

#### **Potential Research Topic:**

# Metrology for large-scale monitoring of water at land surface with cosmic neutrons

M. Zboril on behalf of PTB Department 6.4 Neutron Radiation

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## **Cosmic-ray neutron sensing (CRNS)**



#### Soil humidity $\leftarrow$ Count rate of albedo neutrons

M. Schrön, Diss. Uni Potsdam, 2017



T. Sato, COSMOS Workshop, 2020



## **Potential impact**



- The aim: Monitoring of soil moisture on large scale
  - Bridging the gaps between point-scale sensors and remote sensing
  - Neutron "source" = secondary neutrons of the omnipresent cosmic-ray radiation
  - Non-radioactive. Non-invasive. Continuous. Automated. Networks.
- The impact: Water flux monitoring & modelling in soil and land surface hydrology
  - → Monitoring and forecasting of irrigation, floods and droughts
  - → Improvements in agriculture water and soil management. Smart farming.
  - → Investigation of the consequences of global change for terrestrial ecosystems
  - → Environmental care, preserving Europe's natural capital

# **Needs for metrology**



- Needs identified
  - Further development of CRNS methodology (establish standard procedures)
  - Reliable assessment of uncertainties
  - Calibration & validation of neutron measuring devices used in CRNS community
  - Validation of neutron transport calculations
  - Harmonization and development of standard protocols for CRNS method
  - Link to establishing larger CRNS networks
- Consortium for upcoming PRT: (<u>Neutron</u>) metrology. CRNS development. Neutron modelling. CRNS end users. Hydrology.

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