

Wastewater disposal and earthquake swarm activity at the southern end of the Central Valley, California

Abstract

Fracture and fault zones can channel fluid flow and transmit injection-induced pore pressure changes over large distances (>km), at which seismicity is rarely suspected to be human induced. We use seismicity analysis and hydrogeological models to examine the role of seismically active faults in inducing earthquakes. We analyze a potentially injection-induced earthquake swarm with three events above M4 near the White Wolf fault (WWF). The swarm deviates from classic main aftershock behavior, exhibiting uncharacteristically low Gutenberg-Richter b of 0.6, and systematic migration patterns. Some smaller events occurred southeast of the WWF in an area of several disposal wells, one of which became active just 5 months before the main swarm activity. Hydrogeological modeling revealed that wastewater disposal likely contributed to seismicity via localized pressure increase along a seismically active fault. Our results suggest that induced seismicity may remain undetected in California without detailed analysis of local geologic setting, seismicity, and fluid diffusion. 1