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Type: Oral Presentation

Non-invasive characterization of soils and aquifers: 20 years of hydrogeophysics at the Agrosphere institute

Wednesday, 2 June 2021 09:00 (15 minutes)

Progress in the fields of vadose zone and groundwater hydrology is still hampered by the challenges associated with the characterization of the multi-scale heterogeneity of the subsurface environment. Hydrogeophysics attempts to address this challenge by providing methods that allow the non-invasive characterization of subsurface structures (e.g., layering, sedimentology) and their interaction with processes (e.g., water flow, solute transport). In this presentation, we will provide an overview of developments in the field of hydrogeophysics in the past two decades using examples from research at the Agrosphere institute under the supervision and guidance of Harry Vereecken. After an introduction of the hydrogeological test site Krauthausen that motivated the initial geophysical endeavors at the Agrosphere institute, we will first review developments with geophysical instrumentation and data interpretation methods, including spectral induced polarization and full-waveform inversion of ground penetrating radar data. After this, the high value of time-lapse geophysical measurements for process investigations will be illustrated. In particular, we will present electrical resistivity tomography measurements used to monitor tracer movement at the Krauthausen test site, and ground penetrating radar measurements in horizontal boreholes used to monitor water content dynamics in the vadose zone of a rhizotron facility operated in Jülich. These two case studies will also be used to discuss strategies to integrate geophysical measurements and hydrological models. Due to the high mobility of some geophysical sensors, hydrogeophysical research is increasingly moving towards investigations beyond the field scale. This will be illustrated using a study where electromagnetic induction measurements were used to derive a geophysics-based soil map that can be used to support within-field management in the context of sustainable crop production. Taken together, the presented case studies will highlight the developments in the field of hydrogeophysics and the remaining challenges that will need to be addressed in future studies.

Time Block Preference

Time Block B (14:00-17:00 CET)

References

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Presenter: HUISMAN, Johan Alexander

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