

Development and testing of soil microtensiometers with less than 2 mm diameter

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Testing of the prototype was conducted at University of Natural Resources and Life Science in Vienna. Prototypes have been tested in three different experiments with aim to: a) test the pressure measurement accuracy, where the negative water pressures were measured in bulk water; b) determine response time and measuring range of the device; and c) to conduct a pilot measurement in two samples of different soil types (Sample I: 64.8 % sand, 28.5 % silt, 6.7 % clay and Sample II: 37.9 % sand, 50.4 % silt, 11.7 % clay). The tensiometers embedded in HYPROP (Decagon Devices) were used to perform simultaneous measurement in all three types of experiments, thus serving as a reference. Pressure values obtained by the prototype microtensiometer were compared with pressure values given by the HYPROP device.

Results indicate a very good agreement of pressures sensed by prototype microtensiometers and the HYPROP device. The response of tested microtensiometers to the external pressure changes was almost immediate in bulk water. Maximum range of tested microtensiometers (during short-term experiments) was from - 750 hPa to + 850 hPa. Practical measuring range of tested microtensiometers during long-term experiments varied between ± 230 hPa, while outside of this range the air bubbles developed in the tensiometer body, due to slow air leak to the pressure sensor through moveable part of catheter.

The newly developed microtensiometer proved as a robust device suitable for installation in soils. Despite the pressure measurement range is already sufficient for many applications extending the range for long-term measurements represents a challenge for the next stage of the tensiometers development.