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Investigation on the impact of thermo-osmosis on fluid pressurisation in Boom clay –a case study of the ATLAS in-situ full-scale heating experiment.

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Existing literature suggests the importance of the thermo-osmosis (TO) for an accurate simulation of pore pressure evolution in heater tests for nuclear waste disposal in clay rock. However, there is limited consensus regarding the appropriate choice of parameters controlling TO and the extent of its physical impact. This study will use the ATLAS in-situ heating experiment, a full-scale experiment from an underground research laboratory in Mol in Belgium, to investigate the impact of TO on the thermal pressurisation in Boom Clay.
The ATLAS experiment was simulated using the open-source code OpenGeoSys. A fully coupled thermo-hydro-mechanical model combined with an inelastic constitutive model for the host rock was used. After comparison to published data, a parameter study, using an Assisted-History-Matching
workflow (Buchwald et al., 2020), was performed to obtain a good representation of the in-situ measurements without taking into account TO. Next, the same procedure was repeated with a model extended to account for TO. The comparison of both groups allows a clearer discussion of the influence of TO on temperature and pressure evolution in the studied system. The final step - uncertainty quantification of the TO parameterisation, puts the results in the context of large uncertainty of parameters documented in the literature. The impact of the said uncertainty will be illustrated by a range of plausible model predictions.

Participation

In-Person

References

Buchwald, J., Chaudhry, A. A., Yoshioka, K., Kolditz, O., Attinger, S., & Nagel, T. (2020). DoE-based history matching for probabilistic uncertainty quantification of thermo-hydro-mechanical processes around heat sources in clay rocks. International Journal of Rock Mechanics and Mining Sciences, 134(September). https://doi.org/10.1016/j.ijrmms.2020

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