

*Master thesis*

## Implementation of Hypoplastic Model for Frozen Sand

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**Background:** In contrast to the classical theory of elastoplasticity, the theory of hypo-plasticity relies on the description of the mechanical behavior of soils without the use of a yield surface. Hypoplastic models can describe relevant aspects of the mechanical behavior of soils more easily when is compared to the theory of elastoplasticity. These aspects make the hypoplastic model attractive from the computational point of view and geotechnical engineering application. This master thesis consists of the numerical implementation of a hypoplastic model for frozen sand that can describe the temperature-dependent strength and the effect of confining pressure.



Figure: AGF in Naples underground line 1 – Garibaldi station.

### Task description:

- Implementation of explicit sub-stepping with stress error-control for the hypoplastic model for frozen sand.
- Validation of the hypoplastic model for frozen sand with respect to experimental data from the literature.
- Application of the hypoplastic model to a boundary value problem related to artificial ground freezing (AGF).

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