



## **ISP<sup>+</sup>: improving the Integral Suspension Pressure method by an independent measurement of clay content**

Wolfgang Durner and Sascha C. Iden

TU Braunschweig, Institute of Geocology, Soil Physics, Braunschweig, Germany (w.durner@tu-bs.de)

The particle-size distribution (PSD) is a basic physical property of soils. Its experimental determination in the silt range is based on gravitational sedimentation in an initially homogeneous suspension. Two classic methods that use this principle are the hydrometer method and the pipette method. Recently, Durner et al. (2017) have presented the integral suspension pressure method (ISP) for the accurate, disturbance-free determination of the PSD in high resolution. In this method, a time series of suspension pressure at a fixed depth in the sedimentation cylinder is monitored, and the PSD is identified by simulating the sedimentation process and numerically solving the inverse problem.

We present an extension of the experimental protocol called ISP<sup>+</sup>, which makes the inverse problem better-posed. At the end of the ISP measurement, a part of the suspension is drained laterally from the sedimentation cylinder through an outlet, collected and oven-dried. The resulting dry mass of the soil particles is integrated into the objective function of the inverse problem. This markedly reduces the uncertainty of the identified PSD towards the finest particles. We present theoretical studies using computer-generated data and first experimental results evaluated by inverse modeling to illustrate the new experimental design and the improved accuracy of the ISP<sup>+</sup> method.

Reference: Durner, W., S.C. Iden, and G. von Unold, 2017: The integral suspension pressure method (ISP) for precise particle-size analysis by gravitational sedimentation, *Water Resources Research*, doi:10.1002/2016WR019830.