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<https://fourcornersgeologicalsociety.org>

FOUR CORNERS GEOLOGICAL SOCIETY

September 2022

SEPTEMBER 2022 MEETING

SPEAKER: **Mr. Tim Rynott**

TITLES: **The Paradox Basin: A New Frontier for Helium Exploration**

DATE: Thursday, September 22, 2022

TIME: 5:30 - 6:30 pm: HAPPY HOUR
Drinks and Delicious Food on the 3rd Floor Balcony
~ 6:30 pm - 8 pm: Speaker, Society business and Raffle
in SFH Room #710

No Zoom this month.

LOCATION Room 710, Sitter Family Hall (Geology Building),
Fort Lewis College with Social Hour & Food on 3rd
Floor Balcony

COVID: Please be cognizant of the ever-present danger of this nasty virus.

COST: \$20/person. Please RSVP by Monday, September 19 if possible. 1) PLEASE go to the website to pay and register: <https://fourcornersgeologicalsociety.org/event>. Or, 2) email Jeff Geslin at jkgeslin@gmail.com. 10 students will be sponsored by Dr. Geslin. To sign up, contact Dr. Geslin and RSVP.



Four Corners Geological Society, P.O. Box 1501, Durango, CO 81302
www.fourcornersgeologicalsociety.org

Our Speaker:

Tim Rynott, Four Corners Helium

Mr. Rynott, founder of Four Corners Helium, LLC (FCH) and Ridge Resources LLC based in Durango, Colorado, has 37 years of experience in the energy extraction business via Ridge Resources, and for almost 3 years, has been generating helium opportunities through Four Corners Helium.

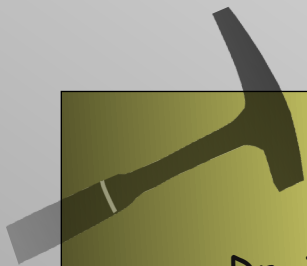
FCH has mapped almost 10,000,000 acres of the helium charged Colorado Plateau, and is currently reviewing helium projects in eastern Colorado, Northern Montana, the Texas Panhandle, New Mexico, and Arizona. Four Corners Helium, one of 25-30 pure Helium exploration companies in North America, has gained appreciable insights for the geologic and geochemical challenges in discovering helium accumulations in North America.



Fifteen months ago FCH teamed up with Grand Gulf Energy (GGE), and GGE subsequently became listed on the Australian Stock Exchange. FCH and GGE formed Valence Resources LTD to be their Operating arm. The maiden Valence well, east of Monticello Utah, is presently in the completion phase.

Mr. Rynott has served on multiple leadership positions with the AAPG and GCAGS and is a past president of the Four Corners Geological Society. Mr Rynott has provided technical presentations for multiple Oil and Gas organizations and conferences, including AAPG, SEG, GCAGS, SIPES, Four Corners Oil & Gas Conference, HGS, LGS, and FCGS.

He is presently serving as Rocky Mountain Section Counselor for the (AAPG) DPA. Mr Rynott is a member of good standing with the AAPG, DPA (Cert #5803), LOGA, HGS, LGS (Honorary Member), FCGS, and SGE.



a HUGE THANK YOU to

Dr. Jeff Geslin, Pictured Cliffs Geoscience LLC,
for sponsoring 10 Student Dinners this month.



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Abstract:

THE PARADOX BASIN: A New Frontier for Helium Exploration

Tim Rynott, Four Corners Helium

The Paradox Basin has two distinguishing traits: Daunting complexities, and world class reservoirs. The former has humbled many qualified geoscientists, while the latter harkens the names Aneth, McElmo Dome, and Lisbon Fields – which speak for themselves.

New to the equation has been the discovery of economic quantities of helium in the Paradox.

Helium exploration has many of the same fundamentals as traditional oil and gas: source, timing, trap, seal and reservoir mechanics all play integral parts. In pure helium exploration, reservoir properties and seal capacity are the difference makers between success and failure.

The Paradox Basin has been blessed by thick salt/anhydrites which mitigate the seal risk, while interfacing rock-mechanics to seismic wavelets can reduce the risk of heterogenic porosities. As an example of the latter, a Houston based seismic reprocessing firm (eSeis, Inc), has utilized patented software to calibrate a seismic attribute to proven porosity in Valence Resources' recent helium discovery in SE Utah.

This calibration not only de-risks Valence Resources' development plans for chasing helium bearing Leadville (Mississippian) dolomites, but also points land brokers to the most optimal minerals to acquire.

North America is presently facing its worst helium shortages in its history, which is highly disconcerting when MRI machines, semi-conductors, rocket propulsion, fiber optics, high-tech laboratories, welding, and lifting applications are all dependent on helium. Even worse, the Federal Helium Reserve, located 12 miles northwest of Amarillo, Texas, could be 100% depleted in less than 2 years. The Reserve currently supplies 30-35% of Americas helium needs, plus acts as stabilizer for global helium pricing.

With contracts for gaseous industrial grade helium presently ranging from \$300 to \$600/MCF, and spot prices for liquid helium reaching \$2000-6000/MCF in isolated cases, numerous nascent helium hunters, of highly variable technical expertise, have jumped into the ring.

Zip codes matter, and the technical expertise of geoscientists from Industry and Academia in the Four Corners region find themselves on the front lines in bringing a precious commodity to a stressed and insatiable consumer.

SAVE THE DATES!

October 20, 2022:

Steve Cumella

November 17, 2022:

Carol Finn, USGS

December 8, 2022:

TBD

January 19, 2023:

TBD

February 16:

Nathan Rodgers/Lauren Broes

March 23:

John Singleton, Colorado State University

April 20, 2023

FLC Student Presentations

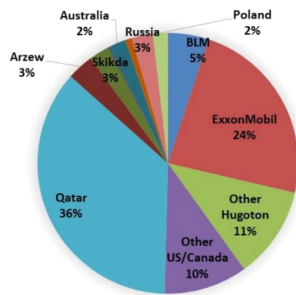
May 2023:

Possible Spring Party

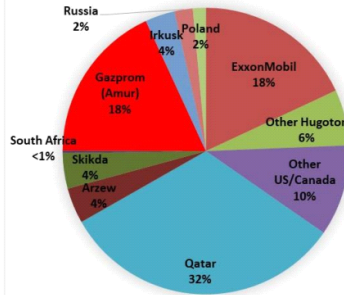


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WW Source Shares of Supply (Production) – 2021 and 2026



2021 WW Helium Production = 5.9 Bcf



2026 WW Helium Production = 7.5 Bcf

- US Sourced helium declines from 51% of worldwide supply in 2021 to 37% of worldwide supply in 2026.

Note: Other Hugoton includes crude recovery and liquefaction plants connected to the BLM pipeline. Other US/Canada includes Doe Canyon, IACX, Paradox, NAH, Thor Resources, Quantum, and Tenawa. In 2026, BLM production is assumed.

Intelligas
Consulting

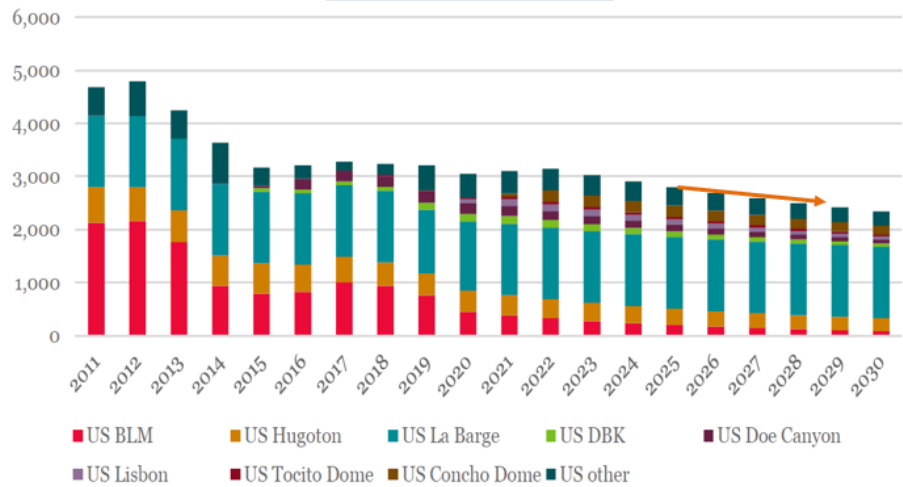
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HELIUM:

“North America
is presently
facing its worst
helium
shortages in its
history”

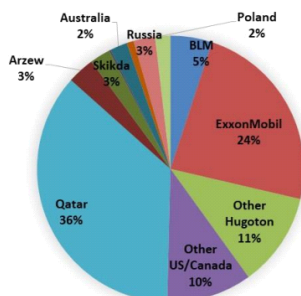
I Love
Helium.
I just can't
speak highly
enough
about it.

US Helium Supply

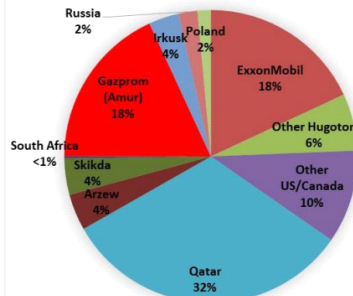


Source: Company Data, USGS, H&P estimates

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“PREZ SEZ” by Jeff Geslin

Greetings!

The FCGS is excited to kick off our fall activities this month. Our monthly technical presentations / social events start with a talk by Tim Rynott on Helium activities in the four corners region. This is a rapidly growing field and it should be a very interesting talk.

We are also resuming our field trips this fall. After our “pandemic hibernation” the FCGS leadership is very excited about returning to the field. I’m writing this during a visit to Grand Teton National Park, and I’m reminded of all of the amazing field geology on display in the western US. As geoscientists we analyze beautiful landscapes by thinking about their history, and it gives us a greater appreciation for our surroundings. For me today it is the Laramide orogenic event that created the Tetons, and the fluvial geomorphology that created terraces along the Snake River during the last few glacial periods. I think that field experiences are what originally attracted most us to the geosciences. And our life-long interest in the earth is what keeps us returning to observe and enjoy the outdoors.



I hope that you can join us on the FCGS October field trip. But if the field trip is full, or you can’t attend for some other reason, please join us for one of the other trips this year. It will be great to go see some rocks!

Best regards,

Jeff

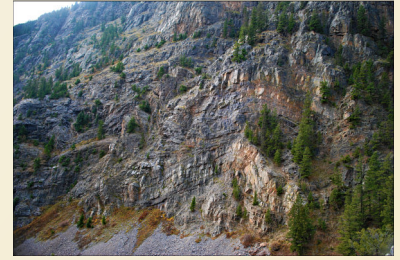


*The Grand
Teton and
river
terraces
along the
Snake River*



FALL FIELD TRIP

A RIDE THROUGH TIME - BY FOOT AND BY TRAIN



Joint FCGS and Fort Lewis College Geo Club Field Trip

Molas Pass to Durango Hike and Rail Ride

October 15, 2019

Join trip fellow FCGS Members and FLC students on the bus ride from town up to Molas Lake. Hike through the fall colors from Molas Lake down to Elk Park in the Animas River gorge following part of the Colorado Trail. The hike starts near the Mississippian-Pennsylvanian contact and continues down-section through Early Paleozoic (possibly Late Precambrian?) basal conglomerates that overlie the "Great Unconformity". Then as we descend into the gorge, we see spectacular sedimentary and structural exposures of the Precambrian Uncompahgre Group. After lunch in the gorge, we will jump onto the train for an enjoyable ride back to Durango. The hike is a little over 3.6 miles long, beginning at an elevation of 10,610' descending to 8,925'. The ~1,700' descent into the gorge is fairly steep, so can be hard on the knees.



Signup will begin Friday, September 16 at 6:00am on the website

You must be a FCGS Member to participate

Itinerary:

Meet at 6:45am in the D&SNRR train parking lot next to McDonalds. We will leave promptly at 7:15am so don't be late! There is a \$10 fee to park in the lot. ***Please bring your own lunch in a light daypack.*** We will provide packable light snacks and water refills at the Molas Lake trailhead.

Note - Please wear sturdy hiking boots and bring your camera, sunscreen, hiking sticks and rain gear.

Literature on the area:

We will send a link to participants containing relevant articles by Sept. 24. Download and print any that you wish.

Registration:

Must be a Four Corners Geological Society member in good standing to participate. [Click Here to Become a Member](#)

IMPORTANT: FLC Geo Club members sign up with Dr Gonzales, not FCGS website!

Registration for non-students opens Sept 16th through the FCGS website. [Click Here to Register for Trip](#)

Cancellation Deadline for refund is Sept. 24th^h.

Any questions? Contact Jim Corken at: rjcork@aol.com or 970-759-2567

THE



FUN

DISPLAYS

INVITES YOU TO MEET US!

Sunday, September 25th
3:00 p.m. to 6:00 p.m.

FOOD

2351 N Main Ave - Brookside Park,
Little Turquoise Building

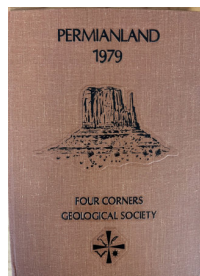
SHOP
TOURS



BLOW OUT BOOK SALE & CLEARANCE

LAST CHANCE to buy these Classic Books.

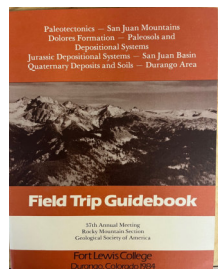
Everything goes by October 15, 2022



Permianland

1979

Ninth Field Conference Sept. '79
17 Technical Papers & 4-day road log from Moab, Lisbon Valley, the Needles, Monument Valley, Flagstaff, to Sedona.



Durango Field Guide

1984

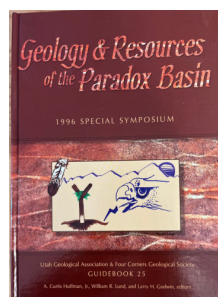
Field Trip Guidebook, GSA 37th Annual Meeting Rocky Mtn. Section
5 Technical Papers & road logs from Durango to Silverton & Telluride plus Quaternary geology of Durango area.



Geology of Cataract Canyon

1987

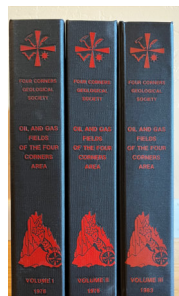
28 Technical Papers. General Overview, Structure-Tectonics, Stratigraphy, Sedimentation & Paleontology, Economic & Groundwater Geology.



Geology and Resources of the Paradox Basin

1996 Special Field Symposium
UGA Guidebook 25

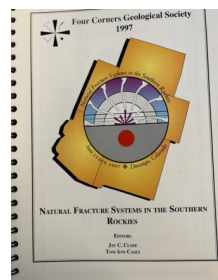
33 various Technical Papers & 3-day road & river logs from Moab to Bluff to Mexican Hat along the San Juan River & back to Durango. *This is an incredible book!*



Oil & Gas Fields of the Four Corners

1979-1983 (Vol I, II & III)

3-ring binders. General papers on various subjects from CO2 to helium to studies. Plus detailed description of almost every conventional field in the 4-corners area to 1983.



Natural Fracture Systems in the Southern Rockies

1997

28 technical papers in a wide range of topics from theory to practical applications. Softbound.

We are closing our storage locker so these volumes will not longer be sold. Price includes shipping.

The Society will continue to sell the digital CD containing **all** of our publications (\$105) and the San Juan River Guidebook (\$15). Please see the website: fourcornersgeologicalsociety.org.

_____ **Permianland : \$11 (50% off)**

_____ **Cataract Canyon: \$12 (50% off)**

_____ **Oil & Gas Fields 3-vol: \$36 (40% off)**

_____ **Durango Field Guide: \$11 (50% off)**

_____ **Paradox Basin: \$42 (35% off)**

_____ **Natural Fracture Systems: \$16 (-65% off)**

_____ **All 4 of Remaining Field Guide Volumes (not the O&G vols): \$61 SPECIAL BUNDLE SALE!**

Instructions to order books: Decide what you want & email your name, address and order details to Tom Ann at: talcgeo@gmail.com or fcgeosociety@yahoo.com.

We will invoice you via our FCGS PayPal site and mail or deliver your books. Questions? Contact Tom Ann!

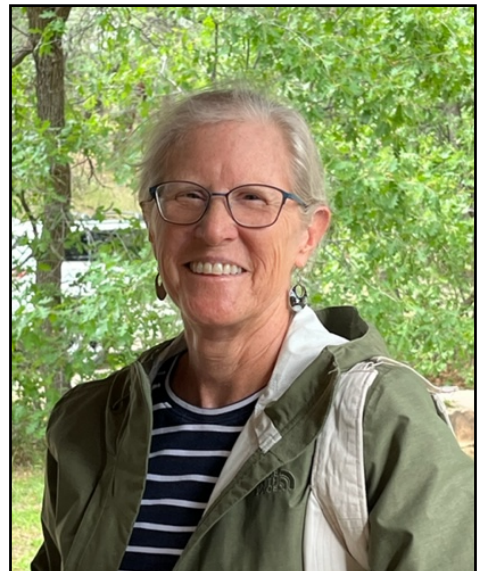


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FCGS MAY END-OF-SUMMER PICNIC!



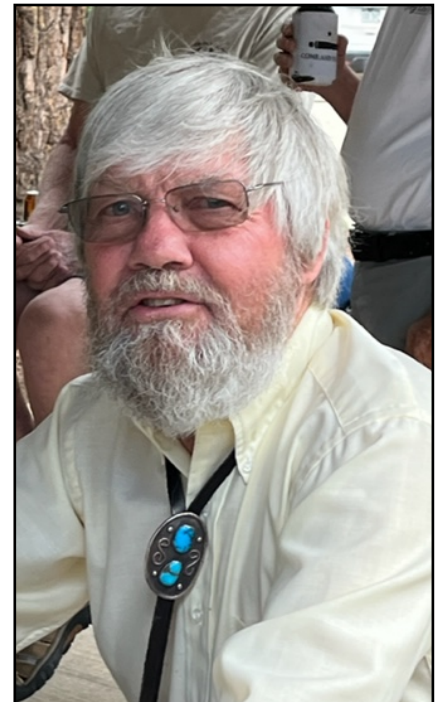
FCGS MAY END-OF-SUMMER PICNIC!



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FCGS MAY END-OF-SUMMER PICNIC!

Were YOU there??



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FCGS MAY END-OF-SUMMER PICNIC!



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NEWS FROM AROUND THE REGION

JOB OPENING:

Principal Geologist – Target Generation

This role will lead target generation and business development services in North America (and globally as requested) to identify new Resources and investment opportunities of economic interest. Focuses time and energy on decisions that have a targeted completion time of 2 years. Contributes up to a 5-year timeline.

Candidates must have:

- Broad based understanding of exploration, mining, commercial issues and risk management
- Ability to develop effective exploration systems, processes and key metrics to improve and monitor exploration performance
- Proficiency with various software packages applicable to the role

Qualifications/Experience:

- Bachelor's degree (Advanced degrees preferred)
- 15 years' experience in exploration geology
- Strong organization & communication skills

For more details, please connect with Samantha Larson at Slarson@MiningSearch.com

Volunteers Needed for Girl Scout Day at Dinosaur Ridge

The Dinosaur Ridge Girl Scout Day is coming up on October 8, from 9 am to 3 pm. CO-AIPG needs volunteers for our annual information booth. I'd like to do 3-hour volunteer windows, 9 am-noon and noon-3 pm. We prefer to have at least 3 people there at the same time because scouts visiting can be quite busy at times.

If you can help please contact:

Jessica Davey

President-Elect, CO-AIPG

davey.jessica7@gmail.com

Colorado Section September Virtual Lunch Talk

September 21, 2022; Noon – 1 PM MT

The AIPG Colorado Section is excited to launch our every-other-month virtual lunch talks. It's been a few years since we have hosted talks, and we're thrilled to be back at it!

To kick our program off right, we will be joined by Nick Coscarella, a Metropolitan State University of Denver student, and his 360° Virtual Tour of the Colorado Plateau.

Description of the Tour:

The following geologic virtual tour was created over the summer (May 2022) and was created utilizing the virtual tour site CloudPano: <https://app.cloudpano.com/tours>.

The tour explores the Colorado Plateau including the unique stratigraphy found within some of Utah's national parks and found within western Colorado. The Colorado Plateau is known to be one of the ideal places in the world to study sedimentary geology, so the purpose of this tour is to show and teach interested geologists about the Colorado Plateau. This virtual experience allows geologists the opportunity to study and see the stratigraphy even if they are not able to visit the stops themselves. It is important to note that there are instructions at the first stop on the tour (Gypsum, CO) that specify how to operate the software and maximize the experience while going through each stop. A huge appreciation goes out to the EAS Department at MSU Denver and to Aaron Adams and Jessica Davey for leading the class and providing all that was needed for the trip to occur.

NEWS FROM AROUND THE REGION, continued

Nick Coscarella has always had a passion for outdoor activities and science. Currently preparing for grad school and enrolled at MSU Denver, Nick is planning to get his masters in geological engineering at the Colorado School of Mines. After working closely with Dr. Barbara EchoHawk and Dr. Uwe Kackstaetter, Nick began working on creating his own virtual tours with the use of Dr. EchoHawk's GoPro. After purchasing his own GoPro Max, he began creating geologic virtual tours that showcase some of the incredible geology around the world. Here are some links to other virtual field trips Nick has created so far:

Triceratops Trail (Golden, CO): <https://app.cloudpano.com/tours/DiMAjBdKX>

Future Glade Reservoir Site and Owl Canyon (Laporte, CO): https://app.cloudpano.com/tours/8Cwh5_SoL

Volcanoes and Volcanic Features of the Western United States: <https://app.cloudpano.com/tours/4vPL7kie>

Cost: Members - \$10, Non-Members - \$15, Student Members - FREE (must be a currently registered member or student member to receive the discounted price)

A Zoom meeting link will be emailed out two days before the event, please make sure to use a valid email address during the checkout process.

To register, go to <https://aipg-cosection.org/meetinginfo.php?id=3&ts=1661819200>

Rockies Prospect Expo

Sept. 22, 2022; 10 Am – 4 PM MT

Denver Earth Resources Library, 730 17th Street, Suite B1, Denver, CO

A Rockies-focused event bringing the industry together to buy and sell deals.

The Denver Earth Resource Library is holding a Rockies Prospect Expo on Sept 22, free to attend, followed by a Happy Hour sponsored by Morning Gun Exploration! We will have 20+ prospects on display, along with a few vendors.

Email amanda@derl.org with any questions.

AAPG distinguished Lecture: Integrated Reservoir Characterization and Modeling with Computational Stratigraphy

September 29; 1 pm CT

Tao Sun, Senior Principal Geologist, Chevron Technology Center

Abstract:

As oil and gas exploration and production occur in deeper basins and more complex geologic settings, accurate characterization and modeling of reservoirs become paramount. Existing technologies for reservoir characterization and modeling have proven inadequate for delivering detailed 3D predictions of reservoir architecture, connectivity and rock quality at scales that impact subsurface flow and reservoir performance.

Enabled by the rapid advancement in digital and computational technology, computational stratigraphy is a physics-based forward modeling system that simulates the Earth's surface processes through computation of fluid flow and sediment transport to generate high resolution, geologically realistic models. Computational stratigraphy models can overcome the data sparsity and resolution gap and quantitatively predict reservoir heterogeneity in 3D, across all scales and for any depositional environment.

By integrating Computational Stratigraphy with existing reservoir characterization and modeling workflows, we can significantly improve reservoir performance forecasts and development uncertainty assessments. A range of models are constructed to capture potential variations in depositional environment, stratigraphic patterns, and basin setting. The developed ensemble of digital analogs defines specific analog predictions that can be validated with well logs and seismic data. Once the ensemble of digital analogs is in place, quantitative prediction of reservoir properties and their 3D distribution can be obtained, and the range of reservoir development uncertainties can also be quantitatively forecasted.

NEWS FROM AROUND THE REGION, continued

Register in advance for the above meeting:

https://aapg.zoom.us/webinar/register/WN_MQknWaavTh2jUJXuZWmkjQ

RMAG OCTOBER LUNCH TALK

October 5, 2022; 12:00 pm - 1:00 pm; In-person and virtual

Maggiano's Little Italy, 500 16th St. Mall, #150, Denver, CO 80202

“CCS Risk Evaluation in the San Juan Basin Using Rock Volatile Stratigraphy – Identification of Fractures, Lateral and Vertical Migration Pathways, Modified Rock Properties, and Implications for CO₂ Injection and Storage”

Christopher M Smith, Advanced Hydrocarbon Stratigraphy

As part of a DOE funded grant to examine the role of faults and other possible communication pathways which may allow injected CO₂ to escape its target storage zones New Mexico Tech (NMT) and Advanced Hydrocarbon Stratigraphy (AHS) have been working together in the San Jan Basin (SJB). The goal of the grant is to demonstrate the utility of new technologies for carbon capture and storage applications with the field work being done used to support NMT's CarbonSAFE program at the Farmington site. The field work will culminate in a well to be drilled later in 2022; while being drilled as a monitoring well, it will be completed such that it could serve as a US EPA Class VI well and inject CO₂ into the Jurassic aged Entrada and Bluff formations. Prior to drilling, Rock Volatiles Stratigraphy (RVS), developed by AHS was used on legacy cuttings from wells in the SJB and the Ute and Barker Dome fields to create an ~8 mile four well transect. RVS gently extracts, identifies, and quantifies over 40 volatile compounds from rock samples that can be fresh or several decades old; compounds include the C1-10 hydrocarbons (HCs), water, CO₂, and several sulfur species among others. The RVS analysis of the cuttings from the Jurassic section of Kirtland 1, drilled in 1961, revealed previously unknown fractures containing HC liquids, most likely condensate. The fractures in the Jurassic were charged by three different pulses of increasingly mature HCs with the most mature charge possibly matching the API gravity of Paleozoic production from the relatively close Hogback Field. The SJB and the Ute Dome Field (UDF) are separated by the Hogback Monocline (HM) (which may possibly be a fault/fold system) with 3-7000' of displacement. The Paleozoic section of Stephenson 1, in the UDF less than a mile away on to the HM, aligns such that Paleozoic HC liquids on the HM could laterally charge the fractures in the Jurassic on the SJB side of the fault. The chemical composition of the HC liquids in the Paleozoic section Stephenson and Kirtland share similarities re-enforcing this mechanism. The Jurassic section of the Stephenson also shows HC liquid filled fractures that are vertically too removed to be charged by the Mancos shale in Stephenson but would reasonably be charged via lateral fractures from the Mancos in the “downthrown” SJB. These RVS data demonstrate lateral communication across the HM. Other RVS signatures from Stephenson document vertical gas migration. Interestingly, the nature of the interaction of the rocks on either side of the HM with CO₂ is different suggesting that the rock properties have been modified post deposition. Strong correlations in the RVS data with this rock property and sulfur species and gas migration signatures suggest it may be linked to the movement of deeper previously documented sour gases on the “upthrown” side of HM which may have modified the surfaces of the rocks across several thousand feet of section. Other features of the transect will be discussed. It is yet unclear if the CarbonSAFE well will encounter these fracture networks – if the well has been drilled and RVS data are available these will be discussed too.

To register or get more info, go to

<https://www.rmag.org/index.php?src=events&srctype=detail&refno=237&category=RMAG%20Luncheons>



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