

Time lapse seismic signal analysis for Cranfield, MS, EOR and CCS site

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The Cranfield field located in Southwest Mississippi is an EOR and CCS project which has been under continuous CO₂ injection by Denbury Onshore LLC since 2008. To date, more than 3 million tons of CO₂ remain in the subsurface. In 2007 and 2010, 3D seismic surveys were shot and an initial 4D seismic response was characterized showing coherent amplitude anomalies in some areas which received large amounts of CO₂, but not in others. Previous work used Gassmann fluid substitution at two different wells, 31F-2 observation well and the 28-1 injection well to predict a post-injection saturation curves and acoustic impedance change through the reservoir. The two seismic volumes were cross-equalized with an appropriate correlation coefficient through well ties. Acoustic impedance inversions were carried out on each survey resulting with higher acoustic impedance changes than predicted by Gassmann for the 28-1 injection well. The time-lapse acoustic impedance however is similar to the difference calculated from a time-delay along a horizon below the reservoir.

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