Technische Universität Braunschweig

MUSEN

From Micro- to Macroscopical Characterization of Porous Media: Experiments, Homogenization and Numerics

Lecture of

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Okerhochhaus, Pockelsstraße 3,
Seminarraum EG

A comprehensive understanding of the (e.g. hydro-mechanical) physical properties of (fluid-saturated) porous media is indispensable in various kind of fields like geothermal exploration/exploitation, water reservoir management, hydrocarbon production or biomechanics or materials science to mention only a few.

E.g. characterization of subsurface fluid flow on the reservoir scale requires accounting for hydro-mechanical coupling between (pore-scale) fluid-pressure variations in high-aspect ratio conduits or faults and related (porous) rock deformations. Inherent heterogeneities on various length scales (from asperities in fractures to sedimentary layers of reservoirs) are some of the involved major challenges for modelling and simulation.

To further develop sophisticated continuum-based porous media models related to these challenges, we are aiming for two-scale numerical investigations based in highly-resolved image-based X-Ray Computed Tomography (XRCT) characterizations (often enhanced by physical experiments) and Direct Numerical Simulations (DNS) based on the acquired XRCT data sets. Therefore, the focus of the presentation is on a (critical) discussion of image-based characterizations and simulations and related consequences for “coarse-grained” continuum-based models.