Contribution ID: **537** Type: **Oral Presentation**

A macro-scale elasto-thermo-viscoplastic constitutive model for saturated frozen soils

Wednesday, June 1, 2022 2:35 PM (15 minutes)

Slow-rate time-dependent behavior (i.e., creep) of frozen soils is experimentally observed in the literature. From a poromechanical point of view, frozen soil is a medium composed of a deformable solid skeleton and a porous space filled with unfrozen water and ice. In addition to pore ice, ice-rich permafrost can also contain thin ice lenses. The rheological properties of saturated frozen soils due to the coexistence of ice and viscous unfrozen water cause slow rate deformation and loss of shear strength of the soil. Temperature, applied stress conditions, ice content, soil type, and density are key factors controlling the viscoplastic reorganization of the inter-particle microstructure and, subsequently, the creep rate of frozen soils. In this study, an Elasto-Thermo-ViscoPlastic (ETVP) constitutive model for frozen soils is formulated within the framework of two-stress state variables in which the cryogenic suction and the net solid phase stress are defined as state variables. In the proposed model, the impacts of the aforementioned factors and their interdependencies, as well as the current state of the frozen soil structure on the creep deformation of frozen soils, are properly considered based on a phenomenological (macro-analytical) point of view.

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Time Block Preference

Time Block C (18:00-21:00 CET)

Participation

Online

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