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Effect of soil texture on consolidation behaviors of an unsaturated porous medium

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In the current study, we apply the poroelastic theory of consolidation (Lo et al., 2013) to examine the consolidation behavior of four types of unconsolidated soil and the corresponding responses to different boundary drainage conditions. Analytical solutions of the excess pore water pressure in temporal and spatial changes under different boundary drainage conditions are determined, using Laplace transform to obtain the quantity of total settlement. A numerical study takes sand, silt, clay loam, and clay as illustrative examples to determine the excess pore water pressure and total settlement. Our numerical results reveal that an instant magnitude of excess pore water pressure is depended on the loading efficiency, in contrast, the rate of dissipation of excess pore water pressure is chiefly concerned with cohesion of soil texture. Lastly, clay has greatest quantity of total settlement, followed by silt, clay loam, and sand, which can be demonstrated that the inverse of bulk modulus represents material's compressibility.