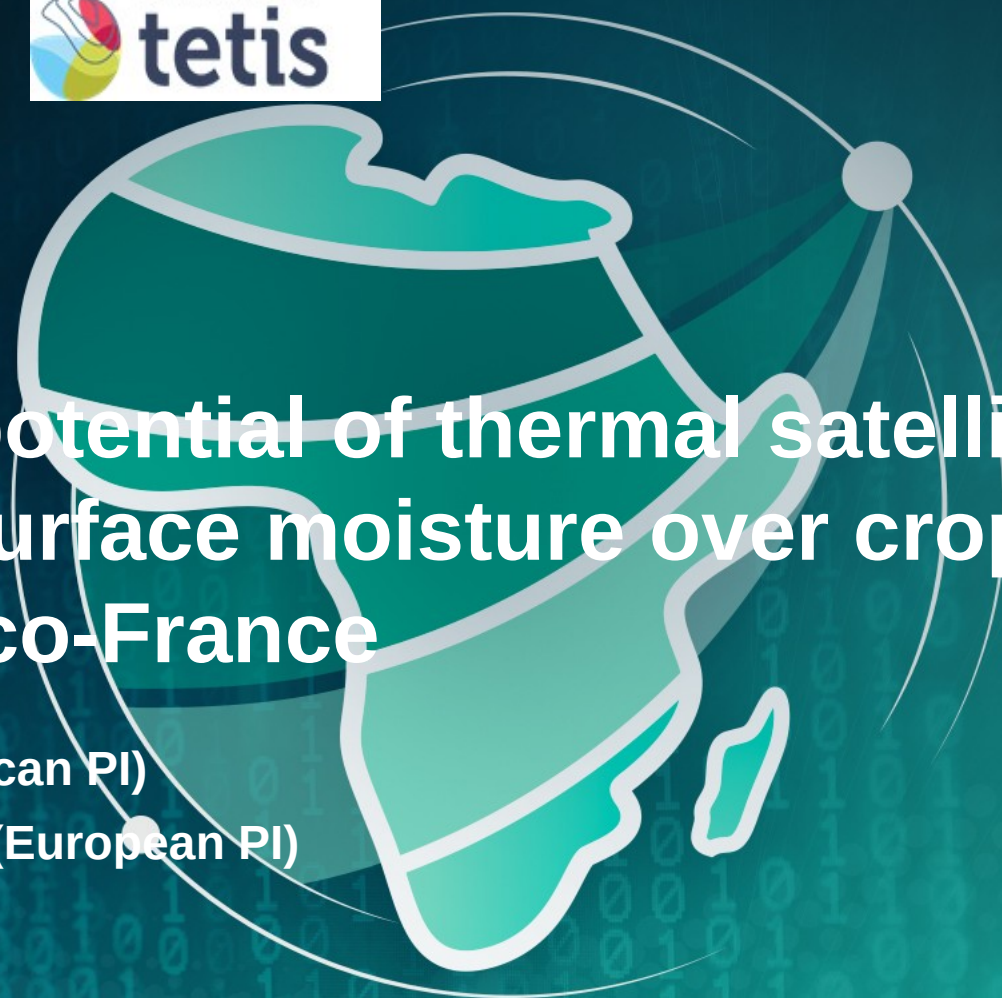


THESM: Exploring the potential of thermal satellite images for estimating surface moisture over crops

Morocco-France

Nadia Ouaadi (African PI)

Nicolas Baghdadi (European PI)



THESM: Exploring the potential of thermal satellite images for estimating surface moisture over crops

Context of the project

Southern Mediterranean region's climate changing faster than global trends (**hot spot of CC**)

+ Population growth

+ Agricultural intensification

+ Water shortage



Challenges to maintain access to water and food resources



Improved agricultural water management →

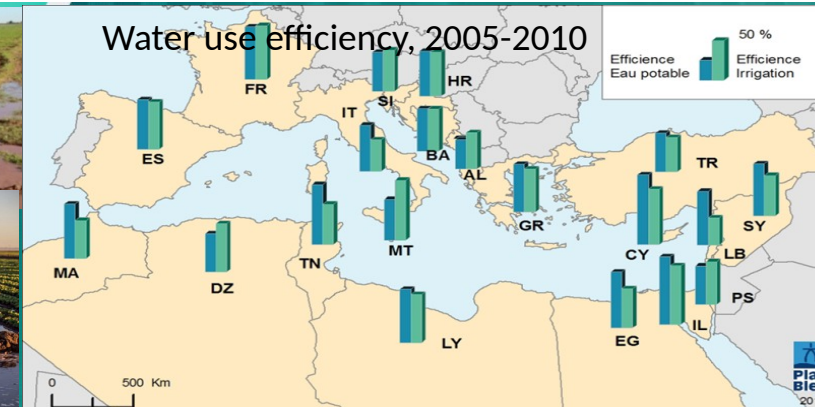
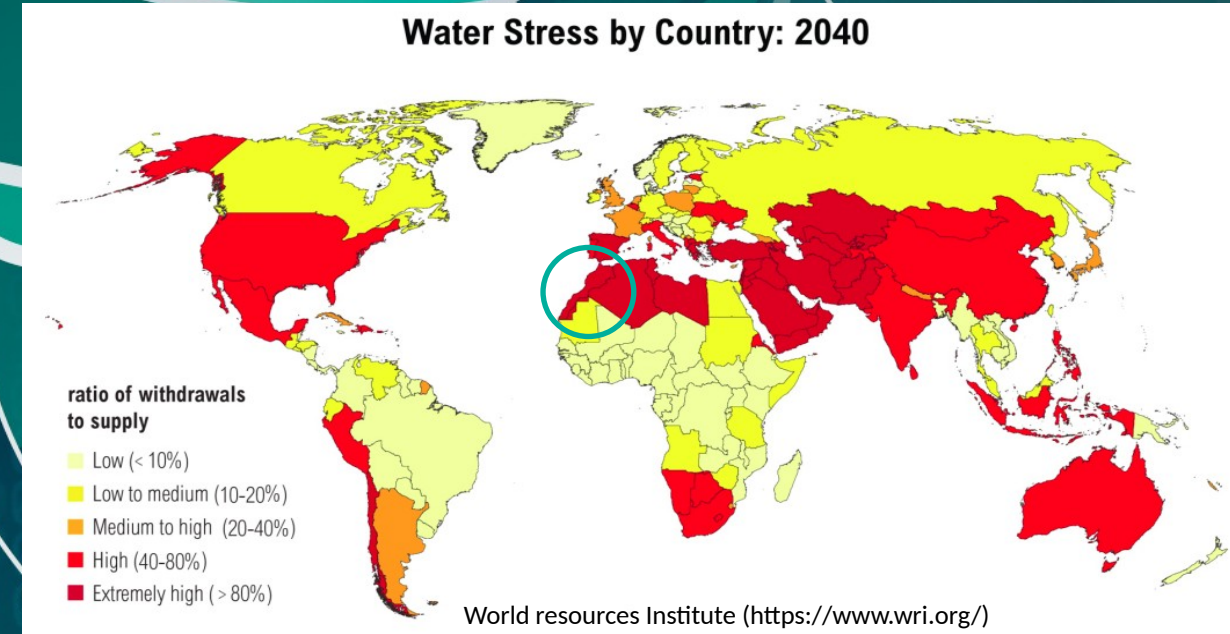
Irrigation management: consumes >80% in Morocco

→ Monitoring the water status of cover crops / plot scale



SSM mapping/ Daily + High spatial resolution

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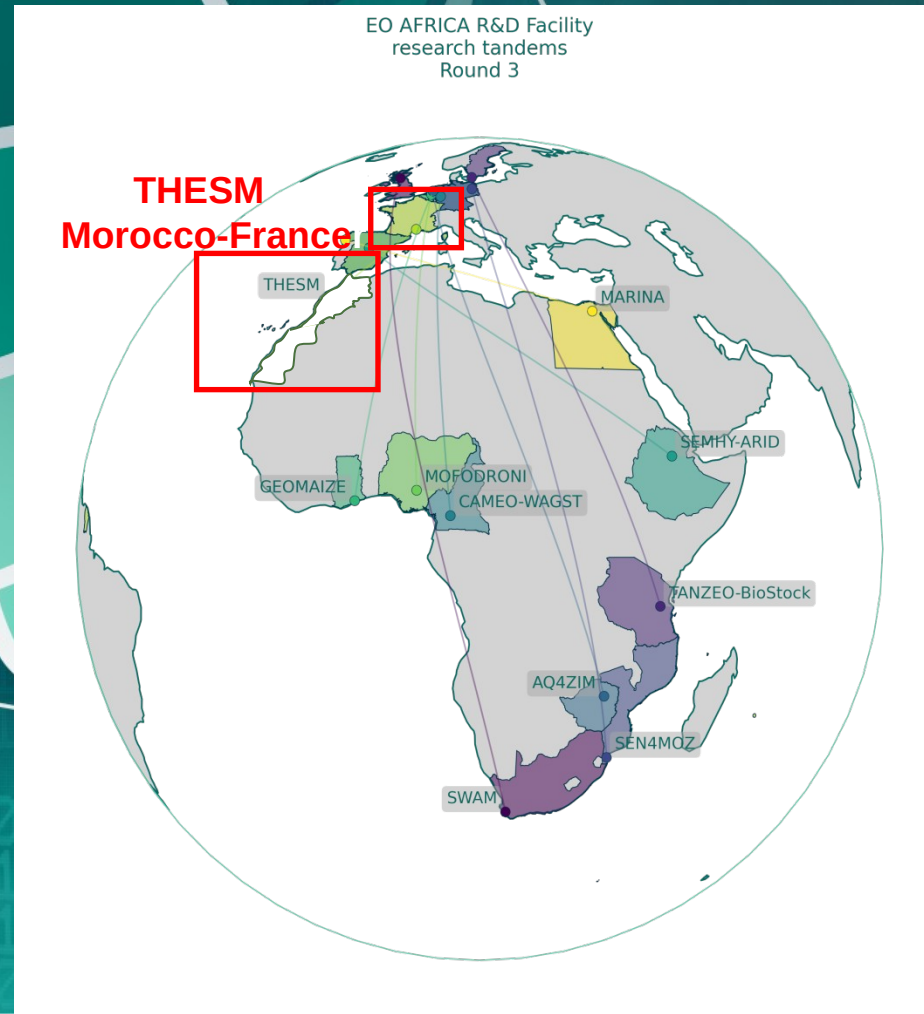
Project concept

Microwave/radar gave product at best every 6-day: not sufficient for irrigation management (soil dries out fast under high temperatures of the region)

→ Daily mapping of SSM using LST (a proxy for SSM) at 30 m resolution

Project objectives/outputs

- Development of an algorithm for daily estimating SSM at 30 m resolution using thermal data and machine learning algorithms. Daily LST is obtained by fusion of Landsat and Sentinel-3.
- Comparison with radar soil moisture product (synergy of S1 and S2)
- Collection of a spatialized surface soil moisture database
- Purchase and installation of three TDR stations (sensors at different depths) on crops and their integration in the ISMN (International Soil Moisture Network)/ available to the community and cal/val for EO missions.



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Activities performed

- Selection of the experimental sites and agreement with the owners for the installation of the three TDR stations : (1) wheat field (2) olive orchard (3) bare soil
- Spatialized SSM database is collected on several fields over several with different irrigation techniques and crop types:
 - 3 field campaigns with Landsat overpass / ~120 measurements
 - 6 field campaigns with Sentinel-1 overpass / ~240 measurements
 - 7 field campaigns with Sentinel-2 overpass / ~280 measurements
- Production of SSM maps from Sentinel-1 images from 2015 to the end of 2024: S1-SSM



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Activities planned

- Continue collecting the spatialized SSM database
- Production of SSM maps from Sentinel-1 images from January 2025 to July 2025
- Organization of French-Moroccan summer school focused on Estimation of Soil Moisture in Agricultural Areas Using Sentinel-1/2 Images
- Development of best ML approach (with the best fusion method) to obtain daily SSM estimate from thermal data
- The purchase and installation of the TDR stations
- Comparison with the Sentinel-1 product (produced by the European team).
- Drafting of the approach paper and finalization of the scripts for the approach developed for publication on an open-access platform
- Drafting of the data paper of the collected SSM database

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