Geophysical Research Abstracts, Vol. 9, 07199, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-07199

Long term predictions of CO_2 migration and fluid rock interaction during CO_2-geological storage

P. Audigane (1), L. André (1), I. Czernichowski-Lauriol (1), P. Durst ,I (1). Gaus, J. Lions (1), Ch. Robelin (1)

BRGM (French Geological Survey), Water Division, 3 Av. Claude Guillemin, BP 36009 45060 ORLEANS, Cedex 2, FRANCE.

p.audigane@brgm.fr

In the framework of the capture and storage of CO_2 underground in order to reduce the release of greenhouse gases into the atmosphere, this work illustrates the application of an entire set of models for the investigation of the impact of CO_2 storage on different case studies. In-house or commercial fluid flow simulators such as MARTHE and TOUGH2 are used for long-term prediction of CO_2 migration considering pressure, temperature and salinity coupled effects. The chemical reactivity between the gas, the brine and the host rock are treated with pure geochemical models and coupled reactive transport models such as SCALE2000, PHREEQC2.8 and TOUGHREACT. In the case of CO_2 injection at Sleipner (North Sea, Norway), 1D reactive transport modelling including full reaction kinetics indicates a slight porosity decrease at the cap rock base due to the diffusion of dissolved CO2 into the cap rock after 15,000 years. A 2D radial model of the long term storage at Sleipner predicts a low mineral sequestration of the CO_2 and porosity changes. The main process of sequestration remains the dissolution of the supercritical CO_2 in the brines. It takes about 6,000 years for the entire supercritical CO_2 gas bubble to dissolve. Injectivity and near well dry out effect have been studied using aquifer properties of the Dogger Formation located in the Parisian Basin (France). Dissecation with clogging effects and high ionic strength solution have been simulated in order to predict mineral precipitation sequences due to CO_2injection. At K12B (North Sea, Netherland), the injection of CO_2 is performed in a depleted gas reservoir. The geochemical reactivity due to injection is estimated very low as the system already contained initially 13% of CO_2. Injection at K12B is performed as an Enhanced Gas Recovery technique. Predictions of breakthrough times

are respectively 60 days and one year for the two producer wells of the reservoir.