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Universität Stuttgart · WAREM · Pfaffenwaldring 7a · 70569 Stuttgart

WAREM Seminar September 16, 2014

Master's Thesis Presentation

of Elena Shigorina

Supervisors

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Numerical investigation of microbially induced calcite precipitation at field scale

The subsurface use is increasing due to increasing energy demands, waste storage or CO₂ storage to prevent global climate change. Hence, separation between different layers of the soil becomes more important, e.g. separation aquifer from layer containing hazardous waste to protect drinking water from pollution. One possible technology to do this is reduction of the permeability of the rock by filling the pore space with solid material. The sealing of the soil is possible by microbially induced calcite precipitation (MICP), where the microbes can hydrolyze urea by urease enzyme to produce ammonium as well as carbonate ions and in the presence of calcium ions which can precipitate calcium carbonate.

MICP can be successfully manipulated to reduce the permeability of fractured rock but it needs further research. The aim of this master's thesis is application of a numerical model for microbially induced calcite precipitation (MICP) on a large, realistic spatial 3 D scale and investigation of the influence of different injection schemes on distribution of precipitated calcite in porous media. In this work a multi-compositional two phase model was simulated on multiphase simulator DuMu^X. The applied model accurately describes the physical process during bacteria injection. The results show reduction of permeability due to precipitation of calcium carbonate.

Date: Tuesday, September 16, 2014

Time: 17:30

Location: Pfaffenwaldring 7, Room 7.11

WAREM Students and other interested parties are cordially invited.