

ADVANCES IN MODELING SOILS UNDER CYCLIC AND HIGH-CYCLIC LOADING

J. MACHAČEK^{*,†}

^{*} Institute of Geotechnics, Technische Universität Darmstadt, Germany

[†] Chair of Soil Mechanics, Foundation Engineering and Environmental Geotechnics, Ruhr
Universität Bochum, Germany
jan.machacek@tu-darmstadt.de

ABSTRACT

The cyclic ($N < 150$) or high-cyclic loading ($N > 150$) of soils is ubiquitous. Be it in the design of foundations for offshore wind turbines, the consideration of earthquake loads, or in infrastructure projects (e.g. cyclic loading due to traffic or installation effects). However, cyclic loading of soils is not limited to purely mechanical loading. Drying and wetting cycles or repetitive temperature changes can have a noticeable influence on soil behavior as well - a topic of great actuality in view of climate change.

The numerical modeling of these effects places high demands on the applied numerical tools. Besides the obvious challenge of the constitutive description of the (coupled) soil behavior, this also includes aspects such as element and contact formulations, or the capability of the numerical method itself (e.g. FEM, FDM, MPM).

For realistic modeling, all the aspects mentioned must be considered - which is still a major challenge and the subject of current research.

This session welcomes, but is not limited to, contributions to the following topics:

- Constitutive models for soils under cyclic or high-cyclic loading. Not limited to purely mechanical loading - hydraulic models (soil water retention curves) are also welcome.
- Numerical modeling of cyclic or high-cyclic soil-structure interaction.
- Verification of advanced numerical methods through transparent and thorough back-calculation of laboratory and model tests.
- Numerical developments for modeling the behavior of saturated and unsaturated soils (e.g. element formulations), insights into the implementation of numerical methods for cyclic loading of soils.