

# Coupled THM mechanical model for porous materials under freezing condition

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## ABSTRACT

Recent growing interests associated with frozen ground have required to advance fundamental theories and to precede systematic researches of soil behaviour under freezing conditions. Unlike the well-established soil mechanics' theory, temperature variation and phase change of pore-water cause water migration to cold side, ground heaving, sharp increase in earth pressure, etc., and they bring about serious problems to freezing geotechnical structures. Elasto-plastic mechanical constitutive model for frozen/unfrozen soil subjected to fully coupled THM phenomena is formulated based on a new stress variable that is continuous in frozen and unfrozen regions. Numerical simulations are conducted to discuss numerical reliability and applicability of the developed constitutive model: one-dimensional heaving pressure, tri-axial compression test, and one-side freezing tests. The numerical results show that developed model can efficiently describe complex THM phenomena of frozen soil, and it can be utilized to analyse and design the geotechnical structures under freezing conditions, and predict long-term behaviour of them.

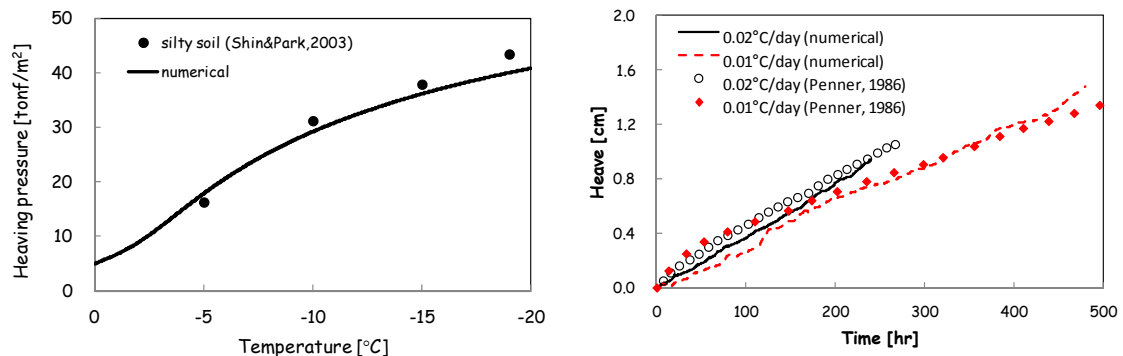


Fig. a) Effect of temperature on heaving pressure in experimental and numerical tests, b) One dimensional freezing test

## REFERENCES

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