Geophysical Research Abstracts
Vol. 12, EGU2010-14064, 2010
EGU General Assembly 2010

The Field-Laboratory for CO2 Storage "CO2SINK" at Ketzin (Germany): Site Preparation, Baseline Surveys and First 20 Months of Operation

Hilke Würdemann (1), Fabian Möller (1), Michael Kühn (1), Günter Borm (1,2), Frank R. Schilling (1,3)

(1) Deutsches GeoForschungsZentrum (GFZ), CO2 Storage, Potsdam, Germany (wuerdem@gfz-potsdam.de, (49)3312881529), (2) Strählerweg 8, 76227 Karlsruhe, (3) Karlsruhe Institute of Technology (KIT)

The first European onshore geological CO2 storage project in a saline aquifer CO2SINK is designed as a field size experiment to better understand in situ storage processes and to test various monitoring techniques. This EU project is run by 18 partners from universities, research institutes and industry out of 9 European countries (www.co2sink.org). The CO2 is injected into Upper Triassic sandstones (Stuttgart Formation) of a double-anticline at a depth of 650 m. The Stuttgart Formation represents a flu vial environment comprised of sandstone channels and silty to muddy deposits. The anticline forms a classical multibarrier system: The first caprock is a playa type mudstone of the Weser and Arnstadt formations directly overlying the Stuttgart formation. Laboratory tests revealed permeabilities in a µDarcy-range. The second main caprock is a tertiary clay, the so-called Rupelton. To determine the maximum injection pressure modified leak-off tests (without fracturing the caprock) were performed resulting in values around 120 bar. Due to safety standards the pressure threshold is set to 82 bar until more experience on the reservoir behaviour is available. The sealing property of the secondary cap rock is well known from decades of natural gas storage operations at the testing site and was the basis for the permission to operate the CO2 storage by the mining authority. Undisturbed, initial reservoir conditions are 35 °C and 62 bar. The initial reservoir fluid is highly saline with about 235 g/l total dissolved solids primarily composed of sodium chloride with notable amounts of calcium chloride. The initial pH value is 6.6. Hydraulic tests as well as laboratory tests revealed a permeability between 50 and 100 mDarcy for the sand channels of the storage formation. Within twenty months of storage operation, about 30,000 t of CO2 have been injected. Spreading of the CO2 plume is monitored by a broad range of geophysical techniques. The injection well and the two observation wells are equipped with "smart casing technology" containing a Distributed Temperature Sensing (DTS) and electrodes for Electrical Resistivity Tomography (ERT) behind casing, facing the rocks. The geophysical monitoring includes crosshole seismic experiments, Vertical Seismic Profiling (VSP) and Moving Source Profiling (MSP), star seismic experiments and 4-D seismics. Gas membrane sensors (GMS) monitored the arrival of CO2 at the observation wells: CO2 arrived after injection of about 500 t of CO2.at the first well. Arrival in the second well was 9 months after start of injection, having injected an amount of about 11,000 t. Prior to CO2, the arrival of the gas tracers nitrogen and krypton was observed. Pressure and temperature logs showed a supercritical state of the CO2 in all three wells at depth of the storage formation after arrival of CO2. Downhole samples of the brine showed changes in the fluid composition and the activity of biocenosis due CO2 exposure (Morozova et al., EGU General Assembly 2010). Numerical models are benchmarked via the monitoring results indicating a sufficient match for the arrival at the first observation well. First results of ERT measurements indicate an anisotopic flow of CO2 coinciding with the "on-time" arrival of CO2 at the first well and the late arrival at the second well. Time lapse crosshole seismics showed no considerable change in seismic velocity between the two observation wells within the first two repeats after injection of 660 t and 1,700 t of CO2, respectively. However, after injection of 18,000 t CO2 all time-lapse surveys showed a clearly observable signature of the CO2 propagating in the Stuttgart formation. In May 2010 results from twenty months of operation and monitoring the storage operation will be presented.

Morozova, D., Zettlitzer, M.., Vieth A., Würdemann, H., (2010). Microbial community response to the CO2 injection and storage in the saline aquifer, Ketzin, Germany. European Geosciences Union (EGU) General Assembly. Vienna.