

2014 AAPG Conference
Theme 6: Water Management and Induced Seismicity,
CO₂ Capture and EOR (DEG/AAPG)
Monday, April 7, 10:30 AM
Room 320

Evaluating Methods to Differentiate Natural and Induced Seismicity

Flowback and produced water generated from hydraulic fracturing and oil and gas production have led to increased wastewater disposal through underground injection wells. Several studies have suggested recently felt seismic events may be associated with underground injection wells in Arkansas, Ohio, Texas and Oklahoma, among others. However, in many cases, such as in Oklahoma, there is debate about whether the earthquakes were related to fluid injection (Keranan *et al.*, 2013), natural tectonic processes (Oklahoma Geological Survey, 2013), or remote events (van der Elst *et al.*, 2013). Moreover, it is unclear why earthquakes have occurred near some injection wells but not others with apparently similar geology, target reservoirs, and injection rates (*e.g.*, Frohlich, 2012), and differentiating between natural and induced seismicity is not always a straightforward process. The timing and distribution of seismic events was well correlated to fluid volumes in instances where injection occurred near a fault (*e.g.*, Rangely, CO), and the interaction between injection and induced seismicity was easily resolved. In other cases (*e.g.*, Oklahoma, Texas), it was more difficult to interpret whether a particular injection well was related to observed seismic events. In this presentation, we explore different approaches that can be used to distinguish between natural and induced seismic events, including recently developed quantitative approaches such as an analysis of frequency magnitude distributions. We draw examples from a number of datasets compiled from different types of injection activities that span a range of operational characteristics and geological settings.