Exploring the potential of thermal satellite images for estimating surface soil moisture over crops (THESM)

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Scientific Background and Objectives

Context of the project

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

+ Population growth

+ Agricultural intensification

+ Water shortage

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Challenges to maintain access to water and food resources

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Improved agricultural water management →

Irrigation management: consumes >80% in Morocco

→ Monitoring the water status of cover crops / plot scale

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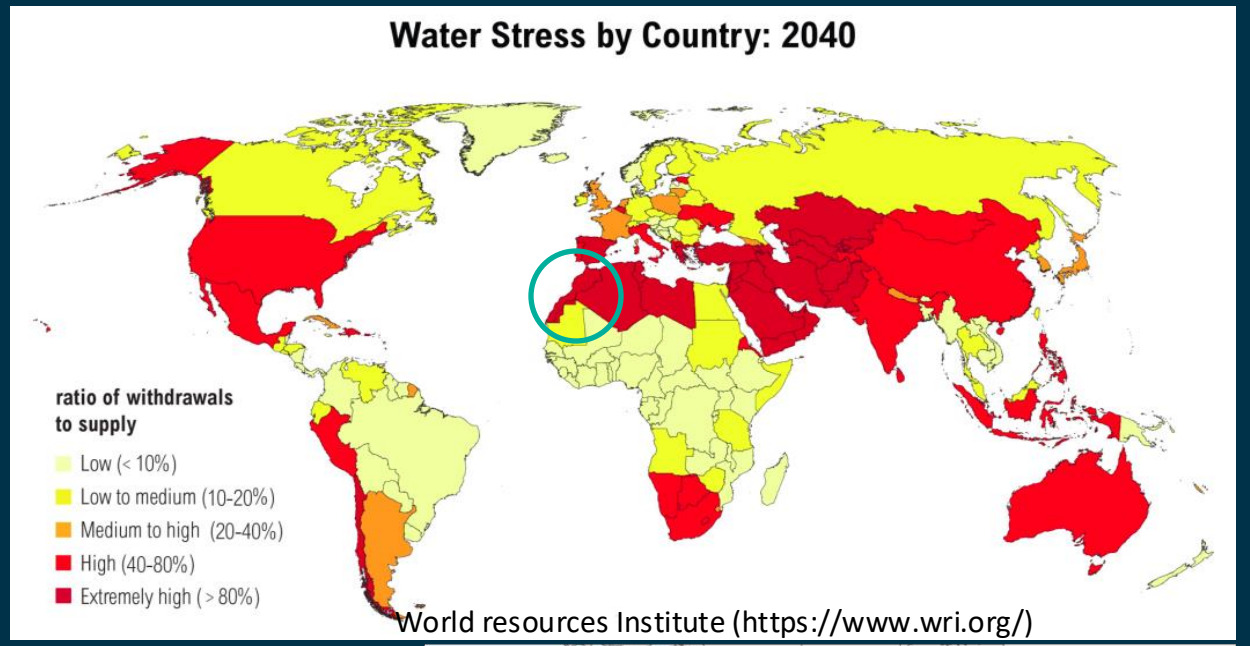
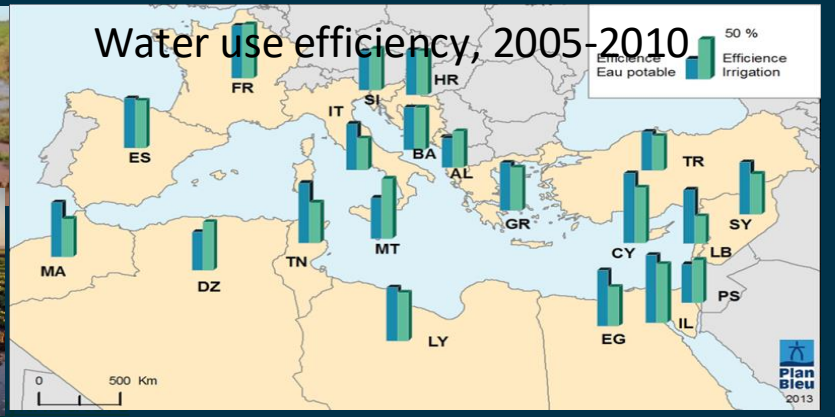
SSM mapping/ Daily + High spatial resolution



World resources Institute (https://www.wri.org/)



Scientific Background and Objectives

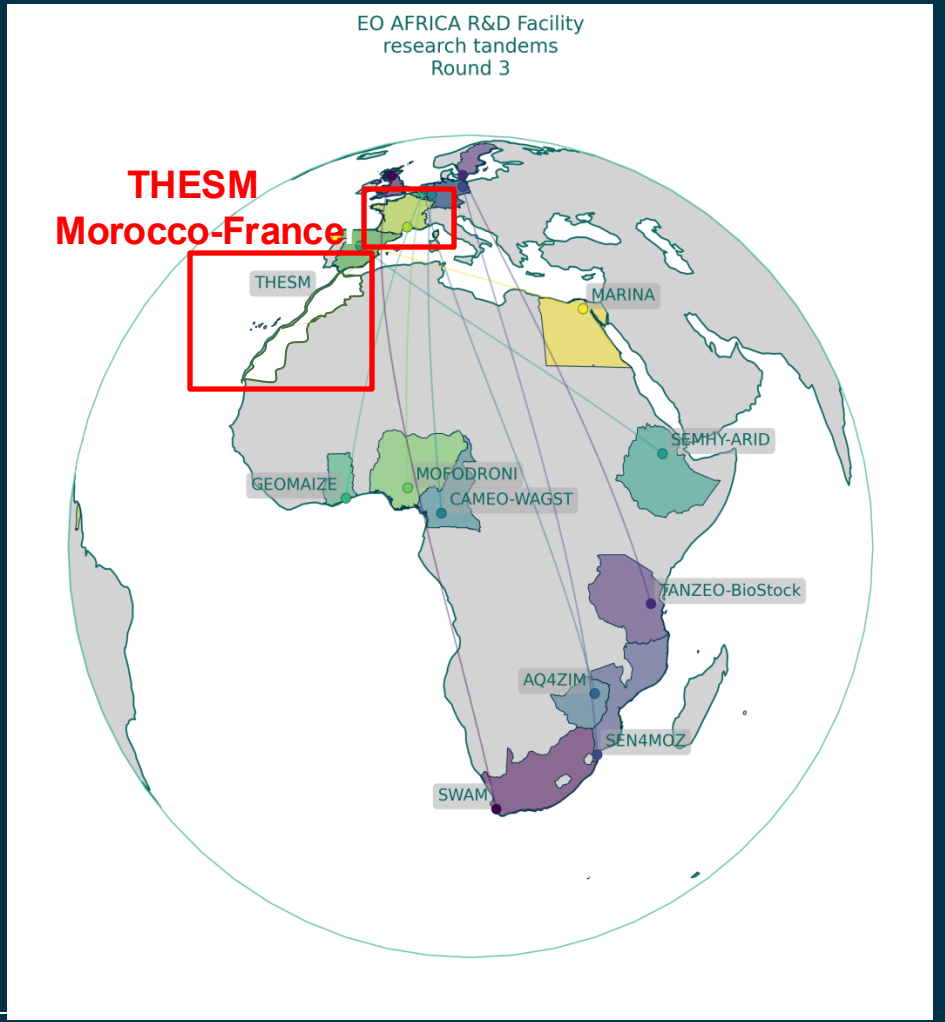
Project concept

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

- 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
- Collection of a spatialized surface soil moisture database
- Development of an algorithm for daily estimating SSM at 30 m resolution using thermal data, machine learning and data fusion algorithms
- Comparison with radar soil moisture product (synergy of S1 and S2)



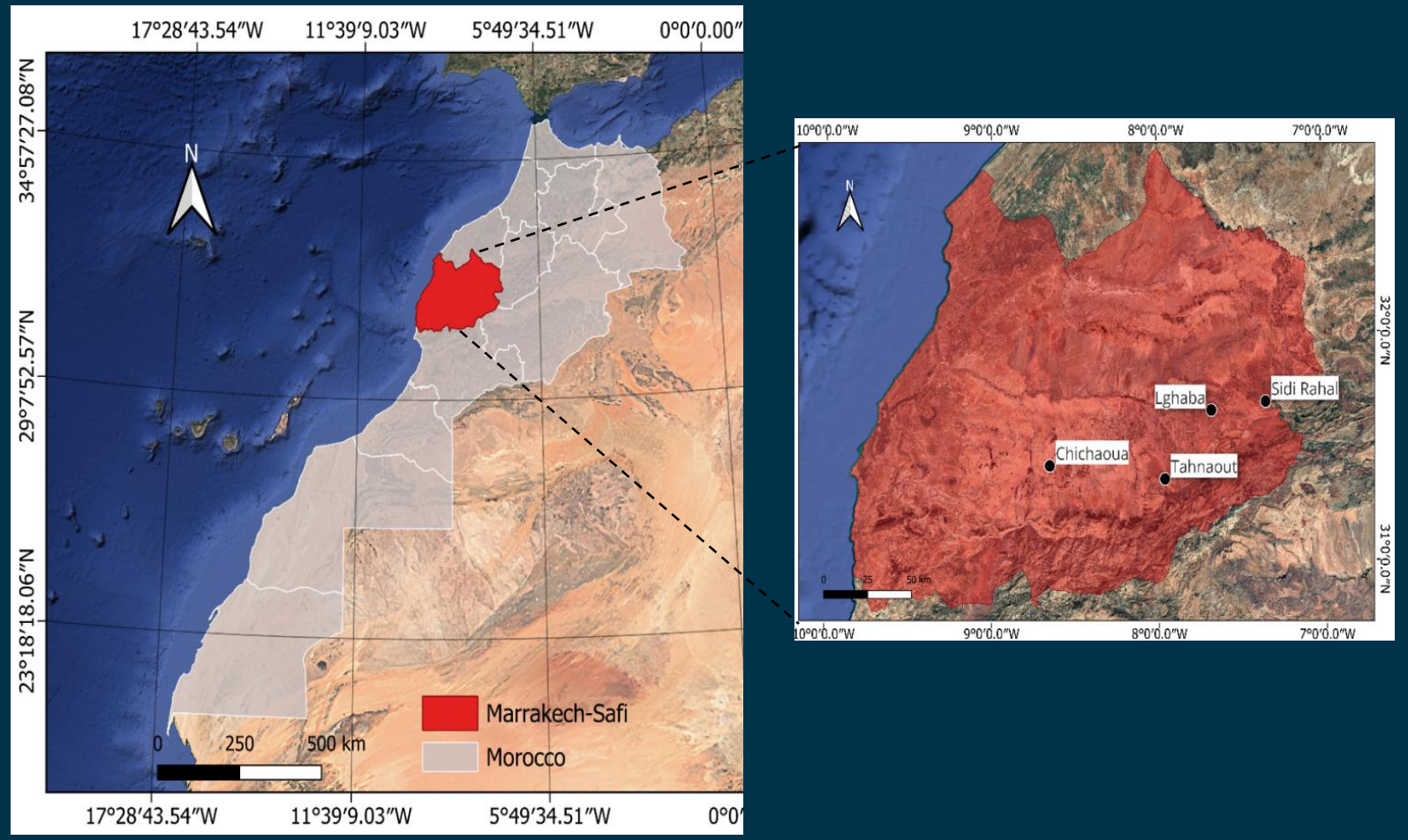
Research Outline

Study Area

Tensif watershed

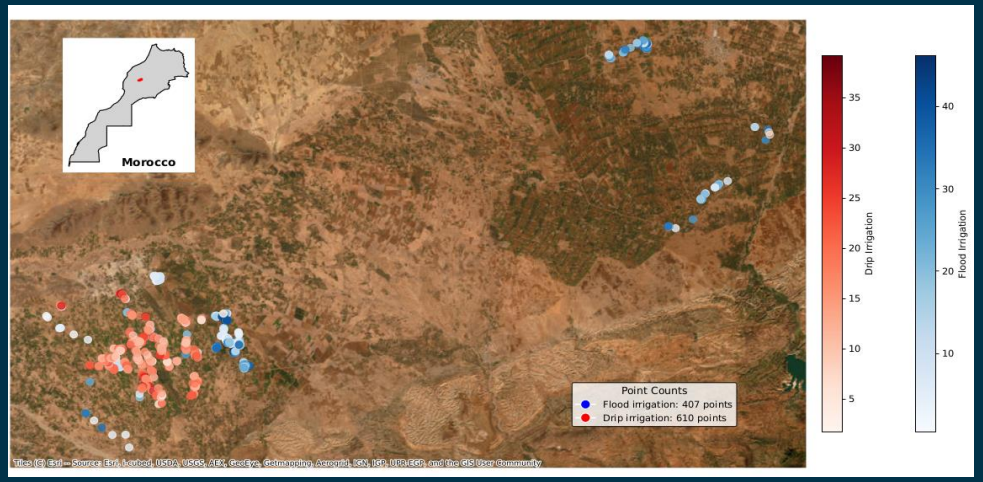
- Among most important in Morocco
- Caracterized by semi-arid climate with variety of crops
- Annual average precipitation amount ~250 mm
- Reference evapotranspiration ET0 ~1600 mm
- Irrigated agriculture accounts for over 85% of water consumption
- An ever-increasing demand for groundwater and surface water

→ Growing recourse to irrigation

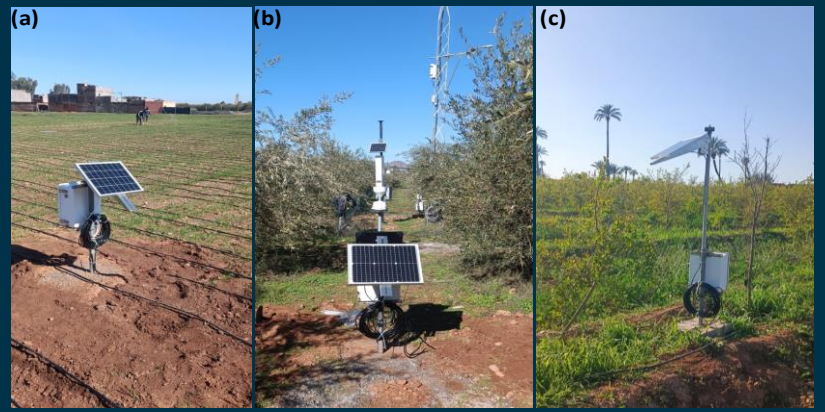


Results

1- Spatialized surface soil moisture database: 1269 samples in total

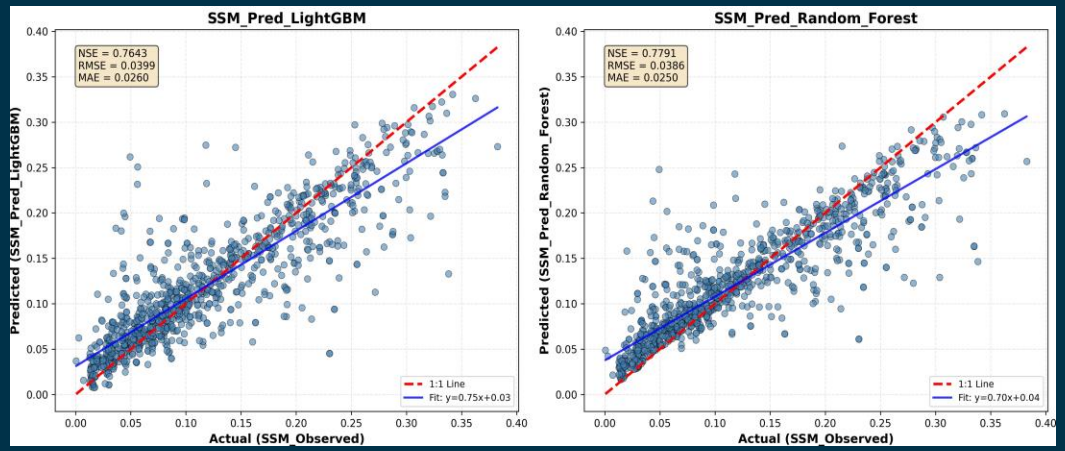


2- Installation of three TDR stations and making data available
https://thesm.crsa.ma/

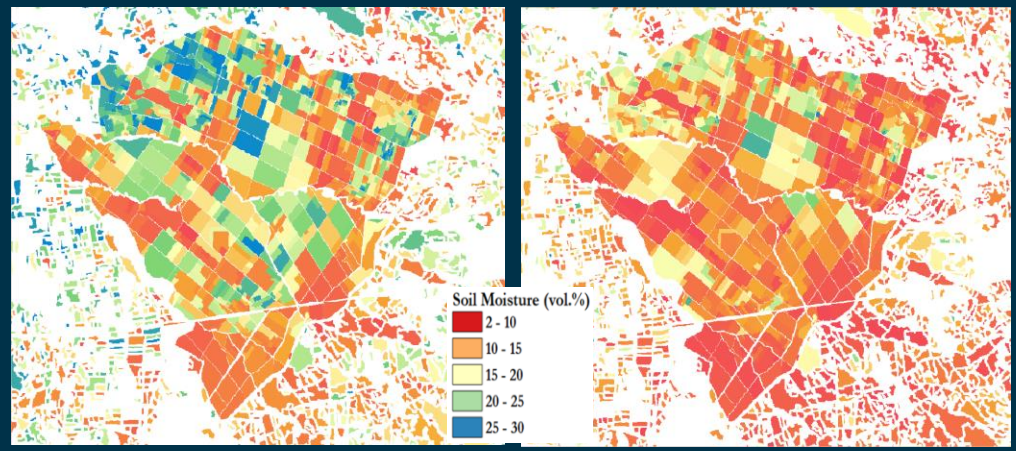


Further work

3- Daily SSM estimation using LST, ML and data fusion algorithms

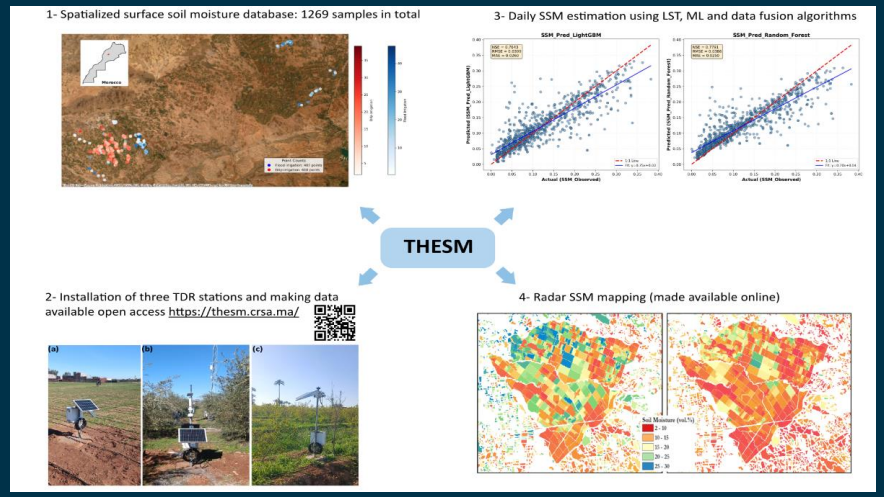


4- Radar SSM mapping (made available online)



Layout for social media posts

Recommended image resolution 1200 x 675 pixels - landscape format



Post for BS and X (max 230 characters including hashtags)

Our THESM project under @ESA_EOAfrica is complete!
The @UM6P_Official & @INRAE_France collab produced open data, new research, and expert training in soil moisture using Sentinel data.
Strengthening EU-Morocco partnership!
#RemoteSensing #ML #EOAfrica

Post in LinkedIn: 600-630 characters including links

After an incredible journey, our project THESM: “Exploring the potential of thermal satellite images for estimating surface moisture over crops”, funded under the ESA EO Africa framework, has officially reached its conclusion! We are proud to highlight the successful collaboration between the Center for Remote Sensing Applications (CRSA) at UM6P and the French Research Institute INRAE Montpellier. This partnership has yielded impactful results, including:

- Open-source soil moisture datasets now available to the community.
- The publication of scientific papers.
- The training of young researchers through our French-Moroccan Summer School on soil moisture estimation using Sentinel-1 and Sentinel-2 data.