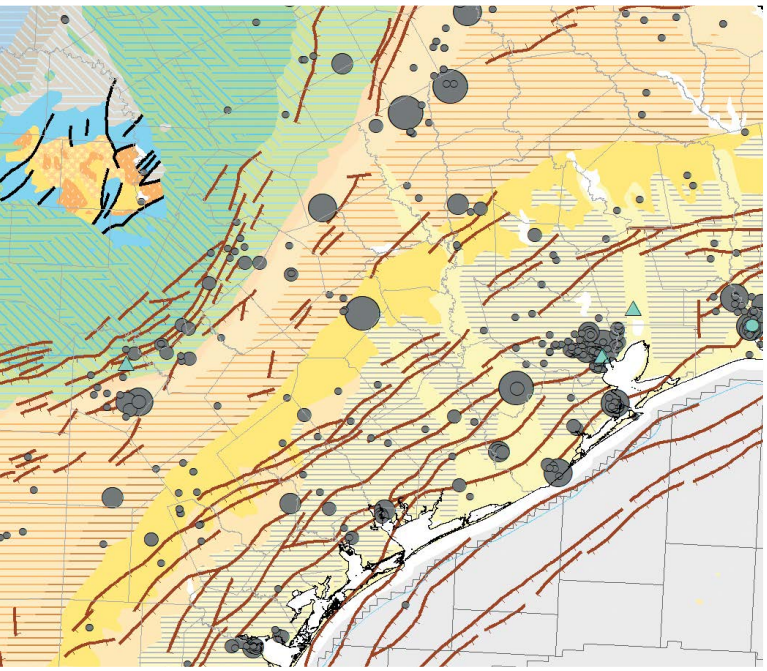
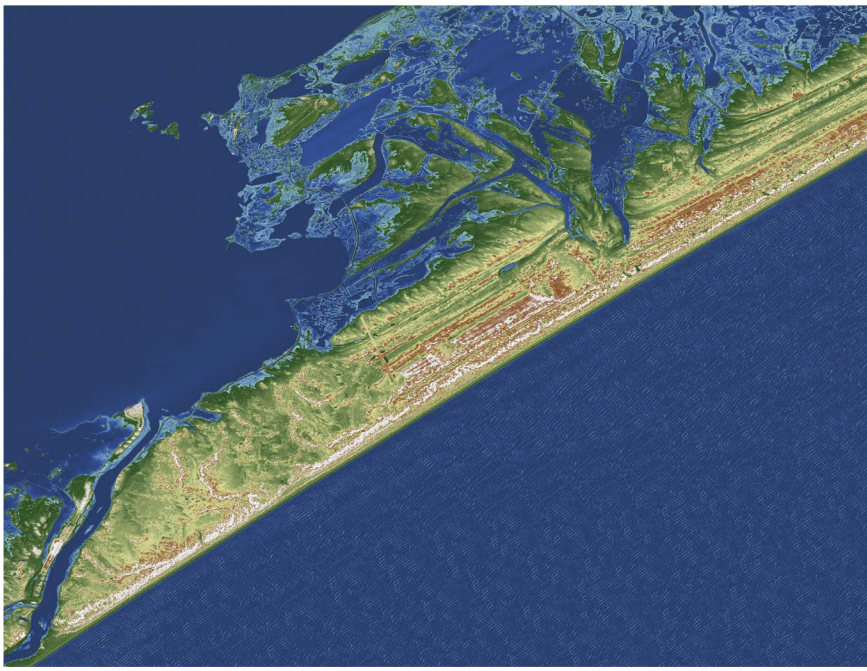
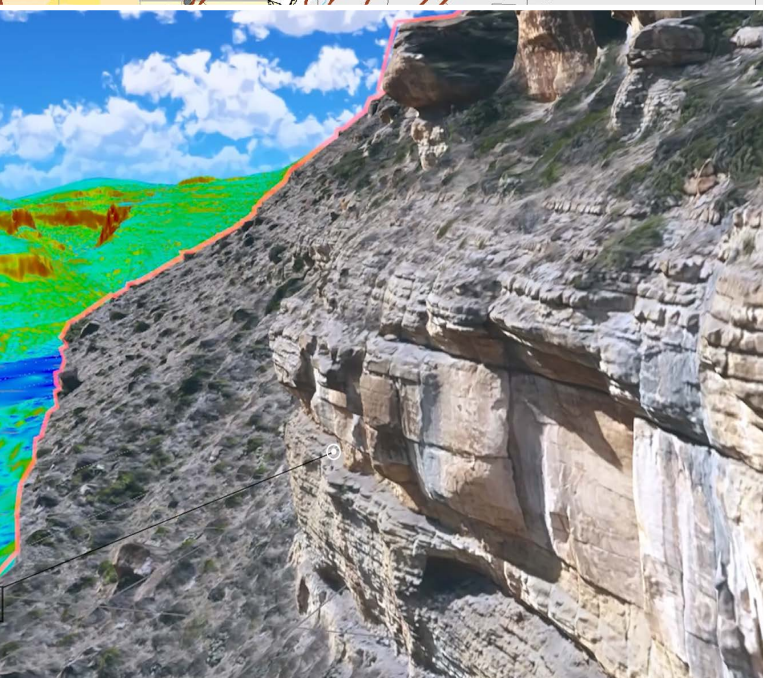
2023 Annual Report







Bureau of Economic Geology
Scott W. Tinker, Director

Contents

Cover images:

This collection of images from 2023 illustrates the diversity of the Bureau's innovative energy, environmental and energy economics research.

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Building on a Legacy of Geoscience Discovery

In the late seventeenth century, Isaac Newton said, deferentially, “If I have seen further, it is by standing on the shoulders of giants.” The metaphor actually goes back to the twelfth century and is attributed to Bernard of Chartres, and perhaps farther still to the Latin scholar Priscianus Caesariensis in the sixth century. It seems there are very few new ideas, but the best ones are built upon and endure.

I am reading a book called *How We Got to Now* by Steven Johnson. He describes the historical evolution and subsequent impacts of six fundamental ideas—glass, cold, sound, clean, light, and time—and how much of what we take for granted today is built on these. Johnson illustrates clearly how the work of others allows us to advance.

At the Bureau, we build on a 114-year legacy of great geologists doing great geology. Field-work done on mules in the Trans-Pecos. Modern sedimentary environments of the Gulf Coast. Carbonate outcrops in the Guadalupe and surrounding ranges. Salt deformation in the subsurface Gulf of Mexico. Fractures at all scales in outcrop and core. Coastal processes. Water–energy interactions. Computer modeling and simulation of petroleum reservoirs and systems. Mudrocks from pore to basin. The list goes on.

It is the legacy of these fundamental discoveries by those who have gone before—always based on the rocks in outcrop and the subsurface—that allows us to tackle modern-day challenges such as carbon capture and storage; hydrogen as an energy source and carrier; geothermal as a resource; and environmental impacts of mining for, and disposal of, solar panels, wind turbines, and batteries. Always advancing and always building.

This will be my last Director’s Message. I am honored to have served this remarkable organization for 24 years and am proud of the legacy that we have created together, one of family, teamwork, impartiality, rigor, impact, and geoscience discovery. I can’t wait to see where the next 25 years takes the Bureau.

With deepest admiration and thanks,

Scott W. Tinker

News and Events

Bureau Launched Partnership with Timor-Leste

A contingent from the Bureau of Economic Geology made a trip halfway around the world at the invitation of the small island nation of Timor-Leste. The country's national oil and gas company, TIMOR GAP, sought Bureau assistance in characterizing and developing the nation's significant natural gas reserves to establish CO_2 and hydrogen storage in depleted reservoirs. The Bureau team included researchers **Robin Dommisse, Dallas Dunlap, Jay Kipper, Toti Larson,** and **Hongliu Zeng**, as well as Mojdeh Delshad from the UT Austin Department of Petroleum and Geosystems Engineering.

The Democratic Republic of Timor-Leste was the first new sovereign state of the twenty-first century, being accepted into the United Nations in May of 2002.

Bureau researchers and TIMOR GAP partners meeting in Timor-Leste.

Located on an island in the southern Pacific Ocean, north of Australia, the country has a population of about 1.1 million people. It is a former colony of Portugal, and Portuguese is still one of its official languages. The nation is predominantly agrarian, and, with a growing population, has a critical need to expand its infrastructure and modernize its economy.

The Bureau used state-of-the-art geological, geophysical, and petroleum engineering technologies to conduct a comprehensive evaluation of the country's Greater Sunrise field complex, which contains two undeveloped gas and condensate fields. The studies were done in close collaboration with TIMOR GAP engineers and geoscientists to enable seamless knowledge transfer. Three TIMOR GAP scientists traveled to the Bureau for several months of work in the integrated project, giving them a hands-on perspective on research techniques and technology, as well as providing them an opportunity to return home with new research and leadership skills. During the Bureau team's trip to Timor-Leste, they met with the nation's energy minister and briefed U.S. Embassy staff on the project. "The people we met were wonderful—caring, thoughtful, and enthusiastic to work on this project," recalled **Dallas Dunlap**, project manager. "Our team established a real bond with them, and we are all deeply invested in the success of this project. Having the benefit of revenue from gas production could be a game changer for Timor-Leste's economy and for the future prosperity of its people."

Bureau Researchers Blaze Trail to In Situ Subsurface Hydrogen Generation

In the Bureau of Economic Geology's analytic labs, petrologists and geochemists collaborate on new research projects focused on finding economic ways to generate hydrogen from rocks. Unlike oil and gas, which is extracted from subsurface reservoirs, hydrogen will most likely need to be produced in situ in the subsurface to meet global demand, through geochemical processes such as serpentinization. Using all available tools, geochemists at the Bureau are trying to better understand reaction rates and, importantly, catalysts that can boost reactions or rate-limiting barriers that may inhibit hydrogen production from rocks. Tackling this problem requires a diverse group of geoscientists and engineers to think differently about energy, and these folks are up to the task!

For more information about this vital research, please contact **Toti Larson** at toti.larson@beg.utexas.edu.

Bureau researchers (from left to right) **Xun Sun, Esti Ukar, Toti Larson, Roxana Darvari, J.-P. Nicot, Tongwei Zhang** and **Andras Fall.**

Bureau Researcher Helps City of Boerne, Texas, to Develop Water Data Dashboard

Water-related data are often collected using a variety of methods, by different agencies and organizations, and stored in different databases. These data can include groundwater and surface-water stocks, rainfall, and other characteristics that impact community-wide water demand, such as drought status and community population. For these data to be useful to the public and decisionmakers, information needs to be captured from these different sources, stored in a single location, and made available to those who need it.

For the past several years, the Bureau of Economic Geology has been working with the City of Boerne, Texas, to create the Boerne Water Data Dashboard. Along with partners from Duke University and the Cibolo Center for Conservation, Bureau Senior Research Scientist **Michael Young** and Vianey Rueda (former UT Austin master's degree student, current University of Michigan doctoral student) used approaches from the Internet of Water Coalition to create this unique community tech tool. The project was partially funded by the Cynthia and George Mitchell Foundation.

The research team met with different stakeholder groups across the community to understand their water information needs, then designed a dashboard to pull data from different sources and display information in a way that would help community members.

The City of Boerne is the first to implement a municipal-scale Internet of Water project in the country. "The Mayor's office, city council and utility officials, and residents were really supportive and interested in testing the Internet of Water in their community," says Young, principal investigator of the Mitchell Foundation grant. "With their support, we were able to develop an effective tool that can promote better stewardship of water resources and greater resilience during droughts." Improving Texans' access to geological and environmental data is one of the Bureau's core missions.

See the dashboard on the **Boerne Utilities website**: https://www.ci.boerne.tx.us/2267/Boerne-Water-Dashboard.

Susan Hovorka (center) presenting at a GCCC workshop.

Gulf Coast Carbon Center Conducts Successful Sponsor Meeting

The Gulf Coast Carbon Center (GCCC) held its largest sponsor meeting yet, with over 100 sponsor representatives in attendance, 45 of them attending in person at the Commons Conference Center in Austin. Three new sponsor organizations attended, as well as many new staff who have joined carbon capture and storage (CCS) teams from long-time GCCC sponsors.

The GCCC showcased a vigorous contingent of its own new CCS practitioners, with twelve talks presenting work from two postdocs and eight graduate students. The highest ratio of technical content to presenter experience was a presentation by a high school student mentored by the GCCC's **Sahar Bakhshian**. Tim Dixon, the director and general manager of the global IEA Greenhouse Gas R&D Programme, flew in from the United Kingdom to present a wide-ranging keynote speech on "CCS Hot Topics."

Thirty-five sponsor representatives attended workshops hosted by the GCCC's **Susan Hovorka** and **Katherine Romanak**. They presented deep dives into technical issues around permitting and monitoring. The group also went on field trips to the Bureau of Economic Geology's Core Research Center and to the UT Austin Department of Chemical Engineering's carbon capture plant. **Carlos Uroza** also presented an invigorating discussion about cored intervals from the Wilcox Group.

For more information about **GCCC**, or to join, please contact **Susan Hovorka** at susan.hovorka@beg.utexas.edu.

Bureau Researchers Analyze New Daisetta Sinkhole

At the request of the Liberty County, Texas, Office of Emergency Management, a Bureau of Economic Geology hazard assessment team made up of researchers **Jeff Paine, John Andrews, Jennifer Morris,** and **Kutalmis Saylam** visited the new Daisetta sinkhole on April 8, 2023. This new, nearly circular sinkhole, located on the southwest side of the larger 2008 Daisetta sinkhole (the subject of earlier Bureau investigations), collapsed on Sunday, April 2, 2023 on the northwest flank of the Hull salt dome in the community of Daisetta, Texas.

The team mapped concentric fissures and scarps around the new sinkhole and conducted a drone-based structure-from-motion survey to obtain high-resolution images and construct a post-collapse topographic map of the sinkhole area. Water depth in both sinkholes was measured using a graduated, weighted string lowered into the sinkholes with the drone. The team also acquired differential GPS elevations for drone imagery georeferencing and elevation-change detection and used a passive seismic method to estimate the depth to salt along the FM 770 highway near the sinkhole.

Data from the site visit will provide critical information on the sinkhole to emergency responders and the public. Studies at the site are supported by the Bureau's State of Texas Advanced Resource Recovery (STARR) program. The team's report on the sinkhole is available at https://www.beg.utexas.edu/files/Articles/2023/begofr2301_daisetta2023_d8_hr.pdf.

For more information, please contact **Jeff Paine** at jeff.paine@beg.utexas.edu.

New Daisetta Sinkhole (above): Oblique drone image of the 2008 and 2023 sinkholes in Daisetta, Texas, acquired on April 8, 2023. "F" denotes areas of prominent concentric cracks, fissures, and scarps. View to the northeast.

John Andrews (left) operating the drone.

Bureau Summer Seminar Series

Every summer Friday at noon, you can find Bureau of Economic Geology employees learning how to hand-build ceramics, seeing "fun things to do with CO_2," hearing about the history of Russian–American relations, exploring how making espresso parallels how fluids flow through nanopores(!), or enjoying a seminar on some other fascinating topic. In addition to the topics above, this summer's Seminar Series covered diverse subjects such as a field trip to the Bureau's community garden, "Cinematic Storytelling: the Art of Film Language," "Taking the Stress out of Getting Promoted," and UT's conflict of interest and outside employment policies. In past summers, Bureau employees learned about lunar geology, asteroids, the Dinosaur National Monument in Utah, a military pilot's perspective on unidentified aerial phenomena (UAPs), and many more subjects. Ultimately, the best part about Summer Seminars is that they offer the chance for all Bureau employees to enjoy one another's company while listening, learning, and sometimes even laughing.

Several past Summer Seminar Series talks may be found on the **Bureau's YouTube channel:** https://www.youtube.com/BureauofEconomicGeology.

NASA Grants $1.3 Million to Bureau Researcher for Wildfire Management with Drones

Wildfires are on the rise in the United States, and when fires get out of control, it can result in loss of life and damages costing billions of dollars. Fortunately, innovation and technology development can provide tools to better face these challenges.

James Thompson, from the Bureau's State of Texas Advanced Resource Recovery (STARR) program, was awarded a $1.3 million grant by NASA to develop technology to address the active-fire stage of wildfire management. The project will advance the spatiotemporal resolution and latency of novel multispectral thermal infrared (TIR) data acquired from a small unmanned aircraft system (UAS), increasing the accuracy of the detection and characterization of burn stages. The idea is to develop an affordable UAS-based, high-temperature, multispectral TIR imaging system with high spatial (meter-scale) and temporal (second) resolution. Thompson has already developed a prototype that was tested over active volcanoes.

For more information, see the project summary at https://esto.nasa.gov/firesense2022final/#thompson.

Texas Consortium for Computational Seismology Hosts Spring Meeting

The Texas Consortium for Computational Seismology (TCCS) held its spring research meeting at the Bureau of Economic Geology's Houston Research Center. Thirty-five people attended, including representatives from nine sponsor companies.

Twelve research presentations from TCCS staff, scientists, and students from the Bureau and the Oden Institute for Computational Engineering and Sciences covered topics including high performance modeling of wave propagation, seismic monitoring of carbon storage, and well-log data analysis using advanced machine learning techniques. The program also included an invited presentation from Purdue University's Elita Li on carbon capture and storage in Southeast Asia.

TCCS, in collaboration with the Center for Numerical Analysis at the Oden Institute for Computational Engineering and Sciences, seeks to address the most important and challenging research problems in computational geophysics as experienced by the energy industry while educating the next generation of research geophysicists and computational scientists.

For more information on TCCS, or to join, contact **Sergey Fomel** at sergey.fomel@beg.utexas.edu.

Sergey Fomel addressing the participants at a workshop in Bureau of Economic Geology's Houston Research Center.

Bureau retreat participants dicussing specimens at the site. **Becky Smyth** (top left), **Tingwei "Lucy" Ko** and **Sheng Peng** (right).

Linda Ruiz McCall (left) and **Travis Hobbs** (right) discuss minerals in the area.

Bureau Retreat Provides Opportunities for Camaraderie

The Bureau of Economic Geology's staff retreat to the White Family Outdoor Learning Center was a tremendous success! About 90 researchers and support staff boarded buses and made their way to the Learning Center, a recent 250-acre property donation to UT's Jackson School of Geosciences. Located in the picturesque Texas Hill Country, the rolling terrain covered in wild flowers, wooded trails, and shaded creek provided the participants a beautiful venue and unique opportunity to relax and reflect. For the geoscientists in the group, tall rock outcrops and varied landforms were available for exploration and study.

There was extensive planning for the event, and a number of activities were available. Brandon Minton, the site manager for the Center, offered information about the property and shared future plans for it. Bureau researcher **Brian Hunt** led discussions about the Glen Rose formation and the Trinity Aquifer. There were viewings of core obtained from the property, bird watching, an art activity, fossil collection and identification, and presentations on snake and amphibian research at the Learning Center. Through it all, lively games of Frisbee and cornhole competitions took place. Credit for the success of the day goes to its organizers and presenters, including the Bureau's **Jay Kipper**, **Cindy Kralis**, **Linda Ruiz McCall**, **Kim LaValley**, **Francine Mastrangelo, Nathan Ivicic**, **Brandon Williamson,** and **Evan O'Donnell**.

After a few years where the Bureau of Economic Geology had faced and overcome a series of challenges, it was refreshing to see this tremendously diverse group of talented people from across the globe share a day of kindness and camaraderie out in the Texas countryside and come together as the Bureau family.

Bureau and Jackson School Produce New Podcast

Beginning in early 2023, the Bureau of Economic Geology and the UT Jackson School of Geosciences, in partnership with the National Academy of Engineering and with support from the Fisher Foundation, launched the **Water Resources Podcast**, hosted by **Bridget Scanlon**. Scanlon is an award-winning Bureau researcher with expertise in hydrogeology with an emphasis on groundwater resources. Scanlon interviews water resource subject matter experts on the challenges and possible solutions to water resource issues caused by global warming and overexploitation by humans. The podcast considers approaches including satellite and ground-based monitoring and global to regional modeling from local to global scale. Twenty-three episodes were released, covering drought forecasting and famine, the effects of agricultural expansion on groundwater levels, virtual water transfer and the global food trade, the potential of groundwater storage for development, the interaction between ground and surface water, the ability of atmospheric rivers to mitigate drought, and Australia's approach to managing the extremes of droughts and floods.

The Water Resources Podcast emphasizes groundwater resources, hosted by **Bridget Scanlon**.

Listeners can look forward to more illuminating discussions released twice a month on Thursdays.
The **Water Resources Podcast** is available on the Water Resources Podcast website: https://wrp.beg.utexas.edu/.

For more information, please contact **Bridget Scanlon** at bridget.scanlon@beg.utexas.edu.

Salty Research at the Bureau: Enhancing Energy Storage in the Permian Basin

The State of Texas Advanced Resource Recovery (STARR) program, in collaboration with the GeoH_2 industrial affiliates program at the Bureau of Economic Geology, has been pursuing comprehensive salt formation characterization for the Castile and Salado Formations in the Permian Basin of West Texas. STARR researchers characterized these geologic formations to identify areas that are suitable for the construction of salt caverns. Salt caverns are created by solution mining and can store a wide variety of products, including liquid and gaseous hydrocarbons as well as hydrogen. Solution mining has also been used to produce potash and other salts with industrial uses. The U.S. Strategic Petroleum Reserve stores liquid hydrocarbons in salt caverns within salt domes throughout the Gulf Coast region. The bedded salt formations of the Permian Basin are also suitable to build salt caverns for energy storage. The Bureau has one of the largest collections of geologic core and cuttings in the world. Among those millions of boxes of rock samples, STARR researchers have located more than 4,000 ft of core from the Castile and Salado Formations in the Delaware Basin, the western part of the Permian Basin.

STARR Principal Investigator **Lorena Moscardelli** presented preliminary results of this research effort in several technical conferences, including the American Association of Petroleum Geologists–Society of Exploration Geophysicists International Meeting for Applied Geoscience & Energy (SEG–AAPG IMAGE) in Houston in August, and the fall 2023 meeting of the Solution Mining Research Institute (SMRI) in San Antonio in October. The salt storage research team also submitted several abstracts to the European Association of Geoscientists & Engineers Global Energy Transition Conference & Exhibition (EAGE GET) in Paris in the fall.

Geologists examining boxes of rock samples at one of the largest collections of geologic core and cuttings in the world.

This research would not be possible without access to the Bureau Core Research Center, including access to state-of-the-art laboratory facilities and a talented and dedicated team of technical staff and facility managers.

To learn more about **STARR**, please see the program's website at https://www.beg.utexas.edu/research/programs/starr.

$GeoH_2$ Fall Meeting Engages Attendees

The $GeoH_2$ research consortium of the Bureau of Economic Geology conducted its fall meeting to share research results, consult with its partners in industry, and discuss goals for future research. The hybrid meeting brought together more than 70 attendees in-person in Austin and online.

$GeoH_2$ researchers discussed themes including geologic storage of hydrogen in porous media; salt characterization for hydrogen storage; techno-economics and hydrogen value chain analyses; novel concepts in hydrogen, including in situ generation and naturally occurring hydrogen; and risk analysis in hydrogen storage. Presentations covered completed and ongoing work on case studies, modeling, and data-based analyses of topics within these themes. Researchers also demonstrated software applications developed by the consortium to facilitate salt cavern storage and economic screening of geologic storage opportunities.

Mark Shuster presenting at the $GeoH_2$ fall consortium meeting.

In-person attendees enjoyed participating in a hands-on session viewing salt cores representing bedded domal salt deposits, followed by entertainment and dinner on the Bureau's terrace on the first day of the meeting. On the second day, in-person attendees toured the Bureau's microfluidics, gas-absorption, and fluid inclusion laboratories.

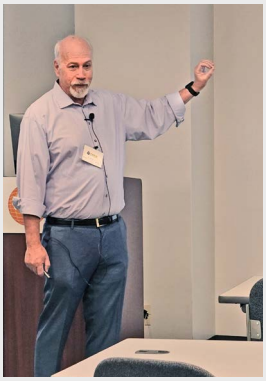
To learn more about or join the **$GeoH_2$ research consortium**, contact **Mark Shuster** at mark.shuster@beg.utexas.edu.

Bureau Enters into Partnership with *Texas Water Journal*

The Bureau of Economic Geology is excited to announce a new publishing partnership with the distinguished online ***Texas Water Journal (TWJ)***, a peer-reviewed, multidisciplinary publication on water resources management, research, and policy.

"Water is only becoming more critical to Texas with time," noted the Bureau's **Ken Wisian**, Associate Director, Environmental Division. "Teaming with the TWJ, bringing our world-class expertise and supporting capabilities to bear, perfectly aligns with our mission to serve the public and is a win-win for all stakeholders in Texas."

For more information about this promising new partnership with the *Texas Water Journal*, please contact Bureau senior research scientist **Michael Young** at **michael.young@beg.utexas.edu**.



Tim McMahon presenting information at the annual consortium meeting.

Amanda Calle presenting information at the annual consortium meeting.

Tight Oil Resource Assessment Consortium Conducts Annual Meeting

The Tight Oil Resource Assessment (TORA) research consortium at the Bureau of Economic Geology held its annual meeting in Austin. The gathering included far-reaching discussions on a broad range of research topics. Over 30 representatives from TORA member organizations participated in two days of presentations from a dozen TORA geoscientists, engineers, and economists who addressed diverse research areas, including major resource play analyses and novel subsurface concepts.

Presentations that piqued the most interest among attendees included the extension of TORA's ongoing Permian Basin analysis into the lower Paleozoic section, environmental topics (carbon sequestration, hydrogen sulfide [H_2S] occurrence, and hydrogen usage), and productivity and decline analyses.

For more information about TORA, or to join, please contact **Tim McMahon** at tim.mcmahon@beg.utexas.edu.

Joint Consortium Meeting Explores Latest Geothermal Energy Research

Geothermal energy has tremendous promise to serve as a baseload resource for the world's energy future, and two University of Texas at Austin research consortia came together in a joint rollout of their ongoing geothermal subsurface and drilling technology research.

The HotRock consortium from the UT Jackson School of Geosciences' Bureau of Economic Geology joined the Rig Automation and Performance Improvement in Drilling (RAPID) consortium from the UT Cockrell School of Engineering's Hildebrand Department of Petroleum and Geosystems Engineering to showcase each consortium's extensive experience and progress in geothermal energy research. The meeting was held at the Bureau's Houston Research Center and hosted representatives from over a dozen member and prospective member companies interested in investing in innovative geothermal technologies.

A team of Bureau researchers shared the podium with the team from RAPID to display the leading edge of research and yet unpublished work that is key to the emerging revolution in geothermal energy: "geothermal anywhere," the ability to successfully locate geothermal energy facilities in multiple areas outside of conventional geothermally active regions. Guests heard a number of presentations regarding the state of subsurface research from the challenges inherent in characterizing potential geothermal formations, to identifying solutions to a number of possible issues with geothermal drilling techniques.

Ken Wisian, Bureau Associate Director and Principal Investigator of HotRock at the Joint HotRock Consortium.

Ken Wisian, Bureau Associate Director and Principal Investigator of HotRock, remarked, "This event was a great demonstration of the power of our consortia, from both the engineering and geoscience schools at UT Austin, to solve real-world problems for industry!"

For more information about **HotRock**, or to join, please contact **Ken Wisian** at ken.wisian@beg.utexas.edu.

Bureau Symposium Showcases Breadth of Research

In most large organizations, functional groups can become "siloed," with the members of one group unaware of the work and objectives of another. However, the Bureau of Economic Geology geoscientists, engineers, and research consortia work together toward common research goals.

Each fall, the Bureau Research Symposium invites researchers to share their work with colleagues through poster displays and brief presentations (or "nano talks"). The Symposium featured a broad range of research, presenting 25 posters and 8 nano talks. The event was well attended by the Bureau community as well as by Jackson School Dean **Claudia Mora**, Associate Dean of Research **Michael Young**, Bureau of Economic Geology Director **Scott Tinker**, and all of the Bureau Directors.

Participants voted "Basinwide Subsurface Stratigraphic Architecture and Wireline Facies Distribution of Leonardian Strata, Midland Basin, West Texas," by **David Carr**, **Bill Ambrose**, and Scott Hamlin as the Best Poster. The Best Nano Talk was "CCS Developments in the Texas State Waters—Recent GLO Leasing and DOE-Funded Research," presented by **Tip Meckel**.

Many thanks to Information Geologist **Linda Ruiz McCall**, with support from cross-departmental Bureau staff, for organizing the event.

Bureau Director **Scott Tinker** (at right) discusses posters with senior researcher **Bob Loucks** (left).

Bureau FRAC Papers Highly Cited in Their Field

The Institute for Scientific Information (ISI) Web of Science recently recognized three Bureau of Economic Geology Fracture Research and Application Consortium (FRAC) papers, all products of a U.S. Department of Energy Basic Energy Sciences grant, as more highly cited than 99 percent of all related papers for their publication years. The three papers are "Natural Fractures in Shale: A Review and New Observations," by **Julia Gale**, **Stephen Laubach**, **Jon Olson**, **Peter Eichhubl**, and **András Fall**; "Microfractures: A Review," by Mark Anders, **Stephen Laubach**, and Christopher Scholz; and "The Role of Chemistry in Fracture Pattern Development and Opportunities to Advance Interpretations of Geological Materials," by **Stephen Laubach**, Robert Lander, Louise Criscenti, Lawrence Anovitz, Janos Urai, and others.

Stephen Laubach, who leads the Bureau's fracture research group, relates the importance of fracture work and these papers: "Information about fractures is needed for effective engineering operations such as fluid injection underground, management of induced seismicity, and the efficiency and success of fluid extraction, for example in unconventional and deep hydrocarbon reservoirs and geothermal systems."

For more information on **FRAC**, please contact **Stephen Laubach** at steve.laubach@beg.utexas.edu or visit the **FRAC website** at https://frac.beg.utexas.edu.

2023 TexNet and CISR Annual Review Discusses Texas Seismicity

Peter Hennings (far left) and **Alexandros Savvaidis** (second from left) presenting discussion of future strategies at the annual review.

TexNet is the State of Texas' earthquake monitoring network, conducting in-depth and timely analyses of data from over 200 seismic sensors statewide. The Center for Injection and Seismicity Research (CISR) is its affiliated research consortium, supported by industry and organizational partners, undertaking a wide range of studies related to earthquake activity and, increasingly, the impacts of production wastewater injection.

At their Annual Review, nearly 100 meeting participants included representatives from upstream and midstream sponsoring companies, the TexNet Technical Advisory Committee, the CISR Science Advisory Committee, the Railroad Commission of Texas, the New Mexico Oil Conservation Commission, and researchers from The University of Texas at Austin, Southern Methodist University, and The University of Texas at Dallas. Over 40 technical presentations from TexNet and CISR researchers during the first 2 days of the meeting focused on statewide efforts at earthquake monitoring and research on seismicity trends and causes, with a focus on the Permian Basin region of West Texas and southeastern New Mexico. The presentations ran the gamut from artificial intelligence (AI)-based research applications to interpretation of fault systems and slip hazards. Follow-up technical meetings on the third day focused on CISR and industry collaborations for research on the impacts of large-scale wastewater injection in the Delaware and Midland Basins and the ongoing challenge of integrated geologic characterization that is needed to support mechanistic studies of induced seismicity. In an open session, CISR industry sponsors presented efforts related to induced earthquake hazard and risk assessment in the northern Delaware Basin of Texas and New Mexico.

For more information about the work and extensive public resources of **TexNet,** please contact program manager and principal investigator (PI) **Alexandros Savvaidis** at alexandros.savvaidis@beg.utexas.edu. To learn more about **CISR**, please contact PI **Peter Hennings** at peter.hennings@beg.utexas.edu or co-PI **Katie Smye** at katie.smye@beg.utexas.edu.

Honors

Bureau Team Wins International Earthquake Forecasting Competition

Yangkang Chen | Alexandros Savvaidis | Sergey Fomel | Dino Huang

In artificial intelligence (AI) and deep learning, progress is recognized through competitions. The Bureau of Economic Geology's **Yangkang Chen** led a team, including **Alexandros Savvaidis, Sergey Fomel, Dino Huang,** and researchers from other institutions, to win first place among 600 international teams in the 2022 international Acoustic Electromagnetic to AI (AETA) Earthquake Prediction AI Algorithm Competition hosted by Peking University Shenzhen Graduate School in China. The research considered for the award is groundbreaking. Seismologists have long envisioned the ability to predict earthquakes, but it is only now that modern AI-based data-analysis tools allow researchers to approach a solution to the problem.

Publication Awards Honor 2021 and 2022 Authors

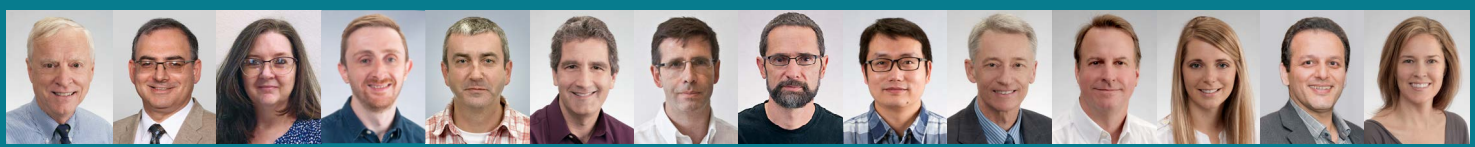
The Bureau of Economic Geology gathered to honor its most notable researchers who published in 2021 and 2022. Publications are the Bureau's major product, and help to share the new knowledge that researchers have uncovered. Because COVID prevented an official awards ceremony in early 2022, this year's gathering paid tribute to authors from both years.

In 2021, 42 Bureau authors produced 114 peer-reviewed publications, and that number increased to 127 publications from 38 authors in 2022. Sixty-nine of the 2021 publications were from Bureau first authors while 64 of the 2022 publications were first authored. Senior Research Scientist **Bob Loucks** led with the most times honored in both years, and Senior Research Scientist **Sergey Fomel** had the most student first authored papers in both 2021 and 2022. Program Coordinator **Nancy Cottington** was also recognized for her exemplary contribution to scientific illustration in the 2021 Bureau publication "Principles of Shortening in Salt Basins Containing Isolated Minibasins," by **Oliver Duffy**, **Tim Dooley**, **Michael Hudec**, **Juan Soto**, and coauthors.

The Tinker Family BEG Publication Award is given annually at the event in recognition of an exemplary publication of demonstrated or expected scientific or economic impact, or that otherwise increases the visibility of the Bureau scientific community. Last year's winner of the Tinker Family BEG Publication Award, "for uncovering overlooked but universal processes in river meandering using open and reproducible science," was **Zoltán Sylvester** and coauthors for "Autogenic Translation and Counter Point Bar Deposition in Meandering Rivers," published in Geological Society of America Bulletin.

This year's winners of the Tinker Family BEG Publication Award, "for a timely contribution to our understanding of regional pore pressure buildup in response to large-volume water disposal in the Delaware Basin," were the Bureau's **Jun Ge** and coauthors, **J.-P. Nicot**, **Peter Hennings**, **Katie Smye**, **Seyyed Hosseini**, and **Caroline Breton**, for "Recent Water Disposal and Pore Pressure Evolution in the Delaware Mountain Group, Delaware Basin, Southeast New Mexico and West Texas, USA," published in Regional Studies.

For more information about the research publications and the Bureau, please see the **Bureau's Publications page** at https://www.beg.utexas.edu/publications/peer-reviewed-publications/2023.



(Left to right) **Bob Loucks, Sergey Fomel, Nancy Cottington, Oliver Duffy, Tim Dooley, Michael Hudec, Juan Soto, Zoltán Sylvester, Jun Ge, J.-P. Nicot, Peter Hennings, Katie Smye, Seyyed Hosseini,** and **Caroline Breton.**

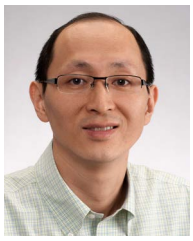
Bureau Well-Represented at Jackson School Walter Awards

Steve Laubach

The winner of the Joseph C. Walter Jr. Excellence Award was the Bureau of Economic Geology's **Steve Laubach**. Dr. Laubach was recognized as he exemplifies a true scientist and has been a role model for many research staff members and graduate students.

Sahar Bakhshian won the Outstanding Educator Award. Dr. Bakhshian was recognized for her exemplary work with outstanding students.

Sahar Bakhshian



Alex Sun

Alex Sun won the Jackson School Outstanding Research Award. Dr. Sun was recognized for his advances in data analytics and applications to fundamental research.

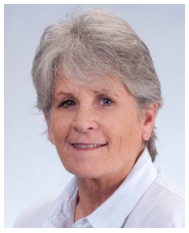
Staff Awards Recognizes Individual Achievements

Robert Morton

A new endowment, the Fisher Research Excellence Prize is named in honor of former Bureau director Bill Fisher, and funded by a generous contribution from Robert and Gwen Morton, the endowment rewards outstanding research done by a Bureau researcher. **Robert Morton** was selected as this year's Bureau Alumnus of the Year.

Gale Ashley

Winner of the 2023 Staff Excellence Award was Senior Financial Analyst **Gale Ashley**.



Jana Robinson

Bridget Scanlon

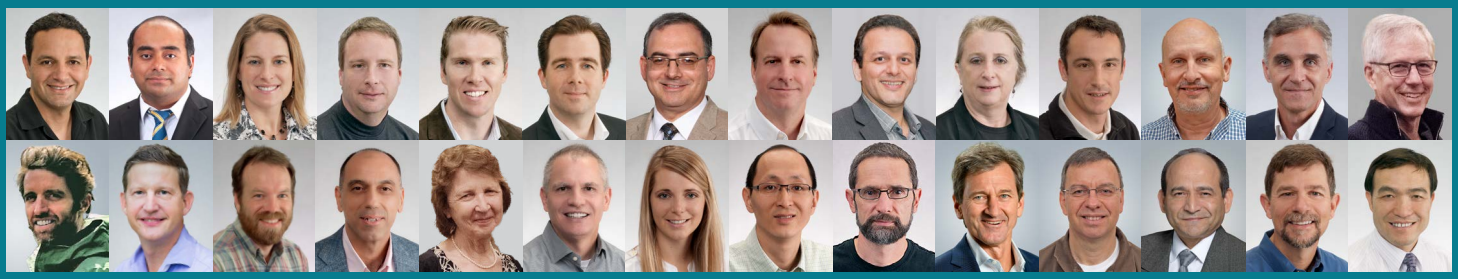
Staff service awards recognize 30 years of service to **Jana Robinson** and 35 years of service to **Bridget Scanlon**.

Honoring Rainmakers

The Bureau of Economic Geology generates a significant amount of its annual funding from the ability of its researchers to garner grant support from a variety of funders keenly interested in their research. Bureau researchers brought in large grants from governments, foundations, and industry.

The highly resourceful folks who have raised the most money in support of their innovative research initiatives—our "rainmakers"—are recognized at the annual Rainmakers' Dinner, a wonderful opportunity to celebrate them and to bring the Bureau community together.

Bureau Visiting Committee member Elliott Pew and his family sponsor the Pew Family Bureau of Economic Geology Rainmaker of the Year Award, a cash award supporting the top fundraiser's work. The Rainmaker of the Year Award recipient, recognized for her exceptional success in attracting funding, is Esti Ukar. Much of her work was funded by the U.S. Department of Energy.

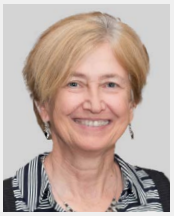


(Top left to lower right) **Mohsen Ahmadian, Shuvajit Bhattacharya, Tiffany Caudle, David Chapman, Jake Covault, Dallas Dunlap, Sergey Fomel, Peter Hennings, Seyyed Hosseini, Susan Hovorka, Xavier Janson, Jay Kipper, Toti Larson, Steve Laubach, Tyson McKinney, Tip Meckel, Jeff Paine, Alexandros Savvaidis, Bridget Scanlon, Mark Shuster, Katie Smye, Alex Sun, Zoltán Sylvester, Scott Tinker, Ramón Treviño, Carlos Uroza, Michael Young,** and **Tongwei Zhang.**

Bureau Researchers Honored at AAPG Annual Convention


Lily Horne


Bill Ambrose


Kitty Milliken

At its Society of Exploration Geophysicists (SEG) and American Association of Petroleum Geologists (AAPG) International Meeting for Applied Geoscience & Energy (IMAGE '23) conference, the AAPG recognized several Bureau researchers for their exemplary accomplishments.

- **Lily Horne** was honored with the prestigious AAPG Petroleum Structure and Geomechanics Division 2023 Best Recent Publication Award for her outstanding research on fault interpretation in application to induced seismicity.
- **Bill Ambrose** received the 2023 Pioneer Award, recognizing long-standing AAPG members who have significantly contributed to the AAPG and who have made meaningful and significant contributions to the science of geology.
- AAPG's highest honor, the 2023 Sidney Powers Memorial Award, was presented to **Kitty Milliken** for her distinguished and outstanding contributions to and achievements in petroleum geology.

SME Hardinge Award

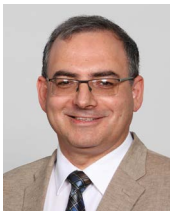
Bureau of Economic Geology researcher, **Rich Kyle** received the 2023 Hal Williams Hardinge Award, as well as the 2023 Mineral Industry Education Award, at the annual meeting of the Society for Mining, Metallurgy, & Exploration (SME). The Mineral Industry Education Award citation read, "In recognition of more than four decades of distinguished teaching of mineral resources and support of mining industry colleagues through applied research publications, short courses, and field trips."


Rich Kyle

The Hardinge Award was presented to Kyle by the SME Industrial Minerals Division and read "In recognition of his efforts as an educator, mentor, geoscientist, editor, and mining professional, and for his contributions to the knowledge of industrial minerals and earth resources." Kyle mentored many graduate and undergraduate students, including those of underrepresented groups, providing practical experience that helped prepare them for applied research and mineral industry careers.

Kyle's Texas industrial minerals research and public service was done with Bureau appointments, starting with the publication The Barite Industry and Resources of Texas, and with chapters four and eight in Report of Investigation 286, The Geologic Basement of Texas: A Volume in Honor of Peter T. Flawn, as well as decadal versions of the Texas Industrial Minerals map. He compiled the Texas mineral industry annual review for Mining Engineering from 2001 to 2008. Kyle and **Brent Elliott** published an update "Past, present, and future of Texas industrial minerals" in Mining, Metallurgy & Exploration. He is a longtime participant in the annual Forum on the Geology of Industrial Minerals and is a member of the SME Legion of Honor.

Audience Choice Award


Sergey Fomel

Bureau researcher and principal investigator of the Texas Consortium for Computational Seismology, **Sergey Fomel**, participated in a hackathon at the annual meeting of the European Association of Geoscientists and Engineers (EAGE). The event allowed geoscience professionals and natural language processing experts to network with each other, work together, and demonstrate their expertise.

Fomel won the Audience Choice Award in a team with Chevron's Steven Braun. The team developed code that used the ChatGPT language model to automatically extract summaries and keywords from almost 900 EAGE expanded abstracts and to perform clustering data analysis based on the extracting keywords.

Outreach

Chock Woodruff Jr. and Christian Dohse at Mt. Bonnell with Boy Scout troops.

Field Trips, School Visits, Tours, and Webinars

Bureau geologists **Chock Woodruff** and **Linda Ruiz McCall** met **Austin area Boy Scouts** (boys and girls) at Mt. Bonnell in Austin. The scouts' field trip was hosted by the Austin Geological Society with leadership by Christian Dohse. Scouts came to learn about Central Texas Geology and earn badges. The spectacular outdoor setting and the **Texas GeoSign** at Mt. Bonnell made it a pleasurable educational experience for all.

Texas GeoSigns

The Bureau's **Texas GeoSign** team established a new partnership with Texas Parks and Wildlife to erect interpretive signs for the public at state parks. GeoSigns at Pedernales Falls and Guadalupe River State Parks are scheduled for installation in 2024. The plan is to continue the collaboration for future signs at other state parks. For information on the **Texas GeoSign** project, please visit the website at https://www.beg.utexas.edu/geosign

Students taking sand dune measurements in the Texas High School Coastal Monitoring Program.

EarthDate

The Bureau continues to produce additional episodes on the immensely popular **EarthDate** public service radio program. Broadcast in all 50 states and abroad, over 360 episodes are currently available on the website where you can listen, read, and download full text of the content. https://www.earthdate.org/

Texas High School Coastal Monitoring Program

The **Texas High School Coastal Monitoring Program (THSCMP)** is a Texas Coastal Management Program-sponsored research and outreach effort that completed its 25th year of data collection in 2023. The program is designed to help students living on the Texas coast develop a better understanding of their natural environment. For more information and to find data, project reports, journal articles, and additional educational resources, please visit the **THSCMP** website at https://www.beg.utexas.edu/thscmp/.

Bureau researcher Amanda Calle shows students rocks

Geology Day

Bureau staff engaged 250 elementary school students and 11 teachers at Thornton Elementary in Temple, Texas, with a **Geology Day** celebration that included activities and demonstrations about volcanoes, dinosaurs and other fossil life, layers of the earth, rocks, the water cycle, and the mystery of invisible gases such as carbon dioxide. The students had spent several weeks studying a geology curriculum that teaches reading skills while building content knowledge about the earth, and the Bureau team was called to help enrich their learning experience.

Fort Valley State University M-SEA students tour Austin Core Research Center with Linda Ruiz McCall.

Summer Student Visitors

Visiting high school students from Georgia's **Fort Valley State University's M-SEA program** returned for another summer visit to the Austin Core Research Center and Stoneburner Family Rock Garden. Dr. Isaac Crumbly, Director of Cooperative Energy Programs stated that he wanted to expose his students to the important research being conducted at the Bureau.

Bureau Engages Educators at the Conference for the Advancement of Science Teaching

Bureau staff joined approximately 3,500 teachers in Houston for the annual Texas **Conference for the Advancement of Science Teaching (CAST)**. The meeting provided an excellent forum for Bureau staff to communicate directly with educators and share resources.

Lucy Phlegar (left) and Linda Ruiz McCall (right) at the Bureau exhibit at CAST.

Research Consortia

Research Partnerships with the Bureau of Economic Geology

The Bureau of Economic Geology conducts objective, impactful, and integrated geoscience research on subjects of high interest to a broad spectrum of stakeholders, including energy and environmental firms, government agencies, and the scientific community, a great number of which actively participate in its many research consortia. Each consortium is designed to complement partner efforts to research a key exploration, production, environmental, or energy economics question. Participation is on a subscription basis. Member benefits vary, but generally include first-look privileges at research outcomes, access to research teams, invitations to annual review meetings, and individual meetings with researchers for presentation and dialogue.

Members also benefit from interactions with counterparts in fellow member organizations. Each Bureau research consortium has a dedicated team of full-time Bureau researchers. Many of them host talented graduate students, with the teams combining seasoned experts and early career specialists. Experienced and effective senior researchers lead each consortium.

Contact the principal investigator of any program of interest to you. For further information about these research consortia, or about the breadth of your organization's engagement with the Bureau, please contact us at 512-471-1534.

Download the consortia brochure: www.beg.utexas.edu/about/reports-and-information.

Advanced Energy Consortium

Mission

Our mission is to illuminate the subsurface reservoir using novel micro- and nanosensing technology developed collaboratively with Advanced Energy Consortium (AEC) members and the global community.

Research Thrusts

Over the past decade, the AEC has played a significant role in enabling nanotechnology solutions for the oil and gas industry. In collaboration with our member companies and researchers, the consortium evolved from fundamental research at individual university labs into a set of integrated, multicomponent, and multi-institutional applied research programs in 2022, transforming the technology of subsurface monitoring and creating exciting field demonstrations to validate our technology. The AEC's reach has extended far beyond simply oil or gas applications and now encompasses a broader spectrum of alternative energy and environmental applications.

Research Challenges

In the decade since its inception, the AEC has progressed nanotechnology from fundamental to applied research and is now targeting commercial applications such as precise reservoir imaging of hydraulic-fracture networks using electromagnetic-contrast agents; microsensor-data logging in wellbores, pipelines, and other infrastructure; and targeted payload deliveries in a host of environments.

Membership

Now is truly an excellent time to be a part of the AEC family. AEC research revenues are increasing as we attract new members. Our level of innovation remains unsurpassed, and we are a recognized leader in nanotechnology research, as demonstrated by our numerous filed patents and papers and our team's prestigious 2019 Best Paper Award from the *Journal of Environmental & Engineering Geophysics*. We invite companies who are ready to transform the future of the energy industry to talk with us about empowering people and protecting the environment using advanced technology.

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Applied Geodynamics Laboratory

Mission

Pure and applied research in salt tectonics has been a strong component of the Bureau's research program since the late 1970's. Applied Geodynamics Laboratory (AGL) research comprises a mix of physical and mathematical modeling, seismic- and field-based mapping, and structural, stratigraphic analysis of some of the world's most spectacular salt basins. In addition, starting in 2019, the AGL added a new research theme investigating mobile shales. Here we use our existing expertise in diapirism and seismic interpretation, combined with physical and mathematical modeling, to understand the origin, evolution, and seismic imaging of mobile-shale structures.

Research Thrusts

Concepts and terminology pioneered by the AGL over the past quarter century have profoundly influenced salt tectonics and are now widely disseminated throughout the oil industry. The AGL strives to effectively communicate these results via a variety of media, including *Salt Tectonics: Principles and Practice*, the leading textbook on the subject in the world.

Research Challenges

The primary goals of the AGL are to develop a conceptual framework for the full range of salt and mobile-shale tectonics; to analyze connections among physical models, mathematical models, seismic data sets, and field examples from all over the world; and to disseminate complex technical information to a constantly shifting spectrum of industrial and academic supporters. Areas of focus include mobile-shale mechanics; mobile-shale piercement mechanisms; salt weld; salt canopy; reactive, falling, and squeezed diapirs; shape of passive diapirs and sheets; fault families (with the University of Colorado); extrusive salt sheets (with BP and ExxonMobil); extensional turtle and mock turtle structures; mechanics of salt-sheet advance; the origins of minibasins; intrusive salt plumes; and salt sutures.

Membership

The 21 supporting companies of the AGL include a wide range of industry partners from around the world.

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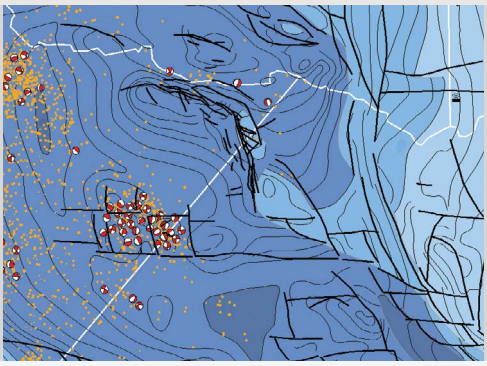
Center for Injection and Seismicity Research



Mission

The Center for Injection and Seismicity Research (CISR) is a multidisciplinary, intercollegiate research consortium. CISR works to understand the processes that influence fault rupture and seismicity, and other dynamic reservoir impacts stemming from large-scale injection.

Research Thrusts

CISR conducts fundamental and applied research to assess the dynamic impacts of injection including seismogenic faulting, reservoir characteristics associated with stress change, fault slip hazard evolution, fluid flow and pore pressure effects, and to provide stakeholders with data, models and analyses to mitigate hazard and optimize subsurface operations. CISR relies on research specialists spanning geology, seismology, geomechanics, hydrogeology, reservoir engineering, and data science and collaborates broadly with other institutions within Texas and beyond.

Research Challenges

Billions of barrels of injection have occurred in basins undergoing unconventional petroleum development, resulting in induced earthquakes, deformation of the ground surface, and other challenges. Handling water produced with oil and gas is a challenge to the sustainability of current practices employed by the petroleum industry. CISR's research findings have application to all aspects of injection including CCS, subsurface gas storage, and geothermal energy development. Understanding the interplay among complex operational drivers of induced seismicity, other dynamic injection capacity constraints, and interdependent subsurface physical processes is a daunting challenge that the Bureau is pursuing head-on.

Membership

Most of the major energy companies that operate in Texas' unconventional plays as well as international operators are CISR members. Midstream water management and land management companies are also CISR members. Each company has one member on the CISR Advisory Committee. Member companies are encouraged to enter into additional confidentiality agreements with CISR to contribute proprietary data and information to advance CISR research.

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Dr. Katie Smye
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Comparing Electricity Options

Mission

The Comparing Electricity Options (CEO) research consortium is to understand the trade-offs among society's goals of mitigating climate change, improving local environments, and providing reliable and affordable energy that can sustain a healthy economy for future populations. Using a three-phase project design, the goals of the CEO consortium are to create tools that support energy-sector decisionmakers with better economic and environmental assessments to manage environmental, social, and governance risks across global supply chains; highlight where innovation can mitigate impacts; and inform policies that encourage innovation.

Research Thrusts

We are developing interactive tools to allow wider audiences to quickly compare alternative scenarios. In Phase 1, we have conducted comparative life cycle assessments (LCAs) of different power plants that generate the same amount of electricity per year and looked at differences in 18 environmental impact categories. The LCA system boundaries encompass natural resource extraction, generator manufacturing, power plant operations, and end of life. Now, in Phase 2, we are investigating how these different technology mixes impact the Texas grid so that we can understand how changes in energy systems alter grid stability. We include costs associated with different generation mixes over time, including new transmission and distribution infrastructure. In Phase 3, we will use results from Phases 1 and 2 to develop a new type of consumer-level cost estimate for electricity that includes environmental and system costs.

Research Challenges

We consider many materials and technologies with complex global supply chains, with each supply chain including many processes. Values for numerous inputs vary widely by location. Publicly available data on global supply chain activities are often scarce. Therefore, we must analyze numerous scenarios for LCAs, power systems, and consumer costs while continuously pursuing new information, preferably primary data, from supply chain stakeholders.

Membership

CEO is currently funded by six industrial affiliates. Membership is tiered to accommodate all interested partners.

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Fracture Research and Application Consortium

Mission

Fracture research at The University of Texas at Austin seeks fundamental understanding of fracture processes with the aim of finding new geological, geophysical, and engineering methods to explain and successfully predict, characterize, and simulate reservoir-scale structures. The research is both fundamental and practical, aiming at improving prediction and diagnosis of fracture attributes in geothermal and hydrocarbon reservoirs and accurately simulating their influence on production. Research is organized around the Fracture Research and Application Consortium (FRAC) and conducted together with scientists from member companies. Students are an important part of the program.

Research Thrusts

Accurate prediction and characterization of fractures hold great potential for improving production by increasing the success and efficiency of exploration and recovery processes. New analytical methods produce data that can enhance well test and seismic interpretations, and can be used in reservoir simulators. We are developing new and more reliable methods to quantify fracture patterns in 3D and to predict hydraulic-fracture propagation in naturally fractured, geothermal, and unconventional reservoirs.

Research Challenges

Faults and fractures are difficult or impossible to characterize adequately using currently available technology. Fractures have been challenging to sample and model, posing serious obstacles to exploration and development. FRAC's approach is helping to overcome the limitations of current methods.

Membership

Training in techniques, software, and FRAC's workflow is a benefit of membership. Annual meetings cover measurement, interpretation, prediction, and simulation of fractures and mechanical properties in carbonate rocks, mudstones, and sandstones.

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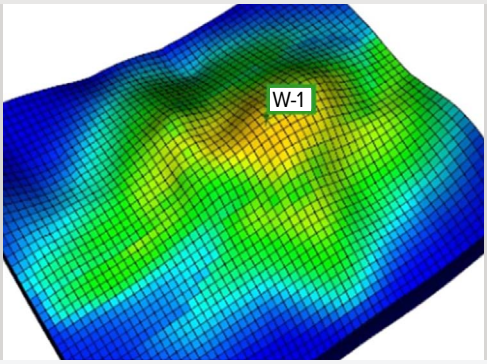
GeoH$_2$



Mission

GeoH$_2$ conducts geoscience and economic research to facilitate and advance the development of a hydrogen economy *at scale*. GeoH$_2$ connects industry professionals in the energy and power sector with researchers in energy geoscience, subsurface engineering, and energy economics to conduct subsurface hydrogen storage research and technology development, market feasibility analyses, and to explore novel subsurface concepts related to hydrogen.

Research Thrusts

Research activities include reservoir modeling coupled with laboratory experiments to understand the behavior of hydrogen in geologic reservoirs such as depleted fields, saline aquifers, and salt dissolution caverns. This work informs techno-economic analyses for different reservoir types and fields for a range of anticipated energy markets and regulatory frameworks. Concepts such as in situ generation of hydrogen, controls on natural hydrogen, and dispersion of hydrogen in reservoirs are also investigated.

Research Challenges

While subsurface hydrogen storage can build on decades of natural gas underground storage, the unique properties of hydrogen require an adaptation of existing storage technology to account for differences in storage capacity, reservoir integrity, and requirements on hydrogen purity. Existing proven storage technology in underground salt caverns requires a reassessment for further upscaling. Predictive economic models of industrial-scale subsurface hydrogen storage face uncertainties in market, regulatory, and technology development.

Membership

Consortium members meet twice a year for research and development reviews, with additional project planning and review meetings as needed. Training and sponsor company visits can be arranged in person or virtually.

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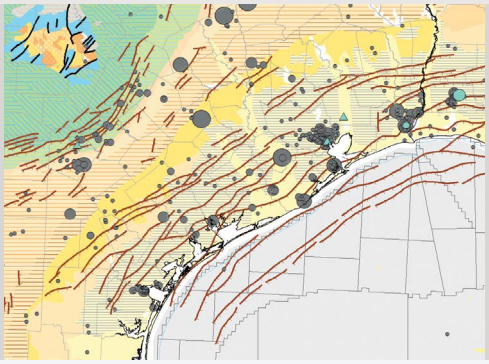
Gulf Coast Carbon Center



Mission

The Gulf Coast Carbon Center (GCCC) conducts research and training in geologic storage technologies used to reduce emissions of carbon dioxide (CO_2). CO_2 is captured from either highly concentrated emissions from industrial facilities or low concentrations from the atmosphere. Once captured, CO_2 is injected kilometers below the ground surface into porous rocks for permanent storage, and the CO_2 becomes isolated from the atmosphere.

Research Thrusts

The GCCC's mission and research into large-volume CO_2 storage achieves the following: (1) improves structural and stratigraphic characterization methods and simulation approaches for identifying suitable storage locations; (2) creates pore- to basin-scale workflows to help projects operate at maximum injection rates and over prolonged periods of time; (3) assesses storage resources in offshore subsea settings in the Gulf of Mexico and globally; (4) develops and tests monitoring approaches to meet regulatory and social license operating demands; (5) monitors long-running CO_2-enhanced oil recovery projects to help address the intersection of economic and storage value while also assessing life-cycle considerations; and (6) provides information and outreach on carbon capture and storage (CCS) to a variety of stakeholders.

Research Challenges

CCS deployment is not happening at the rate and scale needed to achieve global emission reduction goals. Many influential stakeholders, from industrial investors, policymakers, to journalists, do not have the proper information needed to see the critical role of CCS in order to attain these goals and the viability of CCS.

Membership

Members meet twice a year, sometimes jointly with other related groups to discuss priority areas of research, and members receive a quarterly newsletter to stay updated with GCCC events and activities.

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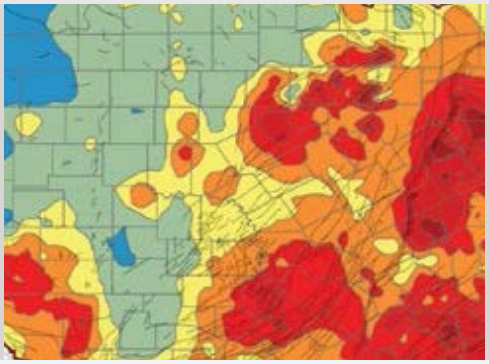
HotRock Geothermal



Mission

HotRock is an industry-funded research consortium to find and fill the science and technology gaps needed to further develop the geothermal anywhere ecosystem. This incorporates science, engineering, economics, policy, and entrepreneurship efforts led by the Bureau, an organization with the skills and proven track record to lead a major enterprise such as this.

Research Thrusts

The HotRock research consortium addresses the broadest of research and engineering topics, from deep within the subsurface to the consumer, including subsurface geology and engineering; surface power generation, grids, economics, and policy; and direct heat applications for heating and cooling, agriculture, and more. As these applications have disruptive impact in the race to lower carbon emissions, the scope is international, exploring how resources and certain technologies that are successful in one region could be scaled up in others.

Research Challenges

Evident issues that need work include, but are not limited to, the following: fit-for-purpose geothermal reservoir characterization—best indicators of suitable heat reservoirs—transfer of oil and gas methodology into geothermal; downhole tools and methods for well construction, well monitoring, and production enhancement; modeling heat transfer in fractures and into wellbores; supercritical CO_2-rock interactions; induced seismicity monitoring and mitigation, higher-temperature materials, sensors, cements, and more.; comparing designs and economics of diverse methods for harvesting heat; techno-economics of converting heat to electricity; low-temperature heating and cooling uses.

Membership

HotRock membership is $75,000 per year. Companies are able to collaborate with principal investigators and researchers, obtain all research results, and influence areas of research. Each member company appoints a representative to the advisory board to help make strategic decisions on spending and research. HotRock holds annual meetings attended by sponsors and other invited guests.

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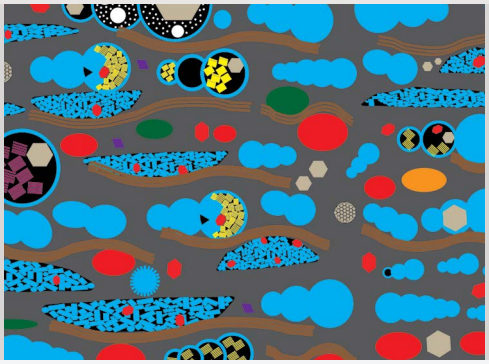
www.beg.utexas.edu/hotrock

Mudrock Systems Research Laboratory



Mission

Since 2009, the Mudrock Systems Research Laboratory (MSRL) has improved our knowledge of reservoir characterization and the stratigraphic framework of mudrock systems by integrating core measurements, fluid saturations, fluid flow modeling, and petrophysics. MSRL studies integrate geology, geochemistry, petrophysics, and well logging to understand geological heterogeneities in the subsurface of oil and gas reservoirs. MSRL research involves exploration, drilling and completions, and understanding controls on reservoir quality and fluid properties.

Research Thrusts

MSRL's core-based research and workflow aims to understand fundamental processes impacting reservoir quality and deliverability. Our petrophysical labs not only measure porosity and permeability, but are working toward advancing workflows to measure relative permeability and wettability. The inorganic geochemistry lab applies X-ray fluorescence and isotope geochemistry to better define facies and their continuity. The organic geochemistry lab measures gas adsorption, oil and gas compositions, thermal maturity, and biomarkers from rock extracts and produced fluids to understand the sources and quality of organic matter, to compare and correlate sources to produced fluids, and to help interpret the drainage rock volume. Reservoir heterogeneity in 3D was quantified using an integrated wireline log and chemofacies model validated by core-based lithofacies, which includes microscopic study of grain types, texture, and diagenesis.

Research Challenges

Mudrock systems are reservoirs for unconventional resources, source rocks for conventional petroleum plays, caprocks and seals for conventional resources, and CO_2 and hydrogen storage in the subsurface. There is a great need to devise more efficient ways of extracting oil and gas from these reservoirs. MSRL seeks to develop new methodologies and workflows for characterizing the dynamics of rocks and fluids over production history.

Membership

Consortium members receive priority access to research data, interpretations, and reports. Results are distributed to members through annual workshops, seminars, short courses, and the internet.

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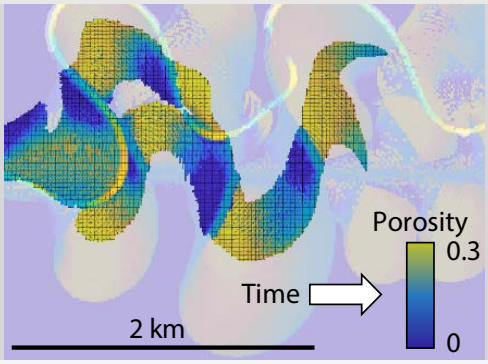
Quantitative Clastics Laboratory



Mission

The mission of the Quantitative Clastics Laboratory (QCL) is to develop a predictive understanding of processes and controls on sediment transport and the stratigraphic evolution of depositional systems, with applications in subsurface characterization, modeling, and correlation.

Research Thrusts

The QCL's researchers study entire sediment routing systems, from source to sink, and all clastic depositional environments. The laboratory's researchers are experts in traditional methods of field geology and subsurface characterization. They also develop machine learning algorithms for correlation of rock properties in the subsurface and mapping of depositional systems in remote sensing data and take characterization further through analog comparison and numerical modeling to gain a more predictive understanding of depositional systems.

Research Challenges

The QCL offers research, training, and technology development for subsurface characterization. Research is motivated by the following questions: (1) What are the sources and scales of heterogeneity impacting subsurface fluid flow in production or carbon capture, utilization, and storage (CCUS)?, (2) How should realistic geology be incorporated into subsurface models, and how does it affect fluid flow?, and (3) What training, algorithms, and software tools can we develop to estimate subsurface risk and expedite subsurface characterization?

Membership

Multiple meetings, workshops, and face-to-face consultations with industry and government members are held annually. The QCL offers members unique access to UT Jackson School of Geosciences expertise, industry subsurface data, investigations of depositional environments and their interconnections at multiple scales, and an evolving quantitative database of clastic depositional systems architecture.

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Reservoir Characterization Research Laboratory

Mission

The primary objective of the Carbonate Reservoir Characterization Research Laboratory (RCRL) is to utilize geological, geophysical, and petrophysical data obtained from both outcrop and subsurface carbonate reservoir strata. This data is the foundation for development of innovative methodologies and concepts aimed at explaining and describing the 3D reservoir environment to enhance hydrocarbon recovery. The RCRL is committed to technology transfer and education, consistently providing cutting-edge training opportunities.

Research Thrusts

The RCRL adopts a comprehensive approach to reservoir characterization, focusing on four main scales of investigation: (1) platform- to basin-scale stratigraphy and structural geometries; (2) reservoir architecture encompassing matrix and nonmatrix systems; (3) characterization of petrophysical, structural, and geomechanical properties; and (4) pore networks and their distributions within the reservoir. The RCRL places a strong emphasis on quantifying observations, ensuring that its findings are applicable to reservoir development. We aim to provide valuable predictive relationships and conceptual tools for reservoir characterization and play analysis.

Research Challenges

The RCRL is actively engaged in the following: (1) Lower Permian shelf-to-basin stratigraphic and structural architecture of the Delaware and Midland Basins; (2) Gulf of Mexico carbonate reservoir settings, pore systems, fracture characteristics, and margin variability; (3) Cenozoic carbonate platform systems, high-resolution stratigraphy, and structural configuration of shelf margins; (4) characterization of fractured carbonate reservoirs in both outcrop and subsurface analogs; (5) origin and petrophysics of tight limestone and dolomite reservoirs; (6) regional reservoir characterization of the Austin Chalk trend; and (7) carbonate rock mechanics and acoustic-properties research.

Membership

RCRL membership is available at a cost of $65,000 per year. Sponsors are encouraged to commit to a two-year agreement at a reduced rate of $60,000 per year, allowing for better planning of longer-range research programs.

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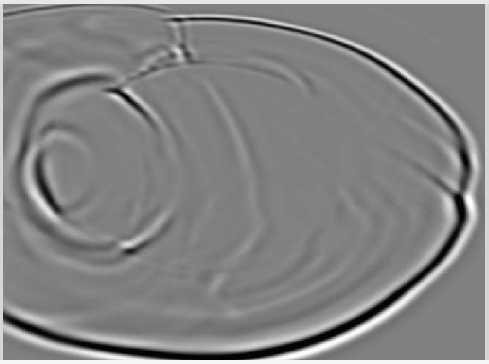
Texas Consortium for Computational Seismology



Mission

The mission of the Texas Consortium for Computational Seismology (TCCS) is to address the most critical and challenging research problems in computational geophysics as experienced by the energy industry and to educate the next generation of research geophysicists and computational scientists.

Research Thrusts

TCCS has pioneered new developments in several application areas: deep learning methods for seismic interpretation, including automatic detection of lithofacies, faults, and geobodies; deep learning methods for seismic data processing and imaging, including noise attenuation, computational wave propagation, and least-squares seismic migration; optimal transport methods for seismic full-waveform inversion; shaping regularization for improving acquisition and imaging with simultaneous sources; diffraction imaging for increasing the resolution of seismic imaging and reservoir characterization; and seismic anisotropy and attenuation parameterizations for efficient imaging in complex media. A new research thrust focuses on instrumentation and techniques essential for the energy transition, such as survey design for seismic monitoring and quantitative analysis of signal-to-noise ratios and data repeatability in land seismic.

Research Challenges

A collaborative effort between the Bureau and the UT Oden Institute for Computational Engineering and Sciences, TCCS develops innovative analysis methods for seismic data. Focusing primarily on resource exploration and carbon capture and storage, TCCS addresses critical research areas such as quantitative data-driven survey design with quality metrics to ensure better evaluation of uncertainty, data-acquisition optimization with simultaneous sources, seismic interpretation automation, increased resolution in seismic reservoir characterization, and accurate estimation of subsurface properties through full-waveform inversion.

Membership

TCCS delivers two written reports and presents its findings in two research meetings annually. TCCS follows the discipline of reproducible research: every computational experiment result links to the open-source code required for reproduction and verification.

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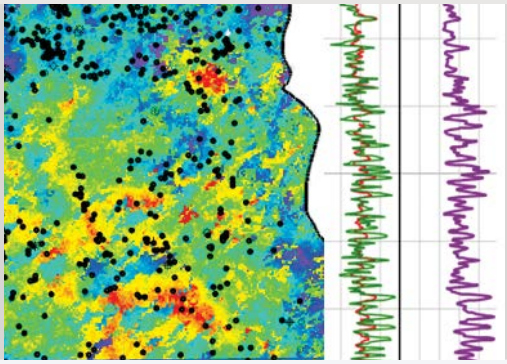
Tight Oil Resource Assessment



Mission

The mission of the Tight Oil Resource Assessment (TORA) is to provide our stakeholders with reliable and up-to-date estimates, projections, play-scale geologic models, and insights at the basin scale for the major U.S. tight oil and shale gas plays by conducting innovative, integrated research of in-place resources and recoverable volumes, play and well economics, and production forecasts with their environmental implications.

Research Thrusts

TORA employs a multidisciplinary, highly iterative evaluation process combining geoscience and engineering: (1) we create a basin-wide 3D facies architecture populated with petrophysical and geomechanical attributes and calculate in-place resources; (2) we model and match all well-production history before projecting future production, and we perform decline analysis using innovative in-house software; (3) we relate the productivity of existing wells to key subsurface and operational attributes to model the productivity of all undrilled locations; (4) we develop the full range of expected outcomes per well, including technological and cost improvements, pricing, logistics, drilling pace, well spacing, and lease accessibility; and (5) we use digital mapping to spatially link key geologic and operational practices to changes in per-well productivity. We also build sector-scale 3D subsurface models for focused studies and develop machine learning and physics-based workflows.

Research Challenges

TORA aims to characterize unconventional reservoirs up to the basin scale, building integrated models and market independent production outlooks. Building on over a century of Bureau Permian research and data from over 30,000 horizontal wells, TORA studies tight oil and gas formations to produce unbiased, data driven, and comprehensive, yet granular results. Our team continues to enhance our workflow to predict future productivity, hydrocarbon recoveries, economic viability, and play-wide production rates at a one square mile scale.

Membership

TORA membership is $60,000 annually.

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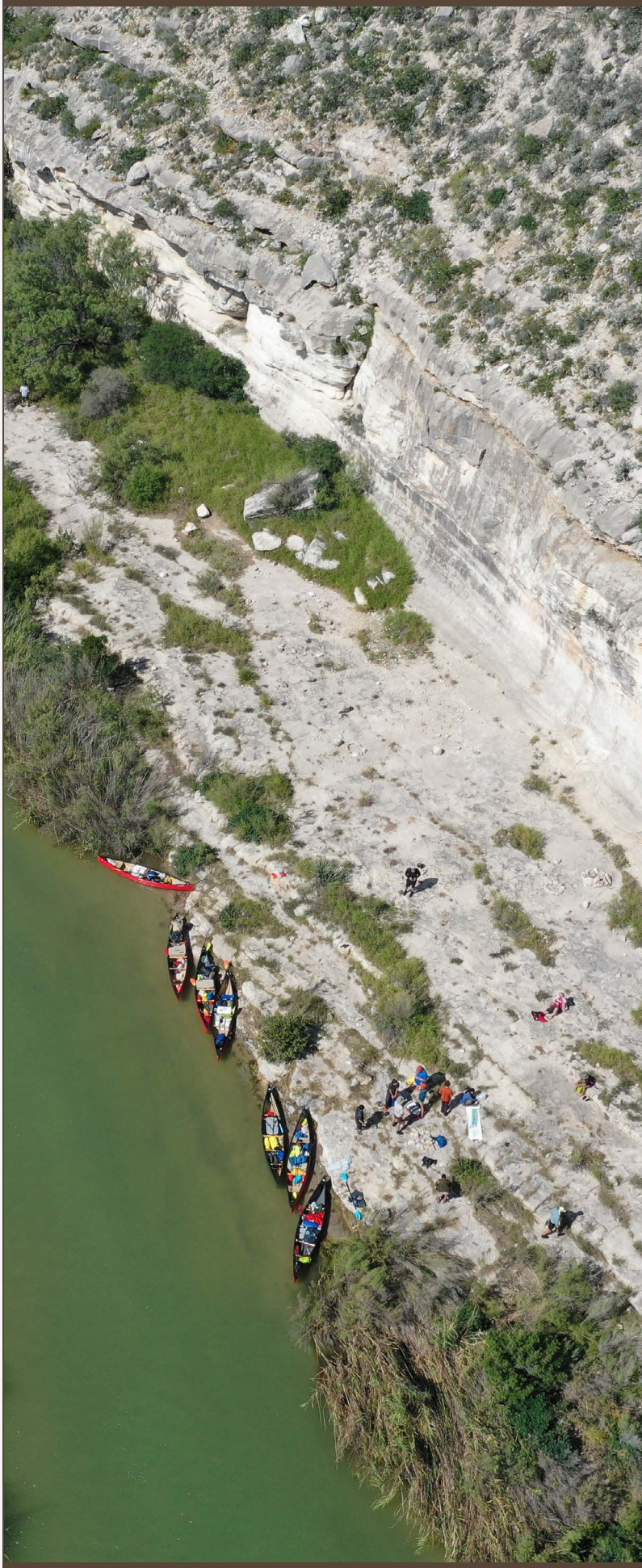


Research Programs

TexNet Seismic Monitoring Program

Mission

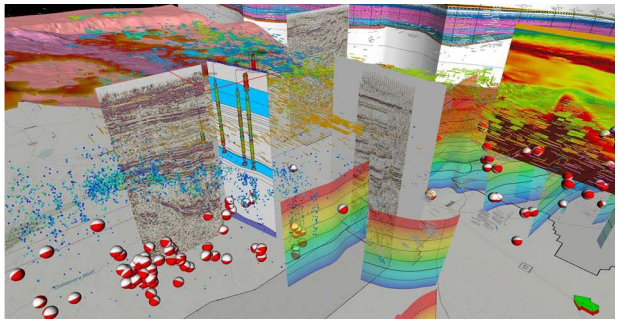
The Bureau's TexNet research program is the State of Texas' earthquake analysis service. TexNet operates a statewide network of over 200 seismometers, capturing vital information on seismic activity across Texas. TexNet hosts a skilled, multidisciplinary team of scientists and engineers who research the geologic and seismic data obtained by the network and from other resources.

Program Thrusts

TexNet actively monitors earthquake activity throughout Texas. TexNet members are also working to determine the causes of earthquakes and to lessen these events' future impacts on people and property, developing algorithms to improve the seismic data analysis and imaging workflow and proposing machine learning approaches to solve diverse seismological problems. TexNet provides the public with safety information, emergency agencies with earthquake facts important to first responders, regulatory agencies with solid data to inform earthquake mitigation policy and decision-making, industry with information to shape earthquake safety and prevention practices, and researchers with reliable seismic data and interpretations for answering complex scientific questions.

TexNet Information

Earthquake data and earthquake monitoring information are now available through the interactive TexNet Earthquake Catalog at catalog.texnet.beg.utexas.edu. Relocated high-resolution earthquake data is now available at hirescatalog.texnet.beg.utexas.edu. Injection of produced water volume information is available at injection.texnet.beg.utexas.edu. All data products are available at texnet.beg.utexas.edu.



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State of Texas Advanced Oil and Gas Resource Recovery

Mission

The mission of the Bureau's State of Texas Advanced Oil and Gas Resource Recovery (STARR) program is to conduct geoscience and engineering research to increase the profitability of earth resources within the State of Texas while encouraging responsible economic development and supporting education and environmental stewardship.

Research Thrusts

Research thrusts of the STARR program and ongoing technology transfer to operators in the Texas energy industry are focused on: (1) carrying out integrated geoscience characterization studies relevant to the oil and gas industry; (2) developing improved oil recovery strategies, including optimization of waterfloods and CO_2 enhanced oil recovery; and (3) conceptualizing and developing geological, geophysical, and engineering projects to support the energy transition in Texas.

Research Challenges

Challenges undertaken by the STARR team are wide and varied, ranging from explaining subsurface characteristics that control oil and gas production in Texas reservoirs to engineering challenges associated with identifying best enhanced recovery practices that have the potential for increasing oil and gas production in Texas oil fields. STARR challenges have expanded into the understanding of how Texas subsurface resources can be positioned to play a role in the ongoing energy transition, aiming at increasing the diversification and resilience of Texas' energy industries and its economy.

Membership

No costs are associated with participation in the STARR program, which is funded by the State of Texas, although research matching support and willingness to facilitate publication of research results is encouraged.

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Critical Minerals

Geopolitical and technology developments related to energy transitions and other societal changes have placed unprecedented global demands for metals, critical minerals, and industrial materials. The United States is heavily dependent on foreign sources for the vast majority of these materials, notably for the critical minerals that are key to energy production and storage and other aspects of technology advancement and national security.

The economic geology program at the Bureau is collaborating with industry and other state and federal entities to locate, assess, and catalog critical and other mineral resources within Texas and the Gulf Coast, making available data and related sample sets to promote exploration for and development of domestic mineral supplies.

These resource studies range from conventional metal resource settings such as West Texas magmatic-hydrothermal, Coastal Plain uranium, and Central Texas and Gulf Coast industrial and critical mineral systems. Current mapping efforts focused on critical minerals associated with igneous bodies in Trans-Pecos Texas are being supported by the cooperative federal and state components of the STATEMAP and Earth MRI programs. These efforts follow the 2021 completion of a regional airborne geophysical survey flown by the U.S. Geological Survey.

In addition, unconventional sources of critical minerals such as lithium from produced waters, rare earth elements in Gulf Coast lignites, coal power plant ash, bauxite residue, and historic mine wastes are being studied. Domestic supply chain security and related environmental concerns require innovation to responsibly source key mineral resources to support large-scale energy and infrastructure development for the growing Texas population.

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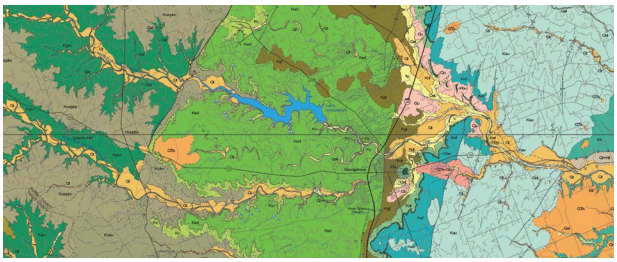

STATEMAP

Bureau mapping efforts continue to expand with the new U.S. GeoFramework Initiative, preparing seamless, three-dimensional geologic maps of the United States. The Bureau produced 13 new maps and geodatabases for the long-running STATEMAP program in 2023. STATEMAP is part of the National Cooperative Geologic Mapping Program, administered by the U.S. Geological Survey (USGS). The State of Texas Advanced Resource Recovery (STARR) program and the Jackson School of Geosciences provide matching funding to complement federal support.

Since STATEMAP began in the 1990s, 274 geologic maps have been published in the Bureau's Open-File Maps series, along with several compilation maps in the peer-reviewed Miscellaneous Maps series. All maps are available through The Bureau Store.

This year's new map areas include the Anahuac in the Galveston Bay area, the Rockport, Tivoli SE, and Tivoli SW quadrangles in the San Antonio and Aransas Bay areas, the Monument Mountain, Panther Creek, and Montopolis quadrangles in Central Texas, the Dolan Springs quadrangle in southwestern Texas, and the Small quadrangle in far West Texas. In addition, three compilation maps were completed for the southeastern part of the Llano Uplift in Central Texas, the eastern half of the Matagorda Bay area, and the Galveston East Bay area on the Coastal Plain. The coastal quadrangles document major sea level changes during repeated glacial and interglacial cycles of the late Pleistocene and Holocene eras. The central and southwestern Texas quadrangles focus on water and mineral resources and on geologic units relevant to rapidly changing land-use patterns in the Central Texas urban growth corridor. The Small quadrangle characterizes critical mineral resources in the Trans-Pecos following completion of an airborne geophysical survey by the USGS. Also completed during the year was a statewide map and database showing significant salt deposits in the East Texas Basin, the Coastal Plain, and the Permian Basin.

Major contributors to the recent STATEMAP effort include Tiffany Caudle, Brian Hunt, Jeffrey Paine (Principal Investigator), Chock Woodruff, Brent Elliott, John Andrews, Jennifer Morris, Ben Grunau, Mark Helper, Linda Ruiz McCall, and Carson Werner. Bureau media staff Jana Robinson, Francine Mastrangelo, Nancy Cottington, Elyse Vane, Amanda Masterson, and Jason Suarez prepared the maps for publication.

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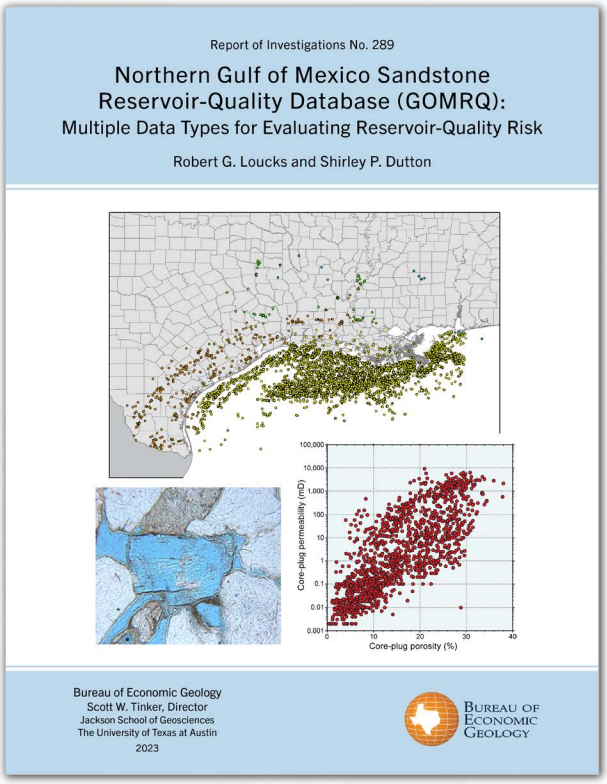
Publications



Northern Gulf of Mexico Sandstone Reservoir-Quality Database (GOMRQ)

Robert G. Loucks and Shirley P. Dutton, 2023, Northern Gulf of Mexico Sandstone Reservoir-Quality Database (GOMRQ): Multiple Data Types for Evaluating Reservoir-Quality: The University of Texas at Austin, Bureau of Economic Geology Report of Investigations No. 289, 16 p., doi.org/10.23867/RI0289D.

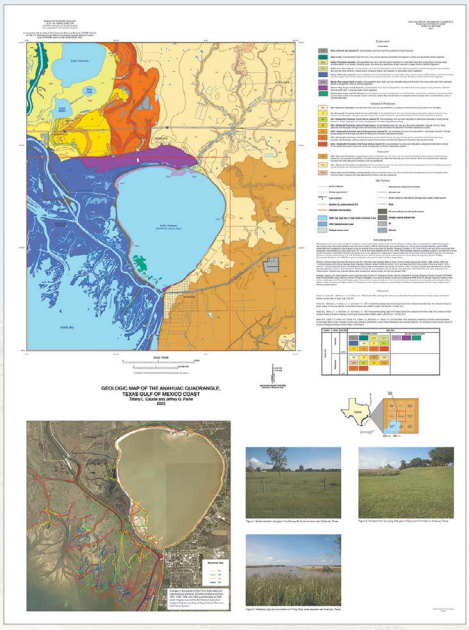
Report of Investigations No. 289 evaluates reservoir quality (i.e., porosity and permeability) as a major risk factor in forecasting economical reservoirs in sandstones. Many geologic factors affect reservoir quality, which makes forecasting difficult. However, construction of statistical and petrographic databases that collect a large population of reservoir quality data under known conditions greatly aids a worker in producing a forecast. Such databases provide a realistic range of reservoir-quality values that can be expected under designated conditions, which constrains the forecast.

Two types of reservoir-quality data sets have been constructed for the northern Gulf of Mexico sandstones ranging in age from Jurassic (Norphlet Formation) to Pleistocene. One data set is a collection of statistical reservoir-quality data, such as core porosity and permeability analyses, wireline-log porosity analyses, pool-data summary statistics, and mercury injection capillary pressure. The other data set consists of petrographic thin-section point-count analyses with associated porosity and permeability measurements. The assembly of these large reservoir quality databases into Microsoft Excel digital spreadsheets allows the data to be integrated into analytical programs to forecast reservoir quality.

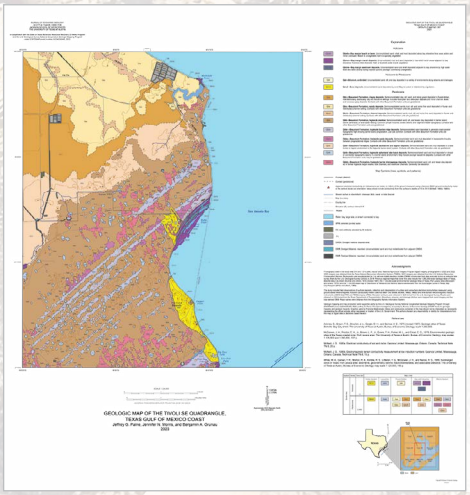
The Bureau Store
The official store of the Bureau of Economic Geology

To purchase any of these publications, visit The Bureau Store: https://store.beg.utexas.edu/

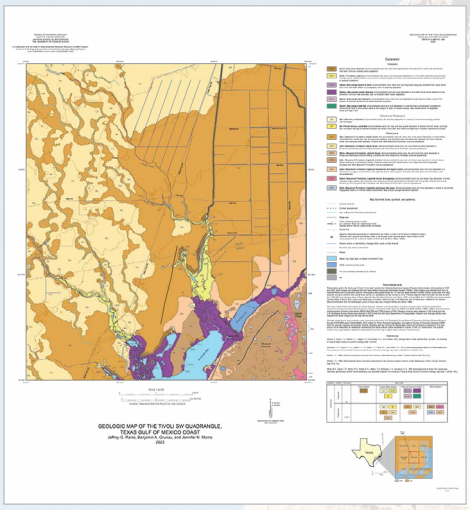
The Bureau's Open-File Maps series, along with several compilation maps in the peer-reviewed Miscellaneous Maps series, are available through The Bureau Store.



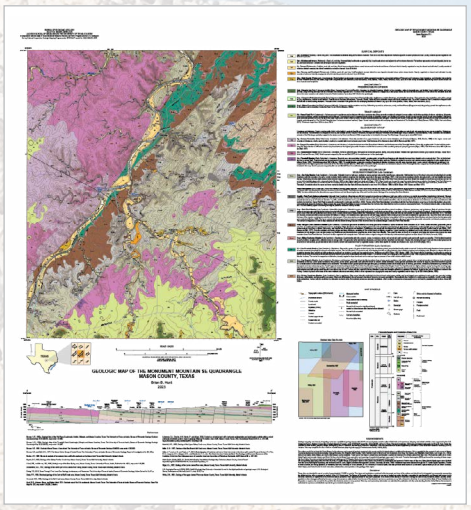
Geologic Map of the Anahuac Quadrangle, Texas Gulf of Mexico Coast
Caudle, T. L., and Paine, J. G., 2023: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 266, scale 1:24,000.



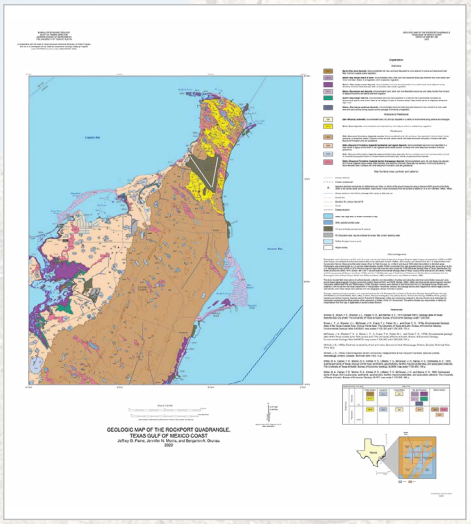
Geologic Map of the Tivoli SE Quadrangle, Texas Gulf of Mexico Coast
Paine, J. G., Morris, J. N., and Grunau, B. A., 2023: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 267, scale 1:24,000.



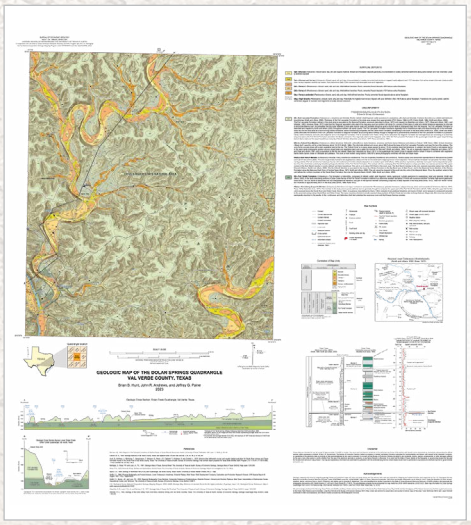
Geologic Map of the Tivoli SW Quadrangle, Texas Gulf of Mexico Coast
Paine, J. G., Grunau, B. A., and Morris, J. N., 2023: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 268, scale 1:24,000.



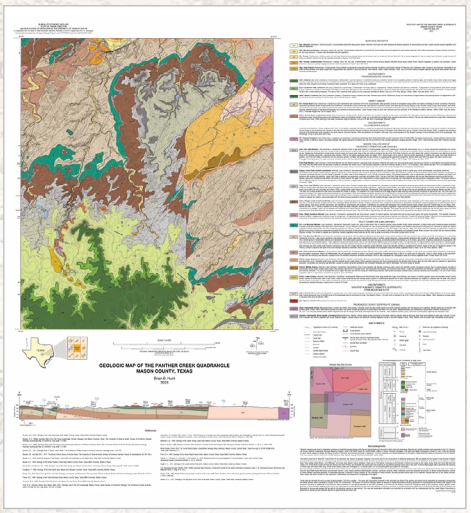
Geologic Map of the Monument Mountain SE Quadrangle Mason County, Texas
Hunt, B. B., 2023: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 271, scale 1:24,000.



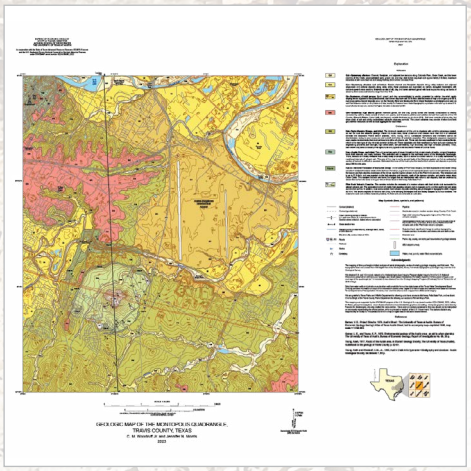
Geologic Map of the Rockport Quadrangle, Texas Gulf of Mexico Coast
Paine, J. G., Morris, J. N., and Grunau, B. A., 2023: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 269, scale 1:24,000.



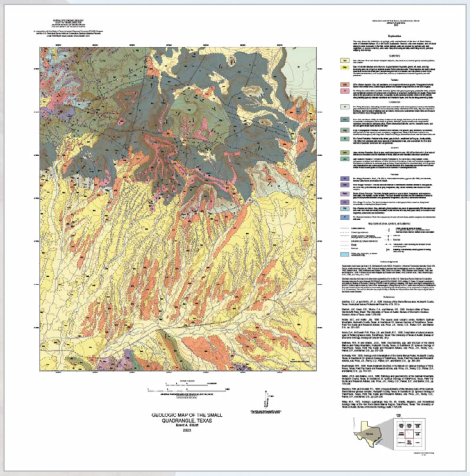
Geologic Map of the Dolan Springs Quadrangle Val Verde County, Texas
Hunt, B. B., Andrews, J. R., and Paine, J. G., 2023: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 272, scale 1:24,000.



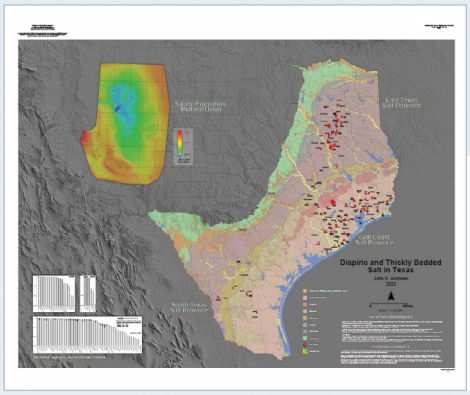
Geologic Map of the Panther Creek Quadrangle Mason County, Texas
Hunt, B. B., 2023: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 270, scale 1:24,000.



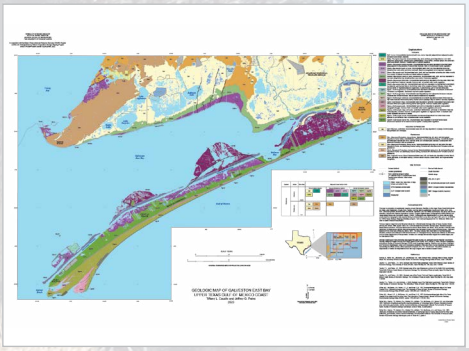
Geologic Map of the Mud Lake Quadrangle, Texas Gulf of Mexico Coast
Caudle, T. L., and Paine, J. G., 2023: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 273, scale 1:24,000.



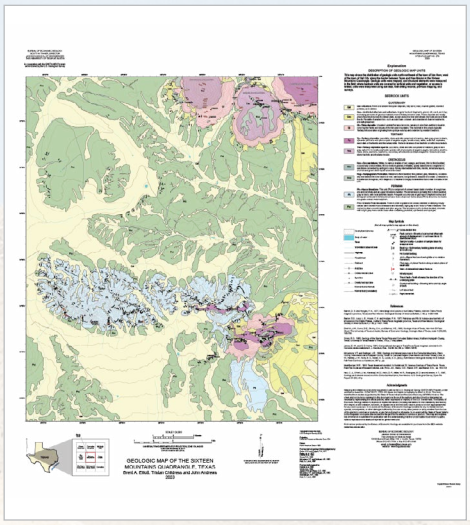
Geologic Map of the Small Quadrangle, Texas
Elliott, B, A. 2023: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 274, scale 1:24,000.



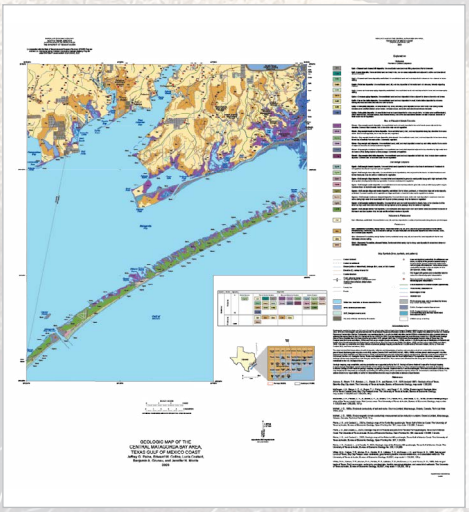
Diapiric and Thickly Bedded Salt in Texas
Andrews, J. R., 2023: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 278, scale 1:1,000,000.



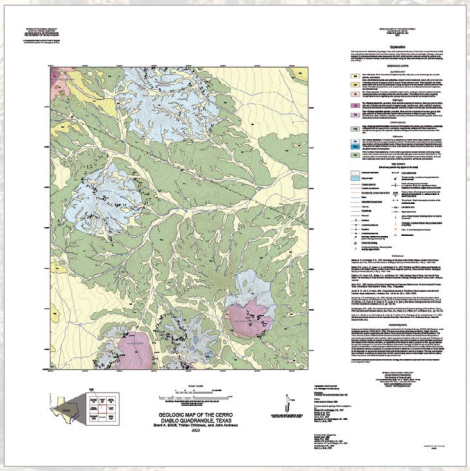
Geologic Map of Galveston East Bay, Upper Texas Gulf of Mexico Coast
Caudle, T. L., and Paine, J. G., 2023: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 275, scale 1:50,000.



Geologic Map of the Sixteen Mountains Quadrangle, Texas
Elliott, B. A., Childress, T., and Andrews, J. R., 2023: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 279, scale 1:24,000.



Geologic Map of the Central Matagorda Bay Area, Texas Gulf of Mexico Coast
Paine, J. G., Collins, E. W., Costard, L., Grunau, B. A., and Morris, J. N., 2023: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 276, scale 1:62,500.



Geologic Map of the Cerro Diablo Quadrangle, Texas
Elliott, B. A., Childress, T., and Andrews, J. R., 2023: The University of Texas at Austin, Bureau of Economic Geology Open-File Map No. 280, scale 1:24,000.

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Transitions

New Employees

The Bureau of Economic Geology continues to attract some of the most talented geoscientists in the world to conduct impactful research on a wide range of energy and environmental questions—and equally talented support staff to help them in their efforts. The year 2023 was no exception, as the Bureau brought a diverse group of 34 new people on board. Please help us welcome them to the Bureau!

Andrey Bakulin
Research Professor

Sofia Berdysheva
Postdoctoral Fellow

Chas Bolton
Research Scientist Associate III

Amanda Calle
Research Scientist Associate III

Ali Cherif
Postdoctoral Fellow

Jani Das
Research Assistant Professor

Xuesong Ding
Research Assistant Professor

Brent Elliott
Research Associate Professor

Jakub Felkl
Project Manager

Dawid Gajda
Postdoctoral Fellow

Ben Grunau
Research Scientist Associate III

Jerry L. Jensen
Research Scientist Associate IV

Jianqiao Leng
Research Scientist Associate III

Chao Li
Postdoctoral Fellow

Leandro Melani
Postdoctoral Fellow

Jennifer Morris
Research Scientist Associate III

Hailun Ni
Research Assistant Professor

Fritz Palacios
Postdoctoral Fellow

Eric Radjef
Research Scientist Associate V

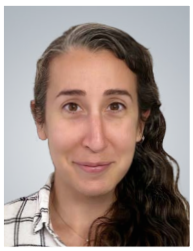
Sobhan Razm
Postdoctoral Fellow

Nichole C. Robinson
Senior Grants and Contracts Specialist

Edna Rodriguez Calzado
Research Scientist Associate II

Carolyn Rozell
Administrative Associate

Victor Salles
Research Scientist Associate III



Nur Schuba
Research Assistant Professor

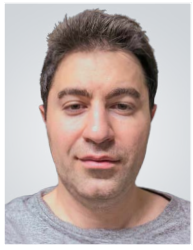
Nikhil Sharma
Postdoctoral Fellow

Rick Sierra
Buyer II

Shweta Singh
Postdoctoral Fellow

James Oliver Thompson
Research Assistant Professor

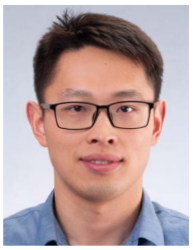
Justin Thompson
Research Assistant Professor



Mert Ugurhan
Research Scientist Associate III

Bede JJ Uku
Research Scientist Associate III

Qiqi Wang
Postdoctoral Fellow

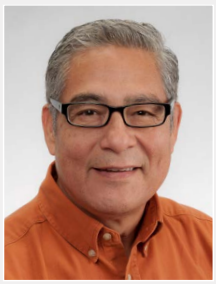


Zhicheng Wang
Postdoctoral Fellow

Retirees

Vickie Amidon
Senior Grants & Contracts Specialists

Jan Braboy
Buyer III



Daniel Ortuno
GLF Manager

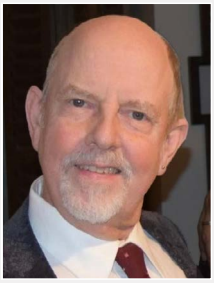
The Bureau thanks 2023's retirees for their years of invaluable service and wishes them a happy retirement. They will be missed!

In Memoriam

Ross Graham
Facility Operator

Lucille Harrell
Manager

Dorothy Johnson
Typesetter



Michael McKinley
Timesheet Processor

Living Memorials

In an effort to recognize the lasting contributions of past employees through a living monument, the Bureau adopted the Memorial Tree Program in 2013. Since its inception, donations by Bureau employees have underwritten the planting of a tree in commemoration of employees whose passing occurred or was noted during the year. The program is administered by The University of Texas at Austin as part of its Memorial Tree Program; an interactive map can be found at https://facilitiesservices.utexas.edu/programs/urban-forestry#treememorial.

2023 Visiting Committee

The Bureau of Economic Geology's Visiting Committee includes leaders from industry, State agencies, academia, and nonprofit organizations, each with a keen interest in furthering the work of the Bureau and the many ways it serves the public by conducting objective, impactful, and integrated geoscience research.

The Bureau's Visiting Committee came together in Austin in August for its Annual Meeting, with 19 members participating. The Committee was briefed by Director Scott W. Tinker on overall Bureau activities during the previous year. After his presentation, Dr. Tinker was recognized by the Committee for his 24 years of exceptional service as Director. There were fascinating presentations by six Bureau researchers regarding their innovative work. The meeting also provided Committee members with every opportunity for dialogue, and there were several sessions set up for the them to exchange insightful ideas about possible new research thrusts and potential Bureau partners.

For more information about the work of the Bureau or its Visiting Committee, please contact **Mark W. Blount**, Assistant Director, External Affairs, mark.blount@beg.utexas.edu.

(From left to right) **Dr. Ken Wisian** (Bureau of Economic Geology), **Mr. John Gibson, Jr.** (Flotek), **Mr. Bud Scherr** (Valence Operating Company), **Mr. Jay Kipper** (Bureau of Economic Geology), **Mr. Scott Anderson** (Environmental Defense Fund), **Mr. Phillip Ashley** (Texas Comptroller of Public Accounts, representing Comptroller Glenn Hegar), **Dr. Claudia Hackbarth, Chair** (Shell Global, retired), **Dr. Scott W. Tinker** (Bureau of Economic Geology), **Mr. James "Jim" Farnsworth** (Beacon Offshore, Azimuth Capital), **Mr. Richard "Dick" Stoneburner** (Pine Brook Partners), **Ms. Carol Lloyd** (Exxon Mobil Corporation), **Chairperson Jon Niermann** (Texas Commission on Environmental Quality), **Mr. William "Billy" Murphy** (University Lands), **Ms. Marilu Hastings** (Cynthia and George Mitchell Foundation), **Mr. Bud Brigham** (Anthem Ventures, Brigham Minerals, Brigham Exploration, Atlas Sand), **Mr. Mark Blount** (Bureau of Economic Geology), and **Dr. Mark Shuster** (Bureau of Economic Geology).

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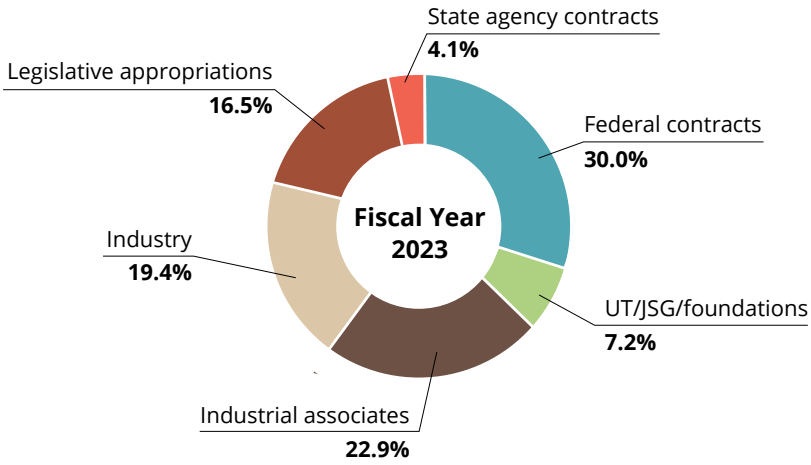

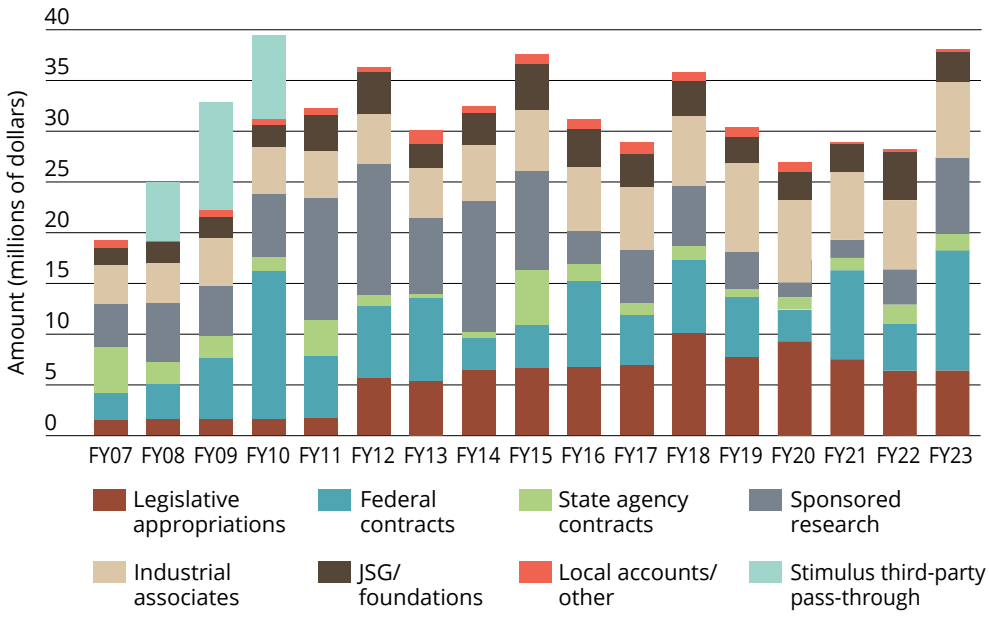

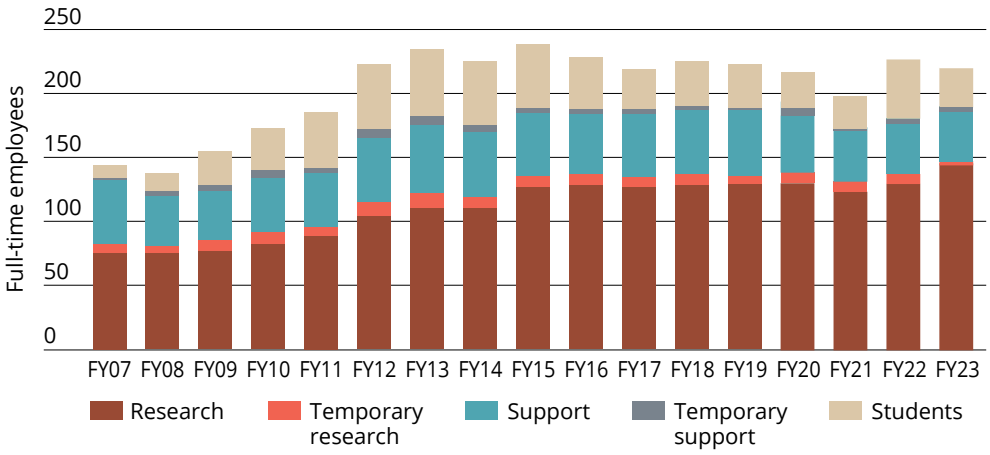

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