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Abstract

In the **C**olloid **F**ormation and **M**igration (CFM) Project at the Grimsel Test Site an experiment has been planned in order to study the generation of bentonite colloid and colloid facilitated radionuclides transport in a low gradient groundwater flow. During the first phase of this project a series of tracer tests have been performed to evaluate suitable flow fields for long-term colloid migration experiments within the fractured shear zone. The tracer tests with uranine have been accompanied by numerical modelling to support the in situ measurements. The overall objective of this modelling work is to understand the flow path and the relevant transport processes within the water-conducting shear zone, considering the low hydraulic gradients.

The numerical analysis was performed with the ADINA-F finite element code. The mathematical model is based on the Darcy's law for groundwater flow and the advection-dispersion equation for the uranine transport through a porous shear zone. For the numerical simulation a two dimensional model in the plane of the shear zone has been used. The computational domain considers the circular tunnel sealed with a surface packer, both injection wells and the extraction hole.

Both field data and modelling results provide a fairly consistent picture of the flow and transport characteristics in the shear zone at the planned CFM location. Furthermore, the simulation results match the experimental breakthrough curves fairly well and give confidence in the numerical model used. The estimated hydraulic and transport parameters from calibration work for two dipole fields show somewhat differences caused by natural heterogeneities in the hydraulic conductivity of the shear zone.