Geophysical Research Abstracts
Vol. 17, EGU2015-2899, 2015
EGU General Assembly 2015

Geophysical methods for monitoring infiltration in soil

Yves Coquet (1), Marc Pessel (2), and Albane Saintenoy (2)

(1) University of Orleans, Institut des Sciences de la Terre d'Orléans, UMR 7327, Orleans, France (yves.coquet@univ-orleans.fr), (2) University of Orsay, Laboratoire GEOPS, UMR 8148, 91405 Orsay, France

Geophysics provides useful tools for monitoring water infiltration in soil essentially because they are non-invasive and have a good time-resolution. We present some results obtained on different soils using two geophysical techniques: electrical resistivity tomography (ERT) and ground-penetrating radar (GPR). Infiltration in a loamy soil was monitored using a 2D Wenner array set up under a tension disc infiltrometer. A good imaging of the infiltration bulb below the infiltrometer could be achieved provided a sufficient resistivity contrast between the wet and the dry soil zones. ERT data could be used to invert soil hydraulic properties. However, we found that the information provided by the ERT could be of limited importance in regard to the information provided by the infiltration rate dynamics if the ERT spatial resolution is not small enough to capture the details of the infiltration front at the limit between the wet and dry soil zones. GPR was found to be a good tool to monitor the progression of the infiltration front in a sandy soil. By combining a water transport simulation model (HYDRUS-1D), a method for transforming water content into dielectric permittivity values (CRIM), and an electromagnetic wave propagation model (GprMax), the Mualem-van Genuchten hydraulic parameters could be retrieved from radargrams obtained under constant or falling head infiltration experiments. Both ERT and GPR methods have pros and cons. Time and spatial resolutions are of prime importance to achieve a sufficient sensitivity to all soil hydraulic parameters. Two exploration fields are suggested: the combination of different geophysical methods to explore infiltration in heterogeneous soils, and the development of integrated infiltrometers that allow geophysical measurements while monitoring water infiltration rate in soil.