TECHNICAL ADVISORY COMMITTEE
TO TEXNET AND BUREAU OF ECONOMIC GEOLOGY

Meeting Minutes

Tuesday, October 17, 2023 – 11:00am to 3:00pm

OPENING
The meeting of the TexNet Technical Advisory Committee was called to order at ~11:00am on Tuesday, October 12, 2023.

PRESENT
Alexandros Savvaidis, Manager of TexNet
Brian Stump, Committee Chair
Jeff Nunn, Committee Member
Chris Hillman, Committee Member
Mark Boyd, Committee Member

ABSENT
Aaron Velasco, Committee Member
Dave Cannon, Committee Member
Kris Nygaard, Committee Member
Scott Mitchell, Committee Member

A quorum was not present. The meeting went forward for information items only.

AGENDA FOR OCTOBER 17th 2023 MEETING

1. Approval of Minutes of the July 12th, 2023 (2023Q2) meeting.
2. Status of Hiring Plan (Description of what new people will do).
3. In person introduction of TexNet Field Engineers (1hr with lunch).
4. Review mission statement and objectives.
5. Progress on TexNet metrics (reporting automatic events for the M1.5 threshold).
6. Operations (eq status/maintenance, resources).
7. Publications and presentations updates.
8. Peer Review Update. (Depth/Horizontal Uncertainty).
9. TexNet TAC suggestions for the subsequent meetings.

APPROVAL OF MARCH 29, 2023 MINUTES

The Committee reviewed the 12 July 2023 Meeting notes but left final approval to next meeting with a quorum.

HIRING UPDATE

Alexandros updated the TAC on the status of hiring in Field Operations, Seismic Analysts, IT and Scientific Support.   With the new and expanded state funds a number of critical hires are now underway. Bernando Garcia has joined field operations with an Instrumentation Engineer still to be identified. Victor Salles will join the Seismic Analysts on 1 November with an interview for a second analyst scheduled for 26 October. Grace Burke will continue as an interim member until two additional analysts are identified and hired. An interview for IT Lead is planned for 16 October as well as for an IT/CS person on 20 November. Filling these positions will complete the IT section. An interview is planned for 31 October for a person to lead the development of new velocity models with a remaining open position focusing on earthquake source characterization. The significant progress in new hiring was recognized.

Alexandros indicated his preference to hire people that can work across discipline boundaries in order to produce a coherent work environment. He noted that office space remains a premium.

A discussion about formal outreach from the TAC acknowledging the progress that has followed the new funding followed. A number of strategies were discussed that need further development.

LUNCH WITH TEXNET FIELD ENGINEERS

During lunch there was a general discussion between the TAC and the field operations staff including Lead Vincent O'Sullivan, Preston Fleck, JJ Uku and Bernardo Garcia. The group described how they work together as a team in responding to problems, assessing issues and making repairs. They emphasized how it is important to plan field operations in dispersed areas such as Delaware Basin, Midland Basin and the Eagle Ford. The group now has their own specially outfitted vehicle which improves the operation. The plans for an instrumentation engineer that can interact with vendors as highlighted as a future need.

REVIEW AND DISCUSSION OF TEXNET MISSION STATEMENT

A detailed discussion of the current mission statement resulted in a slight proposed modification to the statement. No action on the modification was undertaken until a meeting of TAC with a quorum. Below are reproduced the current and proposed updated mission statement.

Current Mission Statement:

Serve as an independent scientific body that measures and analyzes earthquakes and associated data and distributes and communicates these data and related products to government, industry, and the public for their benefit and the benefit of the State of Texas.

Proposed Updated Mission Statement:

Serve as an independent scientific body that monitors earthquake seismicity, analyzes associated data and distributes this analysis and related products to government, industry, and the public for their benefit and the benefit of the State of Texas.

In a similar way the current objectives were discussed, and possible revised set of objectives were developed for future consideration by the TAC.

Current Objectives:

1. Maintain a network of seismometers capable of accurately recording earthquake data across Texas.\
2. Exceed the network technical performance metrics established in consultation with the TAC, USGS and other authoritative bodies.
3. Continuously strive to increase the accuracy of hypocenter location analyses and report with uncertainties.
4. Maintain high quality electronic databases of all event catalogs and products and make them available as appropriate.
5. Seek to understand causes of seismic activity in Texas.
6. Seek to understand and quantify the impact and risk to public safety and infrastructure.
7. Distribute data and analyses to stakeholders effectively and in a timely fashion recognizing their different needs. Stakeholders include:
   a. Texas Railroad Commission (timely, mission critical supporting information)
   b. Texas Emergency Management, Texas Department of Transportation, Texas Commission Environmental Quality, University Lands (rapidly for large events)
   c. Local Communities
   d. Oil and Gas Industry

e. Academic Research Community
                        f. General Public
                        g. Media
8. Receive and utilize input from the stakeholders.

Proposed Updated Objectives:

1. Maintain a network of seismometers across Teas to continuously and accurately record earthquake data.
2. Exceed the network technical performance metrics established by consultation with the TAC and USGS.
3. Strive to increase the accuracy of hypocenter location estimates and their uncertainties.
4. Maintain and make available in a timely manner, all event catalogs and databases of waveform data and products to stakeholders.
    a. Texas Railroad Commission
    b. Texas Emergency Management, Texas Department of Transportation, Texas Commission Environmental Quality, University Lands
    c. Local Communities
    d. Oil and Gas Industry
    e. Academic Research Community
    f. General Public
    g. Media
5. Receive and utilize data from the stakeholders.
6. Seek to understand the causation of seismicity in Texas.
7. Seek to understand and quantify the impact and risk to public safety and infrastructure.
8. Report to State Legislators, the Governor's office, BEG and The University of Texas at Austin.

TEXNET METRICS

Alexandros updated the TAC on their reporting metrics. Progress has been made in terms of using auto-picked events in areas with an adequate number of local stations for constraining depth. A three-part plan for quick release of event locations down to M1.5 was proposed.

1. As of November 1st, 2023, report auto-picked events of M1.5+ for the Delaware Basin. Manually review events at the next business day or as soon as possible thereafter.
2. By end of Q1-2024 report auto-picked events of M1.5+ for Eagle Ford.
3. As soon as the Midland basin seismic network density increases to a similar level as the Delaware basin, report auto-picked events of M1.5+.

He also reported on some progress in using machine learning (ML) to detect events in three areas of Permian Basin.

OPERATIONS UPDATE

The operations update focused on three new stations added in the Midland Basin and one station that was stolen. Seismicity patterns were also updated.

PUBLICATIONS AND PRESENTATIONS

Published:

- Saad, O.M., Chen, Y.F., Daniel, S., Zhang, F., Savvaidis, A., Huang, D., Igonin, N., Fomel, S., and Chen, Y., 2023, EQCCT: A production-ready Earthquake detection and phase picking method using the Compact Convolutional Transformer, IEEE Transactions on Geoscience and Remote Sensing, 4507015.
- Chen, Savvaidis, and Fomel, 2023, Dictionary learning for single-channel passive seismic denoising, SRL, doi: 10.1785/0220230169.

- Saad, Savvaidis, Chen, et al., 2023, Earthquake forecasting using big data and artificial intelligence: a 30-week real-time case study in China, BSSA, doi:10.1785/0120230031.

Manuscripts under review

- Breton C., Savvaidis, A., et al., 2023. Induced Seismicity Data in Texas: Processing of Available Data Using Python and GIS. Interpretation (minor revisions).
- Chen, Savvaidis, et al., 2023, TXED: the Texas Earthquake Dataset for AI, SRL.
- Chen, Savvaidis, et al., 2023, Deep learning for P-wave first-motion polarity determination and its application in focal mechanism inversion, SRL.
- Chen, Savvaidis, et al., 2023, Thousands of induced earthquakes per month in West Texas, BSSA.
- Huang D., Chen Y., and A. Savvaidis, 2023. Complex seismogenic structures in the Midland Basin as constrained by induced seismicity and earthquake source mechanisms, SRL
- Huang, G.-C. D. and A. Savvaidis (2023). Seismogenic Characteristics in the Snyder Area of Texas as Constrained by Seismicity and Earthquake Source Mechanisms, Geophys. J. Intl.
- Lee, J., Chen, Y., Dommisse, R., Huang, G. D., and Savvaidis, A., 2023, "Basin-Scale Prediction of S-wave Sonic Logs Using Machine Learning Techniques from Conventional Logs," Geophysical Prospecting, (in revision).
- Saad, Savvaidis, Chen, et al., 2023, Transfer Learning for Seismic Phase Picking in Texas, SRL.
- Saad, Savvaidis, Chen, et al., 2023, Peak Ground Acceleration Prediction Using Deep Learning from Single-Station Waveforms, IEEE TGRS.

Presentations

- Chen, Savvaidis, et al., 2023, AI-based fully automatic earthquake detection, magnitude estimation, data processing, and location, The International Geoscience and Remote Sensing Symposium, Pasadena.

PEER REVIEW UPDATE

Lack of time precluded a discussion of this update.

SUGGESTED TOPIC FOR NEXT MEETING

1. Update on hiring plan.
2. Finalize goals and objectives.
3. Update on releasing M1.5+ auto-picked events.
4. Operations (eq status/maintenance, resources)
5. Publications and presentations update
6. Peer Review Update (Depth Uncertainty) & Timeline

Updates
- Research presentation (1hr)
- Suggestions for the subsequent meetings (30min)

ADJOURNMENT

Meeting was adjourned at ~3:30pm by Brian Stump, Committee Chair

Minutes submitted by: Brian Stump, Committee Chair

Minutes approved on December 6th, 2023, by:

Brian Stump, Committee Chair

Mark Boyd, Committee Member

Dave Cannon, Committee Member

Chris Hillman, Committee Member

Jeff Nunn, Committee Member

Kris Nygaard, Committee Member (via Teams)

Aaron Velasco, Committee Member