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A creep constitutive model for frozen soils with different contents of coarse grains

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Abstract: The triaxial creep tests of frozen silty clay mixed with different contents of coarse grains were performed at 0.3 MPa confining pressure at -10 °C. Four sets of mass ratio of coarse-grained particles to silty clay are 0.0, 0.2, 0.4 and 0.6 used to form the frozen samples, and the test results demonstrate that: when the shear stress level is low, the tested sample exhibits an attenuation creep; when the shear stress level is high, the tested sample behaves as a non-attenuation creep. It is found that the initial shear modulus and yield strength become greater with the increasing mass ratio of coarse-grained particles to silty clay, but the long-term strength shows an opposite trend. Through the analysis of creep mechanism, both the new hardening variable and damage variable are introduced to improve the Nishihara model, and the three-dimensional formulation of the model is also formulated. According to the experimental results and analysis on the creep model, the model parameters are determined and identified. The simulation results show that the new model can describe the whole creep process of artificial frozen soils with different contents of coarse-grained particles well. Finally,

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