Geophysical Research Abstracts, Vol. 9, 03693, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-03693

Spectral Induced Polarization for monitoring the water infiltration in soils

Ph. Cosenza (1), A. Ghorbani (1), S. Ruy (2), C. Doussan (2), N. Florsch (1)

(1) UMR 7619 Sisyphe, Université Pierre et Marie Curie-Paris6, CNRS, Paris, France.

(2) INRA- UMR Climat, Sol Environnement, Avignon, France.

ghorbani@ccr.jussieu.fr

Abstract: An experimental investigation was undertaken to study the ability of Spectral Induced Polarization (SIP) method to monitor the water infiltration in a clay loamy soil. It was based on the coupled acquisition of tensiometer data and Spectral Induced Polarization (SIP) spectra (1.46 Hz to 12 kHz) during a water infiltration achieved by an artificial constant rainfall rate of about 15 mm/hr.

This approach that was applied both in the field and in a soil column, confirms the existence of significant phase drops in the high-frequency domain (typically greater that 1 kHz) during the first infiltration cycles. The crossed interpretation of tensiometer data and SIP data has shown that these phase drops were correlated with the water filling of pores whose equivalent diameter were estimated in the range of [14-43 μm]. This range is around the classical limit of 30 μm between the storage pores and the transmission pores.

These phase drops were qualitatively and quantitatively interpreted as a Maxwell-Wagner effect: during the water infiltration, the decrease of the polarization amplitude would be due to a release of charge carriers initially blocked in the microporosity, leading macroscopically to a decrease of the bulk soil polarizability.

Consequently, the experimental and theoretical results of this study suggest strongly that the SIP method would be able to control in the field the water filling of the storage pores and to estimate indirectly the soil's field capacity. This original result should be validated in other sites.