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Towards SI-traceable calibration of soil moisture sensors

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Soil moisture is one of the essential climate variables, and it is interesting from both meteorological and agricultural perspectives. At the same time, soil moisture measurements span several length scales, from in-field studies with point scale sensors, to field scale with CRNS-probes to even larger study areas investigated with remote sensing. These different techniques make use of fundamentally different physical principles for obtaining soil moisture measurements, and harmonizing these measurements requires that SI-traceability can be demonstrated. For the common metric of volumetric water content, this requires demonstrating traceability of both water and soil volume.

The Danish Technological Institute (DTI) has implemented a dedicated setup for determination of water content. The setup takes samples ranging from 100 g up to 2 kg and a volume up to 2 liters, which makes measurements on representative soil samples feasible. In contrast to the traditional loss-on-drying method, the DTI reference setup provides SI-traceability of the water content, through measurements of air flow and dew point temperature.

In this presentation, the design principles of the setup and the utilization of the setup for SI-traceable calibration of point scale soil moisture sensors are described.