

Post-injection feasibility study with the reflectivity method for the Ketzin pilot site, Germany (CO₂ storage in a saline aquifer)

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3D time-lapse seismic surveys (4D seismic) have proven to be a suitable technique for monitoring of injected CO₂, because when CO₂ replaces brine as a free gas it considerably affects elastic properties of porous media. Forward modeling of a 4D seismic response to the CO₂-fluid substitution in a storage reservoir is an inevitable step in such studies. At the Ketzin pilot site (CO₂ storage) 67 kilotons of CO₂ were injected into a saline aquifer between 2008 and 2013. In order to track migration of CO₂ at Ketzin, 3D time-lapse seismic data were acquired by means of a baseline pre-injection survey in 2005 and 3 monitor surveys: in 2009, 2012 and in 2015 (the 1st post-injection survey). Results of the 4D seismic forward modeling with the reflectivity method suggest that effects of the injected CO₂ on the 4D seismic data at Ketzin are significant regarding both seismic amplitudes and time delays. These results prove the corresponding observations in the real 4D seismic data at the Ketzin pilot site. But reservoir heterogeneity and seismic resolution, as well as random and coherent seismic noise are negative factors to be considered in this interpretation. Results of the 4D seismic forward modeling with the reflectivity method support the conclusion that even small amounts of injected CO₂ can be monitored in such post-injected saline aquifer as the CO₂ storage reservoir at the Ketzin pilot site both qualitatively and quantitatively with considerable uncertainties (Lüth et al., 2015).

Reference:

Lueth, S., Ivanova, A., Kempka, T. (2015): Conformity assessment of monitoring and simulation of CO₂ storage: A case study from the Ketzin pilot site. - *International Journal of Greenhouse Gas Control*, 42, p. 329-339.