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Effect of Subsequent Drying and Wetting on the Small Strain Shear Modulus of Unsaturated Soils

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Abstract : Evaluation of the seismic-induced settlement of an unsaturated soil layer depends on several variables, among which the small strain shear modulus, Gmax, and soil's state of stress have been demonstrated to be of particular significance. Recent interpretation of trends in Gmax revealed considerable effects of the degree of saturation and hydraulic hysteresis on the shear stiffness of soils in unsaturated states. Accordingly, the soil layer is expected to experience different settlement behaviors depending on the soil saturation and seasonal weathering conditions. In this study, a semi-empirical formulation was adapted to extend an existing Gmax model to infer hysteretic effects along different paths of the SWRC including scanning curves. The suitability of the proposed approach is validated against experimental results from a suction-controlled resonant column test and from data reported in literature. The model was observed to follow the experimental data along different paths of the SWRC, and showed a slight hysteresis in shear modulus along the scanning curves.

Keywords : hydraulic hysteresis, scanning path, small strain shear modulus, unsaturated soil
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