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Preliminary Seismic Time-lapse Results of the First Post-injection Monitoring at the Ketzin Pilot Site for CO_2 Storage

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Time-lapse surface seismic monitoring methods have proven to be notably successful in imaging the development of the CO_2 plume injected into the 630-650 meters deep saline aquifer at the Ketzin pilot site. A 3D baseline survey was acquired in the autumn of 2005 prior to CO_2 injection, followed by two 3D repeat surveys conducted in the same season of 2009 and 2012 after injection of about 22 and 61 kt of CO_2, respectively. These repeat surveys showed that the CO_2 plume was concentrated around the injection well with a preferred WNW propagating trend due to reservoir heterogeneity. The CO_2 induced amplitude anomaly continued to grow with more CO_2 injected into the reservoir. The CO_2 injection ended on August 29, 2013 after a total of about 67 kt injected CO_2.

In the autumn of 2015, a third 3D repeat survey with a nominal fold of 25 was acquired during the post-injection phase. The acquisition was implemented with an identical template scheme and acquisition parameters as in the previous surveys. About 5500 source points were acquired during the 57 days of active acquisition. The same processing steps as used before were carried out from pre-stack to post-stack. In order to minimize changes unrelated to the site operations, cross-calibration was applied to the data. Preliminary results of the time-lapse analysis show that the obtained amplitude anomaly at the reservoir level is smaller in size than the one observed at the time of the second repeat survey. This may indicate that CO_2 dissolution is active, especially east of the injection site, where permeability and flow rate appear to be lower. In comparison to the previous surveys, the maximum amplitude anomaly has moved towards the west, which is consistent with the previously observed propagating tendency of the CO_2 plume within the reservoir. No CO_2 leakage is observed within the overburden.