Geophysical Research Abstracts
Vol. 13, EGU2011-7291, 2011
EGU General Assembly 2011


# Evaluation of design options for a field experiment of CO2 injection to a deep layered aquifer at the Heletz site using numerical modelling

Fritjof Fagerlund (1), Auli Niemi (1), Jacob Bensabat (2), and Vladimir Shtivelman (3)

(1) Uppsala University, Earth Sciences, Uppsala, Sweden (ffagerlund@gmail.com), (2) Environmental & Water Resources Engineering Ltd, Haifa, Israel (jbensabat@ewre.com), (3) Geophysical Institute of Israel, Lod, Israel (vladi@gii.co.il)

Field experiments are essential to further our understanding of the transport and fate of geologically stored CO2 over large spatial scales. At the Heletz site in Israel, a field experiment is being designed with the specific purpose to study CO2 transport and trapping processes at the field scale, as part of the EU-FP7 MUSTANG project. With increasing demand for CCS technology, one can foresee that this type of experiments will become increasingly important, both for researching the storage characteristics and suitability of different kinds of target formations, and for pilot testing of storage sites prior to commercial-scale CO2 injection. However, not many such experiments have yet been undertaken, and it remains a key challenge to design effective experiments in which the CO2 transport and trapping processes can be monitored and quantified. By means of numerical modelling, this study investigates how different experimental design options can be predicted to affect the possibilities of measuring CO2 transport and fate during a CO2 injection experiment. We study the case of the Heletz target formation, a well-investigated lower cretaceous sandstone, layered by interbedded claystone, and overlain by low-permeability marls and shales. Particularly, we investigate the case of a dipole experimental configuration in which the movement of the injected CO2 can be directed towards a second abstraction well and tracers can be used to characterize the distribution of supercritical (sc) CO2 between the two wells. With the overall goal to maximize the information gained from the field experiment, the different design options are evaluated for robustness, meaning their likelihood of producing a measureable spatial distribution of injected CO2, for which transport and trapping processes can be studied, over a range of uncertainty in geological parameters affecting CO2 transport and fate. These geological parameters include hydraulic conductivity in the different layers, residual wetting and non-wetting phase saturations in the two-phase flow constitutive relations and the nature of the boundary conditions of the target formation. Design options include different CO2 and water injection/abstraction schemes using both wells which are also compared to the case of passive monitoring, as well as different dipole distances between the two wells.