

Thermo-Hydro-Mechanical Model Based on Hypoplasticity for Expansive Clays

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Abstract

Behaviour of expansive compacted soils depends significantly on its microstructure. Two distinct pore systems have to be taken into account. Recent advances in modelling of hydromechanical behaviour of unsaturated soils reveal crucial role of hydromechanical coupling. Volumetric deformation of soil skeleton influences the degree of saturation which in turn influences soil effective stress. A special model has been developed by Mašín[1] and Mašín&Khalili [2] who defined the model within the theory of hypoplasticity. Our contribution deals with efficient implementation of a model for temperature dependent behaviour of microstructure and numerical integration of constitutive model. The integration is based on Runge-Kutta method where the Butcher tables are advantageously used. Suitable coefficients in the Butcher tables enable efficient estimate of integration error. The material model was implemented in the open source code SIFEL [3]. The implementation was used for preliminary benchmarks of laboratory tests and there is also comparison of the Runge-Kutta methods with different order applied to the integration of the constitutive equations.

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References

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