FASTER

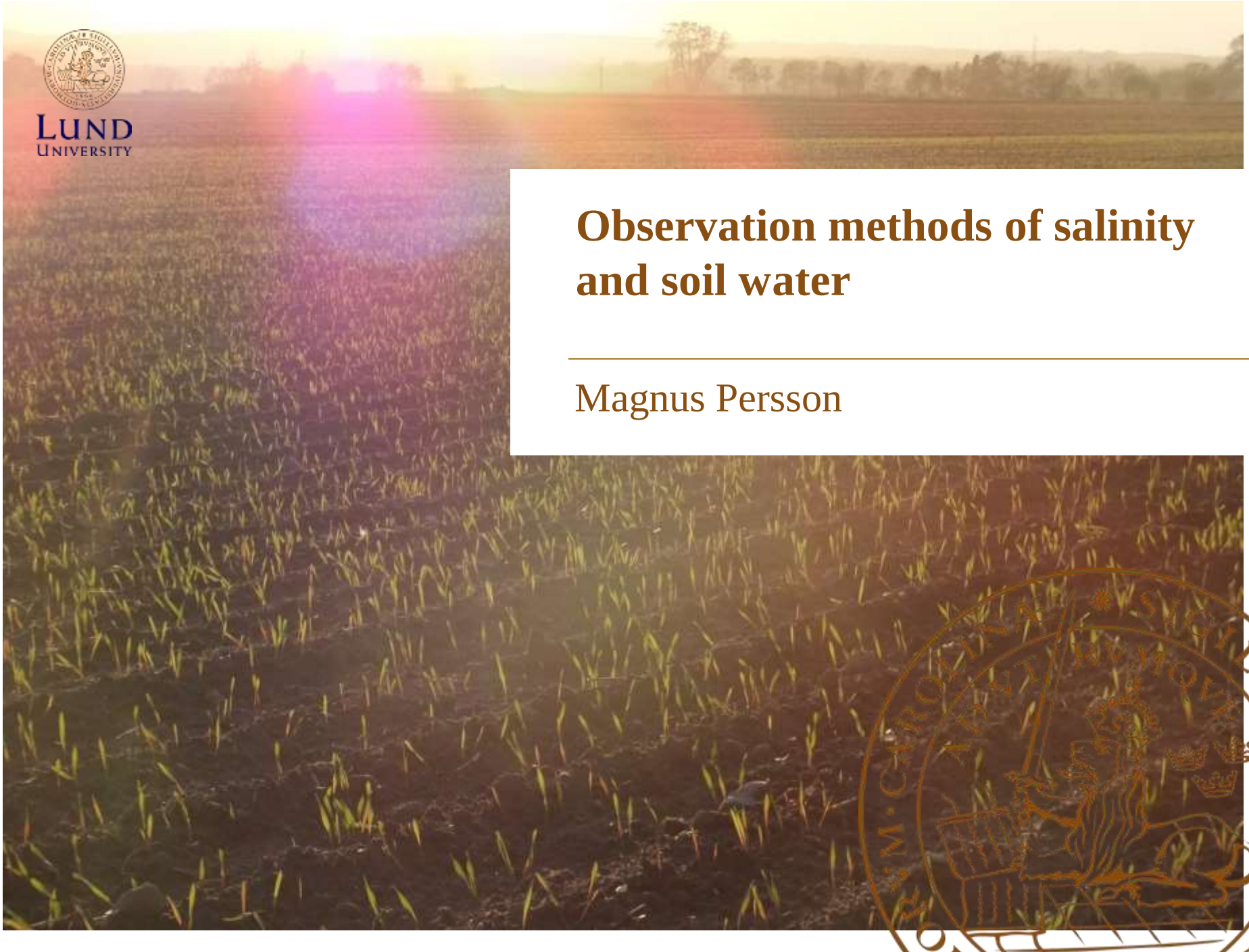
Farmers' Adaptation and Sustainability in Tunisia through Excellence in Research

2nd FASTER SPECIALIZED TRAINING

on Climate change effects on water & land management in the Mediterranean

22-26 March 2021 (ONLINE)

AGENDA



Observation methods of salinity and soil water

Magnus Persson

Who am I?

Professor at Water Resources Engineering, Lund University since 2010.

Main research interest:

- Water and solute transport in unsaturated heterogeneous soil
- Solute transport measurements using TDR
- Catchment hydrology
- Climate change effects on water resources

My profile at LU

https://portal.research.lu.se/portal/en/persons/magnus-persson(903adb99-c1bb-4c6d-abe7-370ee4e293e3).html

Topics

- What to measure?
- Why measure?
- How to measure?

What to measure?

- Soil physical properties
- Crop status
- **Soil water content**
- **Soil (water) salinity**

Why measure?

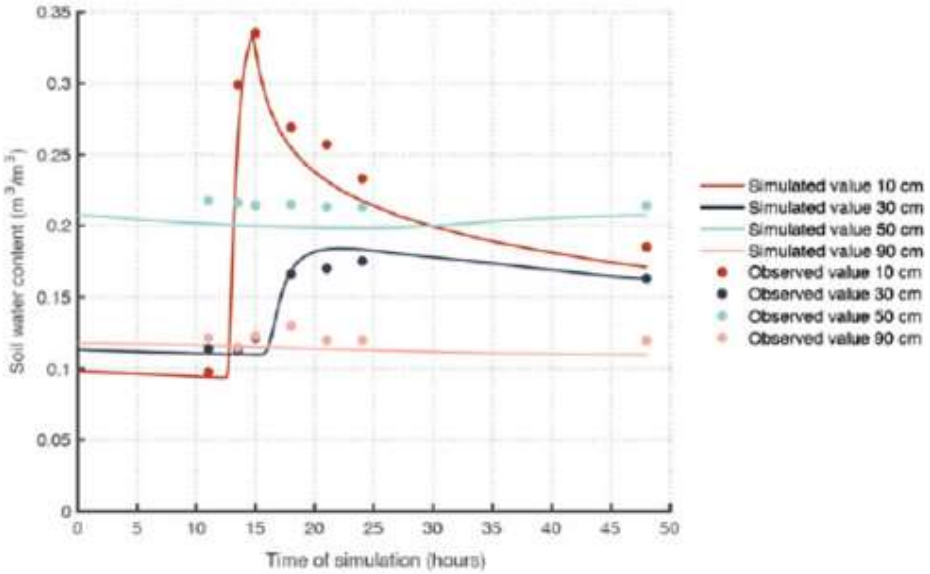
Measurements of soil salinity and soil moisture has many applications in

- Engineering
- Hydrology
- Agriculture
  - Irrigation management
  - Soil management
  - Crop management

Measurement strategy

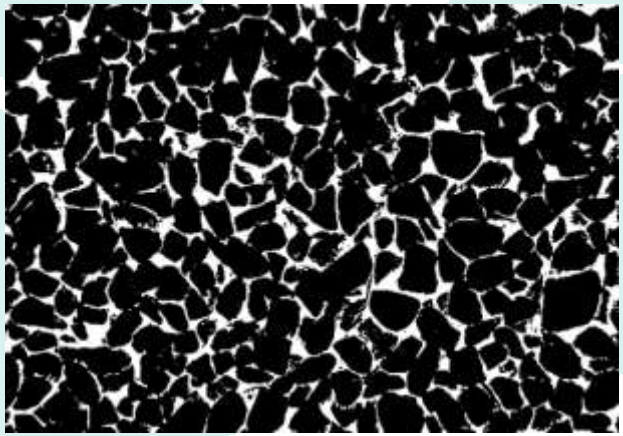
- Measurement strategy depends on purpose
  - Determining the current state
  - Calibrate/validate models to calculate future state

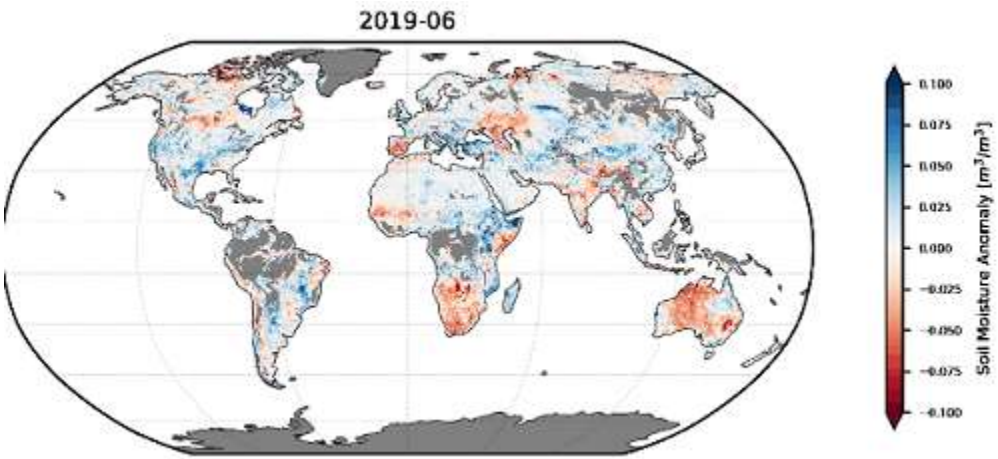
- Other factors to consider
  - Cost
  - Accuracy
  - Scale
  - User friendliness
  - Destructive/non-destructive
  - Other?

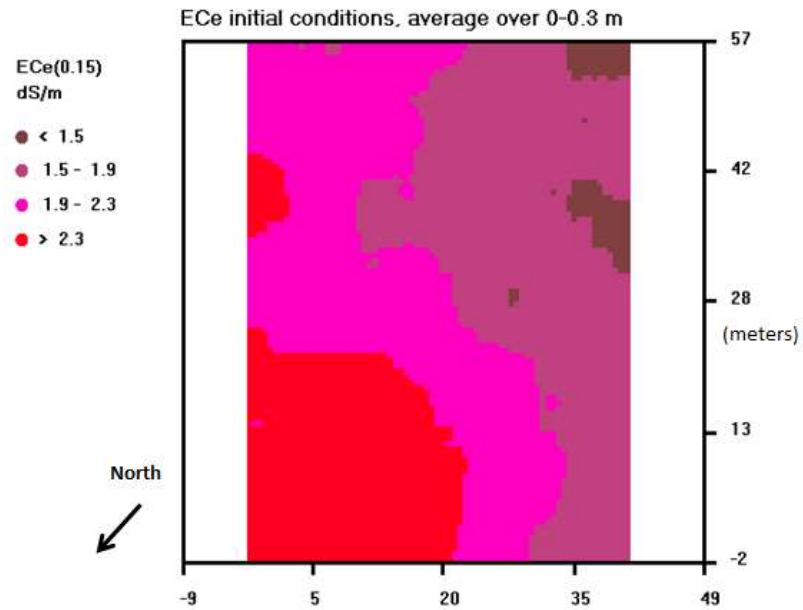


Scale issues and variability

- Microscale (local scale)
- Mesoscale
- Macroscale





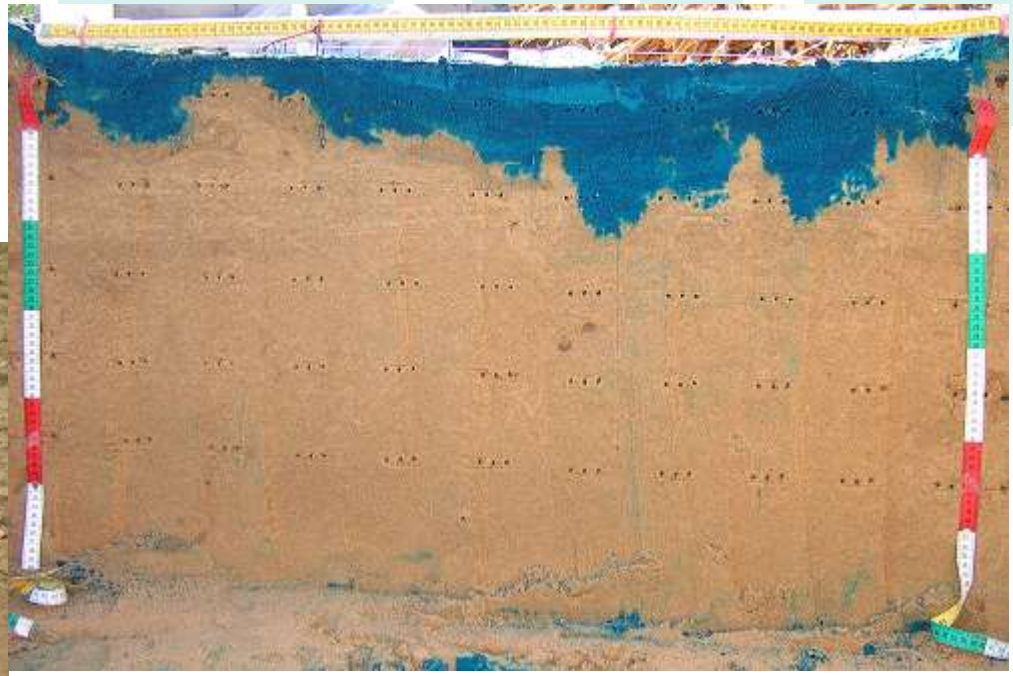


Macropores

- Macropores (desiccation cracks) in a clay soil in Egypt
- What is a representative volume?

Dye infiltration

- A good way to visualize flow patterns and variability

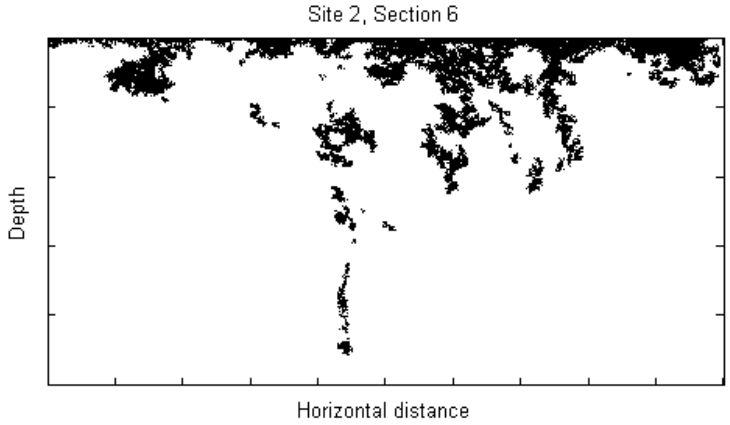


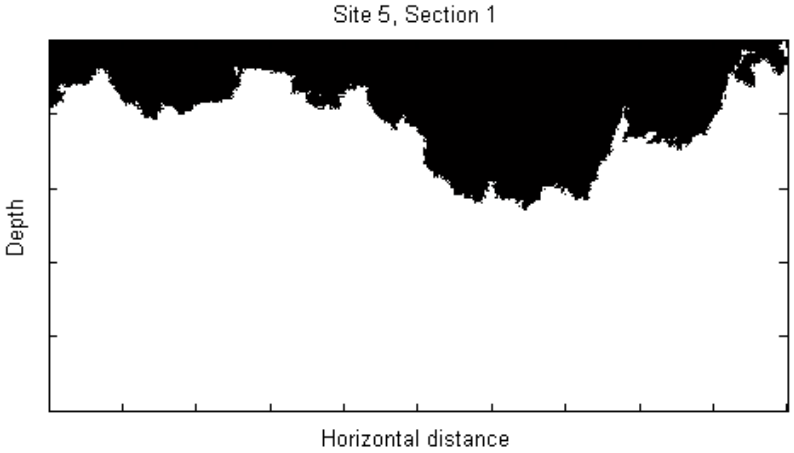
Dye tracers

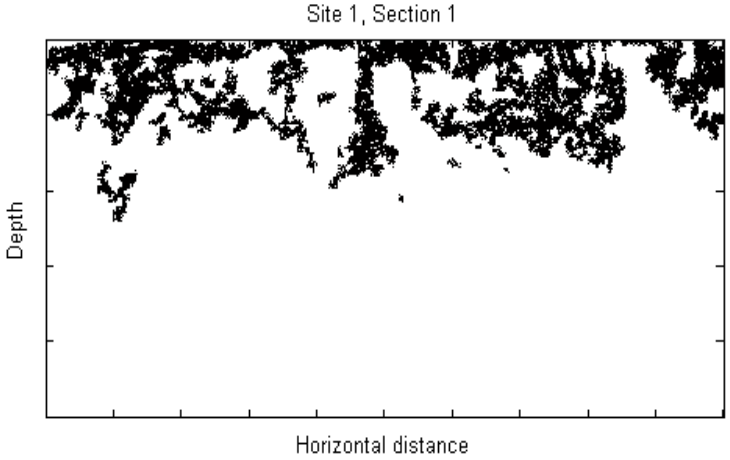
Photo of dye infiltration

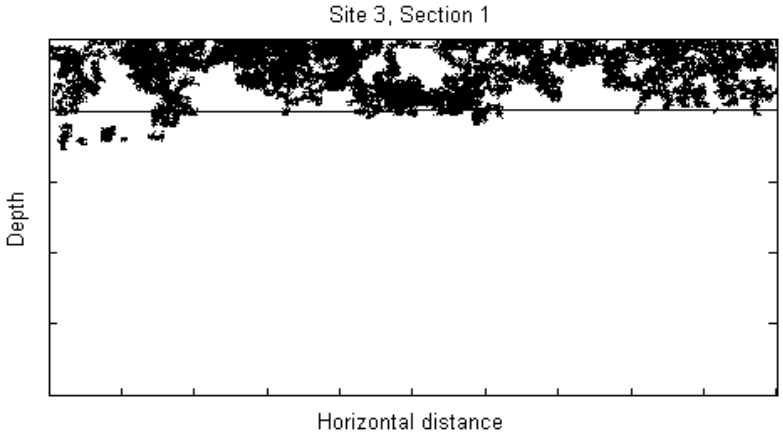
The same photo in binary format

Dye infiltration patterns









How to measure?

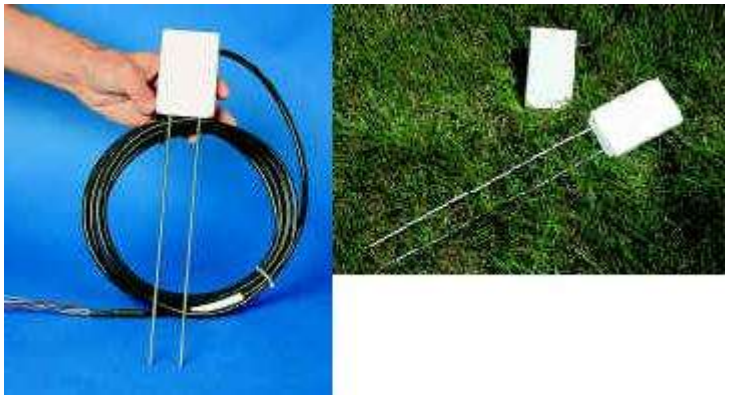
- There are an almost infinite number of techniques and manufacturers (see some examples in the Links slide at the end)
- Why?
- Below some examples
  - Soil sampling (local scale)
  - Capacitance sensors (local scale)
  - Electromagnetic induction (EMI) (mesoscale)
  - Satellite measurements (macroscale)

Soil sampling

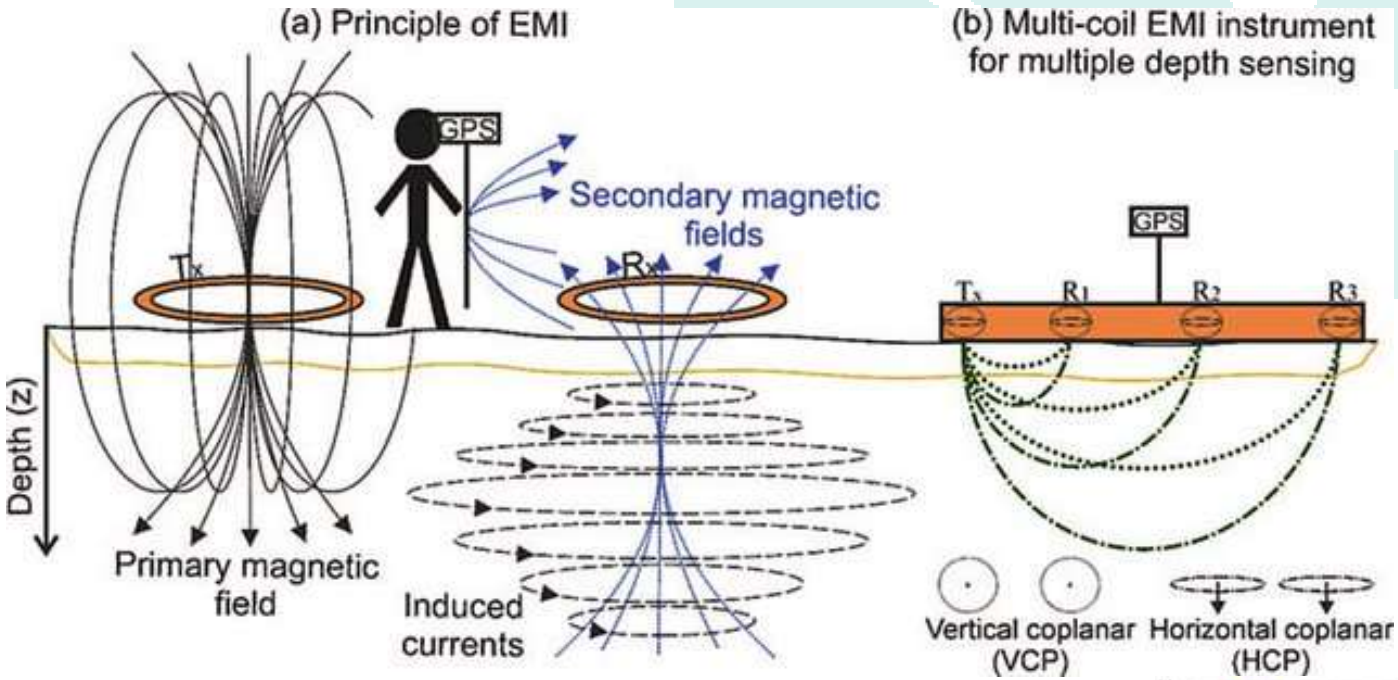
Capacitance sensors

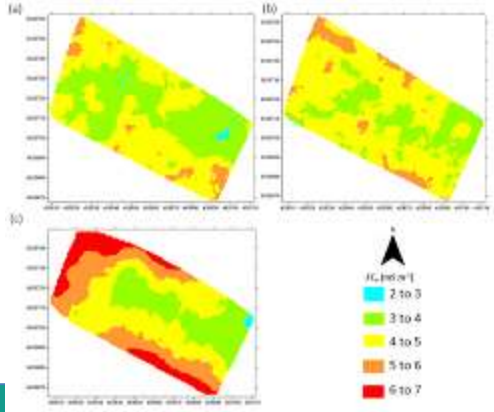
Measures the permittivity at low frequencies (>100 MHz)

Cheap but affected by temperature and soil type.



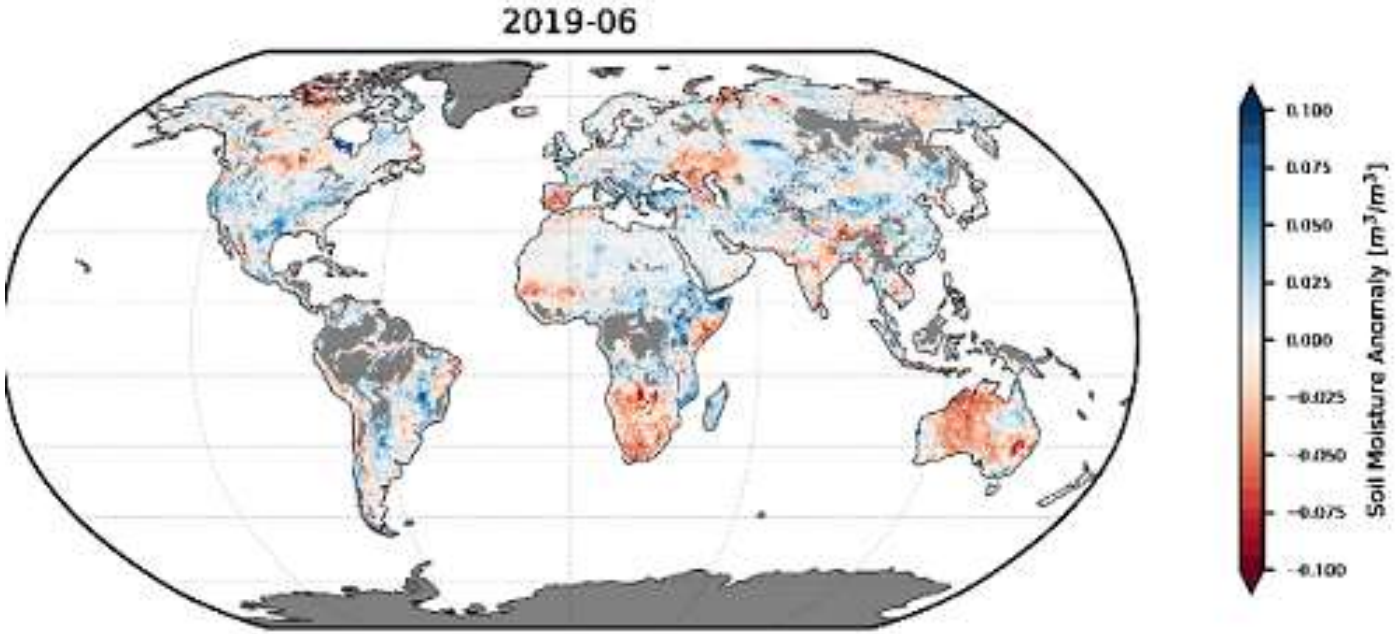
Electromagnetic induction (EMI)





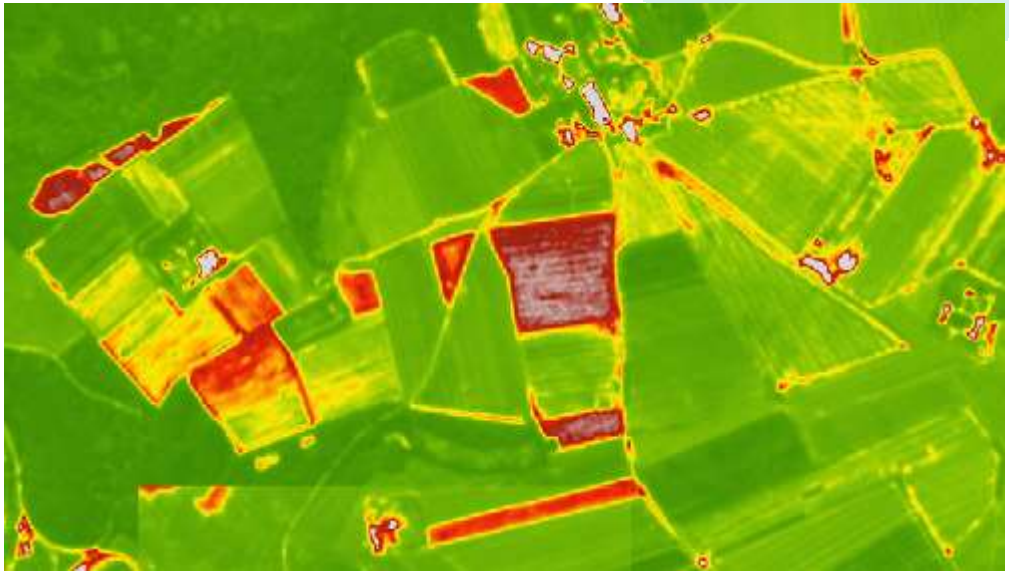
Satellite measurements of soil moisture

- https://esa-soilmoisture-cci.org/



Satellite measurements of crops

- The **normalized difference vegetation index** (**NDVI**)
- NDVI data provides a measurement of crop health.



Links and literature

Links to manufacturers

- http://www.delta-t.co.uk/
- http://www.soilmoisture.com/
- https://www.campbellsci.com/

A global data set of soil hydraulic properties

- https://doi.pangaea.de/10.1594/PANGAEA.870605

Literature

- Allbed and Kumar (2013) Soil Salinity Mapping and Monitoring in Arid and Semi-Arid Regions Using Remote Sensing Technology: A Review

DOI:10.4236/ars.2013.24040

- Jonard, F. et al. 2018. Ground-Based Soil Moisture Determination

https://www.researchgate.net/publication/331333720_Ground-Based_Soil_Moisture_Determination

Facilitated debate

- How would a perfect measuring technique look like?
- What experience do you have with measuring techniques?
- What data sources do you have locally?

That´s all for now!

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