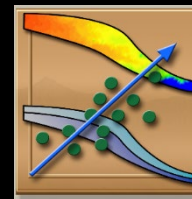


# RCRL Research Prospectus 2021



**Reservoir  
Characterization  
Research  
Laboratory**



**TEXAS** Geosciences

The University of Texas at Austin

Jackson School of Geosciences

Bureau of Economic Geology

# Carbonate Reservoir Characterization Research Laboratory (RCRL)

## Mission

RCRL's 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 better explain and describe the 3D reservoir environment, and to improve hydrocarbon recovery factors. In addition to this research mission, RCRL is dedicated to technology transfer and education, and consistently offers state-of-the-art training in the form of short courses, field seminars, in-house reviews of selected assets, and extensive graduate student supervision and guided research.

## Overall Research Goals

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.

## Membership and Funding

We invite your company to participate in the continuation of the RCRL Carbonate Reservoirs Research Program for 2021. In 2021, the annual RCRL Industrial Associates contribution to the program will continue to be \$55,000 per year. To encourage sponsors to commit to a 2-year agreement so that we can better plan a longer-range research program and reduce the time and effort in securing agreements, we offer a 2-year (2020 and 2021) rate of \$50,000 per year. The agreement would be such that a Memorandum of Agreement (MOA) would be signed agreeing to a 2-year commitment, and payment would be due at the beginning of each year.

## Materials

Industrial sponsors receive research results at annual review meetings, in short courses, during mentoring activities, in prepublications, and on the continually updated, members-only RCRL website database (<http://www.beg.utexas.edu/rcrl/members/>). The searchable website protects the investment in RCRL research and makes previously presented material easy to locate. The data area contains digital presentations, including archived video and annotated presentations, core workshop guidebooks, and field-trip guidebooks. Supplemental data such as maps, core photos, porosity and permeability data, and digital outcrop reservoir models are available through our database.

## Interaction

We host an Annual Review Meeting with its associated Field Trip and Core Workshop, a five-day training workshop is offered in the spring. These workshops are interactive and utilize subsurface data, along with applicable outcrop analogs to emphasize applications of key elements that are important to understanding carbonate systems and the importance to hydrocarbon production. All presentations from our annual meeting and workshops are conducted within online collaboration environments and recorded to be available on our member website. Starting in January 2021, we will host a monthly "RCRL Lab" meeting with active members that are short presentations with discussion periods of ongoing research to allow more feedback from our members.

## Contact

Dr. Xavier Janson, Xavier.Janson@beg.utexas.edu, (U.S.) 512-475-9524

Dr. Chris Zahm, Chris.Zahm@beg.utexas.edu, (U.S.) 512-471-3159

[www.beg.utexas.edu/rcrl](http://www.beg.utexas.edu/rcrl) Twitter: @RCRL15

# Carbonate Reservoir Characterization Research Laboratory (RCRL)

## RCRL Research Topics for 2021

### PROVISO

*The research goals listed here are highly dependent on data and travel access that are both challenging in the current COVID-19 environment. We will prioritize the following list on the basis of changing logistics and on sponsor's interest and input.*

### **Permian Basin stratigraphy, structure, and reservoir characterization**

#### **Shelf-to-basin regional framework**

- Construction of additional regional cross sections (e.g., N-S Delaware and Midland, CPB, southern Midland) via member feedback to refine and improve local correlations
- Integrate growing 2D and 3D seismic catalog as well as detailed well logs and time-depth conversion for improved regional and local correlations, including both stratigraphy and structural relationships across Delaware Basin, CPB, and Midland Basin
- Investigate through seismic and well logs the Influence of Pennsylvanian stratigraphic architecture on younger Wolfcampian sediment routing in the Delaware basin

#### **Reservoir Characterization**

- Step-out characterization of the Guadalupian systems in the Midland Basin for hydrocarbon prospects and volumetrically constrained SWD targets
- Collaboration on characterizing Wolfcamp/Bone Spring Fm. cores including:
  - Detailed core description
  - Petrography and micropetrography
  - Porosity and permeability, TOC, and XRF/XRD
  - Tie petrophysical and geomechanical properties

#### **Analog and outcrop characterization**

- Detailed characterization of end-L6 karst system in Shumard Canyon and surrounding outcrops and subsurface equivalents
- Continue work the Sierra Diablo and Glass Mountain outcrops and tie to subsurface regional cross sections
- Synthesize the Sacramento Mountain Bug Scuffle system, including mechanical stratigraphy and deformation related to fault-propagation folding
- Advance the Late Pennsylvanian to Early Permian syntectonic (Bursum Fm.) correlation in the Fresno-La Luz anticline area and its application to Canyon/Wolfcamp interval in the subsurface
- Investigate the viability of Cambrian microbial deposits in the Western US as analogs for reservoirs in eastern Asia

# Carbonate Reservoir Characterization Research Laboratory (RCRL)

## Mesozoic Stratigraphy and Reservoir Characterization

### Gulf of Mexico Lower Cretaceous Carbonate Seismic Analyses

- 3D seismic-based analysis and characterization of Berriasian and Aptian shelf margins in Eastern GOM, implications for Middle East reservoir intervals
- Large scale early faulting of Lower Cretaceous shelf margin, implication for shelf-margin position and reservoir compartmentalization.
- Regional synthesis of Lower Cretaceous platform architecture around the GOM

### Mesozoic Outcrop Analogs

- Origin of Ft Stockton Intrashelf Basin as a model for intrashelf basins and petroleum systems in Texas and the Middle East. Connect the Pecos River Maverick Basin sequence framework to the Fort Stockton intrashelf basin focusing on analog to GOM seismic and the Bab Basin/Shuiba systems
- Continue advancement of the El Doctor analog, including the correlation of the Albian platform demise and drowning as seen in the outcrops in South Texas
- Investigate potential down-dip carbonate fan development in Jurassic to Cretaceous deep GOM and relate to outcrop work in SE France, Oman, and Portugal
- Microbial carbonate correlation and stratigraphic framework of the Albian microbial deposits of the Comanche Shelf

### Cretaceous Core Studies

- Complete research on the depositional systems and OAEs in several Lower Cretaceous areas in Texas
- Investigate GOM Lower Cretaceous shelf-interior carbonate sand and reef systems for reservoir characteristics including stratal architecture, lithofacies, pore networks, and source rock

## Austin Chalk Reservoir Characterization and Production Analysis

### Austin Chalk Fracture and Matrix Characterization

- Finalize regional architecture and reservoir integration using existing and new cores, including integration of petrography, micropetrography, XRF, XRD and TOC combined with tied well logs within the RCRL GIS Database
- Advance the mechanical stratigraphy, vertical mechanical facies regional correlation, and integrate outcrop and subsurface fault-related fracture research
- Advance the reservoir geomodelling efforts in the Karnes Trough area and integrate with core and wireline machine-learning techniques to develop a high-fidelity reservoir model

# Carbonate Reservoir Characterization Research Laboratory (RCRL)

## Austin Chalk Production Analyses

- Complete the Karnes Trough regional and local 3D models to incorporate 3D fault geometries, including current-day stress field, as interrogation parameters for detailed 3D spatial variation comparisons versus EURs within modern lateral completions
- Develop high-resolution reservoir models of local areas to test the fracture influence and potential impact on production

## Cenozoic carbonate platforms, high-resolution stratigraphy, and structural configuration

- Develop new models for eustatic and glacio-isostatic controls on carbonate sequence stratigraphy and diagenesis using the last 400 ka of stratigraphic record, Bahamian Platform
- Compare Miocene carbonate platform evolution in two contrasting structural settings of the Mut and Adana Basins, southern Turkey
- Inner-shelf seismic analysis of reciprocal sedimentation in Miocene mixed-carbonate siliciclastic system in the Browse Basin, Northwest Shelf, Australia
- Regional seismic characterization and paleogeomorphology of shelf to basin Miocene system in the Canarvon Basin, NW Shelf of Australia.
- Seismic geobodies dimension extractions from the Miocene carbonates of the NW Shelf of Australia.

## Database Updates

- Searchable Catalog of RCRL Presentations and Extended Abstracts
- Austin Chalk Core Properties to Arc-GIS
- Reservoir Properties Digital Database of GOM carbonates
- Digital Outcrop Catalog to Arc-GIS (*coming in 2021*)
- RCRL Core Workshop Database to Arc-GIS (*coming in 2021*)

## Industrial Sponsors

The RCRL program has existed continuously since 1987, maintaining strong company sponsorship each year including 33 companies that supported our research initiatives in 2020.

Apache	ConocoPhillips	Fasken Oil and Ranch	Ovintiv	Sage Natural Resources
BHP Billiton	Continental Resources	Itochu	Oxy	Saudi Aramco
BP	Devon	Lundin Petroleum	Parsley	Sinopec
Chevron	Diamondback Energy	Marathon Oil	PetroChina	Total
Chesapeake	Equinor	Matador	Pioneer	University Lands

## Software and Data Contributors

Fairfield Geotechnologies	TGS	FracMan	IHS Markit	Velocity Databank
Ion	Eliis	Halliburton	Schlumberger	GeoStar Seismic

# Carbonate Reservoir Characterization Research Laboratory (RCRL)

## Research Group

### *Principal Staff*

Dr. Xavier Janson, Research Scientist, Co-Principal Investigator  
Dr. Christopher Zahm, Research Scientist Associate, Co-Principal Investigator  
Dr. Charles Kerans, Goldhammer Chair of Carbonate Geology  
Dr. Robert Loucks, Senior Research Scientist  
Mr. Robin Dommissie, Research Scientist Associate  
Mr. Josh Lambert, Research Scientist Associate

### *Associated Staff*

Mr. Jerry Lucia, Retired Emeritus  
Dr. Frank Male, Research Associate, Reservoir Engineer  
Dr. Lucy Ko, Research Associate, Geochemist  
Ms. Kelly Hattori, Research Scientist Associate, Stratigrapher  
Dr. Hongliu Zeng, Senior Research Scientist, Seismic Analysis  
Mr. Evan Sivil, Research Technician  
Dr. Sheng Peng, Research, Research Associate  
Ms. Sarah Machin, Associated Researcher

RCRL collaborates closely with the Quantitative Clastics Laboratory (QCL) for the characterization of the mixed carbonate/siliciclastic slope to deepwater deposits in the Permian Basin and in Australia.

## Graduate Students

The RCRL is proud of the research accomplishments of our current graduate students. Most of our graduated students are now working in industry research, production, and exploration roles. Our current students and their research projects include:

Ben Rendall (PhD, May 2021) - Anatomy of an ancient mixed shelf: Contemporaneous carbonate-siliciclastic sedimentation during the Late Paleozoic Ice Age (Pennsylvanian: Desmoinesian-Missourian), Sacramento Mountains, NM. RCRL and Dept of Geosciences funded.

Leland Spangler (MSc, May 2021) - Constraints on timing of tectonics and sedimentation in the Middle Paleozoic, Sacramento Mountains, NM. RCRL funded and supported by GSA Graduate Research Grant, JSG Off Campus Research Grant, and JSG Grant Match

Joe Syzdek (MSc, May 2021) - Fold geometry and mechanical stratigraphy of the Gobbler Knob Anticline, Sacramentos. RCRL funded and supported by AAPG Grants in Aid Student Research Grant, SWS AAPG Grants in Aid Student Research Grant, JSG Off Campus Research Grant, and JSG Grant Match

# Carbonate Reservoir Characterization Research Laboratory (RCRL)

## Graduate Students (continued)

Colton Spears (MSc, Dec 2020) - Analysis of the Depositional Systems, Lithofacies, Diagenesis, and Reservoir Quality of the Lower Cretaceous Pettet Limestone Reservoir Section in the Wright Mountain Field in the East Texas Basin, STARR Funded and RCRL contributor

Buddy Price (PhD, Dec 2021) – Controls on morphology and architecture of mixed carbonate-siliciclastic slope and basinal systems, focused on Permian stratigraphy. RCRL Funded and supported by AAPG Grants in Aid, SEPM Student Research Grant, JSG Off-Campus Research Grant, and JSG Grant Matching.

Abdulah Eljalafi (PhD, Dec 2022) - Dissertation Topic #1: Geomorphic Expression of Last Interglacial Maximum Reef Complexes of the Florida Keys: New Insights from LiDAR Data. Dissertation Topic #2: Carbonate Platform Development and Demise during the Mid-Cretaceous in Central Mexico. Implications on Regional Oceanographic Condition Variability and Platform Response to Ocean Anoxic Events. RCRL and DGS – Goldhammer Chair of Geology funded with support from Autonomous University of Mexico (UNAM) Geological Institute Field Fund, European Association of Geoscientists and Engineers/Houston Geological Society, GSA Graduate Student Research Grant, JSG Off Campus Research Grant, JSG Grant Matching

Shawn Fullmer (PhD, May 2022) - Quaternary (Mid-Late Pleistocene – Holocene) Carbonate Geomorphology of the Bahamas-Caicos Archipelago: Carbonate Factory Response to Sea-level and Climate Change. Exxonmobil and DGS-Goldhammer Chair of Geology funded, RCRL contributor

Charlie Zheng (PhD, May 2022) – Dissertation Topic 1: Benthic oxygenation history of S. Texas during the Austin Chalk Group deposition: An integrated ichnologic, sedimentological, and geochemical study. Dissertation Topic 2: Paleoecological and Paleoceanographic Reassessment of Intrashelf Basin Formation for the Upper Albian Devils River – Salmon Peak Formations in the Maverick Basin, S. Texas. DGS, STARR and RCRL funded. GSA student research grant and SEPM student research grant

Mohammed Fallatah (PhD, May 2023) - The Cretaceous stratigraphy of Saudi Arabia at the Arabian Plate scale. Saudi Aramco funded and RCRL contributor.

Scarlette Hsia (PhD, May 2023) - Highstand constraints on the Whale Point succession and MIS 5a GIA trends in the Western Atlantic. Funded through GSA, NSF-GRFP, and DGS. RCRL contributor.

Kyle Fouke (PhD, May 2024) – Architecture and climatic record of the Last Interglacial coral-algal reef complexes, Bahamas-Caribbean region. DGS and Goldhammer Chair of Geology funded, RCRL contributor

## Contact

Dr. Xavier Janson, Xavier.Janson@beg.utexas.edu, (U.S.) 512-475-9524

Dr. Chris Zahm, Chris.Zahm@beg.utexas.edu, (U.S.) 512-471-3159

[www.beg.utexas.edu/rcrl](http://www.beg.utexas.edu/rcrl) Twitter: @RCRL15