Geophysical Research Abstracts
Vol. 20, EGU2018-6759, 2018
EGU General Assembly 2018

Geophysical Methods in Soil Structure Characterization

Alejandro Romero-Ruiz (1), Niklas Linde (1), Thomas Keller (2,3), and Dani Or (4)

(1) Institute of Earth Sciences, University of Lausanne, Lausanne, Switzerland, (2) Department of Agroecology and Environment, Agroscope, Zürich, Switzerland, (3) Department of Soil and Environment, Swedish University of Agricultural Sciences, Uppsala, Sweden, (4) Institute of Terrestrial Ecosystems, Soil and Terrestrial Environmental Physics, Swiss Federal Institute of Technology, Zürich, Switzerland

Soil structure is often defined by the spatial arrangement of soil constituents and voids. Its state plays a central (and often overlooked) role in soil functioning and ecosystem services. Characterization of soil structure often relies on in-situ point measurements or soil sampling and subsequent laboratory measurements. The resulting spatial coverage is limited, sampling is invasive and monitoring of soil structure evolution at the same location is not practical. Geophysical methods may offer solutions to overcome such limitations by expanding the spatial coverage and facilitating in-situ monitoring; thus, enabling the monitoring of soil structure dynamics at the plot scale. The success of such geophysical-based strategy hinges on establishing relationships between the geophysical properties (e.g. electrical resistivity and permittivity, seismic velocities) and soil structure-related properties or state variables (e.g. porosity, water content, density). However, interpretation of geophysical properties in terms of soil structure is restricted by the existing relationships which were developed for stationary soil structure and usually rely on bulk (average) properties that may overlook important structural features (e.g. soil macropores). We review potential frameworks that enable derivation of geophysically-assisted insights related to soil structure by analyzing relative advantages and limitations of various geophysical methods and propose potential combinations of methods and observations that would tease out structure features from surrogate system responses (e.g. rate of internal drainage, simultaneous changes in electrical and seismic attributes and more). The presentation will discuss several specific examples and recent measurements in a soil structure observatory near Zürich, Switzerland.