

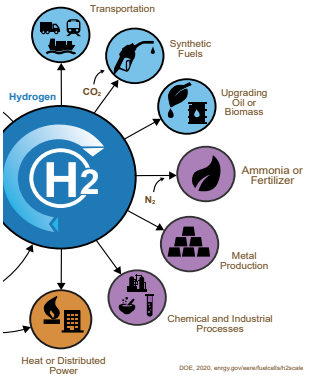
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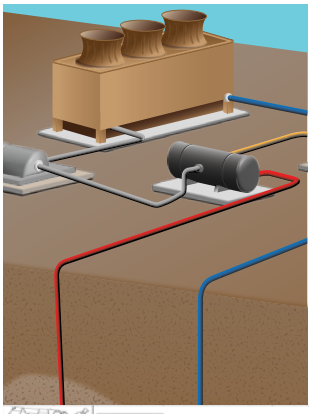
Research Consortia

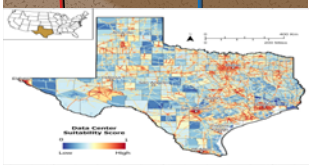
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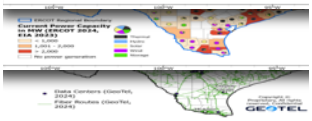
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Director



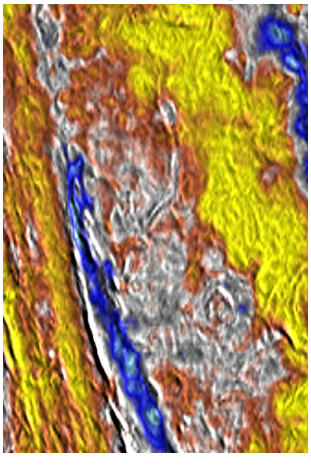












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Research Partnerships with the Bureau of Economic Geology

The Bureau of Economic Geology conducts impactful research on subjects of high interest to the energy industry and to environmental firms, and a broad spectrum of companies and other organizations actively participate in its research consortia. These unique partnerships study subjects as diverse as salt tectonics, hydrogen, geothermal energy, carbonate reservoir characterization, natural fractures and geophysics, carbon storage, sensing technology, quantitative clastics, computational seismology, and mudrock reservoirs.

Collectively, these consortia enjoy the support of global partners, with some companies and organizations participating in multiple separate programs. Each research consortium was designed to complement industry efforts to explain a key exploration, production, environmental, or economic problem. 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 office visits by researchers for presentation and interaction. Members also benefit from interactions with counterparts in fellow sponsoring organizations.

Each Bureau research consortium has a dedicated team of full-time researchers, including postdocs. Many of them host talented graduate students, creating combined teams of seasoned experts and early career specialists. A number of researchers have industry backgrounds, and all share a passion for university-based research.

We invite you to review this brochure and to contact the principal investigator of any program of interest to you. If you would like further information about these research consortia, or about the breadth of your organization's engagement with the Bureau, please contact Assistant Director Mark Blount at mark.blount@beg.utexas.edu, or by phone at 512-471-1509.









UT Bureau of Economic Geology

Who We Are

Established in 1909, the Bureau of Economic Geology is the oldest research unit at The University of Texas. The Bureau is the State Geological Survey of Texas and has been an integral part of the development of the State's oil and gas industry through the years. Our mission is to serve society by conducting objective, impactful, and integrated geoscience research on relevant earth resources, energy, environmental, and economic issues. Our vision is to be a trusted scientific voice to academia, industry, government, and the public, whom we serve. Bureau researchers spearhead basic and applied research projects globally in energy resources and economics, coastal and environmental studies, land resources and use, geologic and mineral mapping, hydrogeology, geochemistry, AI, and subsurface nanotechnology. The Bureau provides advisory, educational, technical, and informational services related to the resources and geology of Texas, the nation, and the world.

Bureau Programs

The Bureau is an international leader in a number of research thrusts, working at the intersection of energy, the environment, and the economy, with strengths that include:

- Unconventional oil and gas exploration and production
- Salt tectonics
- Natural fractures and structural diagenesis
- Subsurface micro- and nanosensing
- Reservoir characterization in carbonates, mudrocks, and sandstones
- Geothermal energy
- Hydrogen storage and technology
- Earthquakes and geologic hazards
- Carbon storage in geological reservoirs
- The water-energy nexus
- Energy economics

Talented people are key to the Bureau's success. The research staff includes 120 scientists, engineers, economists, graduate students, and postdocs, representing 27 countries. Working in integrated, multidisciplinary research teams, they find solutions to the world's greatest challenges in energy and environmental research.





Partnerships

Partnerships drive strategy, innovation, and investigation, and the Bureau engages partners, both new and old, on many levels. Investments in Bureau research provide significant returns. Corporate partners participate in and gain vital new insights from the Bureau's many productive research consortia, which are described herein. Government, agency, foundation, and nongovernmental organization partners include the State of Texas, the Alfred P. Sloan Foundation, the U.S. Department of Energy, and the Environmental Defense Fund.

Facilities

Superb facilities and equipment, some cofunded by industry, give researchers the tools they need to find objective, rock-based research solutions. Such facilities and equipment include:

- More than 15 individual laboratories hosting research teams investigating everything from nanoparticles to shale porosity and permeability
- Two massive well-core research and storage facilities in Houston and Austin that collectively house what may be the largest archive of rock material in the world
- One of the largest collections of well logs in the United States
- An extensive inventory of modern imaging devices and integrated technologies for outcrop and land-surface mapping

Results

More than 100 years of producing research results has earned the Bureau an unparalleled reputation. Successful outcomes can be measured by many yardsticks, and Bureau researchers more than measure up:

- Over 150 peer-reviewed articles, books, and maps published annually
- Hundreds of abstracts and articles published each year in *Conference Proceedings* volumes
- More than 50 keynote addresses made annually
- Bureau researchers frequently serve as presidents of international professional societies and editors of major professional journals, and are recognized by peers with top medals and awards in their fields

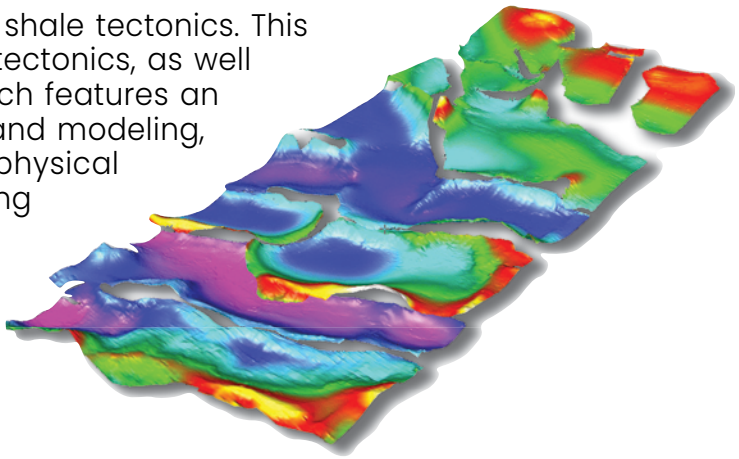


Applied Geodynamics Laboratory
Salt Tectonics

Mission

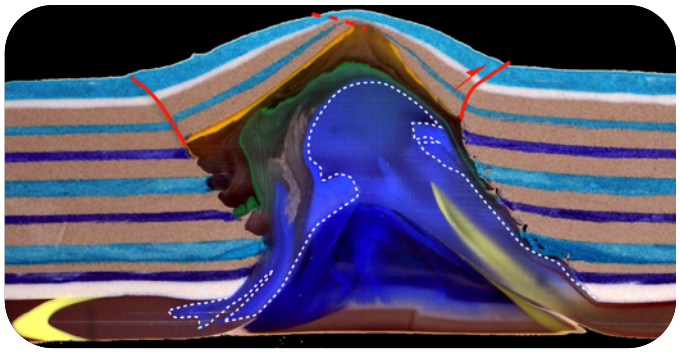
At the heart of this research is the Applied Geodynamics Laboratory (AGL), an industry-funded consortium dedicated to producing innovative concepts in salt tectonics. Research comprises a mix of physical and mathematical modeling, seismic and field-based mapping, and structural stratigraphic analysis of some of the world's most spectacular salt basins—including those of the Gulf of America, West Africa, Brazil, the Mediterranean, and the Canadian High Arctic.

In 2017, AGL added a new research effort in shale tectonics. This work builds on our existing expertise in salt tectonics, as well as our experience in soil mechanics. Research features an integration between seismic interpretation and modeling, finite-element modeling, and subaqueous physical modeling. We are initiating case studies using high-quality 3D seismic data in the Gulf of America and eastern Mediterranean to learn more about the geometry and evolution of 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

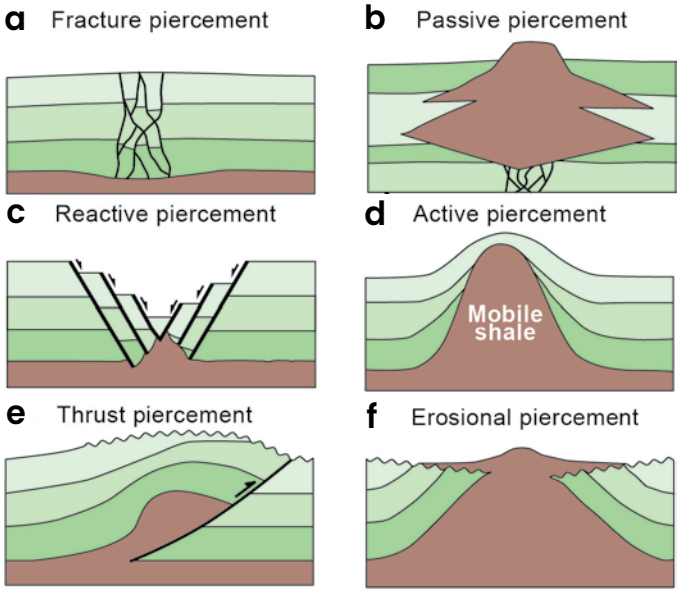
The primary goals of the AGL are to develop a conceptual framework for the full range of salt tectonics and shale tectonics; to analyze connections among physical models, mathematical models, seismic data sets, and field examples from all over the world; and to disseminate complex technical information to a constantly shifting spectrum of industrial and academic supporters.

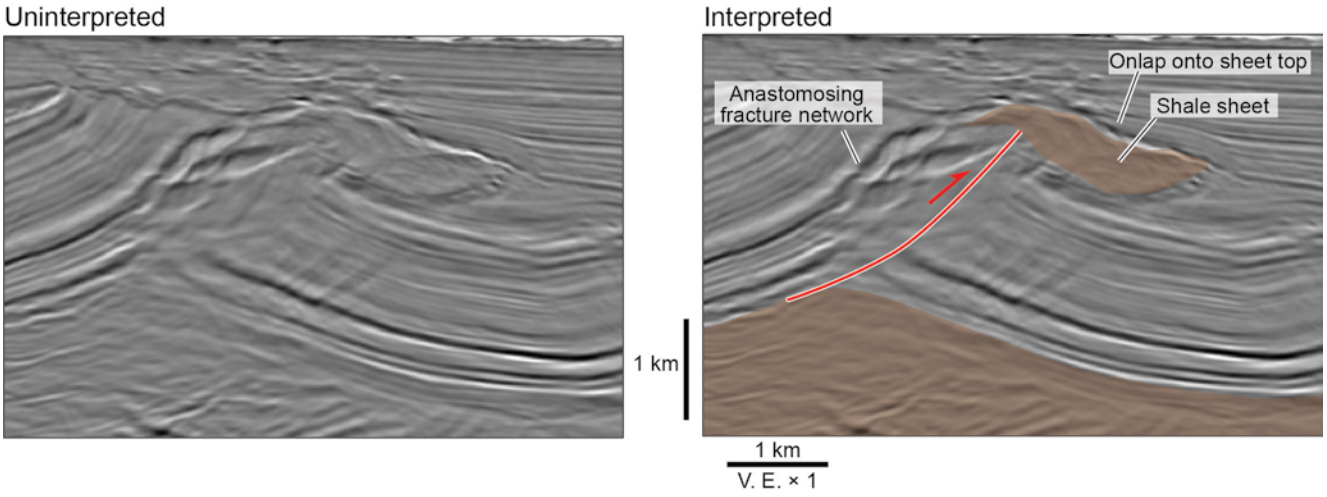
Areas of focus for salt tectonics include salt welds; salt canopies; reactive, falling, and squeezed diapirs; mechanics of salt-sheet advance; the origins and evolution of minibasins; internal salt structures; and salt sutures.

Areas of focus for shale tectonics include mechanical models for mobile shales, mobile-shale piercement mechanisms, and variables affecting the seismic expression of shale diapirs.

Membership

The 29 supporting companies of the AGL include a wide range of industry partners from around the world.





Contact

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Center for Injection and Seismicity Research

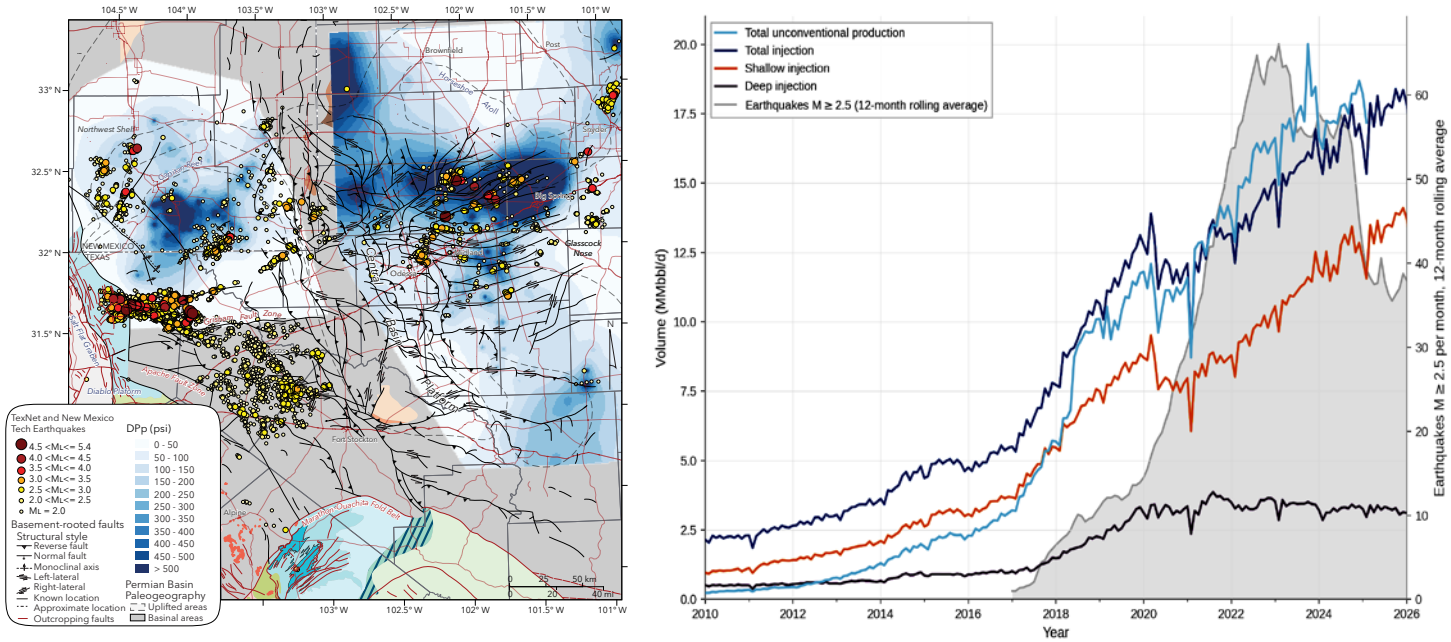
Mission

The Center for Injection and Seismicity Research (CISR) is a multidisciplinary research center managed by the Bureau. CISR studies the impacts of large-scale injection on both the subsurface and surface environment, with a current focus on brine injection in the Permian Basin region of Texas and New Mexico. With its industry and regulatory partners, CISR conducts leading research in the areas of geology, seismology, hydrogeology, reservoir engineering, geomechanics, and satellite geodesy to study how the subsurface responds dynamically to fluid injection. CISR provides resources for its stakeholders to mitigate the hazard of induced earthquakes, threats to the surface and near-surface environment, and challenges to sustainable energy development.

Research Thrusts

CISR conducts fundamental and applied research to better understand the impacts and hazards of large-scale injection. Geologic, geophysical, and reservoir engineering integration underpin all CISR programs. CISR research is conducted by research specialists from the Bureau, the Department of Earth and Planetary Sciences, Institute for Geophysics, the Hildebrand Department of Petroleum and Geosystems Engineering, and Department of Aerospace Engineering. We also partner with many research institutions in Texas and internationally. CISR research seeks to address four main questions:

- What are the physical processes and geologic conditions that promote fault rupture and seismicity?
- How do pressure and stress evolve in complex geological systems subject to large-scale injection?
- What geological and operational factors influence the capacity of active injection systems, and how is capacity distributed stratigraphically and geographically?
- What surface and near-surface hazards are related to large-scale injection and what do they reveal about subsurface dynamics and reservoir containment?



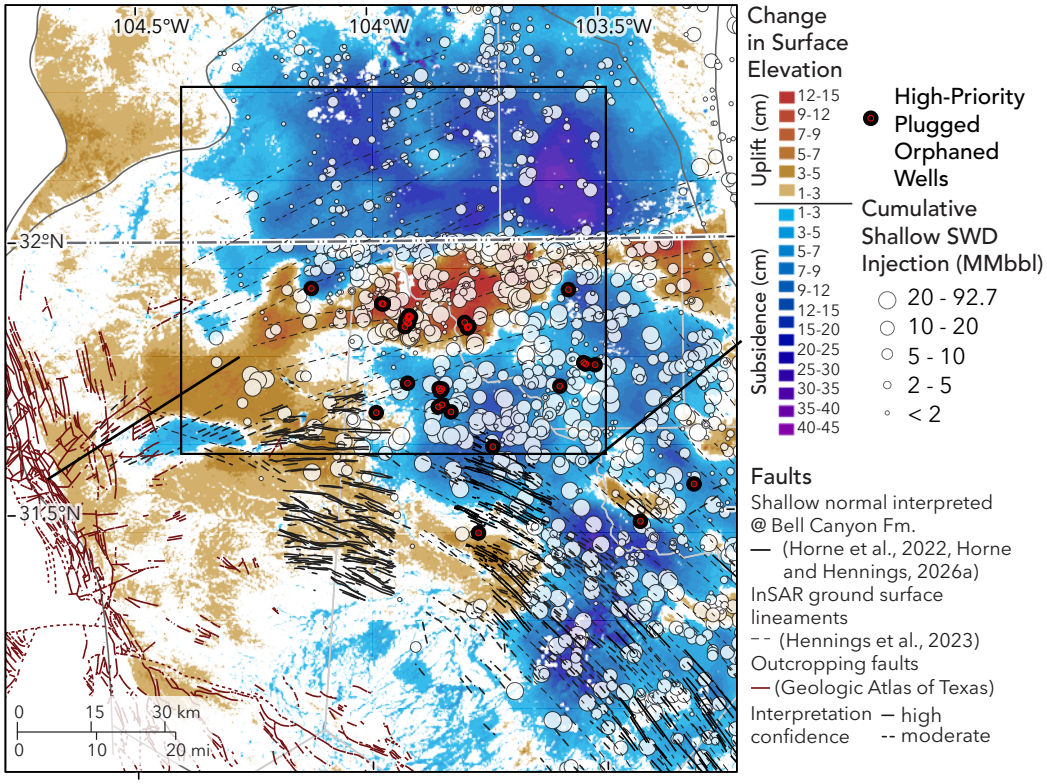
Permian Basin study area showing modeled pore pressure change in deep injection strata, basement-rooted faults, and M2.0+ earthquakes (left). Annual rate of injection into deep and shallow strata and averaged count of M2.5+ earthquakes from 2017 onward, as reported by TexNet, New Mexico Tech, and USGS (right).

Research Challenges

Produced water in unconventional oil and gas basins in the U.S. has increased markedly over the past decade, and in the Permian Basin rates have reached over 20 million barrels per day. Impacts of injection include induced seismicity, surface and shallow subsurface releases of brine through legacy wells, and production challenges. Understanding the interplay between complex operational drivers and interdependent subsurface physical processes is a daunting challenge that the Bureau is pursuing head-on.

Membership

Many of the leading energy companies that operate in Texas' unconventional plays and elsewhere are CISR members, as are key midstream operators, land and minerals companies, and regulatory agencies. Each company has one member who serves on the CISR Science Advisory Committee. Member companies and CISR technical partners are encouraged to contribute proprietary data and information that can guide and advance CISR research.



Subsidence and uplift of the ground surface in response to production and injection activities, with shallow faults and lineaments, shallow injection wells, and high-priority plugged orphaned wells indicative of flow at the surface.

Contact

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Critical Materials Research Center

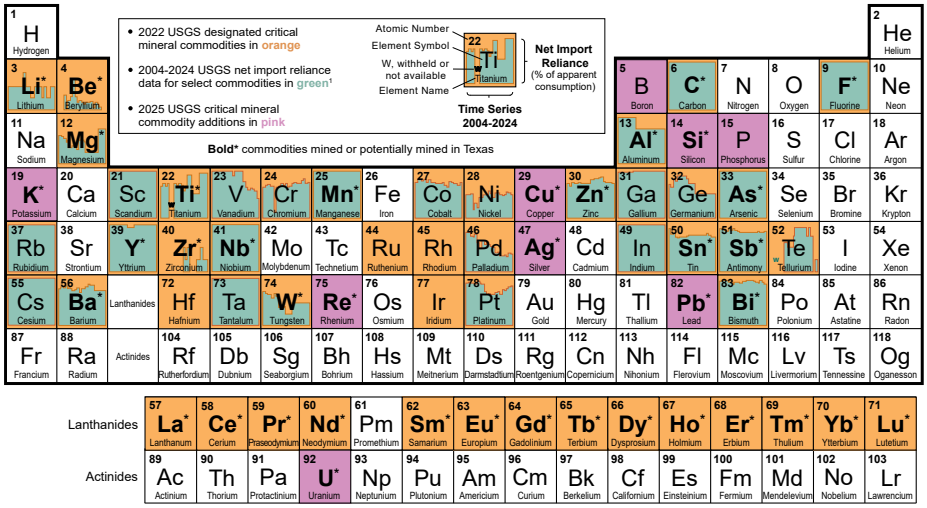
Mission

The Critical Materials Research Center (CMRC) spearheaded by the Bureau connects CM researchers across UT through networking and information sharing, enabling interdisciplinary collaborations leveraging expertise along the entire critical materials value chain from exploration to policymaking. The CMRC aims to establish UT as a center of critical materials expertise and leadership, and CMRC researchers, in collaboration with industry partners, are steering exploration efforts to understand the critical material potential of not only Texas, but nationwide and even globally.

Research Challenges

Why Critical Materials?

Mineral resources extracted from the Earth's crust are essential for human infrastructure, technology, and economic development, and their importance cannot be overstated. Critical materials are particularly vital to infrastructure, modern technology, and national security. The specific subset critical minerals are commodities containing elements that are of significance to the national economy and national security but have serious supply chain vulnerabilities. The most well-known examples are the rare earth elements foundational to renewable energy technologies, computing, and defense applications, but other important examples include nickel, manganese, cobalt, and lithium essential for rechargeable batteries; tellurium for solar panels; and gallium, germanium, and indium for semiconductors.



Periodic table with 20-yr import trends for select USGS 2022 critical mineral commodities. Additional critical mineral commodities finalized December 2025 by USGS in pink.

Research Thrusts

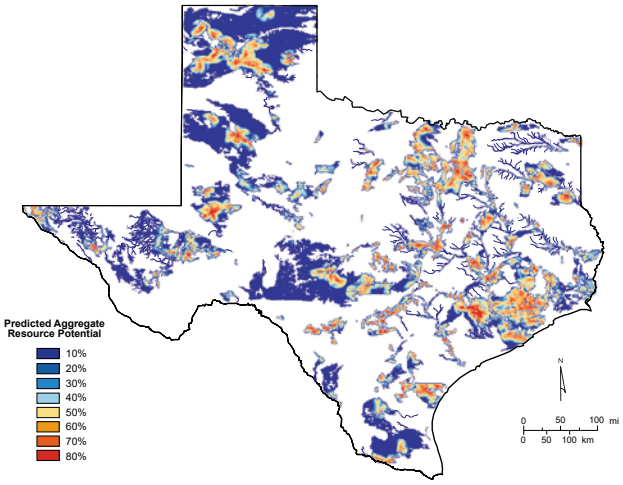
Critical Mineral Value Chain Analyses

The U.S. is heavily import-reliant for most of the 60 USGS-defined critical minerals and demand is only increasing with rising populations and new technology requirements, especially in energy projects. Economic feasibility studies and life cycle assessments play a crucial role in bridging the gap between fundamental academic research and commercially viable applications. CMRC researchers are concerned with value and supply chain integrity for Texas mineral resources as well as for larger national and international interests. Recent success stories include market-based asset valuation of hydrogen geological storage and analyses of the environmental impacts and trade-offs of lithium supply chains.



Texas Aggregate Mineral Resource Mapping

Although Texas has well-developed aggregate resource production, population growth and a robust construction sector outlook require locating and developing critical new sand, gravel, and stone material resources. Using predictions of highest priority areas determined from weighted spatial regression models incorporating known resource site information, economics, geological knowledge, and cost and demand factors like transportation infrastructure and population growth rates by county, CMRC researchers have planned eighty 1:100,000 scale maps covering the Dallas-Fort Worth–Houston–San Antonio–Austin "triangle." This 10-year campaign will inform aggregate reserve estimations and potential uses in the state, with the first phase of mapping underway.

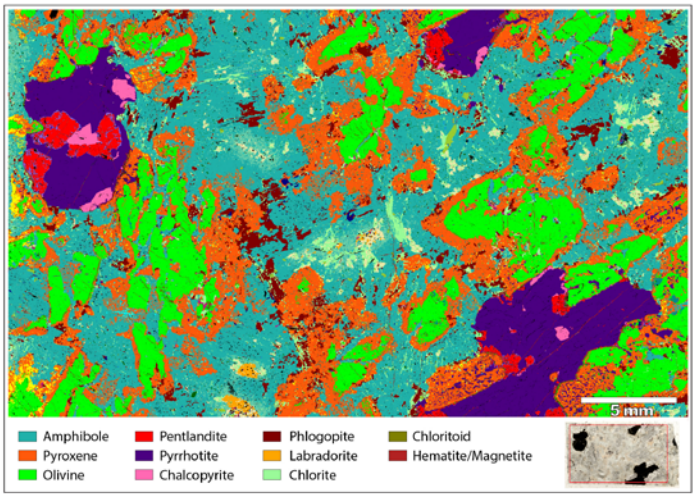


Weighted spatial regression model provides a broad predictive mapping approach for identifying the level of favorability for new aggregate resource development locations in Texas.

Critical Mineral Exploration and Extraction

CMRC researchers are aiding the development of critical mineral extraction techniques from both primary ores and mine-waste products like tailings, coal ash, and produced waters. Because mineral deposits are nonrenewable, developing novel strategies to guide exploration and extraction while mitigating environmental impacts is pivotal to meeting future demand.

CMRC affiliates have access to a wide range of cutting-edge analytical systems enabling macro- to nano-scale characterization of critical mineral-rich samples. Understanding sample mineralogy and deportment of critical minerals in different mineral phases is pivotal for informing mineral extraction feasibility. Areas of active research include gallium, germanium, and indium recovery from copper mine waste; in situ recovery (ISR) solution mining of uranium; lithium recovery from produced waters; and rare earth element extraction from coal ash and bauxite residue.



Magmatic Ni-Cu-PGE-Sulfide deposit, Italy (thin section bottom-right). Scanning Electron Microscope automated software AMICS provides rapid identification of mineral phases, textures, and spatial distributions using the inbuilt Mineralogical Association of America reference database.

Contact

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cmrc@beg.utexas.edu • cmrc.beg.utexas.edu

Fracture Research and Application Consortium

Mission

Fracture research at The University of Texas at Austin seeks a 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 hydrocarbon and geothermal reservoirs and accurately simulating their influence on production. Research is organized around the Fracture Research and Application Consortium (FRAC), conducted together with scientists from member companies. Students are an important part of our 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 predict hydraulic-fracture propagation in naturally fractured and unconventional reservoirs.



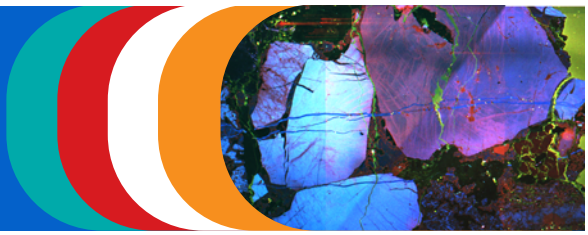
Fieldwork with FRAC's drone and new trace map methods reveal patterns essential to fluid-flow modeling. Example: outcrop analog of geothermal target.

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 challenges to exploration and development. Our approach is helping to overcome the limitations of current methods.

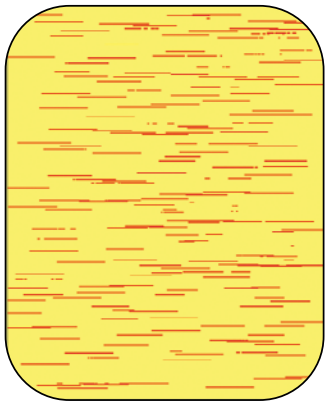


FRAC members get hands-on training in fracture analysis on annual field trips.

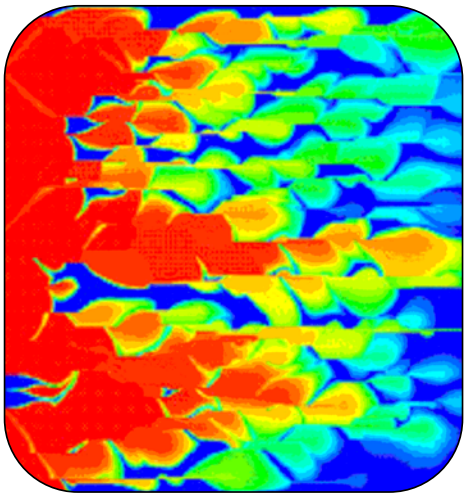


Membership

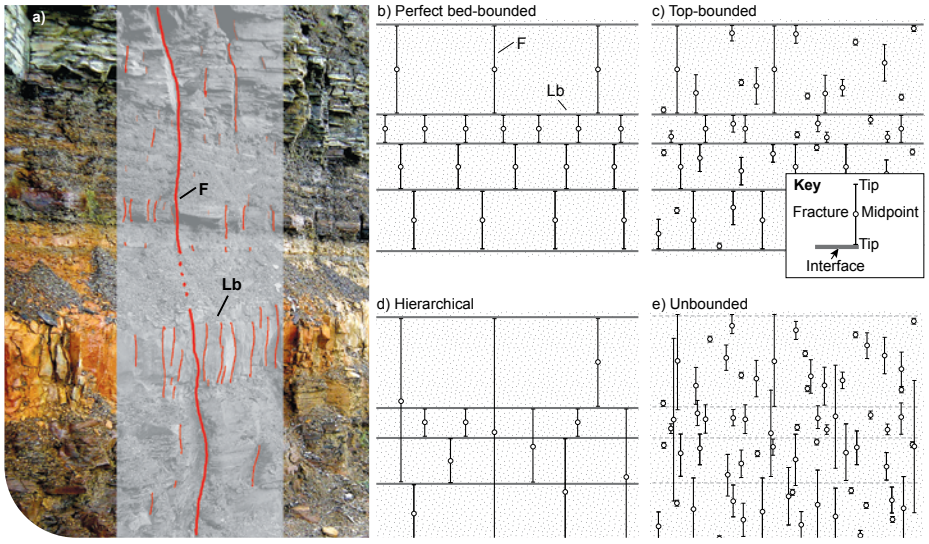
Training in techniques, software, and our workflow is a benefit of membership. Annual meetings cover measurement, interpretation, prediction, and simulation of fractures and mechanical properties in carbonate rocks, mudstones, and sandstones.



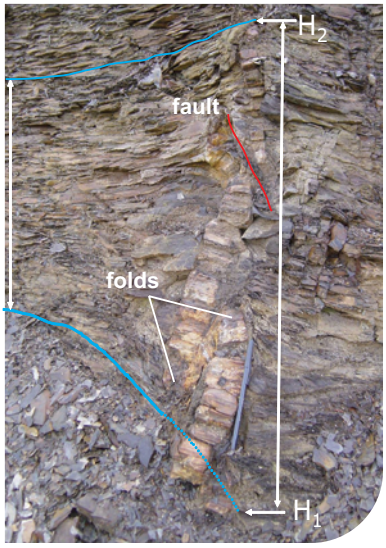
Fully 3D "Joints" software for fracture modeling and permeability estimation.



Flow simulation.



(a) Fracture-height patterns in New Albany Shale roadcut with hierarchical fracture traces, eastern Kentucky. Some fracture traces cut multiple beds, indicated by F. Others are bed bounded (Lb = bed boundary). (b–e) Fracture-height classification categories from Hooker and others (2013).



Quartz, dolomite, and bitumen-filled fracture compacted by folding and faulting. The H_1–H_2 compacted fracture height is 70 cm, from the Blocher Member, New Albany Shale, Kentucky.

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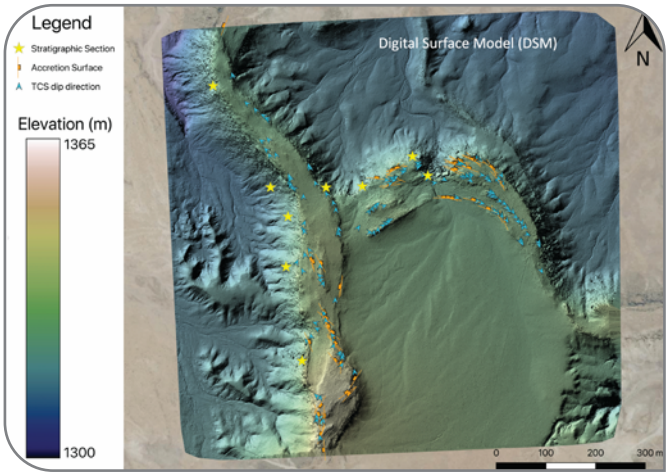
Quantitative Clastics Laboratory

Mission

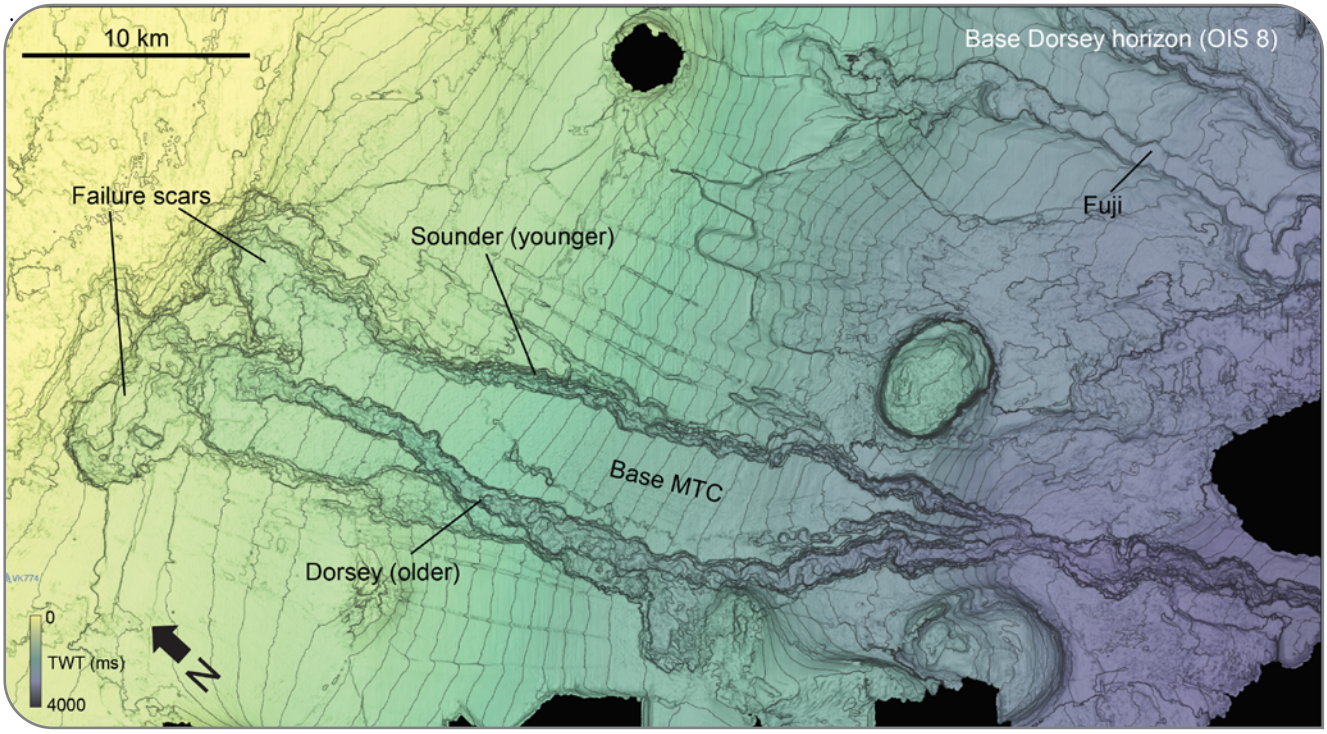
The mission of the Quantitative Clastics Laboratory (QCL) is to develop a predictive understanding of processes and controls on sediment transport and the stratigraphic evolution of depositional systems, with applications in reservoir characterization, modeling, correlation, and source-to-sink predictions for frontier exploration.

Research Thrusts

QCL researchers leverage the broad, world-class expertise of the Jackson School of Geosciences (JSG)—including collaborations with groups specializing in structural geology, Texas and Gulf Coast depositional syntheses, seismic interpretation, and thermochronology—to address key challenges in the exploration and development of natural resources. These challenges include the evaluation of reservoir presence and quality in data-limited frontier basins and the characterization of reservoir connectivity and heterogeneity. The QCL has unique clastic research consortia access to industry subsurface data, including global seismic-reflection data sets and Bureau core repositories.



Digital elevation model of exhumed Cretaceous channel belts in the Cedar Mountain Formation, by JSG student Cole Speed.

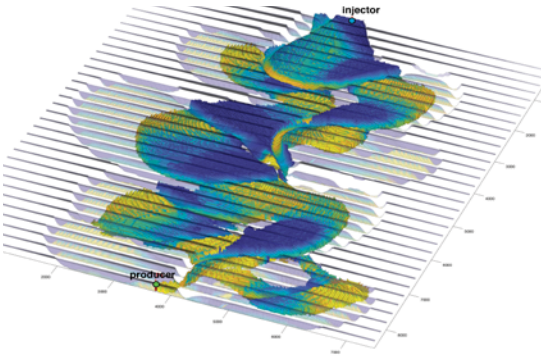


Structure map of a seismic horizon from the eastern Gulf, showing the interaction between shelf-edge deltas, failures, and slope channels.

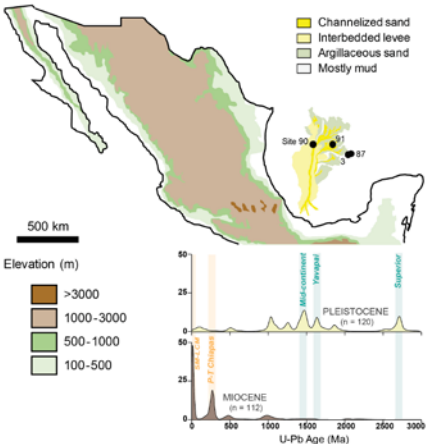


Research Challenges

The QCL has two research themes: (1) reservoir-scale depositional system characterization, modeling, and flow simulation for a better understanding of processes that impact connectivity and heterogeneity; and (2) exploration-scale source-to-sink analysis to evaluate correlation, reservoir presence, and quality in the petroliferous Permian Basin and circum Gulf Coast and Atlantic margins. An exciting update to the QCL program is flow-diagnostics analysis of digital stratigraphic models for evaluating the effect of stratigraphic evolution and facies architecture on fluid flow during production.

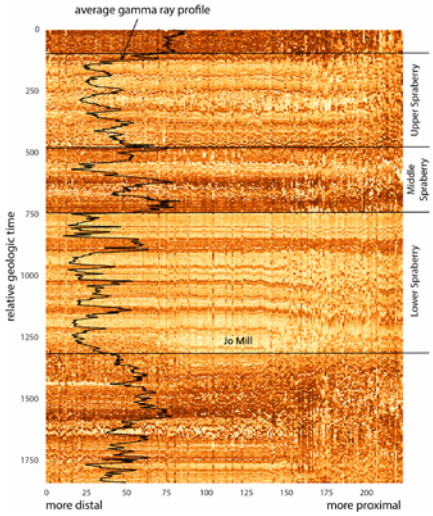


Flow-simulated reservoir model of a fluvial system that includes facies variability due to the presence of counterpoint bars.



Detrital-zircon geochronology to identify source areas for deep-water sands offshore Mexico.





Map showing well pairs used in correlation (left) and the resulting chronostratigraphic diagram for this part of the basin (right).

Membership

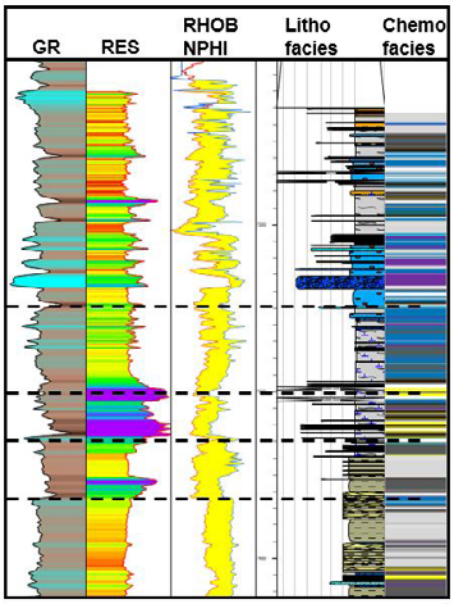
Each year's research calendar begins January 1 and runs through December 31. Multiple meetings, workshops, and face-to-face consultations with industry members are held annually. The QCL offers industry members unique access to JSG expertise, industry subsurface data, investigations of multiple scales of depositional environments and their interconnections, and an evolving quantitative database on clastic depositional systems architecture.

Contact

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Resource Assessment of Mudrock Systems

Mission



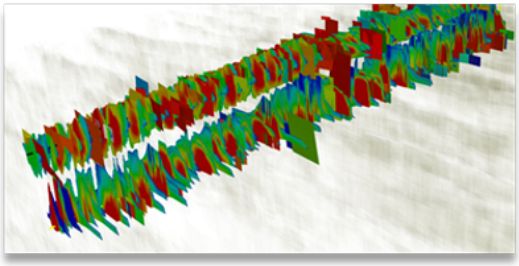
The Resource Assessment of Mudrock Systems (RAMS) research consortium at the Bureau of Economic Geology combines strengths of the Mudrock Systems Research Laboratory (MSRL) and Tight Oil Resource Assessment (TORA) consortia. RAMS answers key research questions about unconventional oil and gas reservoirs by integrating geologic core-based characterizations that include sedimentology, depositional systems, and rock facies with petrophysics and geochemical laboratory measurements to calibrate petrophysics models as input to static reservoir models. These efforts inform basin-scale static models and finer sector-scale static and dynamic models, resource estimates, productivity analysis, and economic models. RAMS continues efforts to understand fundamental parameters that control rock geomechanics; mechanical stratigraphy; oil, gas, and water saturations; effective permeabilities; fluid flow dynamics; and production in mudrock systems. RAMS focuses on methods that leverage core-based observations to inform reservoir models and use detailed pore-scale analyses to inform questions and uncertainties from regional-scale observations.

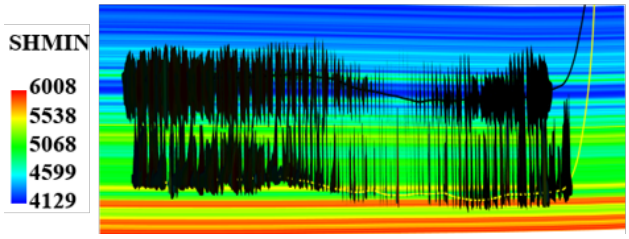
Research Thrusts

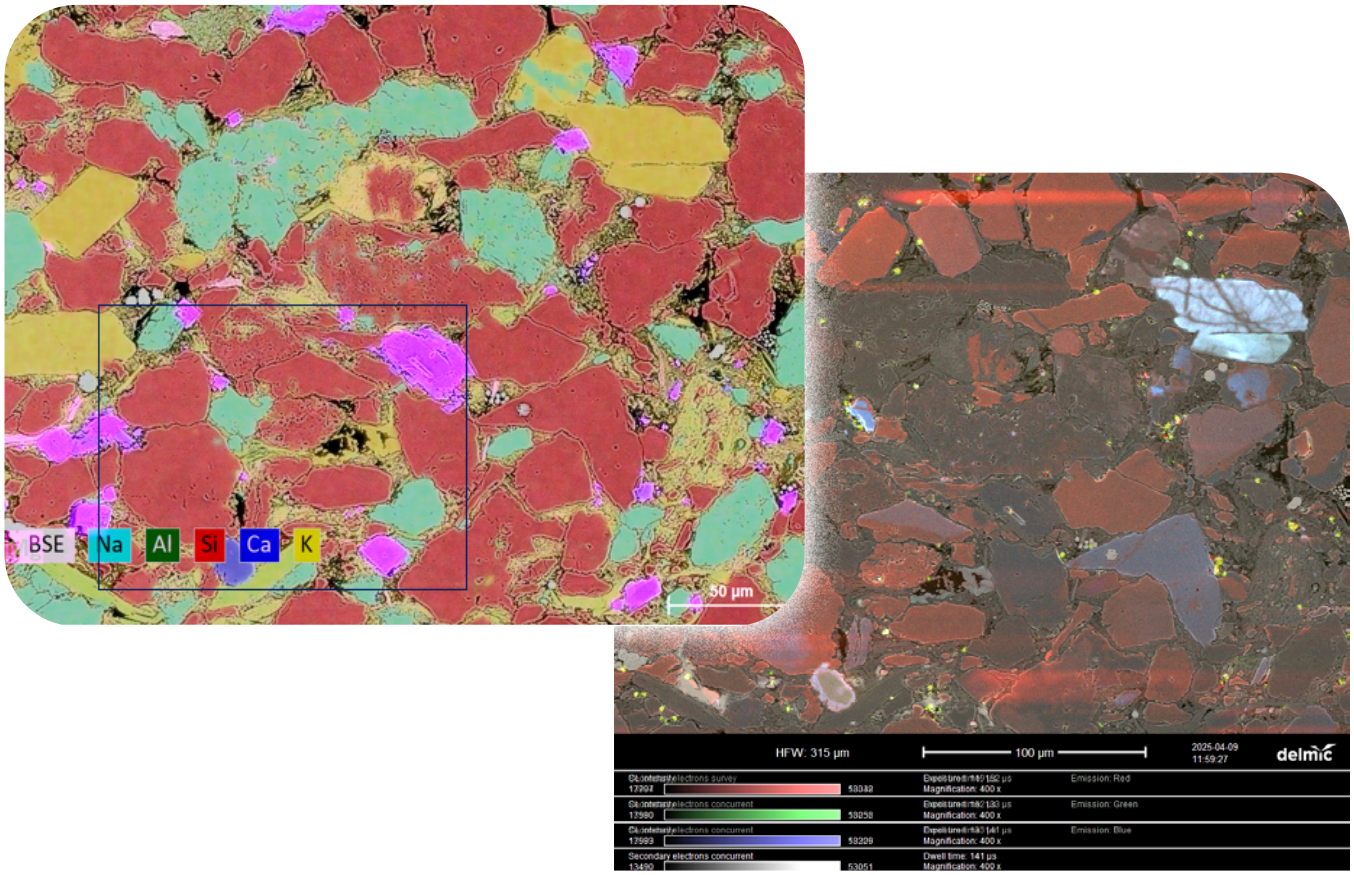
RAMS research thrusts are focused on: (1) geologic and reservoir characterization of mudrock systems to calculate resource volumes, estimate reservoir quality, and identify potential drilling hazards; (2) multi-scale pore network analysis and fluid flow modeling in nanoporous rocks to investigate dynamics of fluid transport and displacement; (3) produced fluid geochemistry to assess oil maturity, quality, and sources; (4) effects of clay mineralogy and diagenesis on reservoir quality and oil and gas deliverability; (5) fluid flow and phase behavior modeling; and (6) analysis of geologic and operational controls on productivity and economic analysis to assess block profitability and develop outlooks of future production.

Research Challenges

The RAMS challenge is to develop a better understanding of reservoir framework and quality through measurement and modeling. RAMS researchers take pride in the integrative multidisciplinary approach to characterize, model, and integrate core-based measurements into reservoir models to better assess the resource potential of mudrock systems. The RAMS workflow integrates pore- and core-scale geologic, geochemical, and fluid flow studies with well log- to basin-scale geologic, engineering, and production studies to develop a multi-scale reservoir characterization of mudrock systems.







Membership

RAMS membership benefits include:

- Spring annual technical meeting
- Winter short course and core workshop
- Fall field trip
- RAMS webinars
- Data access including consortium reports, basin-scale static models, formation tops, and well-log and core facies descriptions and predictions
- Hands-on company involvement: opportunity for companies to conduct research projects with RAMS researchers

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Reservoir Characterization Research Laboratory

Mission

The Reservoir Characterization Research Laboratory's (RCRL) mission is to use outcrop and subsurface geologic, geophysical, and petrophysical data from carbonate reservoir strata as the basis for developing new and integrated methodologies and concepts to explain and describe the 3D reservoir environment and to improve hydrocarbon recovery factors. In addition, the RCRL is dedicated to technology transfer and education and consistently offers state-of-the-art training, such as short courses, field seminars, in-company reviews of assets, and extensive student supervision and guided research.

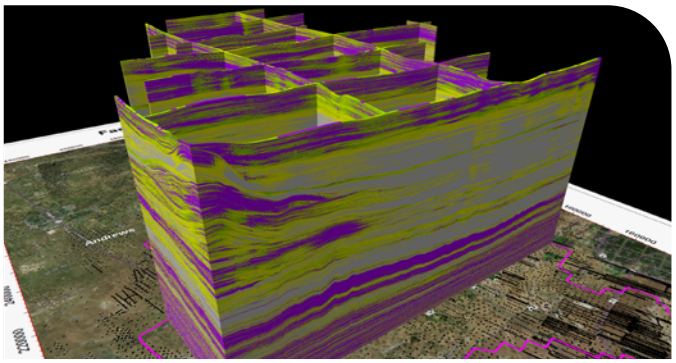
Research Thrusts

The RCRL approaches reservoir characterization through four main scales of investigation: (1) platform-to-basin-scale stratigraphy; (2) reservoir architecture, including both matrix and nonmatrix systems (e.g., fractures and paleokarst); (3) structural- and geomechanical-properties characterization; and (4) pore networks and their reservoir distribution. Research questions are developed using both subsurface data and outcrop analogs. The RCRL emphasizes quantifying observations so that its research is applicable to reservoir models and is valuable in providing predictive relationships and conceptual tools for reservoir characterization and play analysis.

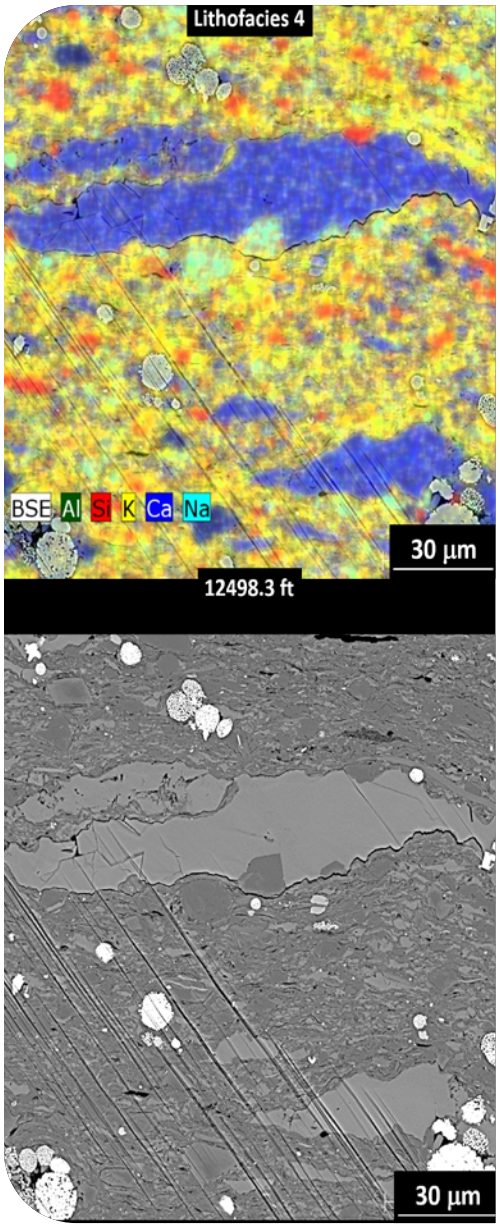
Research Challenges

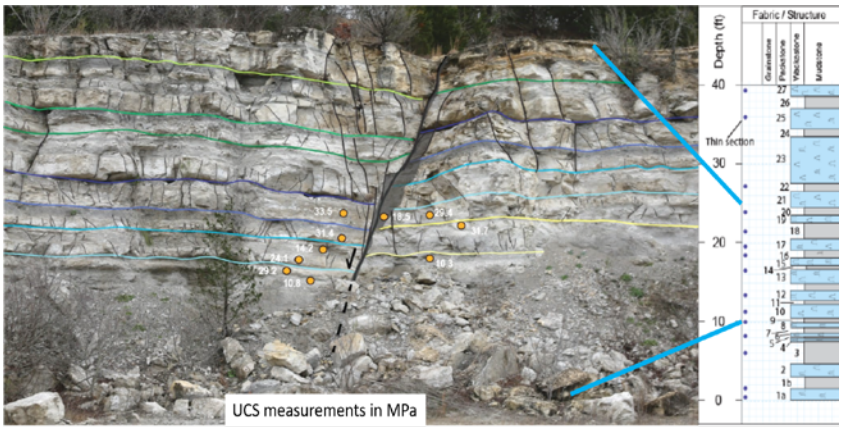
RCRL areas of investigation include Lower Permian shelf-to-basin stratigraphic and structural architecture of the Delaware and Midland Basins; Gulf of America carbonate reservoir settings, pore systems, fracture character, and margin variability; Cenozoic carbonate platform systems, high-resolution stratigraphy, and structural configuration of shelf margins; fractured carbonate reservoir characterization in outcrop and subsurface analogs; origin and petrophysics of tight limestone and dolomite reservoirs; regional reservoir characterization of the Austin Chalk trend; and carbonate rock mechanics and acoustic-properties research.

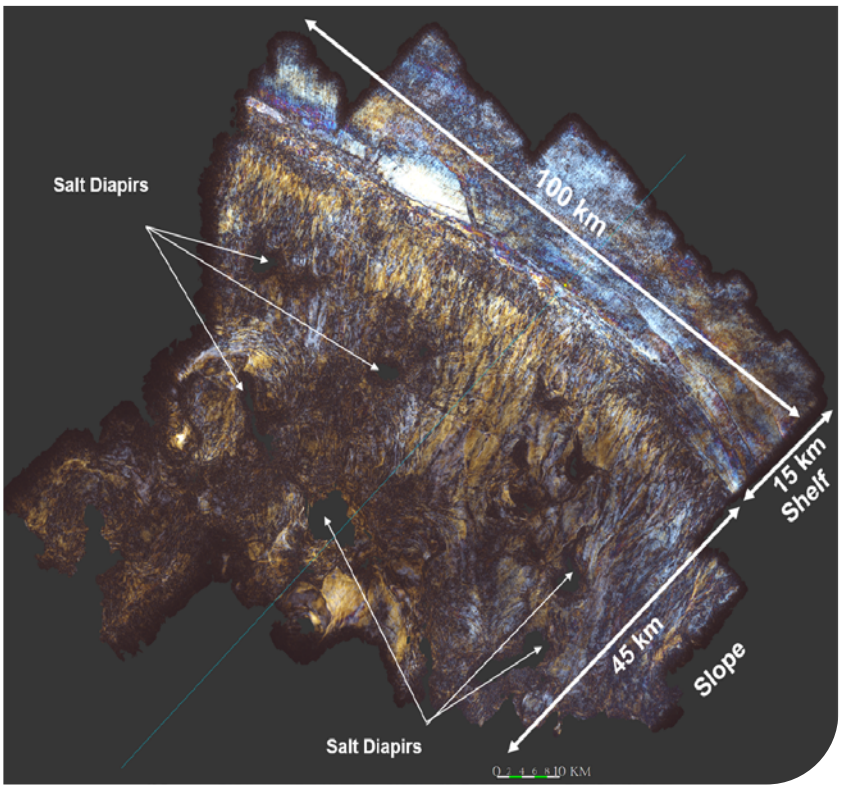












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Texas Consortium for Computational Seismology

Mission

The Texas Consortium for Computational Seismology (TCCS) is a collaboration between the Bureau and the UT Oden Institute for Computational Engineering and Sciences. The mission of TCCS is to address the most important and challenging research problems in computational geophysics experienced by the energy industry and to educate the next generation of research geophysicists and computational scientists.

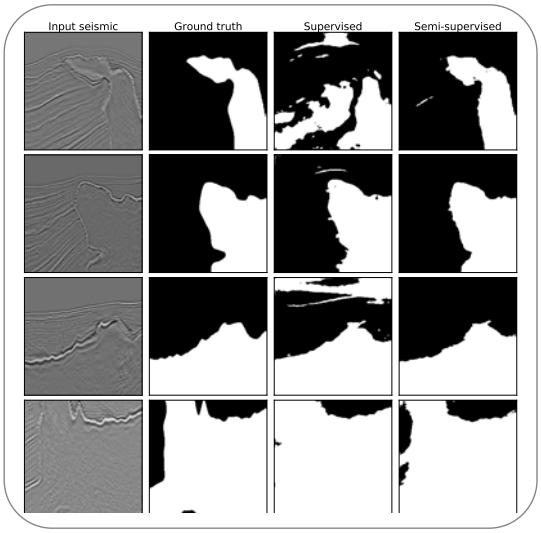
TCCS develops novel methods for seismic data analysis with the focus on both resource exploration and carbon capture and storage. Areas of research focus include optimizing data acquisition with simultaneous sources, automating seismic interpretation, increasing the resolution of seismic-reservoir characterization, and estimating subsurface properties using full-waveform inversion.

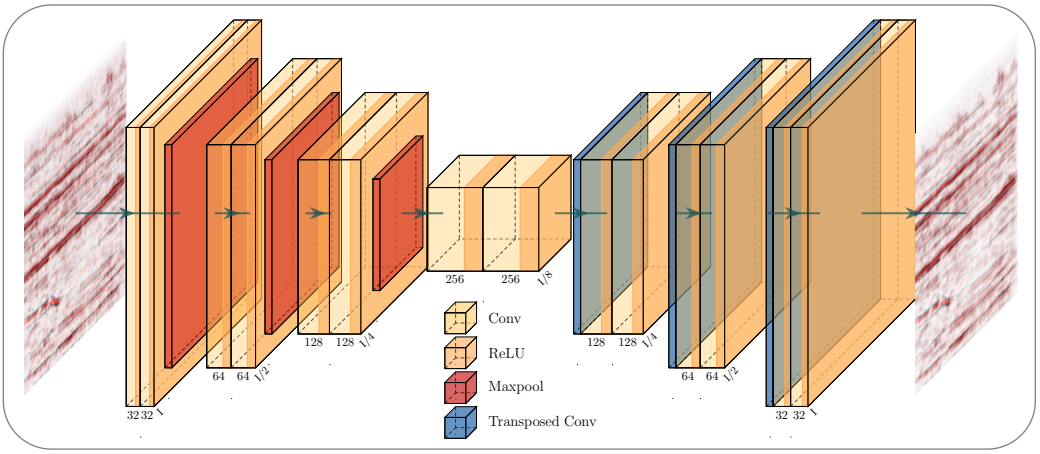


Research Thrusts

TCCS has pioneered new developments in several application areas:

- Deep-learning methods for seismic interpretation, including automatic detection of lithofacies 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
- Seismic anisotropy and attenuation parameterizations for efficient imaging in complex media





Membership

Each year, TCCS delivers two written reports and presents its findings to sponsors at two research meetings.

TCCS publications follow the discipline of reproducible research: the results of all computational experiments are supplied with open-source software code that enables reproduction, verification, and extension of reported results.

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GeoH$_2$

Mission

GeoH$_2$ research consortium conducts geoscience, engineering, 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, perform market feasibility analyses, and explore novel subsurface concepts related to hydrogen.

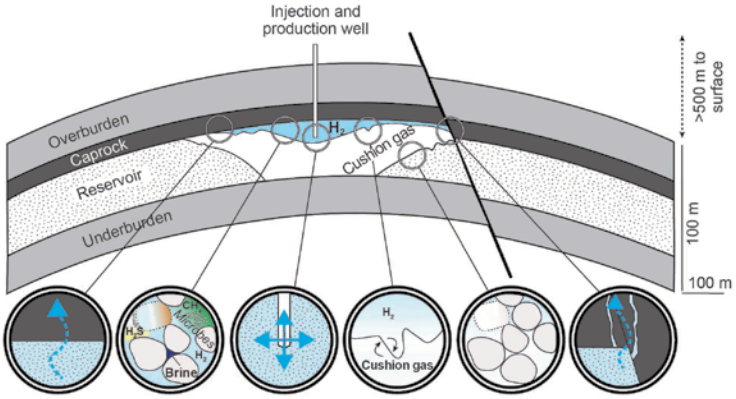
Research Challenges

Why Hydrogen?

Hydrogen (H_2) offers the potential for a transportable, storable fuel and feedstock for a low-carbon economy.

GeoH$_2$ Research and Technology Portfolio

Our research and technology development addresses underground hydrogen storage in porous reservoirs and salt caverns, geological hydrogen, in situ hydrogen generation, monitoring, and techno-economic and value chain analysis. Our program is extremely well positioned with subsurface-data access, modeling capabilities, and laboratories to conduct research that has direct applications.

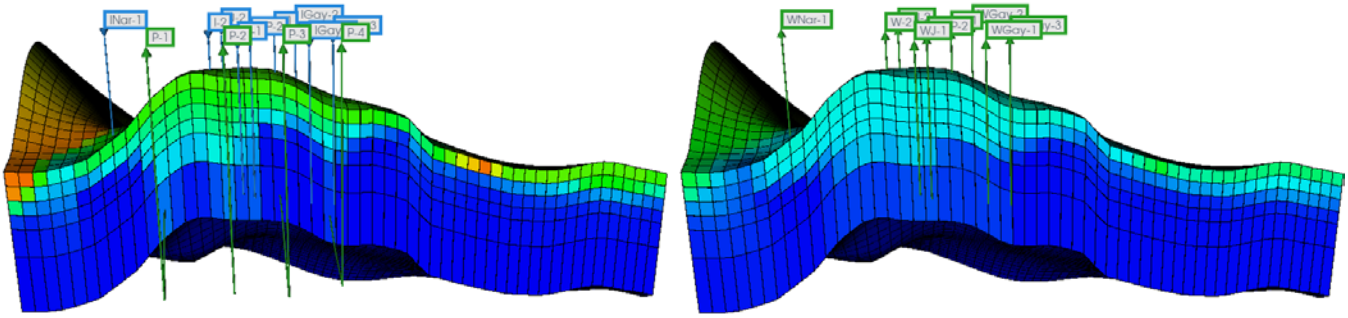


Hydrogen storage in porous media.

Research Thrusts

Hydrogen Storage in Porous Reservoirs

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 for maintaining hydrogen purity. Research activities include reservoir modeling coupled with laboratory experiments to predict flow behavior of hydrogen in the reservoirs, chemical interactions with the reservoir sandstone, caprock, and wellbore cement, and rock fracture mechanical testing. Research outcomes are integrated into predictive tools to evaluate storage risk and economics.



Simulated H_2 storage (H_2 mole fraction) after injection and post-withdrawal.



Hydrogen Storage in Salt Caverns

Hydrogen storage in salt caverns is a proven technology for industrial applications. However, not all salt bodies are the same and heterogeneities are poorly understood. Our research addresses domal and layered salt bodies, and the development of software applications to quickly assess storage and injection/production capacities, and model costs and value for potential salt cavern sites.

Field Experiments for Hydrogen Detection and Monitoring

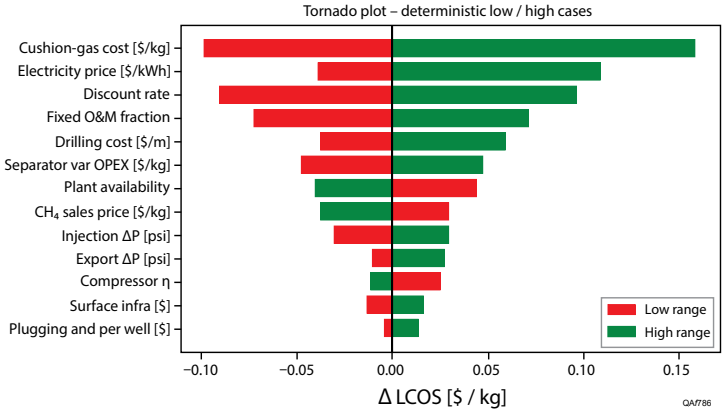
Geophysical detection of hydrogen remains a key uncertainty for both exploration and storage, making field experimentation in porous formations essential. Our work targets hydrogen's acoustic and electrical signatures through integrated field measurements and simulations.

Geologic Hydrogen

Hydrogen occurs in nature, mainly in the form of compounds such as water and hydrocarbons. However, hydrogen gas originating from natural processes such as serpentinization and radiolysis is effused from the Earth in many locations around the world. Nevertheless, the extent of natural hydrogen resources that could potentially be found and economically produced is unknown. Our research is intended to better understand the production of hydrogen from different rock types to guide exploration for natural hydrogen.

Geo-engineered Hydrogen

Multiple technology options exist for in situ production of hydrogen or hydrogen-bearing synthetic gas from the subsurface. These include technologies such as underground coal gasification, in situ combustion of oil fields, engineered biotic (microbial) generation, and abiotic water-rock (serpentinization) of iron-bearing rocks.



Techno-economic analysis of geological storage.

Techno-Economics and Hydrogen Value Chain Analysis

Scaling up the hydrogen sector requires a dedicated and developed transportation and storage infrastructure system. We evaluate the technology options for hydrogen supply, demand, transportation, and storage to develop a system-level understanding to inform preferred options for the fast-emerging value chain. Our work is designed to assess the cost competitiveness of various pathways and technology options to bring hydrogen to market, identifying the optimal technology mix and routes to market. A techno-economic analysis-based tool, HyFive 2.0, has been developed to model costs and value for potential hydrogen storage sites.

Membership

Consortium members meet twice a year for research and development reviews and participate in topical workshops. Training and sponsor-company visits can be arranged in person or virtually.

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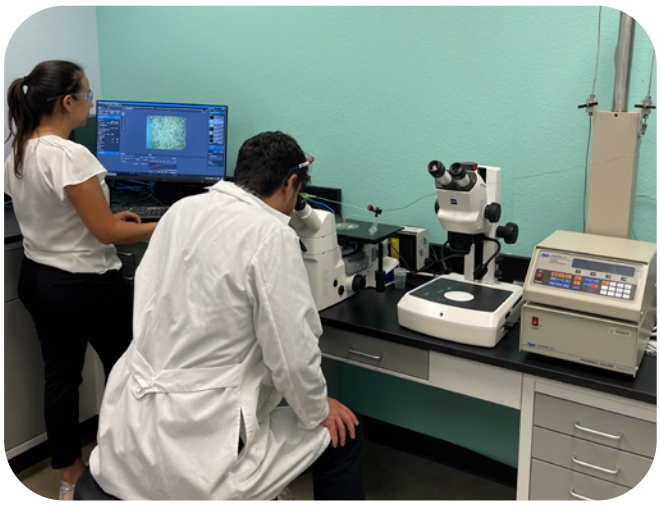
Gulf Coast Carbon Center

Mission

The Gulf Coast Carbon Center (GCCC) works with industry, nongovernmental organizations, and governments to develop and conduct targeted and commercially applicable research to optimize storage of CO_2 in geologic formations in the deep subsurface. The GCCC has a mission with a global reach to provide state-of-the-science information to serve diverse stakeholders, from local residents to international industries. The GCCC also educates the next generation of CO_2 storage geoscientists.

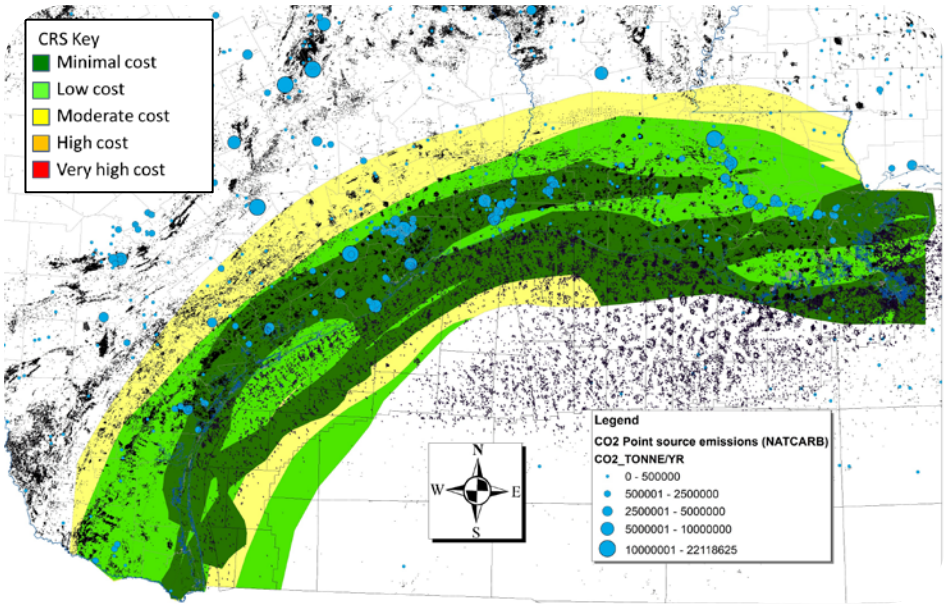
Research Thrusts

GCCC research increases confidence in the large-volume storage resources to support the commercialization of carbon capture and storage (CCS). GCCC (1) collects multiscale laboratory and field-scale fluid-flow data; (2) uses advanced physical and numerical simulation and machine learning techniques to upscale and optimize storage; (3) creates workflows at basin scale that prepare multiple sites to be operated at maximum injection rates over prolonged time periods; (4) improves structural and stratigraphic characterization methods and simulation approaches to identify and permit sites; and (5) develops and assesses methods for monitoring in reservoir, overburden, groundwater, marine and land surface to provide assurance that storage is effective.

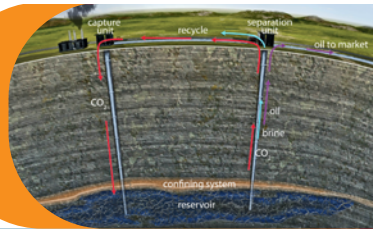


GCCC students Shadya Taleb and Richard Larson are expanding GCCC capabilities to assess CO_2 migration and stabilization by developing micromodel flow through imaging capabilities.

Development of large-volume storage is needed in the very near future to accept CO_2 captured from current point sources. This includes hard to abate sources such as refining, chemicals, cement, and steel manufacturing and CO_2 produced as part of blue hydrogen, bio-energy for carbon abatements, and Direct Air Capture. Information on the value and impacts of future development is needed to support community decision-making.



Example of Oligocene and Miocene storage fairways (green and yellow) and large CO_2 emission sources (blue dots). Black dots indicate well density. Additional fairways are under assessment.

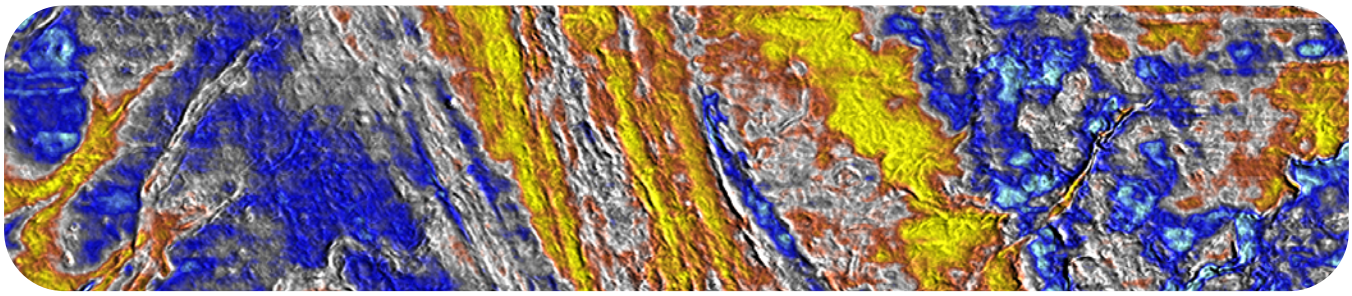


Research Challenges

Industry and government interest in the reduction of carbon emissions is on a rapid upswing. However, many stakeholders, from industrial investors to policymakers to journalists, do not have the information needed to evaluate the risks, benefits, and the critical role of CCS in comparison to other mechanisms for attaining climate goals. GCCC addresses information gaps via: (1) providing substantive technical information; (2) translating technical information so that it is accessible to users; and (3) targeting research to reduce uncertainties.



GCCC researchers celebrate 25 years.



High-resolution seismic slice collected in shallow water allows improved above-zone monitoring design.

Membership

Members develop aspirational multiyear goals, oversee the incubation of new research thrusts, seek augmentation via increased investment, receive a quarterly newsletter, and meet twice per year for research review.

Contact

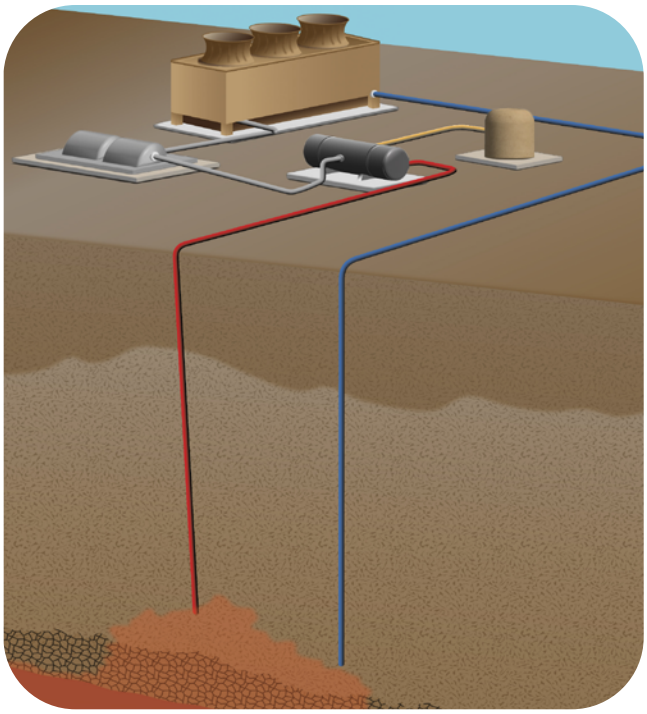
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HotRock
Geothermal Research Consortium



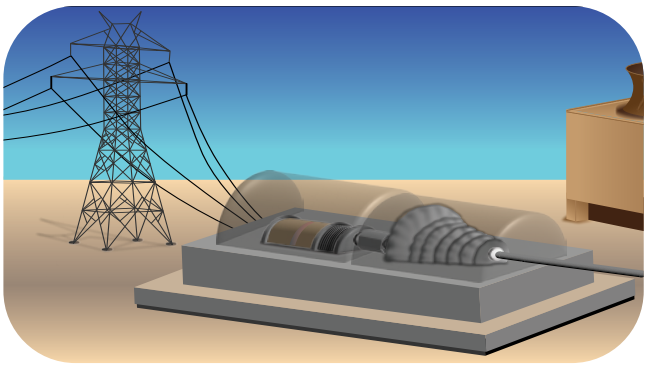
Mission

HotRock is an industry-funded research consortium aimed at closing the science and technology gaps that limit geothermal development anywhere on Earth. We incorporate science, engineering, economics, policy, and entrepreneurship efforts.
The HotRock consortium is more than an academic research program—it is a collaborative forum to accelerate innovation, address current bottlenecks, and scale next-generation geothermal solutions (enhanced geothermal systems, closed-loop geothermal systems, and energy storage). HotRock achieves this via regular meetings to set priorities, workshops, shared databases, GIS maps, workflows, and collaborations on external grant proposals.



Research Challenges

Evident issues that need further work include improved geothermal resource assessment, sustained thermal longevity, drilling and completing wells in high-temperature environments, fluid loss and induced seismicity mitigation, techno-economics of diverse technologies for power and direct use, integration with the power grid and data centers, and field demonstration tests.



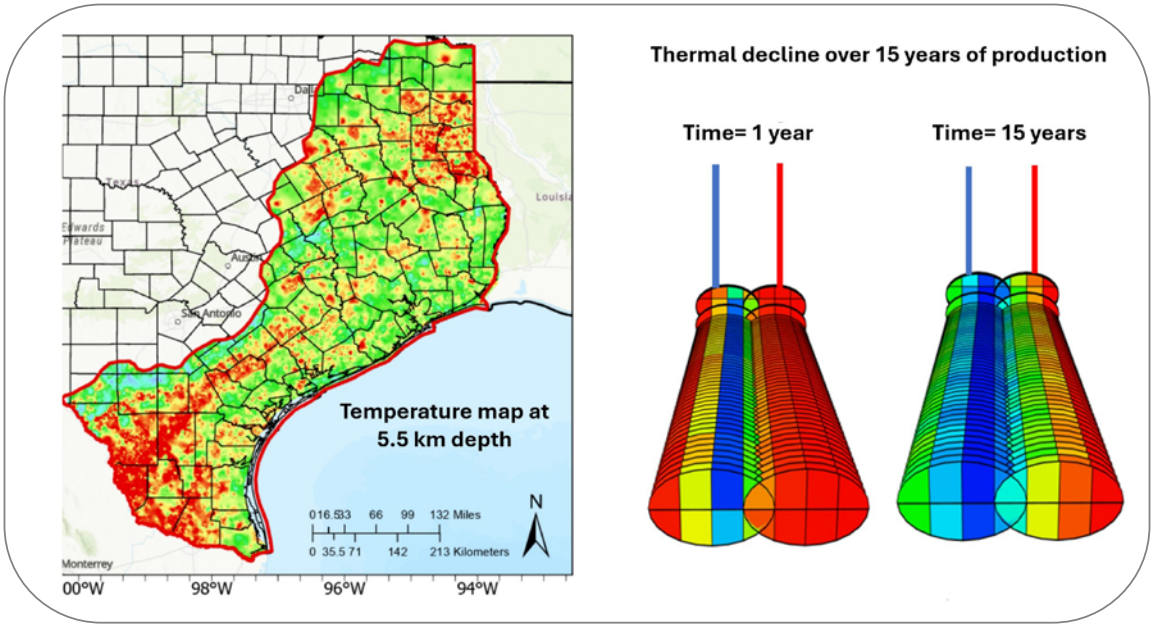


Research Thrusts

HotRock conducts applied research across the full geothermal development lifecycle:

- Integrated geothermal resource characterization and assessment
- Laboratory tests (thermal properties, petrophysics, geomechanics, and fracture mechanics)
- Dynamic reservoir simulation and well completions optimization
- Techno-economics of various geothermal drilling and completion styles, and co-production of hydrocarbons and critical minerals
- Geothermal integration with power grid and data centers, and thermal demand

HotRock works on projects in Texas and beyond (domestic and international). In addition to the consortium, the HotRock team also works on sponsored projects with individual companies, startups, county, state, and federal agencies (DOE and DOD), private foundations, and others.



Membership

HotRock integrates all sponsor contributions with major external projects funded by DOE, DOD, and state geological surveys. Sponsors obtain all research workflows, results, GIS maps, and the rock database, and can influence areas of research. HotRock holds two annual meetings and workshops.

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Collaborative Optimization & Management of Power Allocation—
Surface & Subsurface strategies

Mission

Collaborative Optimization & Management of Power Allocation—Surface & Subsurface strategies (COMPASS) is a multidisciplinary research initiative dedicated to analyzing the complex trade-offs between systems and resources in the rapid expansion of digital infrastructure and large loads in Texas.

At COMPASS, we take a systems approach to support resource alignment for large-load development in Texas. Our research examines the interactions between power, water, land use, community, and policy & regulatory systems, and brings together stakeholders to align economic competitiveness with community stewardship, regional resilience, and sustainable infrastructure.

Research Thrusts

Integrated Infrastructure & Siting Analysis

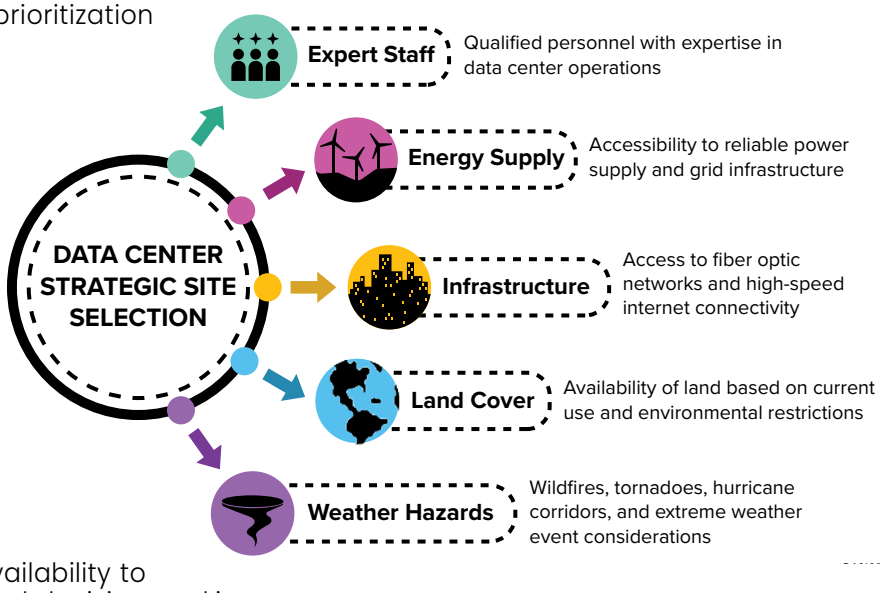
- Surface-subsurface integration for energy, water, land, and reuse opportunities
- Geospatial screening and site prioritization

Water Resource Integration & Cooling Technology

- Assessment of direct and indirect cooling demand across technology choices
- Water-energy trade-off analysis

Community & Workforce Alignment

- Assessing regional readiness: housing, roads, permitting, and labor availability
- Research-based information availability to communities to support informed decision-making



Environmental Trade-offs & Grid Resilience Modeling

- Life-cycle and techno-economic analysis of site-level impacts
- Assessment of behind-the-meter configurations
- Emissions, water use, and co-location trade-offs

Policy & Permitting Pathways

- Mapping and tracking of Texas regulatory landscape for large-load development



Research Challenges

Texas is at the center of a surge in large-load development—from data centers and oil and gas to advanced manufacturing, refining, and mining. While these sectors serve different purposes, they share the same energy, water, infrastructure, and labor systems. This convergence creates new risks and opportunities:

- Projects and neighboring communities may compete for limited grid or water capacity resources.
- Local infrastructure can become strained, requiring substantial upgrades and expansion.
- Project-level approvals accumulate into regional impacts no one reviews.
- Environmental and social impacts may amplify without early coordination or access to evidence-based data.

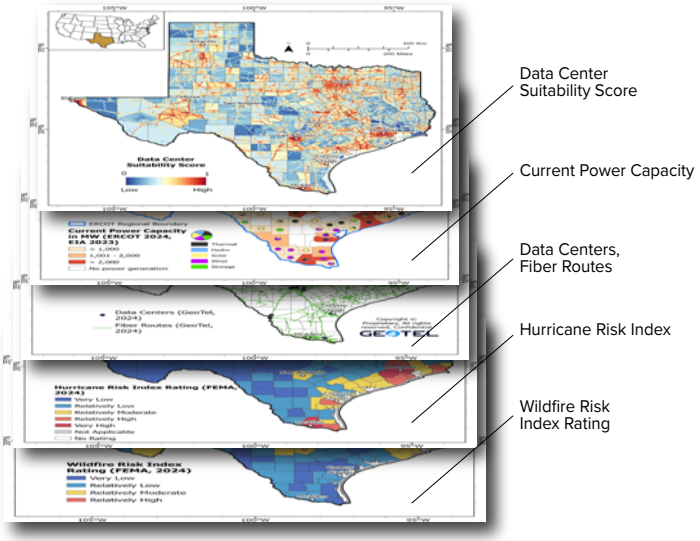
There is a growing need for an objective, science-based forum that brings together stakeholders to support integrated planning, scenario modeling, and siting strategies that reflect regional realities and infrastructure constraints.

Membership

Membership is open to organizations across the entire large-load development value chain, including energy developers and infrastructure investors, grid operators and transmission planners, water and land resource managers, construction and site development firms, industrial load developers (e.g., data centers, hydrogen and CCS, manufacturing), and local and state agencies involved in permitting, planning, or infrastructure oversight.

COMPASS membership benefits include:

- Technical briefings and policy advisory memos
- An interactive GIS planning platform
- Project-level deliverability assessment
- Workshops, sponsor roundtables, and stakeholder engagement opportunities
- Participation in pilot case studies and early access to research findings
- Outreach materials and communication strategies for community alignment



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Notes

Notes

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