

Monitoring Droughts in Mozambique from Space

DrySat

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With funding from
Austrian
Development
Cooperation

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Context

Mozambique is vulnerable to climate change

- High-reliance on rain-fed agriculture
- Increased occurrence of droughts
- Delay in the start of the rainy season

Stakeholders

- Mozambican Ministry of Agriculture and Rural Development (MADER)
- National Institute of Meteorology (INAM)



Objectives

Improve early warning/action for drought and agricultural practices with stakeholders

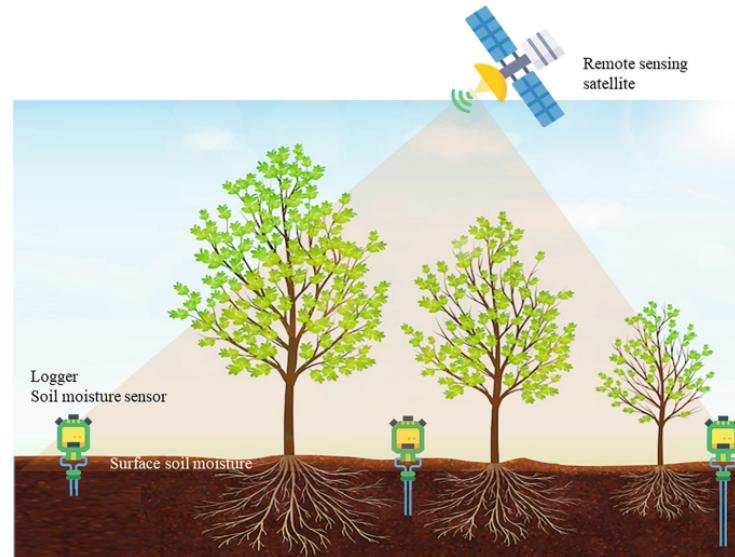
- Developing satellite drought indicators at a kilometer sampling scale
- Integration of early warning system tools for drought monitoring
- Gender sensitive capacity development of project beneficiaries



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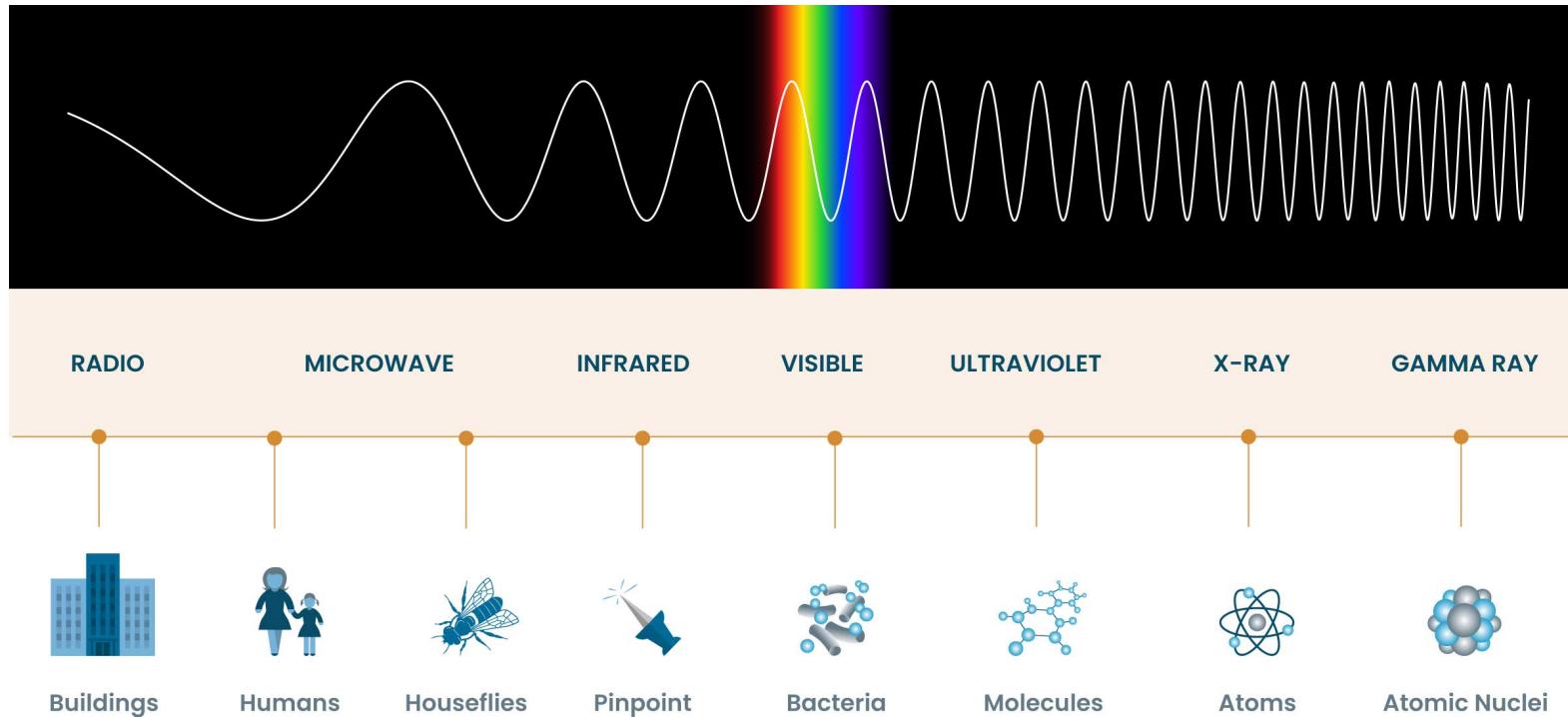
Detecting Droughts

- Rain gauges
- Field soil moisture sensors
- Microwave Satellites
 - continuous (all weather, day-and-night)
 - km sampling scale



Bhardwaj et al. 2022

Microwave Backscattering



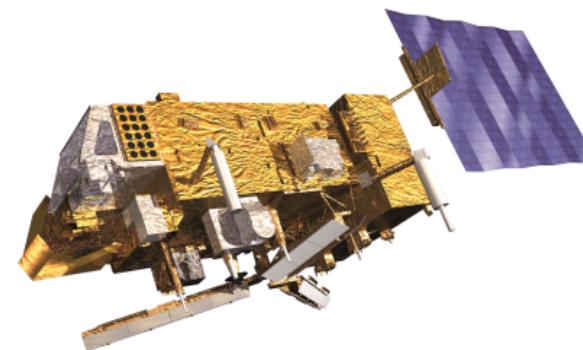
<https://hubblesite.org>

Microwave Backscattering



Sentinel-1

1 km sampling soil moisture



Metop-A

6.25 km sampling soil moisture

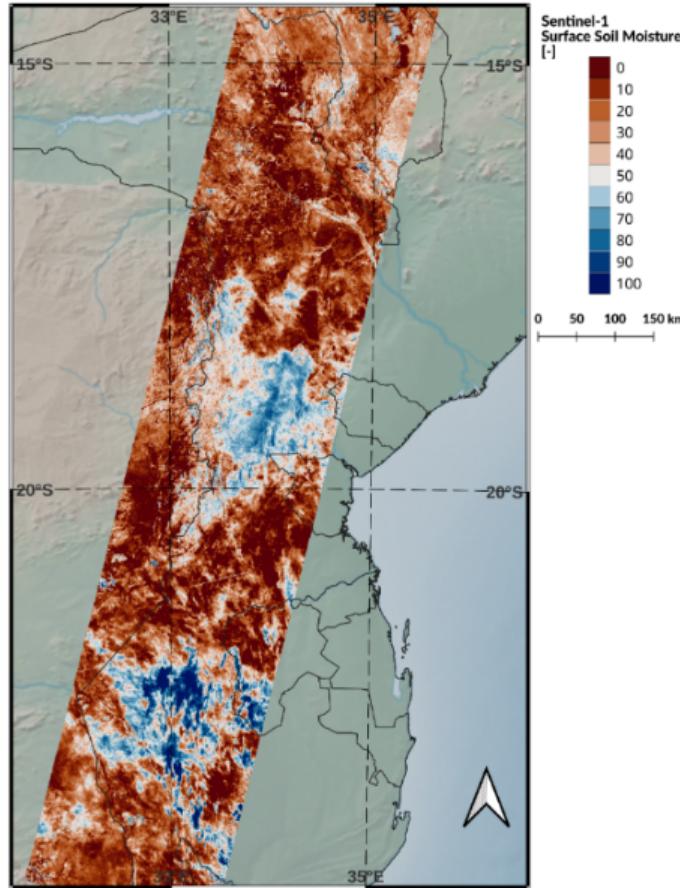


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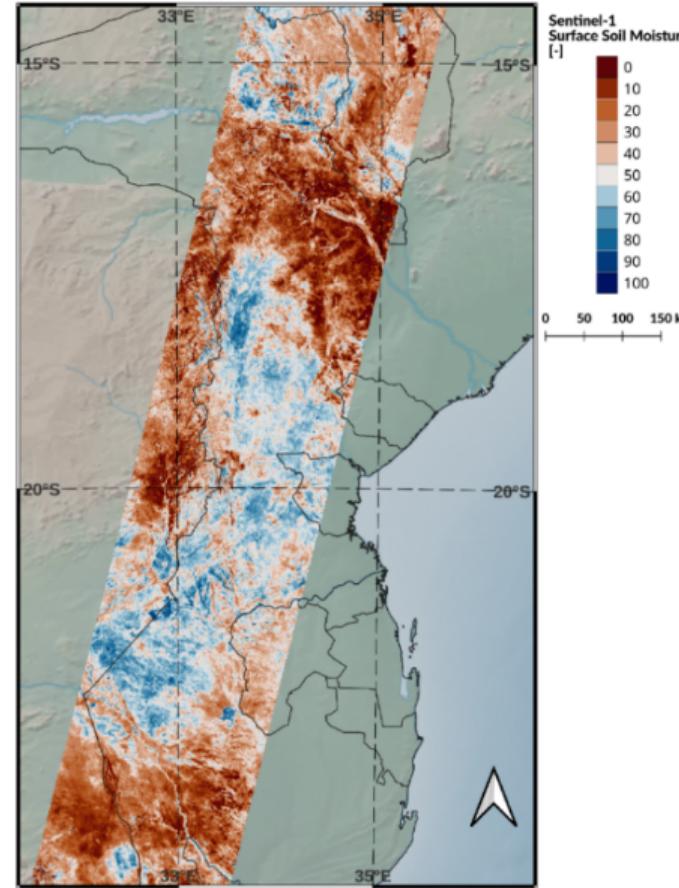
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Remotely Sensed Soil Moisture

Sentinel-1A Descending orbit (D079) - 02 June 2016 - 03h17m



Sentinel-1A Descending orbit (D079) - 09 June 2017 - 03h17m



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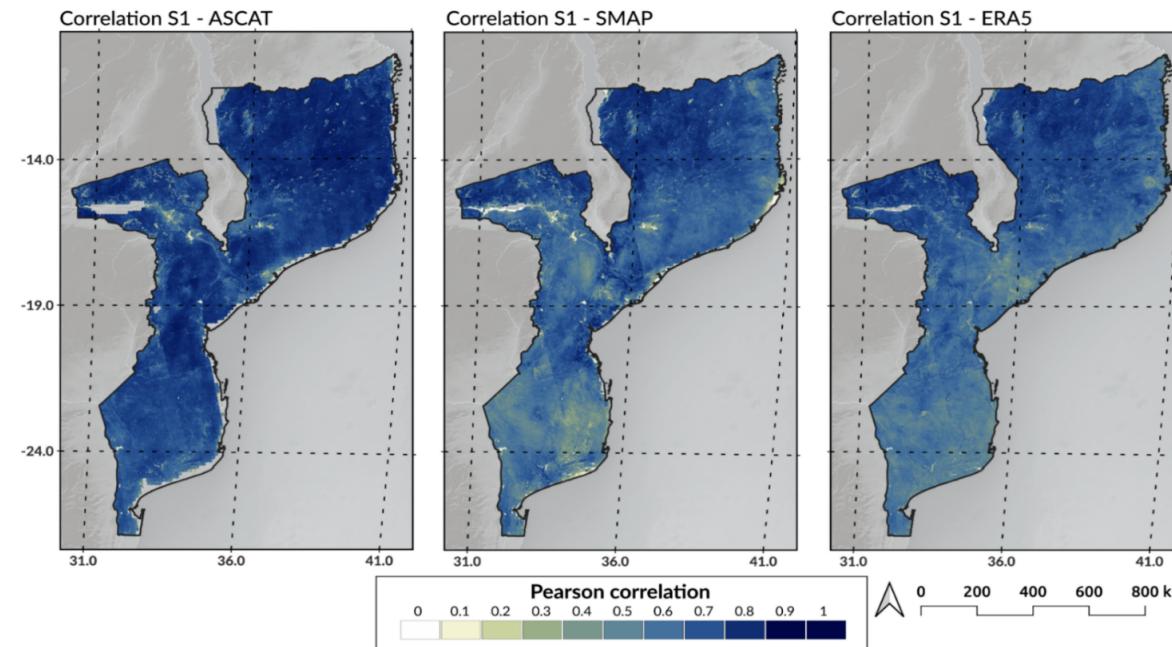
In Situ Soil Moisture

- 2023 in-situ installation
- General lack of in-situ data for product validation in Mozambique
- 4 depths (10, 20, 50cm)
- Daily update to the cloud



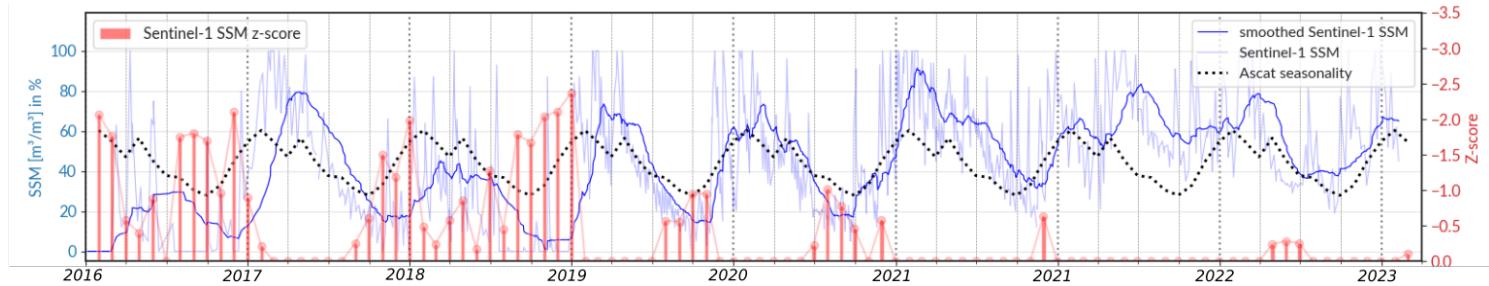
Validation

Result and validation in future publications: *High-resolution drought monitoring with Sentinel-1 and ASCAT: A case-study over Mozambique*, Massart Samuel,, Vreugdenhil Mariette, Rogerio Borguete, Rafael, Villegas-Lituma Carina, Muguda Sanjeevamurthy Pavan, Hahn Sebastian, Wolfgang Wagner (submitted)



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Simple Metrics for Drought



Mozambique Badly Hit by El Nino-Induced Drought

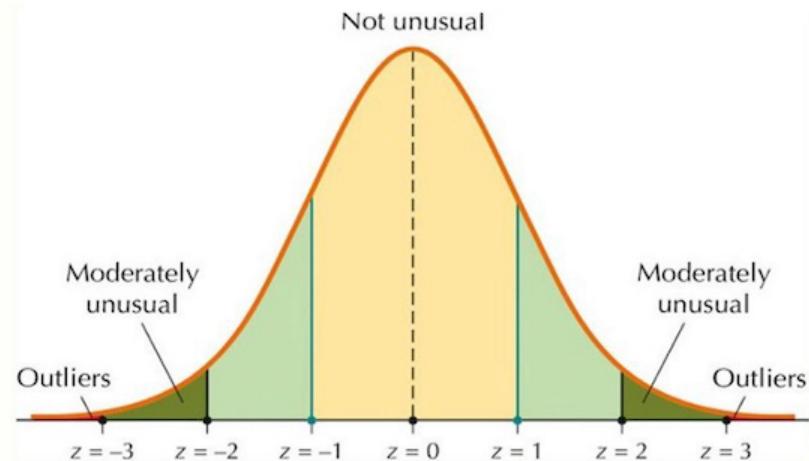


FILE — Mozambican child refugees prepare food at Kapise camp in Malawi's Mwanza district, Jan. 18, 2016.

GENEVA — The United Nations warns at least 1.5 million people in Mozambique need international assistance to see them through a disastrous El Nino-induced drought.

Related

Detecting Outliers with z-Scores



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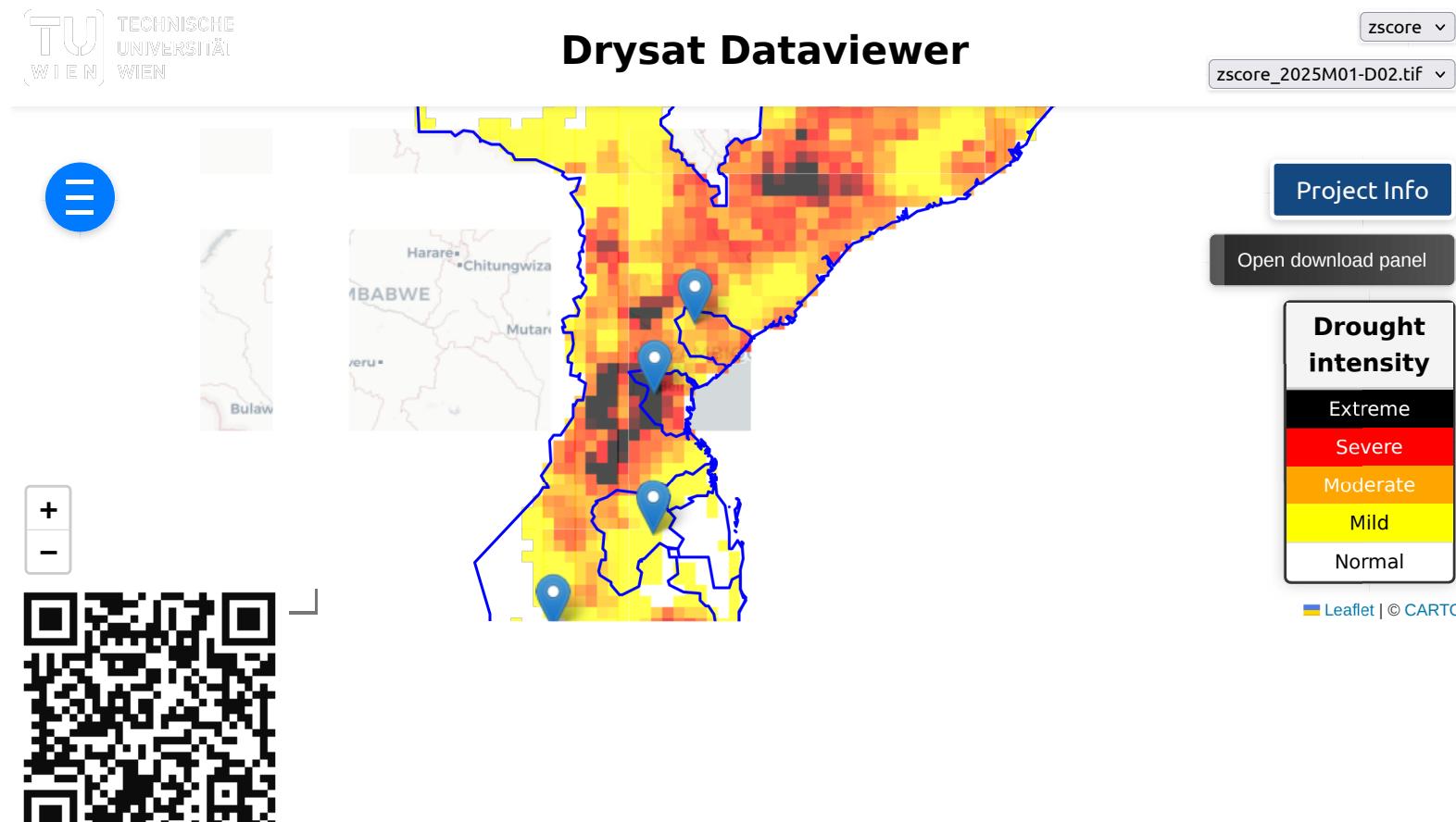
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Data Dissemination

<https://drysat-viewer.geo.tuwien.ac.at/>



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Capacity Building

Remotely sensed drought as early warnings:

- Field demonstration of early warning tools
- Training of extension workers
- Continuous professional development
 - On-site and remote courses
- Digital learning environment
 - Cloud-based
 - Browser as only requirement

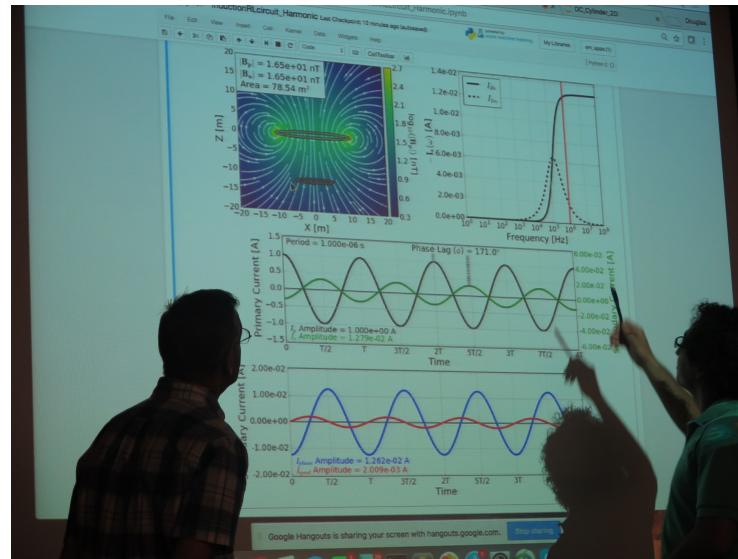
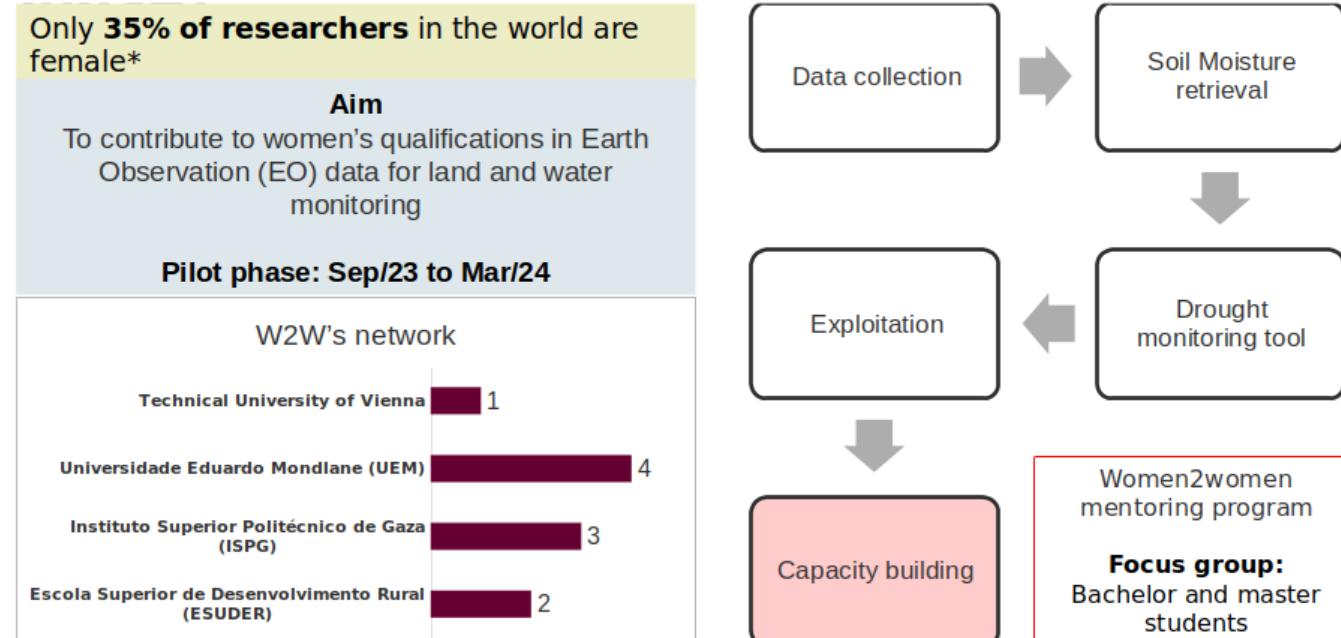


Photo credit: Seogi Kang

Women2women Mentoring Program



*UNESCO. (2017). Cracking the code: Girls' and women's education in STEM (UNESCO Publication No. 25479).
<https://unesdoc.unesco.org/ark:/48223/pf0000253479>



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Outlook

- Start of the rainy season metric
 - Context of climate change
 - Historical microwave backscatter time series
 - Region-specific likelihood
- Intuitive drought information tools
 - Mobile friendly
 - Easy maintenance
 - Open source and interoperable



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Acknowledgements

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