Science Societies

An Automated Hanging Water Column for Water Retention Measurements

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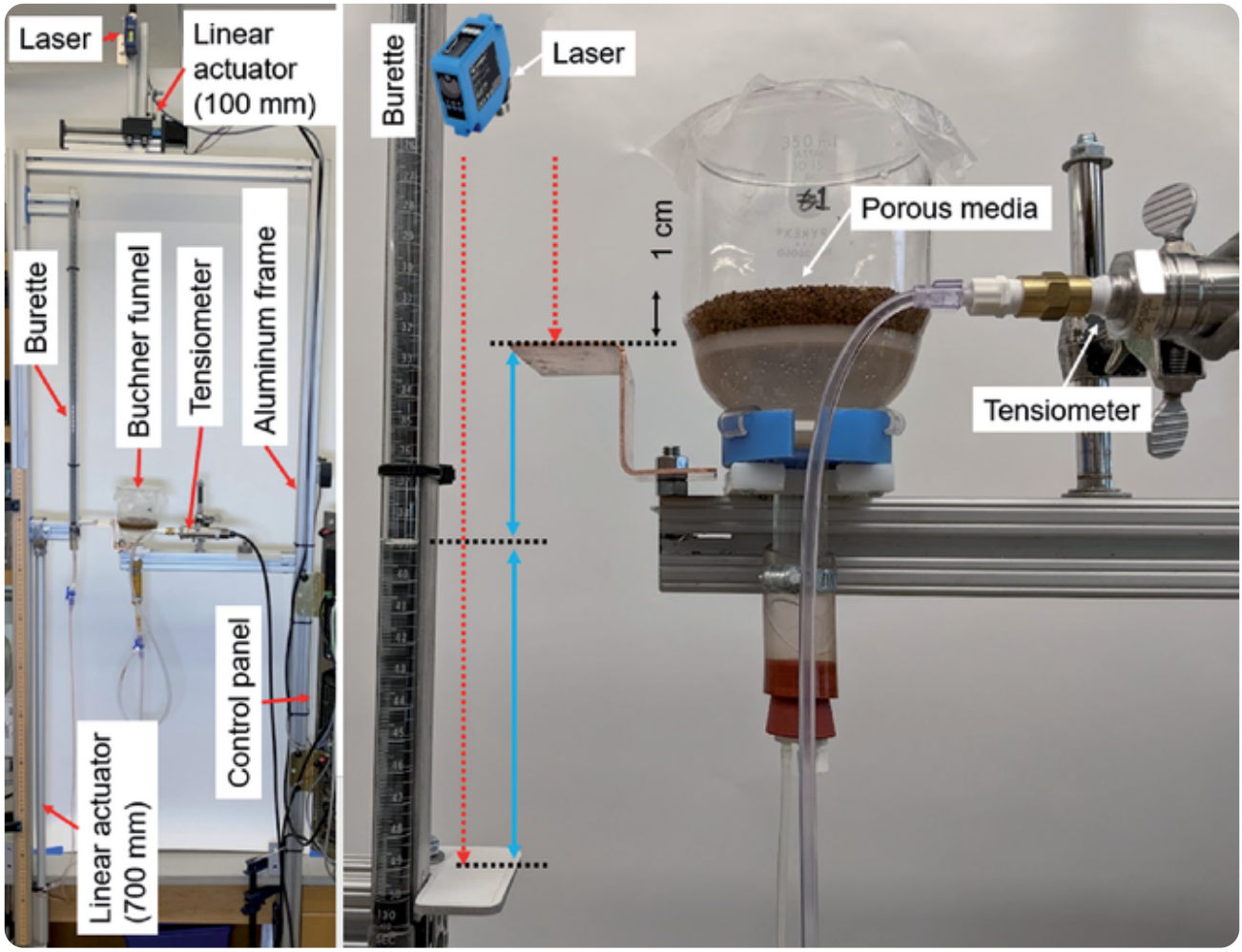

Labeled photo of the automated water retention measurement system created in this study. Image by Scott B. Jones.

Water retention describes the relationship between water content and hydraulic energy state, or matric potential, in porous media. This relationship plays an essential role in understanding the retention, transport, and fate of substances in agricultural, ecological, and engineering disciplines. The basic principles of measuring water retention were established almost 100 years ago, but current methods still apply those same fundamentals. Traditional methods are time consuming and labor intensive, involving stepwise energy adjustments and long wait times to equilibrium.

To tackle these problems, researchers designed and fabricated an automated hanging measurement system especially for coarse-textured porous media. The automation provides accurate and repeatable data describing the hysteretic draining and wetting retention cycles, adjusting matric potential, and monitoring the rate of change to determine a quasi-equilibrium condition. The researchers demonstrated the system with quartz sand, reporting the initial draining-water retention data from full saturation followed by repeated wetting- and draining-water retention data, demonstrating highly repeatable hysteretic measurements.

The researchers provide details of and a program for the automated system design. Interested users can construct a similar system for reproducible water retention measurements in coarse-textured porous media with minimal manual labor required.

Adapted from

Dixon, C., Blakeslee, A., Mills, M., Sheng, W., & Jones, S. B. (2023). Automated hanging water column for characterizing water retention and hysteresis of coarse-textured

porous media. *Soil Science Society of America Journal*.

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