600 mm/y)
- **Irrigation** for cereals, vegetables and orchards, dry cereals exists



Project Objectives

- **Crop identification and Crop Area Estimation** using multitemporal NDVI data (thresholding or off the shelf)
- **Crop Condition/Stress**: methodological developments for the estimation and monitoring of crop and irrigation water requirements (multi-sensors, multi-spectral), ETR from IRT and VIS data (FAO-56 and energy budget)
- **Soil Moisture** : middle resolution soil moisture (1km) by disaggregation of SMOS satellite data with TIR and VIS data
- **Yield Prediction/forecasting** with empirical relationships; statistical analysis (optical and μ wave data, climate...)
- **others**: integrated modeling (surface flow, recharging process, snow cover in mountain, assimilation in models...)

Earth Observation (EO) Data Received/Used

- **SPOT 5 Take-5:** CNES, VIS-MIR, April to Sept 2015 /5j, 24, processing using MACCS chain, similar to level 2A sentinel-2, CNES, Pole THEIA), used
- **Landsat 8:** USGS/JECAM, VIS-MIR IRT, processing using MACCS chain, brightness temp. correction, used
- **ASTER:** NASA/JSS, VIS-MIR IRT, 3 (?), over R3 site,
- **SMOS:** ESA, passive micro waves, revisit time <3 d.
- **MODIS:** VIS-MIR, TIR, /d

In situ Data

- **Crop types validation** (sub-site R3, 3000ha): 600 plots/year from 2009; *110* random sampling “along the road” in 2015.
- **Vegetation** (subsite R3 and Agafay): LAI, fraction cover, biomass=> annual (3) and field campaigns (/10 days, 3-4 months); yield: annual (cereals)
- **Water and Energy budget**: flux tower on dry cereals and irrigated orange grove
- **Weather**: 15 meteo. stations/30mns, 36 pluviometers/d
- **Remote sensing**: NDVI (cropscan/15d), **photometer** Aeronet), thermal radiometer
- **irrigation**: by water turn (R3), drip (daily, Agafay sub site),



Collaboration

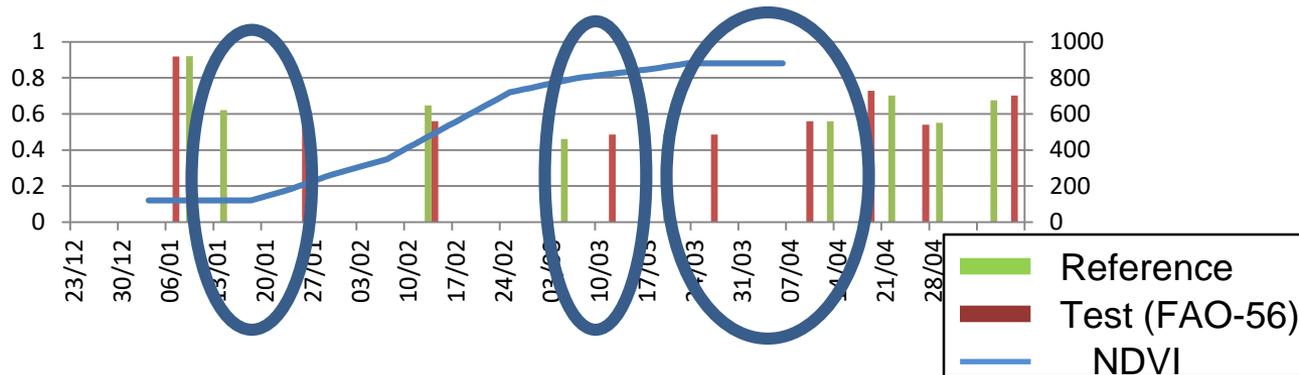
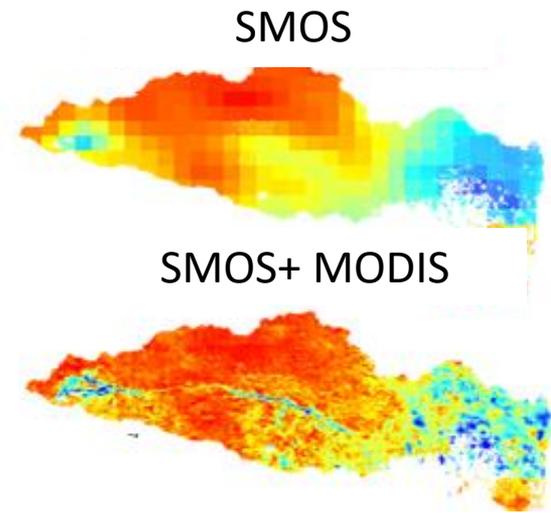
- The International Joint Laboratory TREMA associates several partners from the research and academic sector (**Univ. Cadi Ayyad of Marrakech, Moroccan Center of Energy and Nuclear Sciences, Moroccan National Meteo Center, CESBIO/IRD**), decision makers (**Basin Agency of the Tensift River, Regional Office of Agriculture**)
- The LMI TREMA works with the “Merguellil team” in Tunisia, which is also a JECAM site (CESBIO and G-EAU labs, Tunisian Institute of Agronomy).



- The Tensift site is part of the Sen2-AGRI project (ESA).
- Main external fundings: CNRST SAGESSE program (Morocco), ANR AMETHYST, SICMED/MISTRALS, ANR REC...

Results

- **Soil moisture** derived from μ wave SMOS data (40km) downscaled at 1km resolution (DISPATCH) with thermal data and NDVI MODIS and evaporative fraction approach
- **Crop water budget monitoring** with high resolution and high repetitivity remote sensing data to improve f_c and K_{cb} with the SAMIR tool for a better water use



- **Improvement of water consumption** based on estimation of complete stress conditions (four sources surface energy balance model, SEB-4)
- **Yield forecasting** with Aquacrop model + remote sensing

Research Plans for Next Growing Season

- Will you hold the course, or modify the approach?
- **evaporation/transpiration partitioning** with thermal data and near surface soil moisture from microwave data (Sentinel-1)
- **More precise water budget and energy budget under drip and flow irrigation** (cereals)
- Estimation of evapotranspiration of tree crops over a mountainous area (scintillometry...and high resolution optical imagery at high repetitivity with Sentinel-2)
- Do you anticipate using the same type/quantity of EO data next year? Y/N