Geophysical Research Abstracts,
Vol. 10, EGU2008-A-04000, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-04000
EGU General Assembly 2008

High- and Low-Field NMR Relaxometry in Homogenized Model Soils

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Nuclear magnetic resonance (NMR) relaxometry is a convenient tool for the characterization of water in natural porous media. This method is widely used in well logging techniques in order to probe pore spaces in rocks with respect to fluid content, pore size distribution, and pore fabric.

The present work is a contribution to extend this application to unsaturated natural porous media. Before routinely using the method one should know more detail about their relaxation behaviour. This poster summarises a parallel between two NMR studies at 7 Tesla and 0.46 Tesla on model soil samples. We determined T_2 relaxation times for a number of sand/clay mixtures and homogeneous natural soil samples with different water contents (from saturation to minimum necessary to obtain a NMR signal). One basic NMR protocol, the Carr-Purcell-Meiboom-Gill sequence (CPMG), was used for determining the bulk T_2 value for echo times (T_E) in a range of 0.2 to 0.8 ms. Bimodal T_2 relaxation processes (T_2 app. 20 ms and 200 ms at T_E = 0.8 ms) were observed, which decrease with decreasing water content, whereas the magnetisation M_0 was found to be proportional to the mean water content in the samples. The obtained relaxation times T_2 are affected by the soil properties like: pore-size distribution, bulk density, water content, magnetic susceptibility as well as the effective diffusion coefficient in the pores.