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Impact of stone content on soil moisture measurement with capacitive sensors 10HS (Decagon)

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Lot of soil survey focused on agricultural soils. For practical reasons, those soils have a low stone content. So, most of the soil water content sensors are placed on low stone content soils and the calibration equations are developed for them. Yet some researches take an interest in forest soils that are often much different from the previous ones. The differences lie in their stone content and their slope. Lots of studies have proved the importance of making soil specific calibration of the soil water content sensor. As our lab use regularly the 10HS sensors (Decagon Devices, United States) in forested soil, we decided to evaluate the importance of the stone content in the soil moisture measurement.

The soil used for this experimentation comes from Gembloux (50°33'54.9"N, 4°42'11.3"E). It is silt that has been sieved at 2 mm to remove the gravel. The stones used to form the samples come from an experimental site located in the Belgian Ardennes (50°1'52.6"N, 4°53'22.5"E). They are mainly composed of schist with some quartz and sandstone elements.

Initially, only five samples were constructed with three replications each. The size and the proportion of stones were the variables. Stones were classified in two groups, the first contains gravels whose size is less than 1,5 cm and a the second contains gravels whose size is comprised between 2 and 3 cm. The proportions of stone selected for the experiment are 0, 20 and 40%. In order to generate validation data, two more samples were constructed with intermediate proportion of stone content (30%). The samples were built in PVC container which dimensions are slightly bigger than the sensor volume of influence (1.1-1.3l).

The soil samples were saturated and then dried on a thermal chamber set at about 32°C. During at least 14 days, the samples soil water content was determined by the sensor measurement with the Procheck read-out system (Decagon Devices, United State) and by weighting the samples thrice a day. The evolution of the soil sample height was monitored as well.

As first result, the stone content is a parameter that seems to influence soil water content. The stone size is no important. Because soil moisture deserves to be measured accurately in every soil and to confirm the first results the experiment is going on with more samples, different stone proportions, other sensor positioning and a natural air drying.