Open water science for food and water

Ann van Griensven


OPEN SCIENCE
Open Source
Open Acces
Open Infrastructures
Open Hardware
Open Educational Resources
Open Evaluation
Open Data
Citizen Science
Open Labs
Open Innovation
Open Notebook
Crowd-Funding

Soil moisture Monitoring

Observations are globally sparse with regional imbalances in coverage

However…

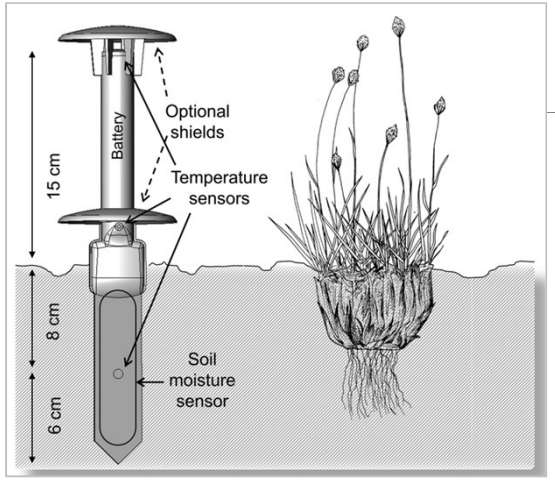
Emerging low-cost sensors provide opportunities to monitor soil moisture over large areas at reasonable cost

Soil moisture Monitoring for sustainable agriculture

ILVO
Instituut voor Landbouw-,
Visserij- en Voedingsonderzoek

The sensor

TMS4 sensor



Capture climate experienced by small herbaceous plants

- Temperature sensors (3)
- Soil Moisture sensor (1)

SM Sensor: Time domain transmission (TDT)

Can collect data over a long period > 10 years

A Unit is currently ca. 100 EUR for the standard sensor

Variants

TMS standard, extreme and long: 29-45 cm

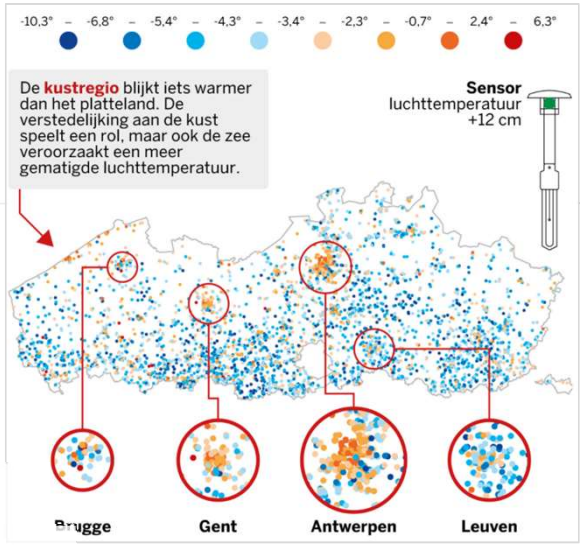
Buriable TMS: 0,5m, 1m and 2m

https://tomst.com/web/en/systems/tms/tms-4/, Wild et al., 2019

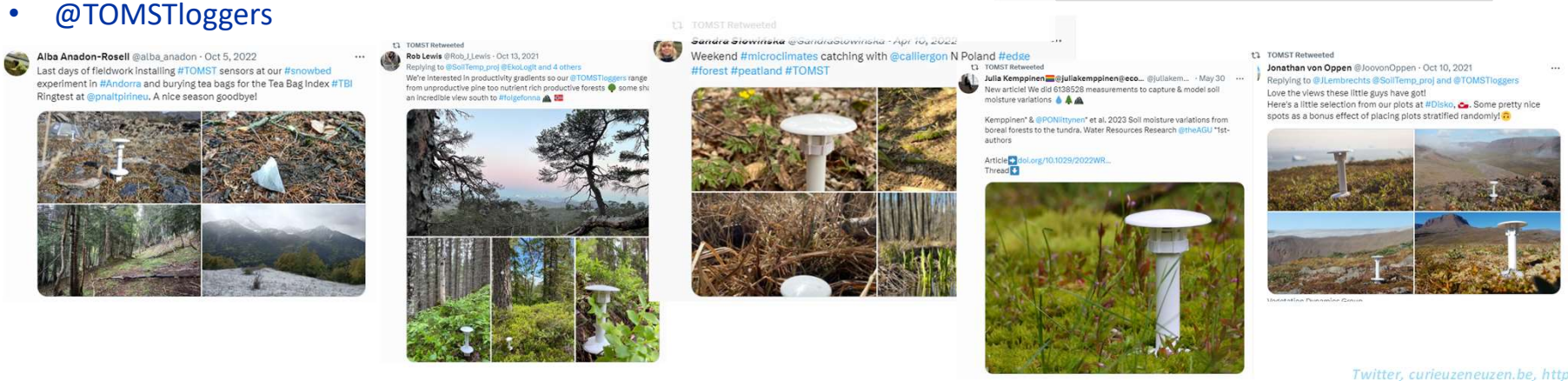
Previous applications

Curious noses in the Garden

- Large-scale citizen science project
- 5,000 sensors installed in gardens across gardens, parks, nature reserves and farms across Flanders to develop data driven recommendations to reduce the impacts of heat, drought and extreme precipitation

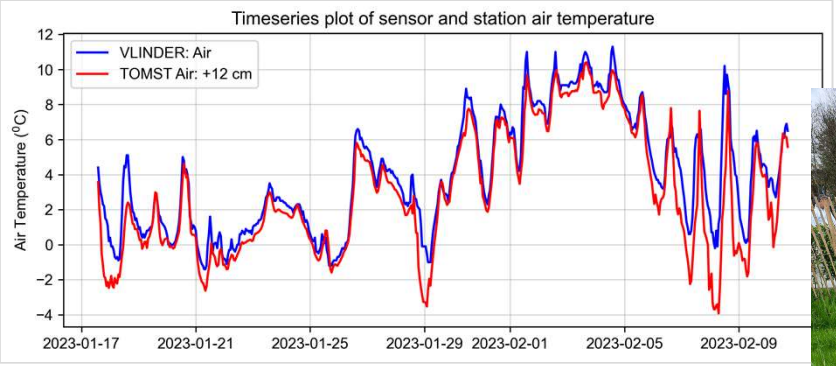


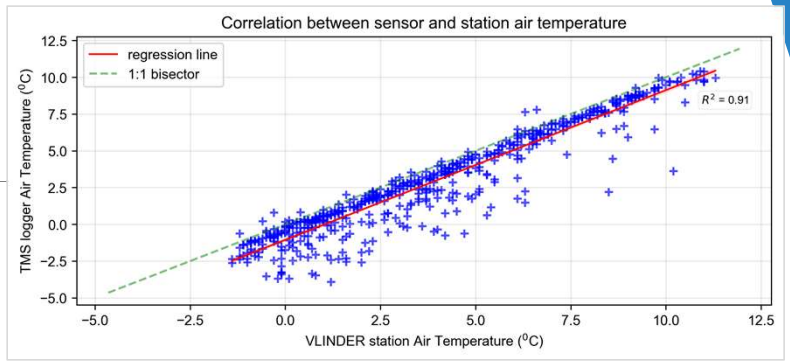
- Very popular with microclimate scientists
  - @TOMSTloggers

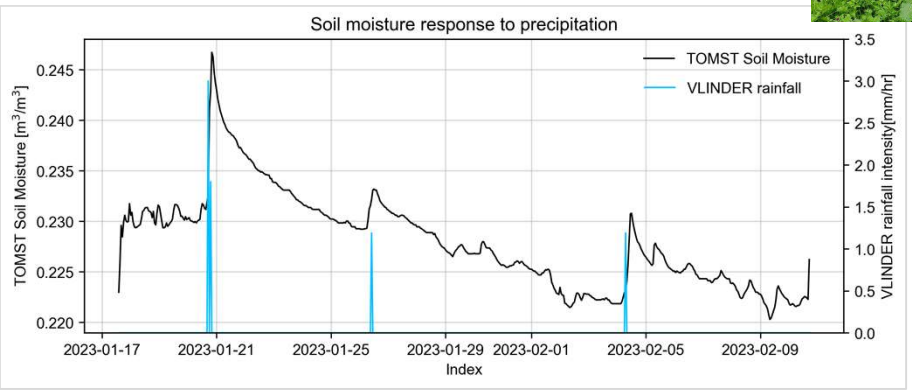


Twitter, curieuzeneuzen.be, https://the3dlab.org/

Data validation

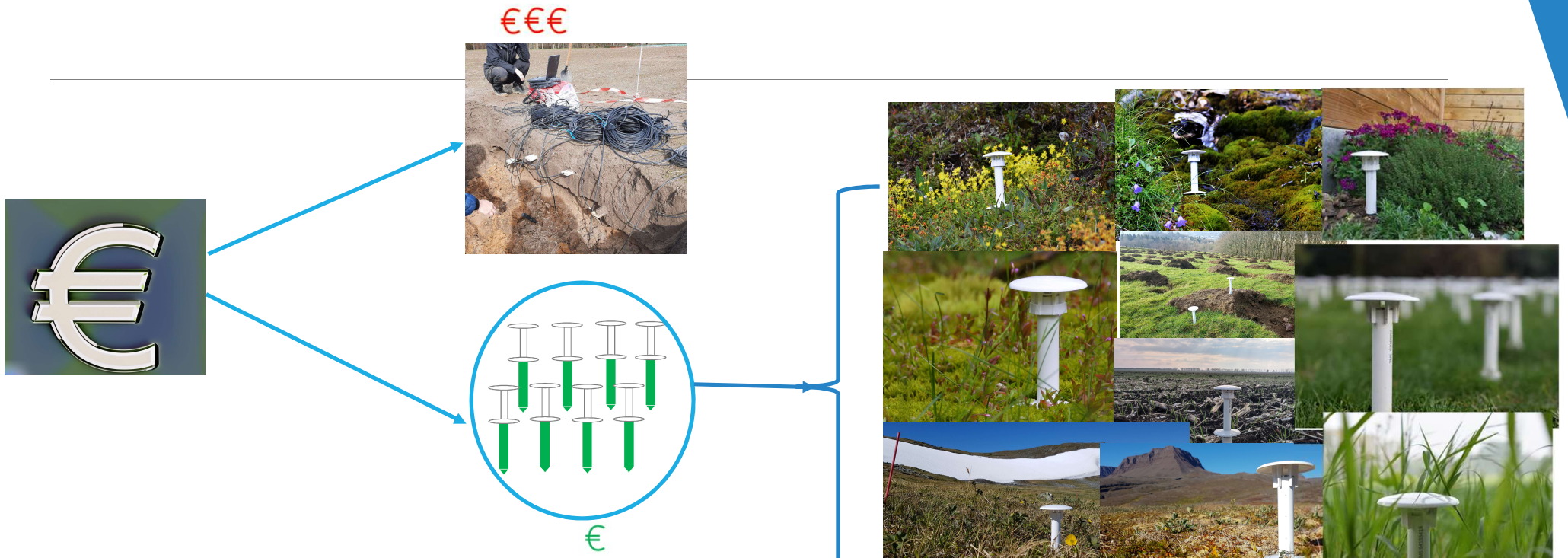






Measurements over large scales

- How can we improve coverage with limited resources?



Accuracy

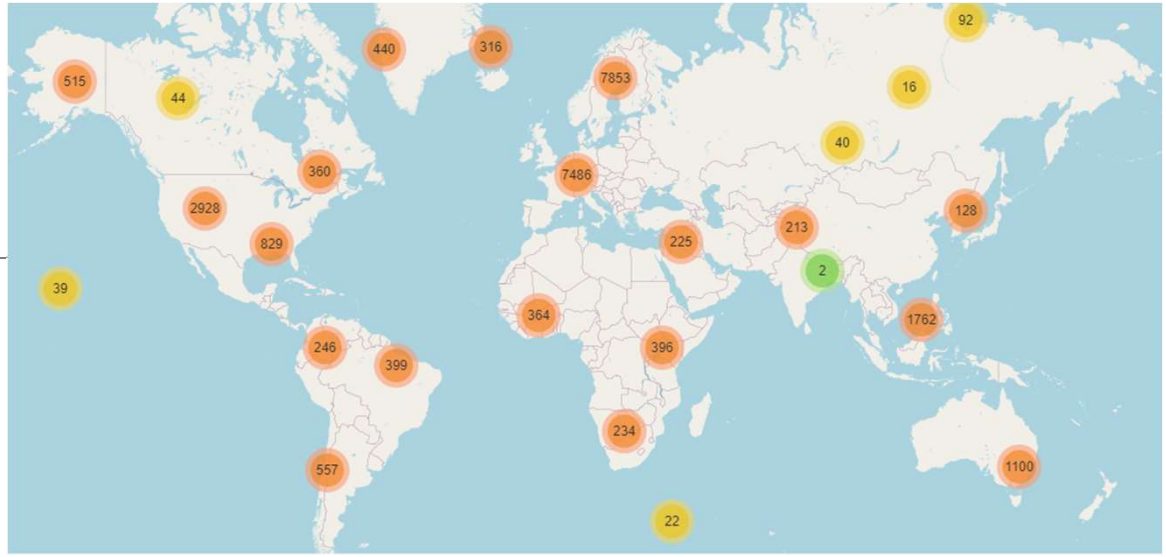
Twitter: @Serega_XP, @juliakemppinen@ecoevo.social, @ADThomas_1970, @Jlembrechts, @PaulKardol, @JaovonOppen

Soil moisture Monitoring

SoilTemp provides a harmonized database for storage of TMS measurements with a footprint in all continents

…including Antarctica!

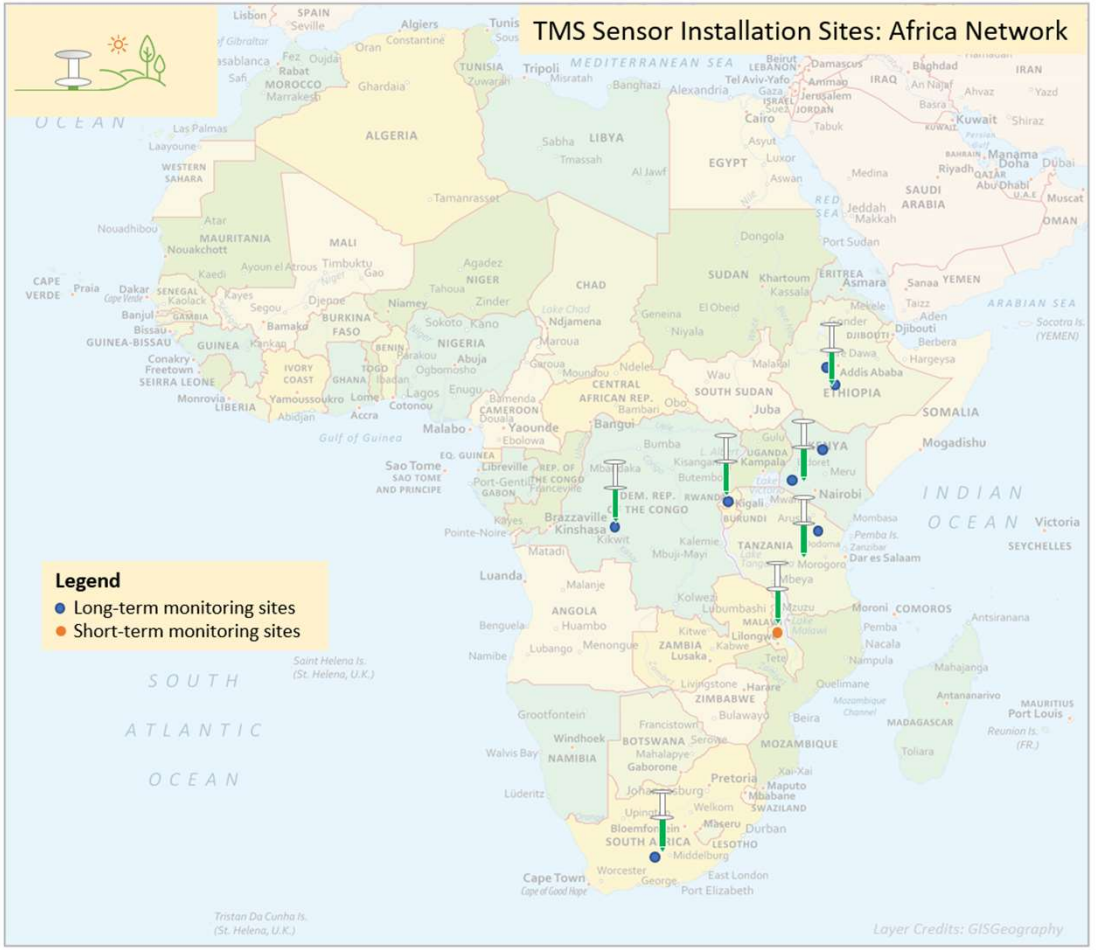
More than 8,000 observations globally and growing



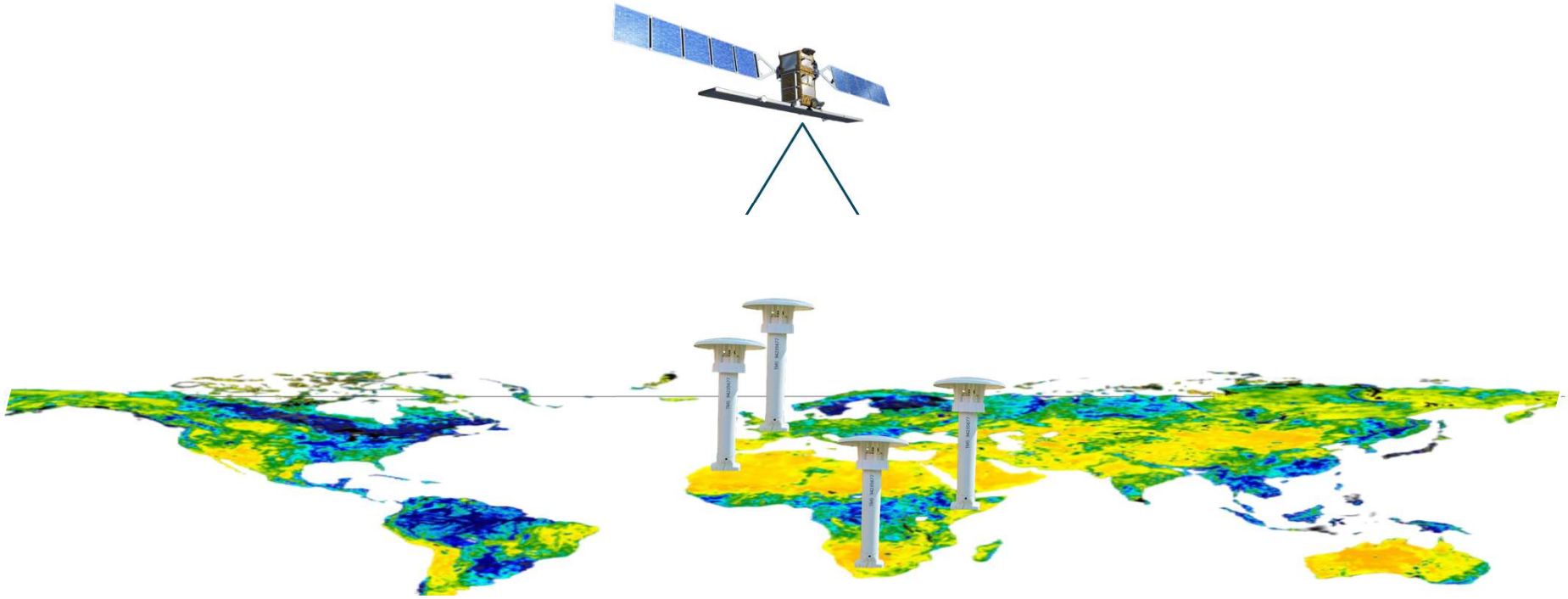
SoilTemp, X @TOMSTLoggers, TOMST

International partnerships

Linking to UNESCO-IHP

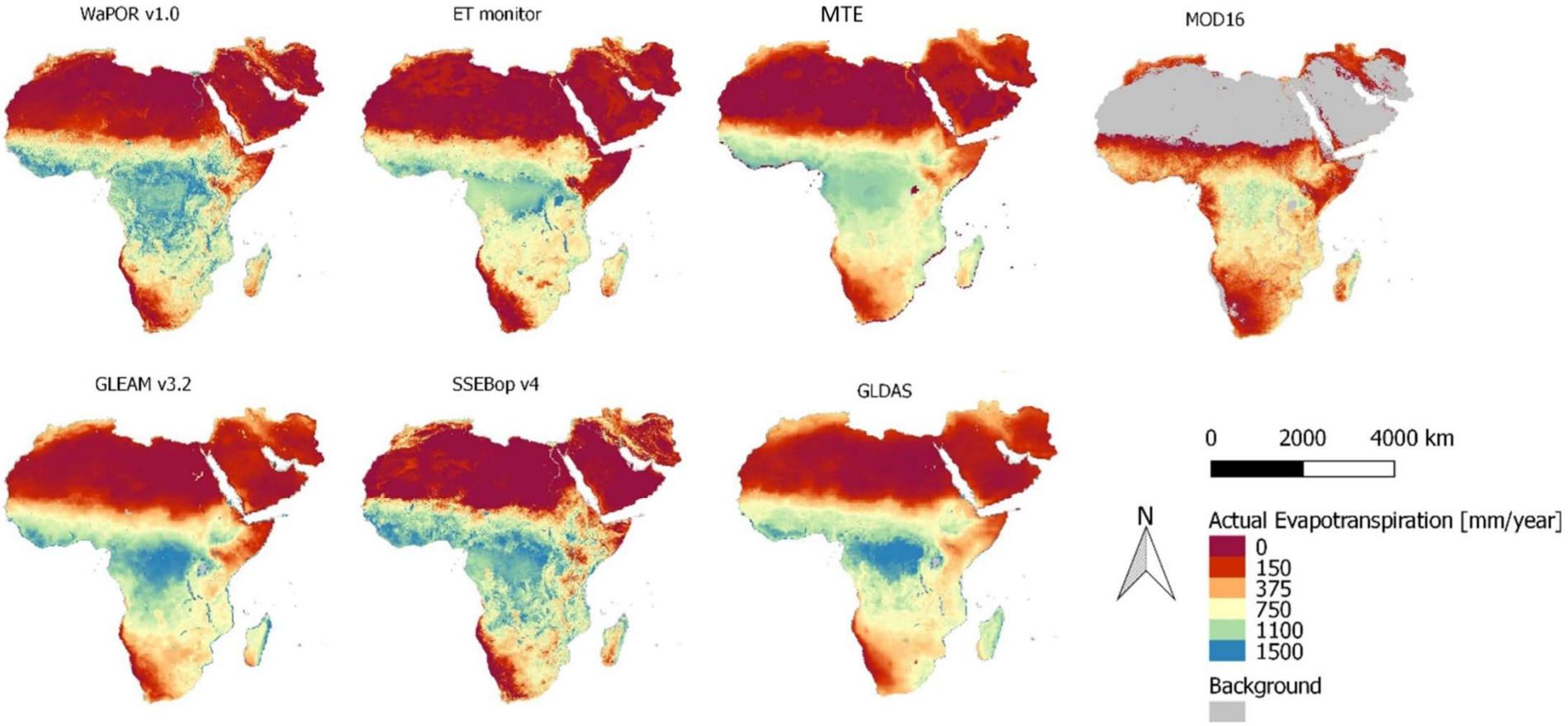


Integration with remote sensing and models



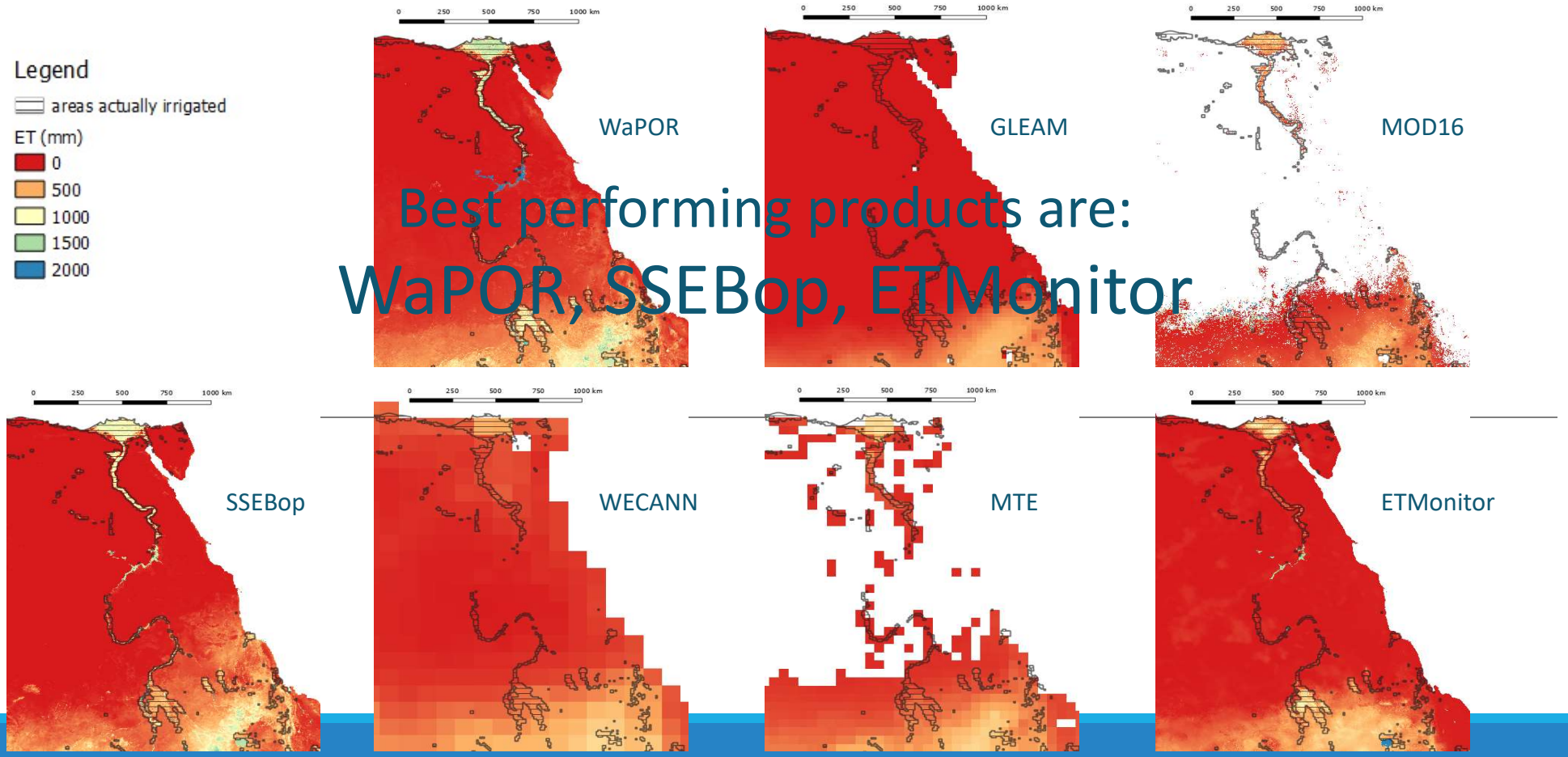
SMAP, TOMST, Sentinel

Several ET products based on Remote Sensing



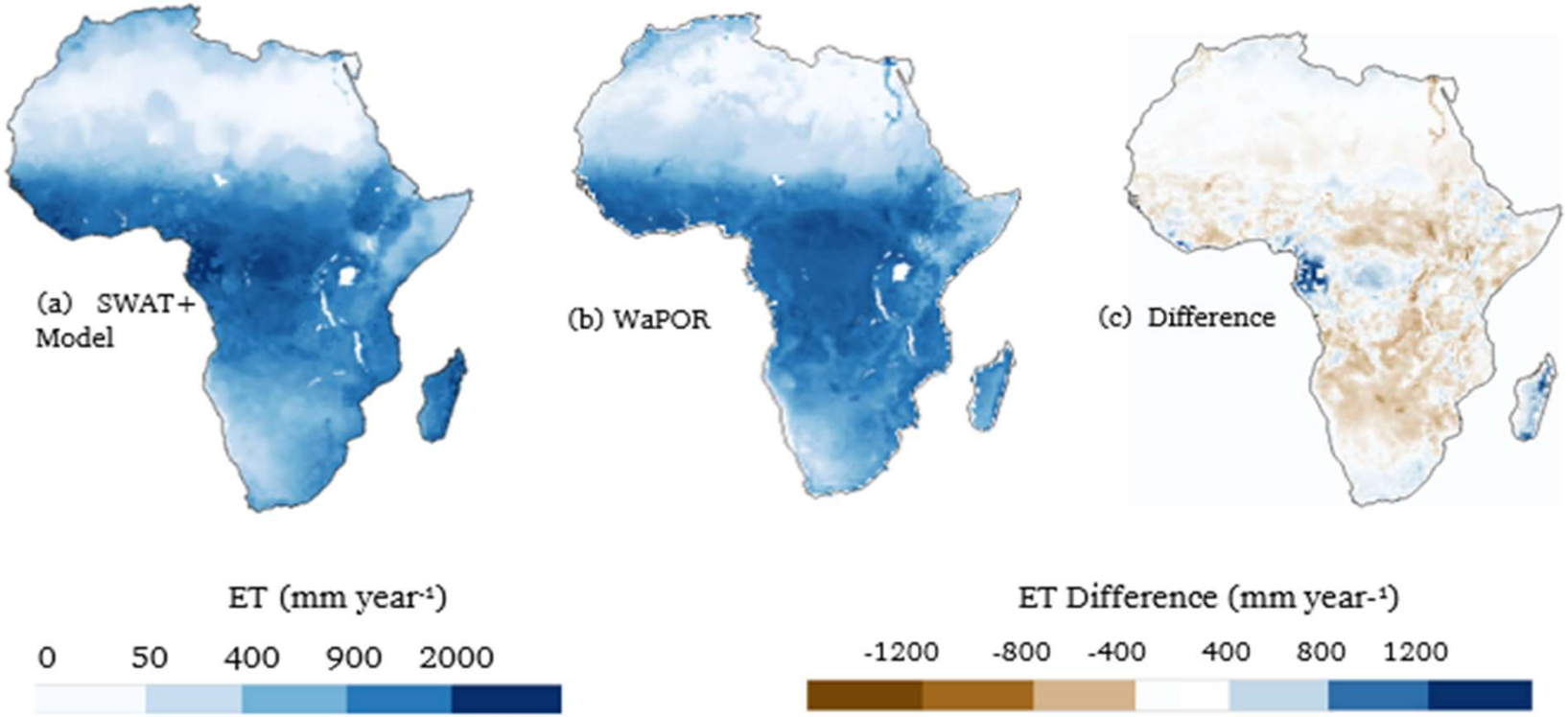
Spatial comparison

using land cover elements – irrigated areas



Best performing products are:

WaPOR, SSEBop, ETMonitor


(a) SWAT+ Model
(b) WaPOR
(c) Difference
ET (mm year-1)
0 50 400 900 2000
ET Difference (mm year-1)
-1200 -800 -400 400 800 1200


Drought , soil moisture,
monitoring, remote sensing
Thank you
for your time