

Recent work: multiphase flow

► Multi-phase flow models (TH²)

Y. Huang et al. (2017). "Comparing global and local implementations of nonlinear complementary problems for the modeling of multi-component two-phase flow with phase change phenomena". In: *Environmental Earth Sciences* 76.18, p. 643

► Multi-phase flow with mechanics (TH²M)

N. Böttcher, J. Maßmann, et al. (2017). "Modelling CO₂-Trapping Mechanisms for Geological Carbon Capture and Storage: Description of Constitutive Relations". In: *Poromechanics VI*. eprint:

<http://ascelibrary.org/doi/pdf/10.1061/9780784480779.076>

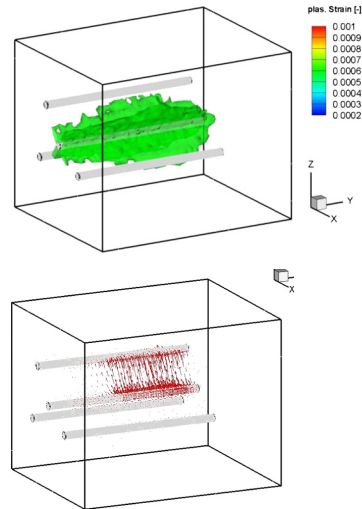
W. Wang et al. (2011). "Non-isothermal flow in low permeable porous media: a comparison of Richards' and two-phase flow approaches". In: *Environmental Earth Sciences* 62.6, pp. 1197–1207

► THM models of clay

W. Xu, H. Shao, J. Hesser, W. Wang, et al. (2013). "Coupled multiphase flow and elasto-plastic modelling of in-situ gas injection experiments in saturated claystone (Mont Terri Rock Laboratory)". In: *Engineering Geology* 157, pp. 55–68

► Swelling in clay

W. Xu, H. Shao, J. Hesser, and O. Kolditz (2014). "Numerical modelling of moisture controlled laboratory swelling/shrinkage experiments on argillaceous rocks". In: *Geological Society, London, Special Publications* 400.1, pp. 359–366



Plastic strain and gas flow rate during gas injection at Mt. Terri.
From Xu, Shao, Hesser, Wang, et al., 2013.

Recent work: rock salt and fault reactivation

► Elasto-visco-plastic models of rock salt

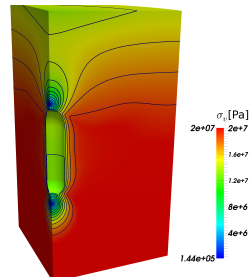
T. Nagel, W. Minkley, et al. (2017). "Implicit numerical integration and consistent linearization of inelastic constitutive models of rock salt". In: *Computers & Structures* 182, pp. 87–103

► Thermo-mechanical analyses of salt caverns

N. Böttcher, U.-J. Görke, et al. (2017). "Thermo-mechanical investigation of salt caverns for short-term hydrogen storage". In: *Environmental Earth Sciences* 76.3, p. 98

► Fluid-injection induced fault reactivation in clay rocks

G. Ziefle et al. (2017). "XFEM modelling approach for the hydro-mechanical response of clay rock due to fluid injection into a single pre-existent fault". In: *The 7th International Conference on Clays in Natural and Engineered Barriers for Radioactive Waste Confinement*. 24–27 September, Davos, Switzerland. eprint: <http://ascelibrary.org/doi/pdf/10.1061/9780784480779.245>



Recent work: crystalline rock

► Analysis of deep geothermal reservoirs (THM)

A. B. Jacquy et al. (2016). "Thermo-poroelastic numerical modelling for enhanced geothermal system performance: Case study of the Groß Schönebeck reservoir". In: *Tectonophysics* 684, pp. 119–130

► Granite-water interaction/pressure solution (THMC)

R. Lu et al. (2017). "Calibration of water–granite interaction with pressure solution in a flow-through fracture under confining pressure". In: *Environmental Earth Sciences* 76.12, p. 417

► Fracture-matrix flow in deformable rocks (HM)

N. Watanabe et al. (2012). "Lower-dimensional interface elements with local enrichment: application to coupled hydro-mechanical problems in discretely fractured porous media". In: *International Journal for Numerical Methods in Engineering* 90.8, pp. 1010–1034

