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FIELD MONITORING OF VARIABLES AND PROCESSES IN UNSATURATED SOILS

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ABSTRACT

Long-term and cyclic (wetting and drying) monitoring of variables in unsaturated soils, which are necessary to contribute to the design of engineering works, has been challenging over the last decades [1, 2]. To cite but a few examples, these challenges have primarily focused on delaying cavitation in high-capacity tensiometers to extend their long-term performance, improving the accuracy of relative humidity probes and psychrometers at high relative humidity values, reducing hysteresis effects in water content probes, minimising installation effects and following correct protocols and approaches for their positioning, and miniaturising sensor sizes to assess process at interfaces accurately. These aspects are essential for new opportunities in unsaturated soil mechanics, in which the expansion of geotechnical engineering applications focusing on environmental and energy geotechnics and the resilience to adapt to and mitigate climate change effects is becoming broader (e.g., monitoring expansive soils, vegetated soils, soft organic soils with biogenic gas, mine tailings, earthworks and slopes with strong soil-atmospheric interactions and the associated seasonal variations of soil variables and processes; monitoring large-scale *in situ* demonstration tests with unsaturated engineered barrier systems within the environmental and energy sectors).

This mini-symposium focuses, on the one hand, on technological developments in field transducers and procedures for measuring suction and volumetric water content combined with other temperature/thermal probes and full meteorological station information. Also included are numerous applications in different fields (ground engineering, environmental and energy geotechnics, bioinspired geotechnics, tailings, soft soils with biogenic gas) in which these monitoring techniques are discussed regarding the suction measurement range and the position at which suction or water content variables are to be monitored. The comprehensive information will be useful for site characterisation, understanding and simulating multi-physics processes and developing advanced theoretical and numerical models for practice. All contributions within this broad spectrum are welcome.

REFERENCES

[1] Tarantino A., Romero E. & Yu-Jun Cui (eds.) (2009). *Laboratory and field testing of unsaturated soils*. Springer Science.

[2] Khalili N., Romero E. & Marinho F.A.M. (2022). *State of the Art Report. Advances in Unsaturated Soil Mechanics: Constitutive modelling, experimental investigation, and field instrumentation*. Proc. of 20th International Conference on Soil Mechanics and Geotechnical Engineering (ICSMGE 2022). Sydney, Australia, 1-5 May 2022. Rahman and Jaksa (eds). Australian Geomechanics Society, Sydney, Australia, 297-348.