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Wetting kinetics determined from contact angle measurement

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Soil water repellency affects a number of processes in the soils like mobilisation, transport and immobilisation of pollutants and nutrients as well as growth of plants and microbial activity. The common methods to determine the water repellency of soils are the Water Drop Penetration Time (WDPT), the molarity of ethanol drop test (MED-Test), the measurement by Contact Angle Tensiometer (Wilhelmy Plate or Kapillary Rise Method) or the optical measurement of contact angle by goniometer (Sessile Drop Method). While the WDPT describes the intensity of wetting resistance, the other methods characterize the initial contact angle or quantify the water repellency or wettability in the first moment of contact with the liquid.

But the contact angle between liquid and soil is subjected to a subsequent change due to the process of wetting initiated by the interaction between soil and water. Wetting kinetics of soils have been scarcely investigated yet. TODORUK et al. (2003) and SCHAUMANN et al. (2004) used ^{1}H-NMR Relaxometry to monitor wetting and swelling kinetics of soil samples. By ^{1}H-NMR pore-scale redistribution of water in the soil samples due to changes in the wettability of pore walls can be detected. But it is still unknown, how the surface properties change with time.

As a first approach, the contact angle was measured at several points of time during the wetting process with a modified Sessile Drop Method. The time and temperature dependency during the wetting process as well as the influence of the conditions of pretreatment of the soil samples were investigated. The observed wetting kinetics of hydrophobic soil samples will be presented and compared with the results of ^{1}H-NMR-Relaxometry of comparable soil samples. Finally, the relevance of these two methods for a description of wetting kinetics in soils will be compared and disscussed.