

WHAT IS SEISMICITY?

Seismic activity, or seismicity, is the energy released during the movement or slippage of rocks along a fracture or fault deep beneath the earth's surface. Seismicity is measured in magnitude which represents the amount of energy released in a seismic event and is typically defined by the Richter scale. Felt seismic events, or seismic activity that can be felt at the surface, are usually magnitude 2 or greater.

Comparison of Minor Global Seismic Events Organized by Richter Scale Magnitude

Magnitude	Description	Earthquake Effects	Frequency of Occurrence
<2.0	Micro	Microseismic, not felt	Continual
2.0–2.9	Very Minor	Generally not felt, but recorded	1,300,000 (est.) per year
3.0–3.9	Minor	Often felt, but rarely causes damage	130,000 (est.) per year
4.0–4.9	Light	Noticeable shaking of indoor items, rattling noises. None to slight damage	13,000 (est.) per year

Based on information from: U.S. Geological Survey Earthquake Facts and Statistics and Magnitude/Intensity Comparison (<http://earthquake.usgs.gov>).

MICROSEISMICITY

The earth also produces very small, unfelt, "microseismic" events that can only be recorded with highly sensitive monitoring equipment. Millions of unfelt microseismic events happen around the globe annually.

Microseismic events can take place naturally or in conjunction with energy-related activities, such as oil or geothermal energy production, and subsurface storage of carbon dioxide (CO₂) because of minor adjustments deep underground. Vibrations similar to microseismic events can be caused by other activities such as trains, large trucks, quarrying, and factory operations.

MICROSEISMICITY IN DECATUR

ADM began subsurface monitoring in Decatur in 2010, prior to beginning CO₂ injection. The Decatur carbon capture and storage (CCS) site was carefully selected after extensive imaging of the subsurface showed no detectable faults in the area.

Along with many other types of monitoring, ADM operates 5 surface seismic monitoring stations and 3 borehole monitoring stations that continuously record seismic activity at the CCS injection site. The United States Geology Survey (USGS) has also deployed a network of surface seismic and borehole monitoring stations to provide additional monitoring support. The system is designed to detect microseismic events more than 1 billion times smaller than what would be felt at the ground surface.

Microseismic events have been recorded in Decatur since monitoring began, primarily in association with CO₂ injection during the research demonstration phase (between 2011 and 2014). These events have all occurred at energy levels far below that which could be felt at the surface. The events have ranged in magnitude from -1 to +1.2, far below the level that could be felt at the surface. The microseismic activity releases very low amounts of energy and has no mechanical or physical impacts to the rocks or the well, so there is also no impact to CO₂ stored underground.

For more information about seismic activity and CCS, visit:

<https://www.usgs.gov/centers/geology-energy-and-minerals-science-center/science/induced-seismicity-associated-carbon>