

Monitoring Droughts in Mozambique from Space

DrySat

University of Eduardo Mondlane
(UEM), Maputo, Mozambique

Vi



With funding from
Austrian
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Cooperation

DrySat Team



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- Rogério Borguete A. Rafael
- Luis Artur
- Famba, Sebastião
- Celma Niquice Janeiro
- Jaime Macuácua



- Mariette Vreugdenhil
- Samuel Massart
- Carina Villegas Lituma
- Wolfgang Wagner



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Source: <https://baxter-agency.com/>



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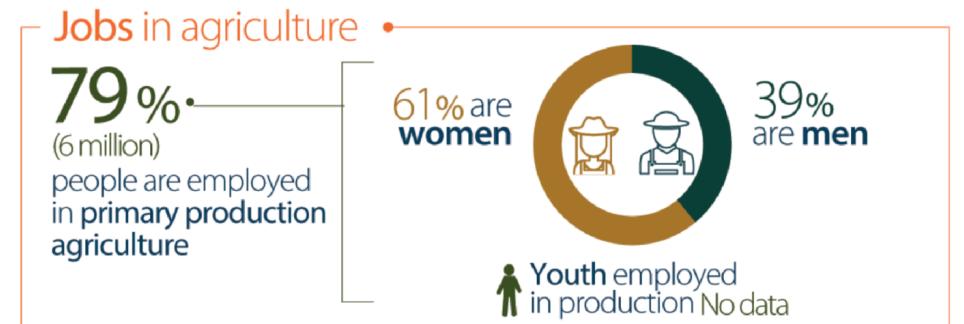
Context

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)



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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

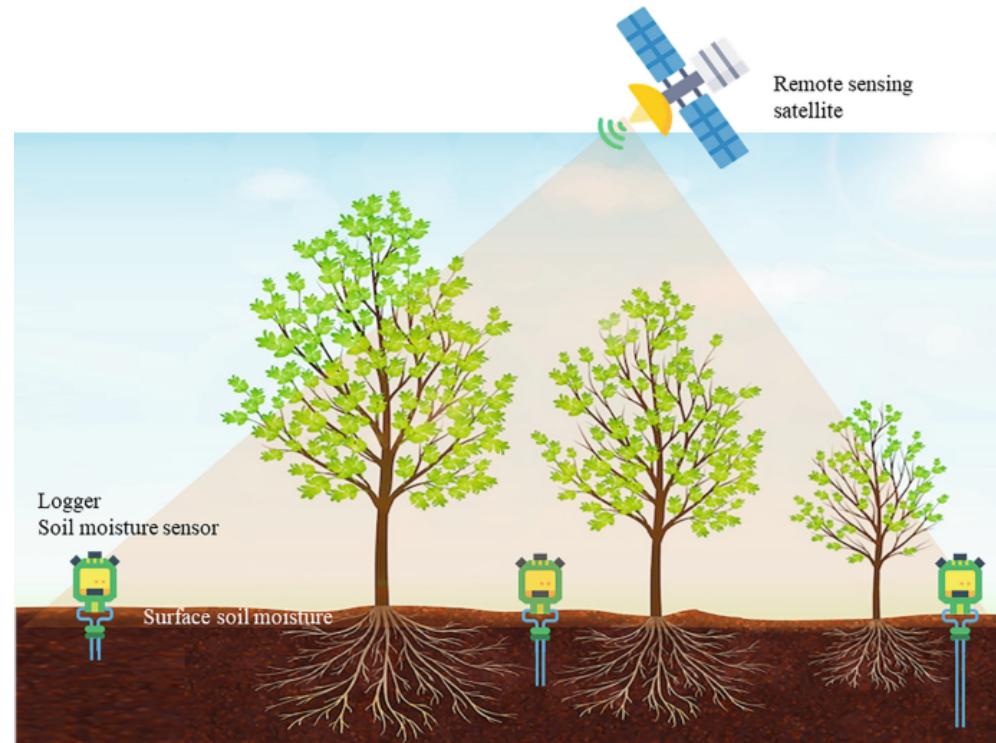


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Detecting Droughts

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



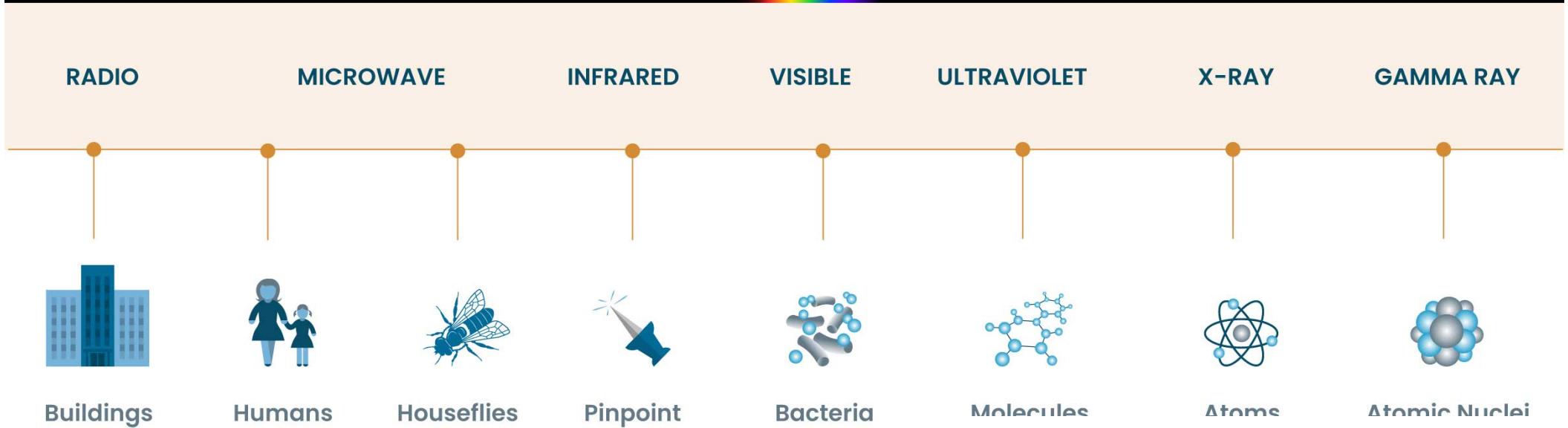
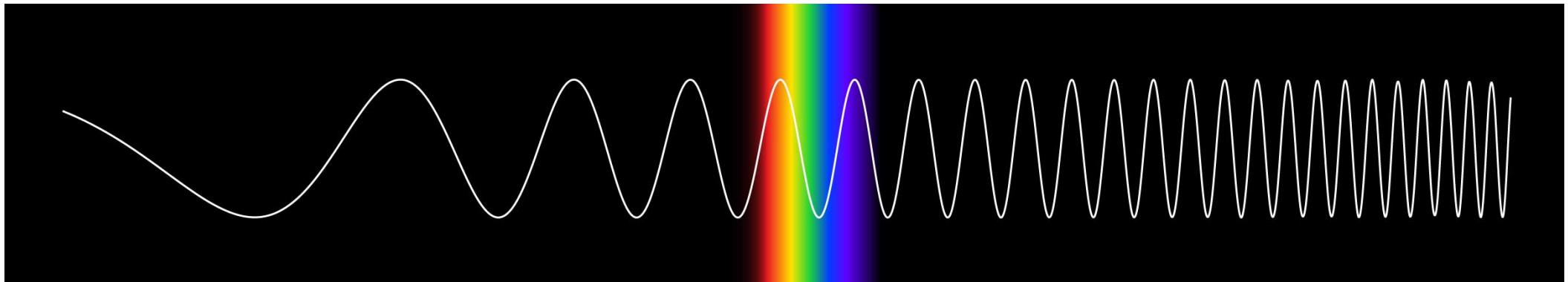
Bhardwaj et al. 2022



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Microwave Backscattering



<https://hubblesite.org>



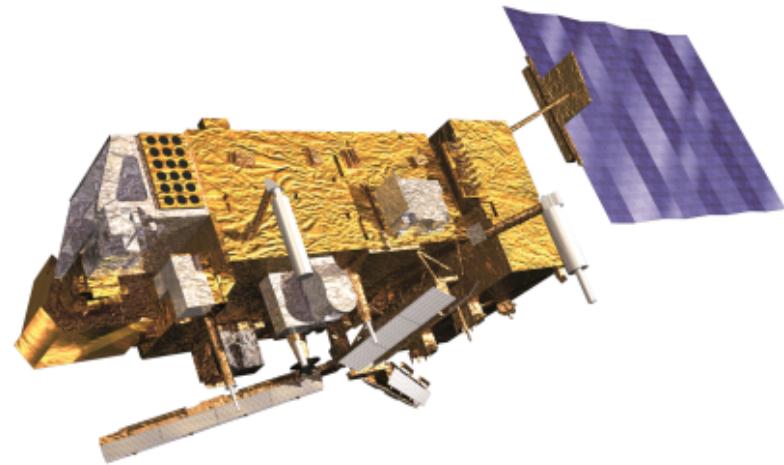
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Microwave Backscattering



Sentinel-1

1 km sampling soil moisture



Metop-A

6.25 km sampling soil moisture



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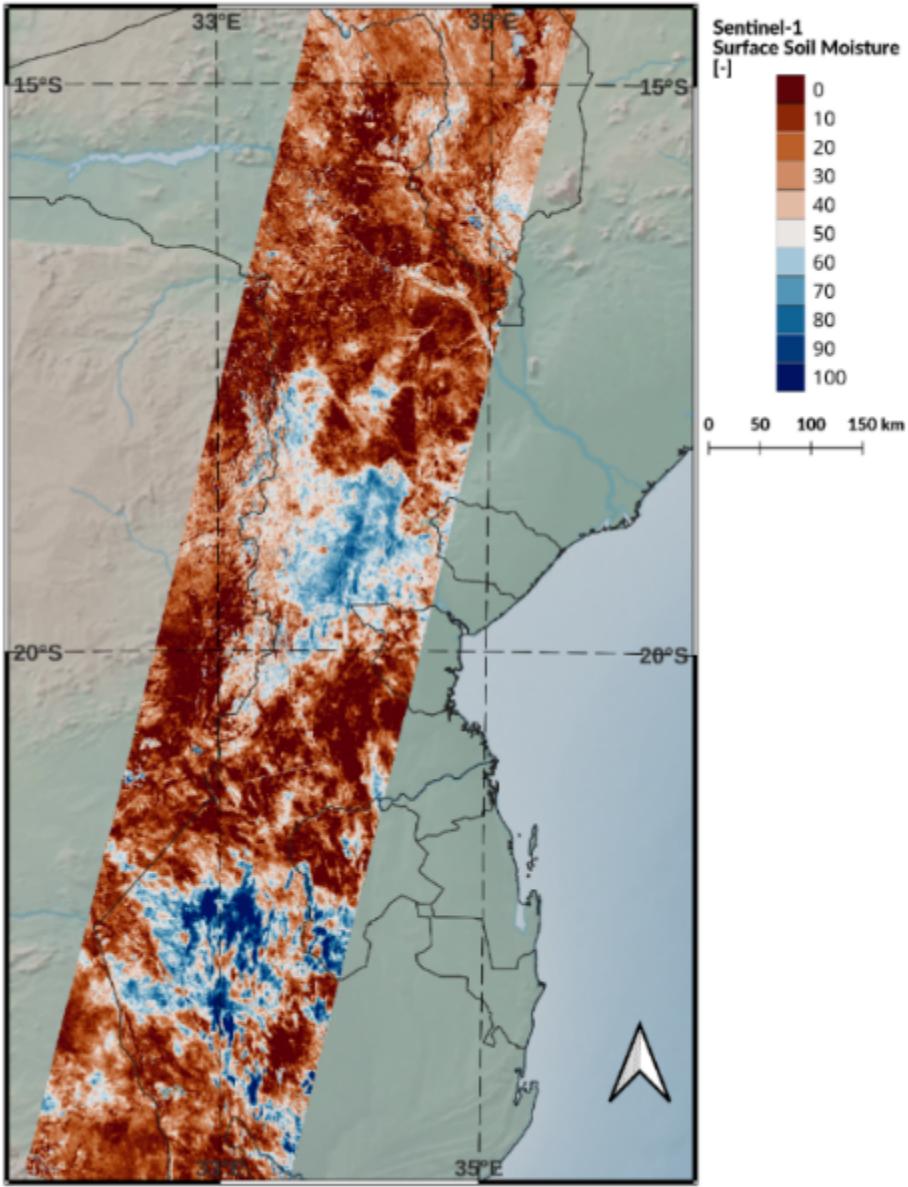
Remotely Sensed Soil Moisture (Quast et al. 2023)



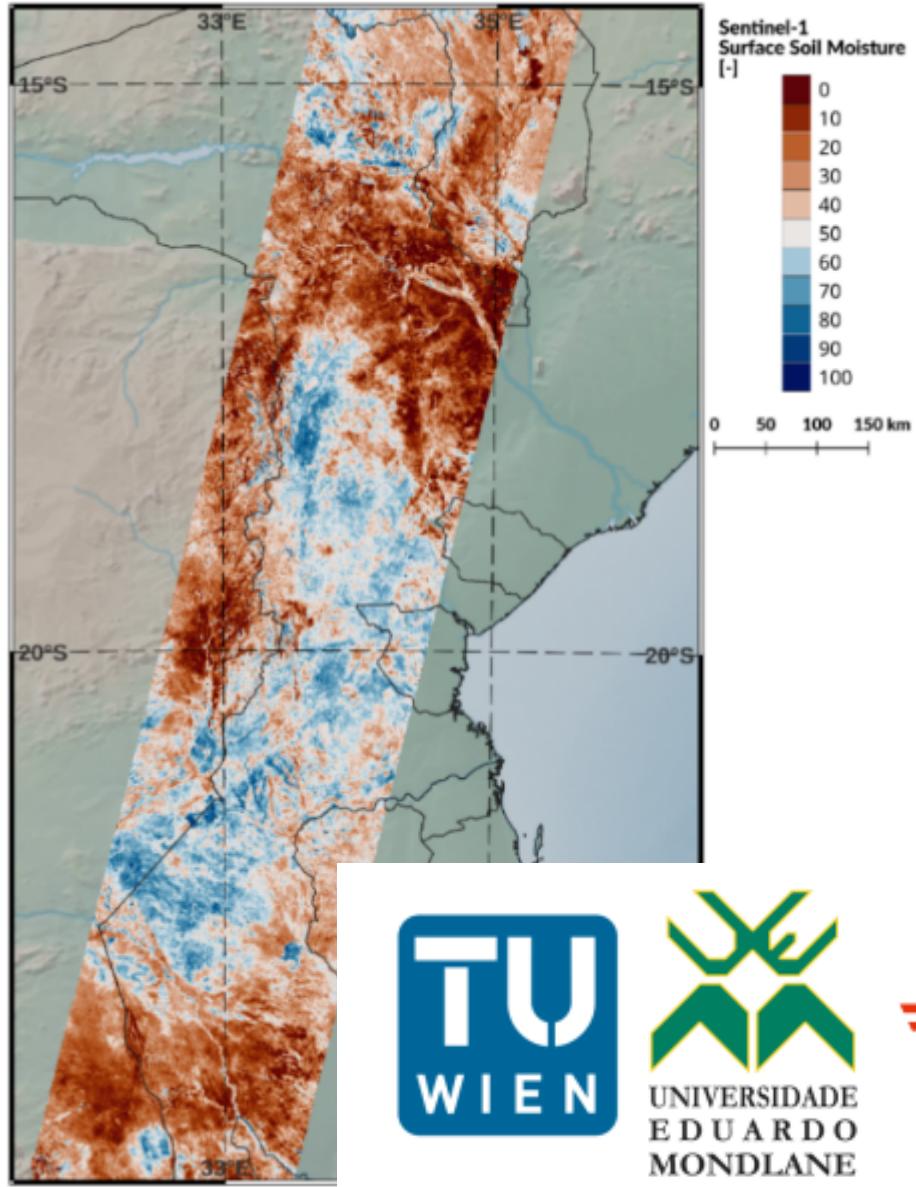
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Remotely Sensed Soil Moisture

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



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

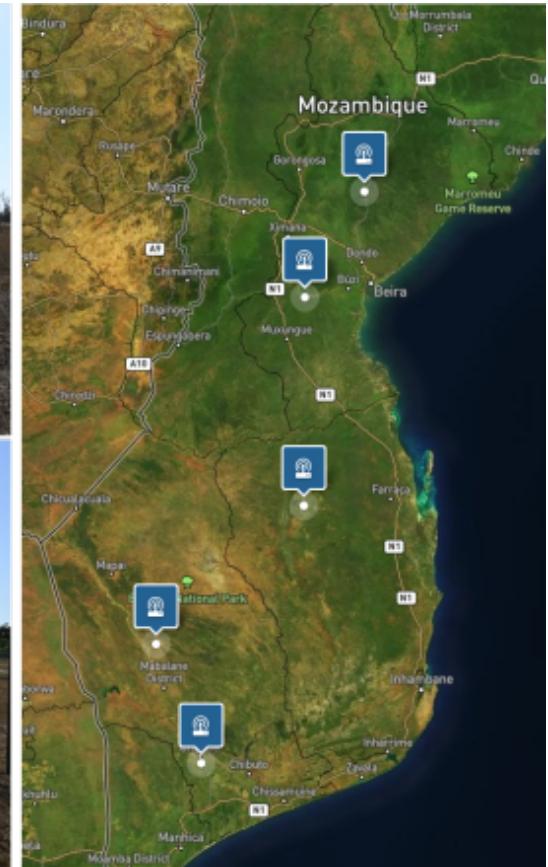


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In Situ Soil Moisture

- 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

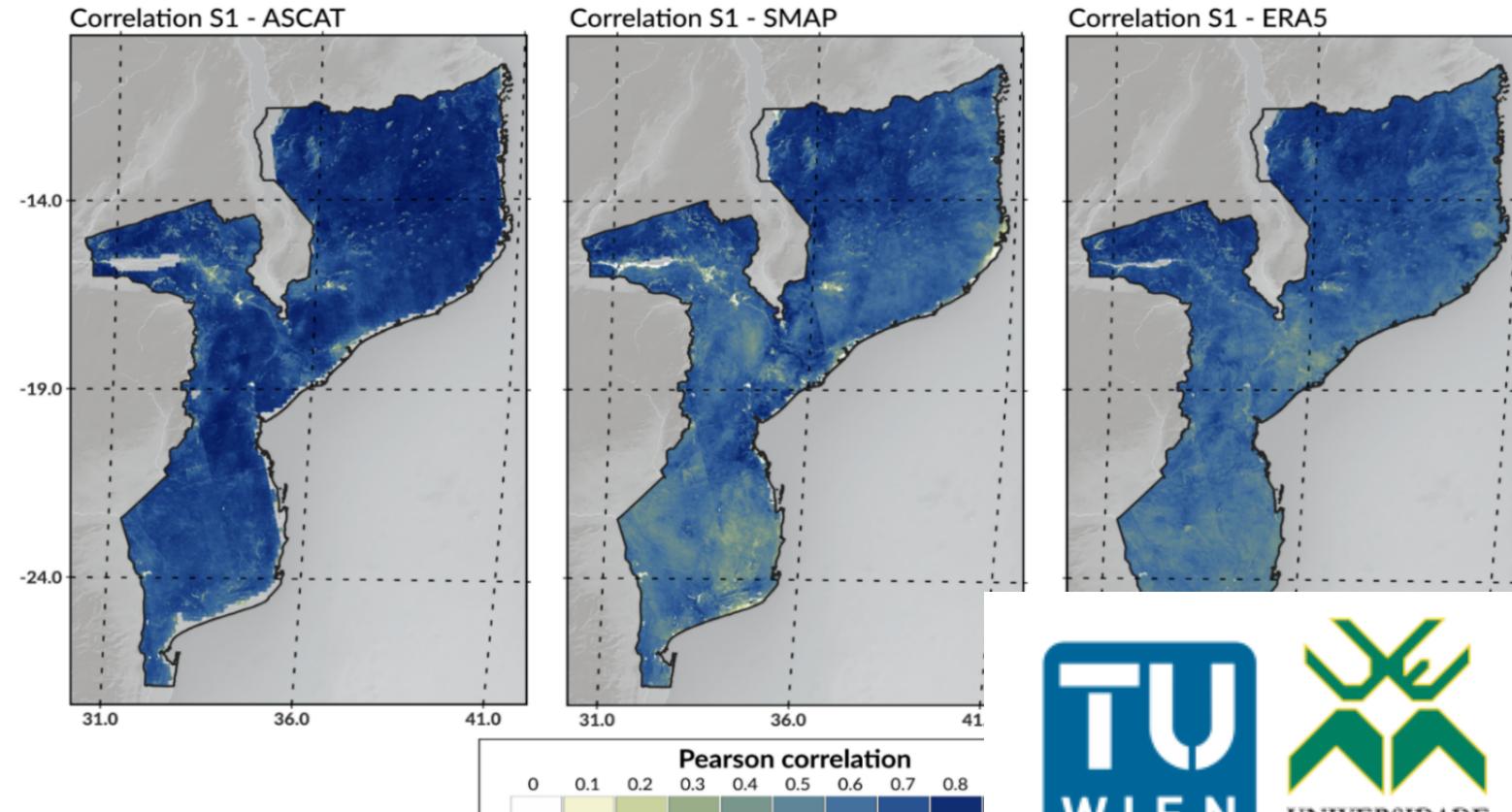


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Validation

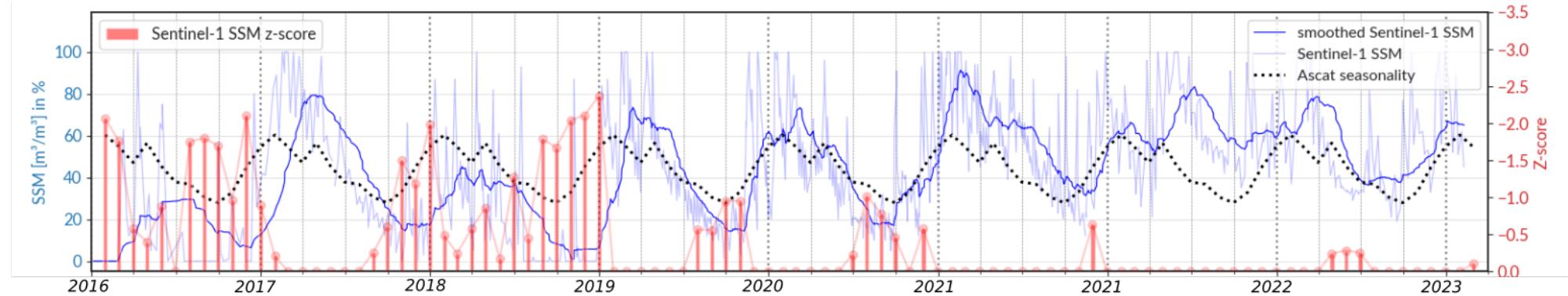
Result and validation in future publications: *High-resolution drought monitoring with Sentinel-1 and ASCAT: A case-study over Mozambique*, Massart Samuel,, Vreugdenhil Mariette, Rogerio Borguete, Rafael, Villegas-Lituma Carina, Muguda Sanjeevamurthy Pavan, Hahn Sebastian, Wolfgang Wagner (submitted)



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Simple Metrics for Drought



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Mozambique Badly Hit by El Nino-Induced Drought

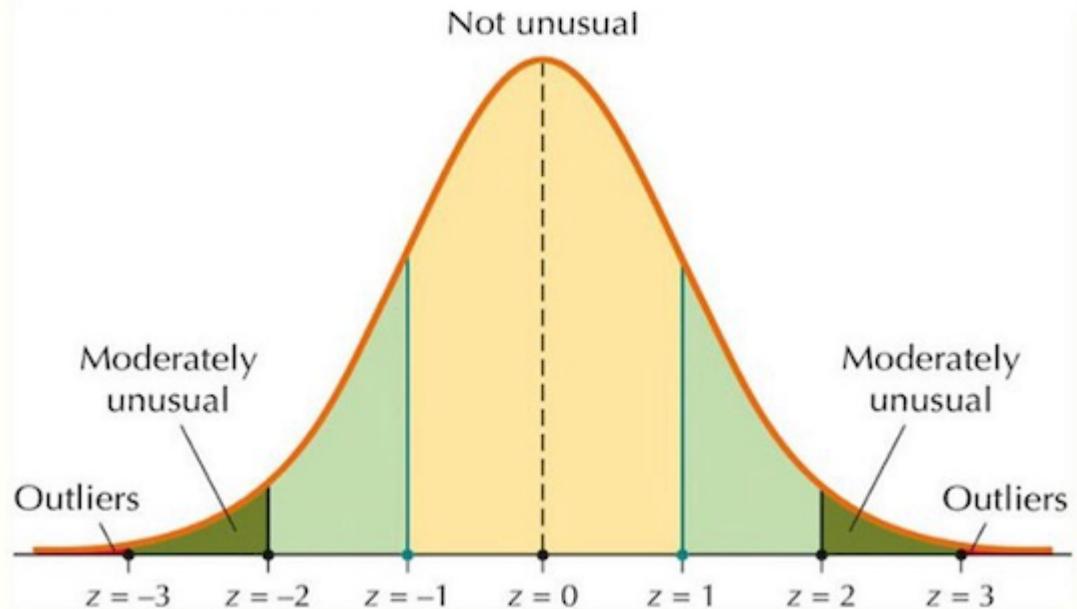


FILE - Mozambican child refugees prepare food at Kapise camp in Malawi's Mwanza district, Jan. 18, 2016.

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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Data Dissemination

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



Drysat Dataviewer

zscore ▾

zscore_2025M01-D02.tif ▾

Project Info

Open download panel

Drought intensity

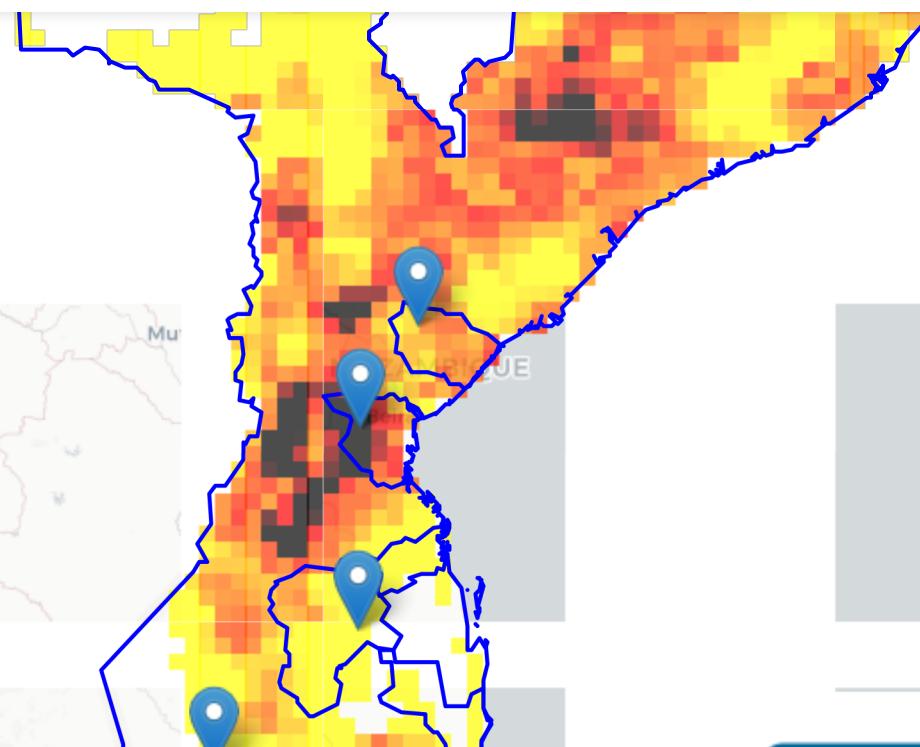
Extreme

Severe

Moderate

Mild

Normal



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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

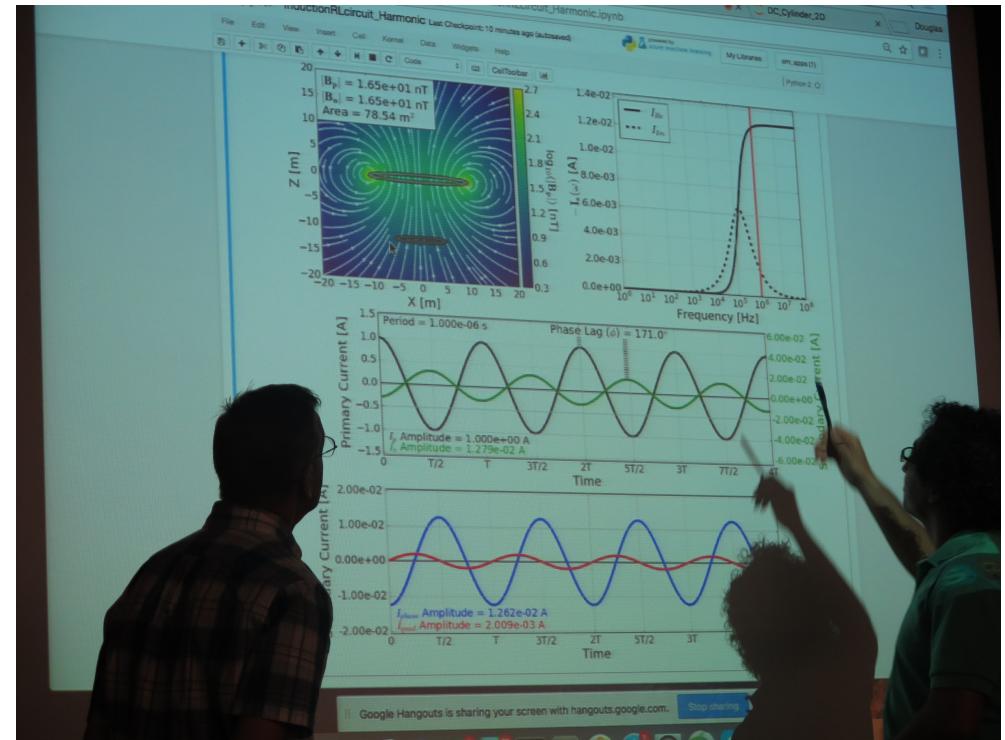


Photo credit: Seogi Kang



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Women2women Mentoring Program

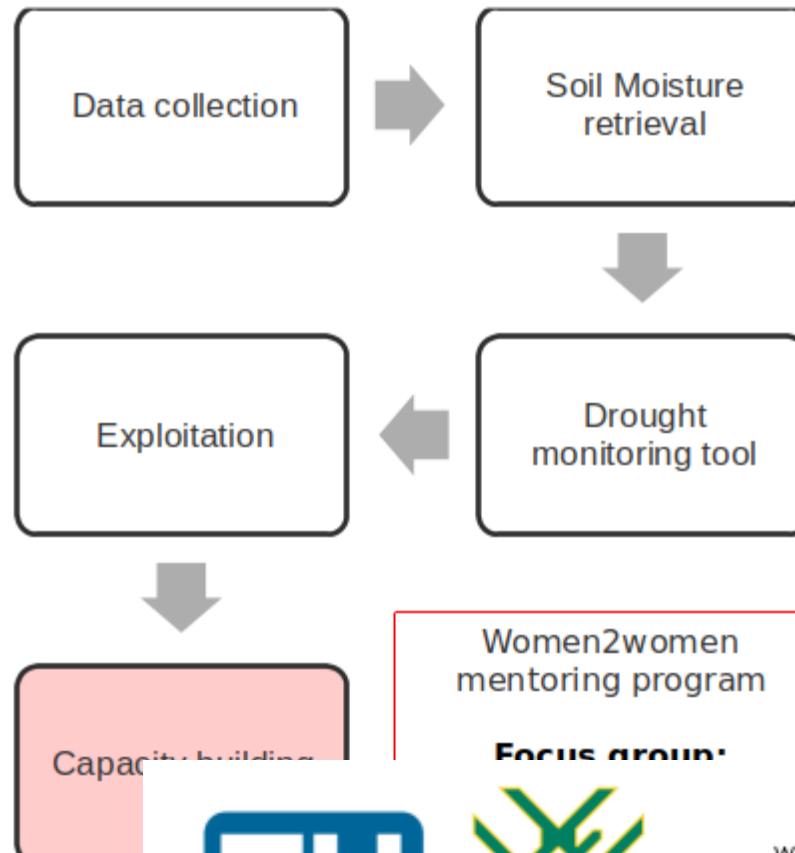
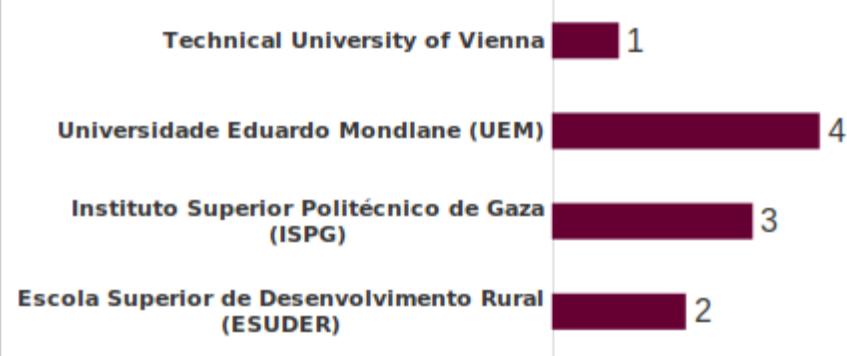
Only **35% of researchers** in the world are female*

Aim

To contribute to women's qualifications in Earth Observation (EO) data for land and water monitoring

Pilot phase: Sep/23 to Mar/24

W2W's network



*UNESCO. (2017). Cracking the code: Girls' and women 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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