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# Repeatability, bias and accuracy of soil particle size analysis with the PARIO device

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The reference methodology for determining the particle size distribution (PSD) of soils and sediments in the silt range is based on gravitational sedimentation of particles in an initially homogeneous suspension. This process is traditionally evaluated either by recording the buoyancy of a floating hydrometer that is inserted into the suspension at different times (Hydrometer method) or (ii) measuring the particle mass in extracted volumes of the suspension that are obtained at predefined sampling depths and times (Pipette method, Atterberg method). Both methods lead to a disturbance of the sedimentation process and provide only discrete data of the PSD.

Recently, Durner et al. (2017) developed the so called integral suspension pressure method (ISP). This method estimates continuous PSD's from sedimentation experiments by recording the temporal evolution of the suspension pressure at a certain measurement depth in a sedimentation cylinder. It requires no manual interaction after start and thus no specialized training of the lab personnel and avoids any disturbance of the sedimentation process. The METER Group AG, Munich, developed an instrument called PARIO, which records the suspension pressure data and is connected to an computer-based automated ISP evaluation via a user interface.

In this work, we investigate a series of PARIO measurements in order to answer the following questions: (i) How precise are PARIO measurements if we repeat measurements for the same sample, (ii) Give different PARIO devices equal results? and (iii) How do PARIO results agree with the standard pipette method? To answer these questions, a series of 27 samples was investigated by the two methods. PARIO measurements were repeated three times for each sample. For five out of the 27 samples, PARIO measurement were repeated 24 times, which revealed surprising effects.

**Literature**: 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.