Geophysical Research Abstracts
Vol. 14, EGU2012-5425, 2012
EGU General Assembly 2012

A detectability study of CO_2 migration at the Research Laboratory on Geological Storage of CO_2 in Hontomín (Burgos, Spain) using a deep controlled electromagnetic source

E. Vilamajó, P. Queralt, J. Ledo, and A. Marcuello
Institut Geomodels, Departament de Geodinàmica i Geofísica, Universitat de Barcelona, c/ Martí i Franquès s/n, 08028 Barcelona, Spain

Electromagnetic (EM) methods are becoming essential techniques on controlling the injection of carbon dioxide in geological structures. The resistivity variation caused by the presence of CO_2 is especially significant in saline aquifer reservoirs because of the conductive behavior of the pre-injection reservoir. The Controlled Source Electromagnetic Method (CSEM) is a key technique on CO_2 reservoir monitoring using EM methods due to its flexibility.

The supercritic resistive CO_2 plume can be monitored studying the time-lapse variation of an EM signal propagated from an EM source to several receiver stations. The feasibility of detecting the resistivity changes and the determination of the migration of the CO_2 plume can be maximized with a borehole-to-surface logistic: locating the EM source at reservoir's depth ensures that the EM wave travels through the volume of interest.

We define the detectability for each specific source-receiver configuration as the capability of measuring the effect of the carbon dioxide taking into account the specific characteristics of the area -EM noise conditions, non-natural conductive structures that affect signal propagation (borehole casing, wires...)- and the instrumentation features.

We are carrying out several simulations to establish the potentiality of the Hontomín's (the Spanish Research Laboratory on Geological Storage of CO_2) reservoir monitoring using the CSEM method and to compare the benefits of the CSEM method in front of other EM monitoring techniques. We present the results of a detectability study by comparing the current noise conditions on the CO_2 Storage Site area and the instrumental constraints with the CO_2 response (amount of change in the electric field amplitude in the receivers). We consider also the influence of the three conductive well casings expected to be installed. Furthermore, the viability of monitoring the carbon dioxide injection with a deep EM source is studied with the simulation of realistic pre- and post-injection situations. A surface distribution of the receiver stations is proposed to provide an adequate measurement of the CO_2 response.