Geophysical Research Abstracts
Vol. 14, EGU2012-12807, 2012
EGU General Assembly 2012

Electromagnetic monitoring of CO_2 dissemination: a case study in the North Eastern German Basin

G. Muñoz and O. Ritter

GeoForschungsZentrum Potsdam, Geophysical Deep Sounding, Potsdam, Germany (gmunoz@gfz-potsdam.de)

Storage of CO_2 in saline aquifers is a topic which is recently gaining a lot of interest. The BRINE project, funded by the German Ministry of Education and Research (BMBF) has the double objective of investigating the endangerment of freshwater reservoirs by upward migration of brine from saline aquifers as a result of the pressure increase subsequent to a CO_2 injection into a target storage formation and the synergetic utilization of geothermal heat production and CO_2 storage by implementation of pressure discharge wells.
The success of geological CO_2 storage projects depends largely on the ability to monitor the state of the reservoir during and after CO_2 injection, particularly in terms of fluid saturation and pressure. This is essential from the reservoir engineering as well as for risk assessment perspectives. Electrical conductivity of sedimentary rocks depends strongly on the presence of fluids, their temperature and salinity. Therefore, electromagnetic (EM) methods, such as magnetotellurics (MT) and controlled source magnetotellurics (CSMT) are promising exploration techniques for characterizing and monitoring deep aquifer systems, such as CO_2 storage sites or geothermal reservoirs.
In order to develop an electromagnetic monitoring system it is necessary to have a good understanding of the electrical conductivity distribution and the changes produced by the dissemination of the CO_2 in the deep saline aquifer. Based on the geological model of the study area and using conductivity values of similar structures in the North Eastern German Basin we have created a vast collection of models simulating different scenarios of CO_2 migration, whose responses have been then computed using different forward modelling codes. The synthetic model responses have been calculated both for passive MT (with natural source) and CSMT (with active sources), in 1D, 2D and 3D scenarios. These synthetic model studies represent the basis for the development of a monitoring concept.
From the MT and CSMT models it is possible to determine which station locations and frequency ranges are more sensitive to the changes in the conductivity distribution and which configurations of transmitters and receivers have better resolution capabilities.