**Session Proposal**

# Session Title

# Nanosensors for Soil Quality Monitoring: Design, Mechanisms and Field Applications

# Session Organizers

Yasin Orooji, Distinguished Professor, College of Geography and Environmental Sciences, Zhejiang Normal University, orooji@zjnu.edu.cn (primary contact person)

# Hassan Karimi-Maleh, Professor in Biosensing Technologies, affiliated with multiple collaborative institutions, hassan@uestc.edu.cn

# Session Description

This session explores the development of advanced nanosensors for soil quality monitoring, including electrochemical sensors, optical nanosensors, and MXene-based sensors. It covers their design principles, detection of soil heavy metals, nutrients, and pollutants, as well as integration with IoT for real-time soil analysis. Discussions will focus on improving sensitivity, stability, and cost-effectiveness for field-scale deployment.

# Relevance

# Addressing the critical need for precise soil monitoring in sustainable agriculture and environmental protection, this session aligns with the congress’s focus on innovative soil technologies, enabling timely detection of soil degradation and optimized resource management.

# Format

Oral presentations + interactive workshop (sensor prototype demonstrations) …

# Proposed Speakers

Zeeshan Ajmal, Researcher in MXene-based frameworks, specializing in their application in soil pollutant sensing (contributions: MXene sensors for heavy metal ion detection in soil).

Samira Arefi-Oskoui, Expert in membrane and sensor technologies, focusing on ultrafiltration membrane-based sensors for soil organic pollutants (contributions: MoS2/O-MWCNTs composite sensors for soil dye detection).

Asif Hayat, Specialist in covalent organic frameworks (COFs), researching COF-based sensors for soil nutrient monitoring (contributions: COF sensors for real-time detection of soil nitrogen compounds).

Tariq Bashir, Scholar in 2D materials, developing MXene/metal oxide nanocomposite sensors for soil pH and salinity monitoring (contributions: Bi2O3@Ti3C2 sensors for soil electrochemical analysis)