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Experimental study on the permeability evolution of unsaturated clay under the condition of freeze-thaw cycle

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The permeability of soil is an important index to evaluate its antifreeze performance [U+FF0C] it has close relationship with soil structure, pore, particle size and so on. During the freezing and thawing cycle, the internal water phase change causes the soil to produce repeated frost heave and thaw, changing the original structure of the soil and the composition of the particles then breaking the coupling force between the particles which make the soil permeability exhibit different characteristics. In order to study the permeability evolution of unsaturated clay under the condition of freeze-thaw cycle, this paper aims at different saturation and different compactness of soil samples, testing permeability of clay under freezing and thawing cycle.The experiment can be divided into freeze-thaw phase and permeability testing. The number of freeze-thaw cycles is set as 0, 1, 3, 7, 9, 12, 15 and 20 times respectively [U+FF0C] choosing the saturation of 40%, 50%, 60%, 70%, 80% and the soil density is of 1.3,1.5and 1.7. The results show that the permeability coefficient of clay increases grows with the increasing number of freezing-thawing , a tendency to grow quickly and then steadily by the end. The degree of density is equal while the saturation is higher, the rate of change of soil permeability coefficient is greater . When the saturation is lower, the permeability coefficient is faster to the dynamic stable state. The degree of saturation of the same and initial density is greater, the permeability coefficient is smaller. When the initial density is small, the coefficient of permeability is relatively large. Based on the experimental results, an infiltration coefficient evolution model with involving multiple factors is presented. The model can predict the evolution of the penetration coefficient of clay with the degree of saturation, density and degree of freeze-thaw. The predicted values are consistent with test results and can effectively predict the evolution trend of unsaturated clay under freeze-thaw conditions, which can be used as reference for practical projects.