



INSTITUTE OF ROCK MECHANICS AND TUNNELLING

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FACT SHEET of the research project ChaMod-HSSR

SHORT TITLE / ACRONYM

ChaMod-HSSR

LONG TITLE

Characterization and modelling of hard soil/soft rock
considering anisotropy and swelling capacity

DESCRIPTION

Transitional stratum, also termed hard soil / soft rock (HSSR), is geomechanically a challenge. Its behaviour strongly depends on the state of stress, it alters rapidly in contact with water, and often conventional characterization and classification methods from rock and soil mechanics as well as numerical material models are often inadequate. HSSR can feature an inherent anisotropy and may be prone to swelling. Not only the numerical modelling of the swelling behaviour according to the state-of-the-art has deficits, but above all those of the anisotropic rock mass and system behaviour.

The Angath adit tunnel in Tyrol (Austria), through the rock mass of the Unterangerberg formation was constructed from 2023 to 2025. The studied rock mass is classified within the HSSR spectrum. The ChaMod-HSSR research project seized this rare opportunity and aimed at a detailed characterization of HSSR as well as the further development and calibration of material models. In the Angath adit tunnel, observations were carried out and relevant information and data from experimental (in-situ, laboratory) and measurement campaigns were included in the evaluations and modelling work. Among other things, the project resulted in a detailed description of the essential material specifics in their natural variability, a pool of information, and data of high quality, as well as recommendations for characterization and modelling of HSSR. In addition, it contributes to a clear and meaningful approach differentiating between rock, HSSR, and soil. The long-term goal of the project consortium is to reduce uncertainties in the planning and execution of structures on and in HSSR and to optimize them.

PROJECT COORDINATOR

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RELATED MASTER'S THESES

YEAR	AUTHOR	TITLE
2026	Kleb	Numerical modelling of the Angath Test Gallery (<i>in progress</i>)
2026	Correa Kleuters	Experimental study on specimen aging of soft rock samples from the Angath Test Gallery (<i>in progress</i>)
2024	Zani	Photogrammetric Documentation in Tunnelling Case study of the Angath Test Gallery
2023	Bostjancic	Correlating Lab Data in Argillaceous Soft Rocks: Towards a Comprehensive Database

RELATED PUBLICATIONS

YEAR	AUTHOR(S)	TITLE
2025	Metzler, Wölflingseder, Fernandes Couto & Marcher	Modeling the swelling extent of argillaceous soft rock using the PLAXIS swelling rock model
2025	Zani, Metzler & Marcher	Photogrammetric documentation in tunneling
2024	Metzler, Frühwirt, Hölzl & Marcher	Argillaceous Soft Rock in-situ Test Program in Tunneling
2024	Metzler, Bostjancic & Marcher	The challenge of classification argillaceous soft rock (HSSR)

RELATED THIRD-PARTY FUNDED PROJECTS

YEAR	PROJECT DESCRIPTION	INFORMATION TO FUNDER(S), FUNDING PROGRAM(S) AND CO-OPERATION PARTNER(S)
2022 – 2025	Characterization and modelling of hard soil/soft rock considering anisotropy and swelling capacity (ChaMod-HSSR)	- Funders: FFG – Austrian Research Promotion Agency & ÖBB-Infrastruktur AG - Funding program: FFG BRIDGE - Co-operation partner: ÖBB-Infrastruktur AG