Impact of injection strategy on calcium carbonate distribution in porous media

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One of the major challenges of *in situ* applied ground improvement techniques like Microbial and Chemical Induced Calcite Precipitation (MICP and CICP) is the homogeneous, or at least spatially controlled, distribution of the desired reaction products in order to obtain controlled improvement of geotechnical bulk soil properties (Redding, 2007; Van Paassen, 2009).

Numerical modelling simulations at continuum (Darcy)-scale are performed to study the spatial distribution of reaction product(s) as a function of the injection strategy. An example of the simulations is shown in the figure below. The models are validated with laboratory experiments using a quasi two dimensional flow box with a large number of ports which could be either used as injection/extraction well or as a sensor port. This article presents the results obtained when multiple injection wells are operated simultaneously in which two reactive solutions (calcium chloride and sodium (bi-) carbonate) are injected separately in alternating wells, located perpendicular to the background flow. Water is used as a non-reactive spacer. Hydraulic pressures and electrical resistivity tomography (ERT) are used in the laboratory set-up to monitor the spatial distribution of reactants and products. The shape and location of the mixing zone during treatment, and the spatial distribution of calcium carbonate after treatement are evaluated for different injection strategies.

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