



The International Soil Moisture Network (ISMN) for satellite-based products validation

QA4EO/IDEAS Cal/Val Workshop #2

December 2nd 2020

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QA4EO/IDEAS Cal/Val Workshop #2 - December 2nd 2020 || Irene Himmelbauer

- Overview of the ISMN
- Data collection: Status update
- Provider: TAHMO network Africa
- New ISMN paper envisaged
- Outlook

Overview of the ISMN

ISMN = a global **in situ** (surface and subsurface) soil moisture database.

- Established in 2009
- International cooperation (ESA, WCRP GEWEX, CEOS, GTN-H)
- Funded by ESA ever since : SMOS, IDEAS+, **QA4EO**

Idea: Reliable and consistent validation datasets \Rightarrow crucial for (satellite) soil moisture products

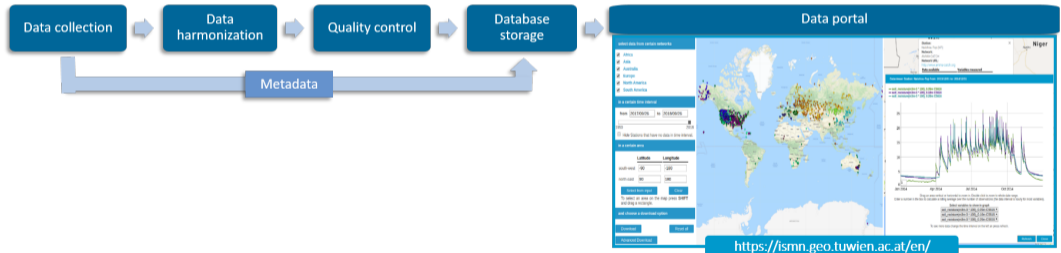








Figure 1: Diagram of workflow of the ISMN.

-  **In situ data + metadata**
-  **Soil moisture + 7 additional variables**
integrated in the DB (see Figure)
-  **65 networks** participate
(status December 2020)
-  **>2600 stations** with several depths
integrated (status December 2020)
-  Time series available from **1952** up
to near real time
-  **Daily update** of 7 NRT networks →
~1000 stations (status December 2020)

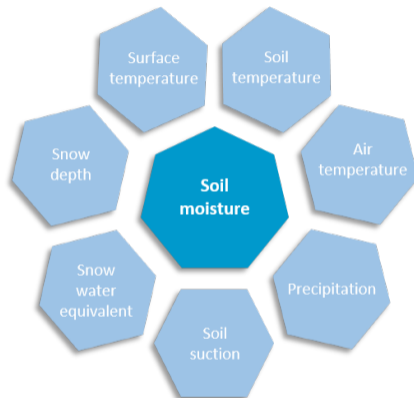


Figure 2: 8 in-situ variables can be implemented in the database (per station and depth)

Data collection: Status update

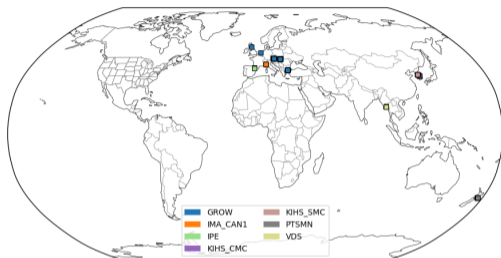


Figure 3: Locations of all new 7 networks since start of QA4EO (November 2019).

PTSMN (New Zealand)

- 20 Stations

IPE (Spain)

- 2 stations

GROW citizen science (UK - Europe)

- Located throughout Europe (Greece, Hungary, Austria, Netherlands, UK, Ireland)
- 151 Stations

IMA_CAN1 (Italy)

- 12 Stations

VDS (Myanmar)

- 4 stations

KIHS_CMC and KIHS_SMC (South Korea)

- 37 stations

The Trans-African
Hydro-Meteorological Observatory
(TAHMO)

TAHMO's weather stations today

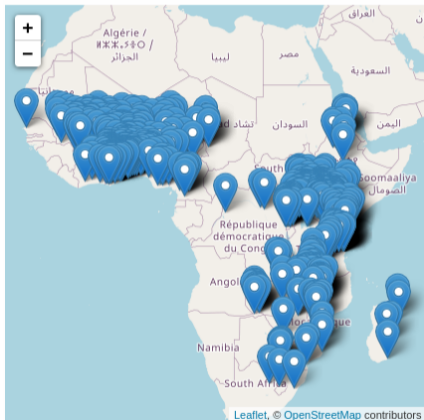


Figure 4: TAHMO station availability (status December 2020).

- Area of Sub-Saharan (Sahel Zone)
- Free and open exchange of data
- Support of WMO resolution 40 and 25
- Installment of 20 000 stations
- Near - real time availability
- Innovative sensor development in Netherlands (TU Delft)
 - Inexpensive and robust sensors
 - 300\$ for two detectors + housing
 - Acoustic Disdrometer (rain gauge) - 10 €
 - Goal to half that price
- Stations financed through donations
- Stations often maintained by schools

More information on the network/ donating: <https://tahmo.org/>

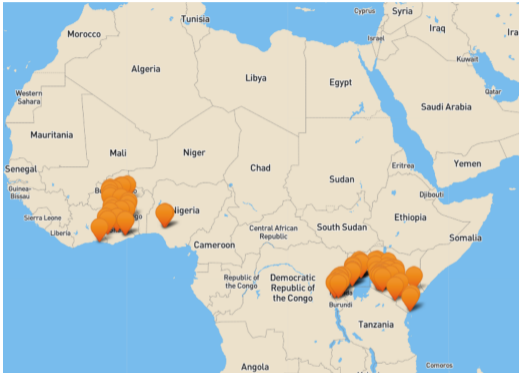


Figure 5: TAHMO soil moisture station availability.

70/79 soil moisture stations - 6 countries - nrt:

- 2015 - 2017: 4 stations measuring soil moisture in Kenya
- 2018: 11 stations measuring soil moisture in 3 different countries (Kenya, Nigeria, Rwanda)
- 2019: 66 stations measuring soil moisture in 6 different countries
- 2020: 79 stations measuring soil moisture in 6 different countries

Ivory Coast 1 station

Nigeria 2 stations

Rwanda 9 stations

Uganda 11 stations

Ghana 21 stations

Kenya 26 stations

New ISMN paper envisaged

One new publication about ISMN - draft in progress:

- ⇒ Title: 10 years of the International Soil Moisture Network - providing new insights to Earth system science
- ⇒ Journal: HESS
- ⇒ Goals:
 - Overview of ISMN
 - Recent developments (since 2013 paper)
 - Literature overview of studies that have made use of the ISMN and how (similar as in Wouter's CCI paper in RSE)
 - Summarize what impact the ISMN has made
 - Summarize current shortcoming and future needs (long-term monitoring sites, global distribution, upscaling concepts, improved uncertainty characterization etc.)
- ⇒ Authors: ISMN team + ESA + BfG + GEWEX - GTN-H - invited 1 person per network

Conclusion and outlook

- Outlook
 - Operations funded until March 31st 2021 by ESAs QA4EO programme
 - R&D not included in current funding
- Future ideas currently explored:
 - ICWRGC, hosted by Federal Institute of Hydrology (BFG, Germany) has strong interest in taking over operational tasks
 - Financing Has been approved by the Ministry itself
 - Awaiting final decision from German Bundestag
 - TU Wien would keep scientific development of the ISMN \Rightarrow ISMN + QA4SM* = FRM4SM (flags, upscaling, uncertainty propagation)

* More information on the online validation service QA4SM can be found here : <https://qa4sm.eu>



Thank you for your attention!

ISMN: <https://ismn.geo.tuwien.ac.at>
CLIMERS: <https://climers.geo.tuwien.ac.at>

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