

Advanced modelling tools for subsurface hydrology: from the vadose zone to deep environments

The session focuses on the development and use of methodologies that enable the identification, quantification and prediction of processes occurring in the subsurface at multiple depths. The session evaluates and discusses topics related to the movement of fluids in any phase (gas, water, NAPLs, etc.) through the unsaturated zone or directly into saturated environments and the migration of the dissolved substances, using digital mapping techniques (e.g. geostatistics, Bayesian statistics, machine learning, neural networks) for the interpretation and prediction of flow, vulnerability to contaminants and contaminants fate in aquifers. Process-based models, such as those embedding partial differential equations controlling flow and transport in the subsurface include both deterministic and stochastic modelling approaches. In the latter, models that explicitly quantify the uncertainty due to the lack of information, computational limits and the complexity of modelling processes controlling water flows and contaminants behaviour in heterogeneous media are particularly welcome. Biogeochemical aspects that include a broad range of homogeneous or heterogeneous biochemical reactions are analysed and discussed. This session welcomes the contributions on advanced experimental and modelling solution, including the use of isotopes and natural or environmental tracers and the development of new modelling solutions regarding also managed aquifer recharge to nuclear waste management. Presentations by students and postdocs on topics related to the fate of contaminants or recovery of resources (e.g. energy, hydrocarbons) that involve the unsaturated zone are particularly well accepted. The session is cast in the framework of the EU H2020 ENeRAG (Excellency Network Building for Comprehensive Research and Assessment of Geofluids) project.