**Session Proposal**

# Session Title

Modelling soil processes from ped to global scale

# Session Organizers

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# Session Description

Soils are dynamic systems where hydrological, chemical, biological, and geological processes interact across a wide range of spatial and temporal scales. Accurate representation of these complex interactions in soil models is critical for understanding their role in ecosystem services, climate feedbacks, and responses to land-use and global change. Modelling soil processes aims to advance prediction capabilities across a range of soil-related processes, including the biogeochemical and hydrologic cycle, erosion, solute transport, catchment response functions, land-atmosphere interactions, and land-climate feedbacks. Despite significant advances, challenges persist in linking soil processes with robust computational frameworks, integrating diverse data sources, and scaling from pore to global levels. This session, organized on behalf of the International Soil Modeling Consortium (ISMC), aims to foster discussion and collaboration among scientists to address these challenges and explore innovative solutions in soil modelling. We invite contributions that focus on but are not limited to the following topics: 1) Multiscale soil modeling to integrate processes such as infiltration, root water uptake, and evapotranspiration across pore, pedon, catchment, and global scales, utilizing both process-based and data-driven models. 2) Emerging data and technologies to inform and validate soil models. 3) Development and refinement of methods, such as pedotransfer functions, ensemble approaches to predict soil hydraulic, thermal, and biogeochemical properties. 4) Model integration work, such as coupling soil hydrology with energy, carbon, and nitrogen cycles to improve Earth system models and quantify planetary boundaries. This session will highlight how cutting-edge tools and interdisciplinary collaboration can enhance soil modeling frameworks, addressing gaps identified in recent research (e.g., soil structure representation, dynamic properties) and paving the way for predictive tools that support sustainable land management and climate adaptation.

# Format

Oral presentations, poster, panel discussions

# Proposed Speakers

Wenke Wang, a professor at Chang’an University, is a renowned scientist in vadose zone hydrology. His groundbreaking research on fluid flow and solute transport in soil hydrology has significantly enhanced our understanding of soil-water dynamics, particularly in arid environments. Serving as Associate Editor of Journal of Hydrology and Hydrogeology Journal, and as Director of the Shaanxi Province Groundwater and Ecological Engineering Research Center, China, he leads two field research stations in Northwest China, designated as the “Arid Zone Critical Zone” observation station. With over 150 journal papers and numerous scientific awards, his contribution is globally recognized.

Xiaofan Yang, professor from Beijing Normal University. She is a leading scientist in soil science and multi-scale modeling. With a PhD in Mechanical Engineering from Kansas State University, she excels in soil-environment interactions and advanced modeling. Her groundbreaking research on soil quality, solute transport, and microbial processes has greatly advanced the field. Serving as a leading scientist in, she has published extensively and earned global recognition for her innovative contributions. In 2016, she was honored with the National High-Level Talent Award, solidifying her reputation as a trailblazer in soil and environmental modeling.