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Microseismic Monitoring of a Carbon Sequestration Field Test

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SUMMARY

Event location and failure mechanism analysis of microseismicity to identify processes associated with a CO₂ injection program.

Microseismic monitoring was implemented as part of a comprehensive carbon sequestration monitoring program at the Midwest Regional Carbon Sequestration Partnership's geologic field test site in Ostego County, Michigan. The field test consisted of the injection of just over 10,000 tons of CO₂ over a period of approximately one month. Microseismic monitoring was achieved using two temporarily deployed downhole eight level triaxial geophone arrays located in observation wells within 750m of the injection well. The intent of the monitoring program was evaluate the potential for verifying cap rock integrity and identifying the position of the CO₂ plume. During the deployment period, a total of 2974 triggers were recorded, of which 100 events were located, including 7 orientation shots. One of these events, during a period of increased injection, was located at the base of the cap rock, suggesting that the presence of CO₂ in that particular location. The other events may be attributed to the injection of CO₂ into a deeper reef structure as part of EOR activities in the field. Additionally, the spatial distribution of these events is in line with the maximum horizontal stress orientation of the local reef structure. Additional failure mechanism analysis of the dataset is in progress.