Geophysical Research Abstracts
Vol. 14, EGU2012-5657, 2012
EGU General Assembly 2012

First results of an integrated monitoring concept to detect brine migration processes in freshwater aquifers

M. Möller, C. Schmidt-Hattenberger, F. Wagner, and S. Schröder
Helmholtz Centre Potsdam, GFZ German Research Centre for Geosciences, Telegrafenberg, 14473 Potsdam, Germany

The reduction of new carbon dioxide emissions is an important contribution to realise climate change mitigation solutions. One possibility consists in the long-term storage of industrial produced greenhouse gas in deep saline aquifers. The most important research focus of the multidisciplinary integrated project BRINE is to ensure the safe storage operation.

This research work refers to an area in eastern Brandenburg (Germany). However, the analysis can be applied to regions with comparable geological characteristics. The relevant reservoir horizon is located within a classic anticlinal structure, generated by salt tectonic processes. Due to the local geological site specifics, the CO_2 injection could cause a pressure build-up and thus a brine migration in the reservoir layer. For this reason, an adequate monitoring system for the observation of possible brine displacement into upper freshwater aquifers is essential. For both the qualitatively and quantitatively investigation a combination of several geophysical methods is needed. The electrical resistivity tomography (ERT) is a measurement method with a comparatively high spatial resolution on small scales. Therefore it will be generally used for borehole and near subsurface investigations.

The presented monitoring concept focusses on three potential pathways. Beside regional fault-zones, also formation defects in the upper aquitards and leakages around the wellbore could promote a saltwater migration. The main objective is to find an optimal combination of several electrode arrays like surface, surface-downhole and cross-borehole configurations to detect time-lapse effects of the resistivity distribution in the subsurface. By means of numerical modelling studies of different salinisation scenarios, we have tested several standard and several adapted electrode arrays. In order to further improve the results, an inversion code based on the measured resistance ratios is used. Parallel to the large-scale modelling procedure, a suitable sandbox model has been realised in order to control and to adjust the numerical modelling. In addition to resistivity as geoelectrical parameter, the salinity and the temperature are measured, using different sensing techniques.