Geophysical Research Abstracts
Vol. 17, EGU2015-4878, 2015
EGU General Assembly 2015

4D Seismic Monitoring at the Ketzin Pilot Site during five years of storage – Results and Quantitative Assessment

Stefan Lüth (1), Alexandra Ivanova (1), Monika Ivandic (2), and Julia Götz (1)

(1) GFZ, Centre for Geological Storage, Potsdam, Germany (slueth@gfz-potsdam.de), (2) Department of Earth Sciences, Uppsala University, Uppsala, Sweden

The Ketzin pilot site for geological CO_2-storage has been operative between June 2008 and August 2013. In this period, 67 kt of CO_2 have been injected (Martens et al., this conference). Repeated 3D seismic monitoring surveys were performed before and during CO_2 injection. A third repeat survey, providing data from the post-injection phase, is currently being prepared for the autumn of 2015. The large scale 3D surface seismic measurements have been complemented by other geophysical and geochemical monitoring methods, among which are high-resolution seismic surface-downhole observations. These observations have been concentrating on the reservoir area in the vicinity of the injection well and provide high-resolution images as well as data for petrophysical quantification of the CO_2 distribution in the reservoir.

The Ketzin pilot site is a saline aquifer site in an onshore environment which poses specific challenges for a reliable monitoring of the injection CO_2. Although much effort was done to ensure as much as possible identical acquisition conditions, a high degree of repeatability noise was observed, mainly due to varying weather conditions, and also variations in the acquisition geometries due to logistical reasons. Nevertheless, time-lapse processing succeeded in generating 3D time-lapse data sets which could be interpreted in terms of CO_2 storage related amplitude variations in the depth range of the storage reservoir. The time-lapse seismic data, pulsed-neutron-gamma logging results (saturation), and petrophysical core measurements were interpreted together in order to estimate the amount of injected carbon dioxide imaged by the seismic repeat data. For the first repeat survey, the mass estimation was summed up to 20.5 ktons, which is approximately 7% less than what had been injected then. For the second repeat survey, the mass estimation was summed up to approximately 10-15% less than what had been injected. The deviations may be explained by several factors of uncertainty, and by partial dissolution of the injected CO_2, thus reducing the amount of free gas, which can be detected by seismic time-lapse observations. These quantitative assessment studies have shown that conformity between injected and estimated CO_2 quantities can only be achieved with some degree of uncertainty which needs to be quantified for a realistic assessment of conformity studies.