Contribution ID: **71** Type: **Oral Presentation**

Towards Geologic CO2 Sequestration at Scale: A Review of Geomechanical Impacts, Induced Seismicity Concerns, and Mitigation Measure

Monday, 31 May 2021 18:00 (15 minutes)

After decades of research on carbon capture and geologic sequestration (CCS), the world needs to finally move from pilot and demonstration experiments to industrial-scale implementation. CCS at scale will involve unprecedented fluid injection volumes that can result in large-scale pressure increases in the subsurface and may cause unwanted geomechanical effects, such as generating seismic events per reactivation of critically stressed faults. Understanding and predicting induced seismicity potential is critical in CCS projects for two reasons: (1) to avoid the potential for damaging earthquakes at the ground surface, and (2) to ensure that caprock integrity is not jeopardized by permeability increases of slipping faults. Also, in a future world with CCS being a fully deployed technology, sedimentary basins with interconnected reservoirs might host multiple storage sites between which pressure interference can be expected. Thus, large-scale pressure buildup can be a limiting factor for CO2 sequestration capacity, because of induced seismicity concerns or because the possibility of distant pressure-related impacts of individual projects needs to be considered. It has been pointed out that the subsurface storage capacity for CO2 may be increased via extraction of the native brines, a pressure management approach that of course comes with additional cost for the handling, treatment or disposal of the extracted brine and thus needs to be carefully optimized.

This presentation will start with a short description of the current worldwide status of CCS and its role as an important climate-mitigation technology. We will then illustrate the basin-scale pressure impacts expected from industrial-scale implementation based on regional modeling studies of future CCS scenarios, and will discuss the potential for generating earthquakes from CCS at scale using the practice of waste water injection in Oklahoma and surrounding States in the U.S. as an analog. We will also present lessons learned from two field experiments—one being a controlled-injection fault slip experiment in a clay (caprock) formation which is highlighting the importance of aseismic leakage and its potential coupling to induced seismicity, the other a CO2 demonstration site where micro-seismicity has occurred along pre-existing basement faults—and will finally evaluate brine extraction as a mitigation measure currently tested in a deep reservoir in the southern United States.

Time Block Preference

Time Block C (18:00-21:00 CET)

References

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