The Geology of Active Earthquake Sequences in Texas

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ABSTRACT

The TexNet Earthquake Monitoring Network and its partner seismic networks have been providing detailed information on seismicity in Texas for ~5 years. Areas of active seismicity include the Delaware Basin, Midland Basin, Scurry Co., the Eagle Ford operating area, Texas Panhandle, and East Texas Basin. The Fort Worth Basin is now seismically inactive as compared to its years of heightened seismicity from 2008 through 2018. Each of these areas has unique geologic and operating histories that must be considered when assessing seismicity at the local to regional scale—the earthquake habitat. What are the similarities and differences in the habitats of these areas? Each area has a unique stress state, fault architecture, fluid pressure regime, tectonic history, operational history, and earthquake sequence history. Some areas appear to have mainly induced seismicity from injection of wastewater and/or hydraulic fracturing, some have mainly naturally-caused events, and others have a mix. Comparing the geology of these areas to each other provides insight into the specific characteristics that may be important to understanding earthquake cause and to define the scope of steps required to reduce the hazard where possible. In this presentation, I will review recent earthquake data on active sequences in Texas and SE New Mexico and provide a synopsis of research progress by TexNet and the Center for Integrated Seismicity Research toward synthesizing and understanding the role that geologic setting and operational history play in inducing earthquakes. I will discuss a comparison of the earthquake habitats, summarize things we think we understood, and outline the scientific questions that can be tractably addressed by current research approaches.

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