

PROGRAM UPDATE — January through March 2018

These quarterly reports provide information on the TexNet seismic monitoring program and the Center for Integrated Seismicity Research (CISR). The information is intended to be a high-level summary of this complex project and is written for a broad audience with an interest in seismicity monitoring and research in Texas.

Network Installation and Operations:

- The *Bureau* has increased the number of deployed permanent TexNet broadband seismic stations to 25 which, along with the 17 existing stations, finalizes the TexNet “backbone” seismic [network](#).
- Thirty portable TexNet seismic stations are currently deployed in areas of ongoing seismic activity including the DFW area, northeast of Snyder, the Delaware Basin, and in the Eagle Ford operating area. During 2018, the *Bureau* plans to add another 14 portable stations in the Permian Basin region and 2 in the Eagle Ford region.
- Using CISR funds, as many as 5 portable seismic stations are being considered for deployment in the New Mexico portion of the Delaware Basin in partnership with the New Mexico Bureau of Geology and Mineral Resources. These additional sensors will improve earthquake locations in Texas.
- *SMU*, funded by TexNet, maintains another 20 portable seismic stations in the Dallas-Fort Worth area. *SMU* decommissioned station AZDA near Azle after it was replaced by TexNet-installed station and added station LLGR near Lake Lewisville, to assist in monitoring a recently detected earthquake sequence nearby.
- The *Bureau* is tracking the number of unique users that visit the [TexNet Earthquake Catalog](#). The average number of visits per month over the last 3 months is 1,186.

Synopsis of January-March 2018 Seismicity in Texas:

- During January-March TexNet cataloged approximately 300 earthquakes per month, 50% of which occurred in the Delaware Basin region. The remainder of the events occurred northeast of Snyder, in the Dallas-Fort Worth area, and southeast of San Antonio.
- The two highest local magnitude events of $M_L=3.4$ occurred northeast of Snyder and south of San Antonio.
- The *SMU* North Texas earthquake network recorded 38 earthquakes in the Dallas-Fort Worth region ranging in local magnitude from $-0.5 \geq M_L \geq 3.0$. The seismicity occurred mainly in northeast Johnson County and in Denton County near Lake Lewisville. The Irving-Dallas sequence generated events in January and early February.

Partnerships:

- The TexNet Seismology research team at the *Bureau* has initiated collaboration with the University of Houston to monitor and study earthquakes in the Midland Basin and with the University of Texas at Dallas to perform full waveform inversion for 3D high resolution imaging of earthquakes in the Delaware Basin.
- Subcontracts with NM, KS, and OK were completed for the DOE-funded Regional Induced Seismicity Collaboration (RISC) which is being managed by the *Bureau*. A kickoff meeting was held in Oklahoma City to discuss next steps and technical topics that will lead to collaborative research by the members.

Recruiting and Staffing:

- Margo Grace joined the *Bureau* in the capacity of TexNet-CISR Program Coordinator.
- Thomas Clay Templeton joined the TexNet Operations and Seismology team as a Senior Software Developer.
- Stefanie Whittaker joined the TexNet Operations and Seismology team in the capacity of Senior Analyst.
- Patricia Martone joined the TexNet Operations and Seismology team in the capacity of Analyst.
- Ibinabo Bestmann joined the TexNet Seismology team in the capacity of Geophysicist.

Research:

- The TexNet-CISR operations and research team worked with principal stakeholder groups to finalize the 2017-19 operations and research project portfolio, which can be found at www.beg.utexas.edu/texnet-cisr.
 - The TexNet-CISR research team presented recommendations for allocation of FY 2017-19 TexNet research funds to the TexNet Technical Advisory Committee. The plan was approved. The split of total TexNet funding between TexNet network operations (36%) and research (64%) had been approved prior.
 - The TexNet-CISR research team met with CISR industrial sponsors to review the composition of CISR-sponsored research as well as the merged TexNet-CISR research portfolio.
- *Seismology*
 - The *Bureau* has developed a 3D crustal velocity model covering north and west Texas, which will greatly improve the determination of earthquake location and depth. The model is currently being tested and benchmarked.
 - *SMU* published the paper “Stress Orientations in the Fort Worth Basin, Texas, Determined from Earthquake Focal Mechanisms” by L. Quinones, H. DeShon, M. Magnani, and C. Frohlich (2018) in the Bulletin of the Seismological Society of America. The research was funded by TexNet.
 - Two new projects were initiated: Midland Basin Seismicity Characterization in collaboration with University of Houston, and High Resolution Imaging of the South Delaware Basin in collaboration with UT Dallas.
- *Geologic Characterization*
 - Two new projects were initiated within this theme: Texas Production and Injection Analytics and Permian Region Geological and Mechanistic Characterization.
- *Hydrogeologic and Geomechanical Analysis*
 - The *Bureau* initiated geomechanical modeling of the effects of injection and production in the Venus area of NE Johnson County on basement fault stress and possible relationship to induced seismicity.

Outreach:

- A. Savvaidis presented the Texas Seismological Network (TexNet) and the TexNet-CISR Seismology Research program to:
 - Petroleum Engineer's Club of Dallas.
 - EAGE Passive Seismic – Induced Seismicity Workshop in Krakow, Poland.
- P. Hennings and A. Savvaidis presented the Texas Seismological Network (TexNet) and the TexNet-CISR Research program to:
 - Anadarko at their office in The Woodlands, TX.
 - Statoil at their office in Austin, TX.
 - ExxonMobil during a 2 day meeting at the Bureau.
 - Occidental Petroleum at their office in Houston, TX.
 - CISR Research Science Advisory Committee meeting at ExxonMobil at their office in Houston, TX.
 - TexNet Technical Advisory Committee 1Q2018 meeting at the Capitol in Austin, TX.
- P. Hennings presented TexNet-CISR to the Association for Corporate Growth in Austin, TX.