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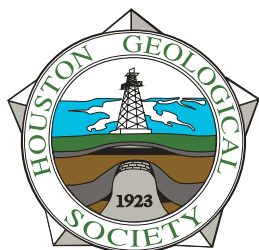
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About the Cover: The cover features Dune 45, a star dune located in the Sossusvlei area of the Namib Desert in Namibia. Named for its position 45 kilometers from the park's Sesriem gate, this dune is known for its 170-meter height and vibrant red-orange color from iron oxide in its quartz-rich sands. Photo courtesy of Lucia Torrado.

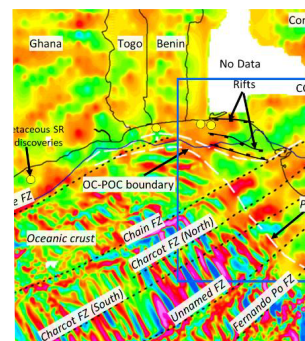
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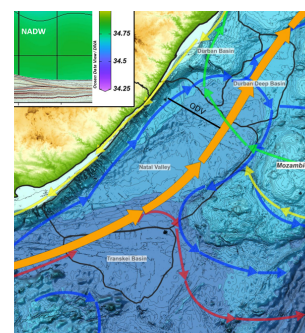
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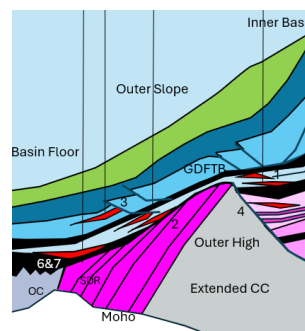
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Patty walker, HGS President 2025-26
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President's Letter – October 2025

This past month, I had the privilege of attending two landmark HGS events that offered unique perspectives on both the proud history and bright future of our profession and our Society.

HONORING THE PAST, INSPIRING THE FUTURE

The Past Presidents' Lunch is one of HGS's most cherished traditions, hosted by the immediate past president and bringing together those who have served in this role over the years. It was my honor to present Penny Patterson with her Past Presidents' pin and to hear reflections from our past leaders on their service and current endeavors. Their dedication to our Society and our profession was inspiring—and a reminder of the great responsibility I feel in following their footsteps.

Just a week later, I had the pleasure of welcoming attendees to the HGS Student Expo. To say I was impressed is an understatement and the positive impact the expo has for the Houston Geological Society is immense. Thanks to the leadership of co-chairs Andrew Stearns and Julian Chenin, and the efforts of many young HGS volunteers, this two-day event has quickly become the premier hiring event for geoscientists in the nation. Over 320 students from 70 universities across 30 states attended, alongside 20 recruiting companies. I took some time to visit with the recruiters who consistently praised the event's organization, the quality of students, and the critical role HGS plays in supporting the next generation of geoscientists. The strong sponsorship and volunteer support are proof of the passion and commitment of our members. I left the event reassured that the future of both geoscience and HGS is in excellent hands.

FALL PROGRAMS AND COMMUNITY EVENTS

September also marked the start of a new year of technical programs, offering diverse opportunities for learning and exchange across a broad spectrum of topics of interest to our membership. Based on her research of where our membership lives and works, our Vice President, Caroline Wachman, has worked diligently to identify central, affordable, and accessible

venues for our evening dinners and lunchtime talks—no small task given the commute in Houston traffic! Please take a moment to thank her for delivering such an engaging and educational program.

October also brings Earth Science Week, October 12–18, with the theme *Energy Resources for Our Future*. Earth Science Week (ESW) began in 1998 under the auspices of American Geological Institute with a goal to bring awareness of the importance of understanding Earth sciences and the stewardship of Earth. Since its inception, ESW has grown to international importance. In 2024, ESW events were observed in all 50 states, the District

of Columbia, Puerto Rico, and Guam, as well as 23 countries. HGS's continued voice and participation in this ever-evolving topic of energy resources is critical. In partnership with the Houston Museum of Natural Science, HGS will host an ESW event on Saturday, October 11, from 10:00 a.m. to 2:00 p.m. in the Paleontology Hall Lobby.

For those looking to connect socially, mark your calendars: the HGS NeoGeos Pickleball

Tournament will be held on October 16, and the Annual HGS Golf Tournament takes place Thursday, October 23. Registration is now open!

LOOKING AHEAD TO 2026

Planning is already underway for *Case Studies Seminar II*, scheduled for January 15, 2026. Co-hosted by HGS and the Geophysical Society of Houston, this one-day conference will feature real-world field studies and lessons learned from drilling successes and challenges. With leadership from Linda Sternbach (HGS) and Katya Casey (GSH), the program promises to be even stronger in its second year. Promotion begins this month, so spread the word—this popular seminar is expected to fill quickly.

As we welcome fall, I hope for cooler weather in Houston and many opportunities to connect with you at upcoming HGS events. It is an honor to serve as your President, and I look forward to the year ahead. ■

*The strong sponsorship
and volunteer support
are proof of the passion
and commitment of
our members*



Lucia Torrado, HGS editor 2025-26
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Shaping Our Understanding of the World: Africa, Exploration, and Member Connections

Some stories demand attention, not only for their scientific merit, but for the subtle ways they shape our understanding of the world. This month's *Bulletin* is one such collection, with a special focus on African geology in anticipation of the upcoming Africa Conference on October 24-25th (don't forget to register!).

Having recently attended IMAGE 2025, it became clear that African contributions - from keynote talks to exhibit booths - are increasingly growing in geoscience research and exploration across the continent. A standout session, the *Discovery Thinking Forum: Integrating Geology and Geophysics*, highlighted major deep-water discoveries in Africa (among other places in the world) and underscored the importance of interdisciplinary approaches to understanding complex geological settings. It seemed only fitting, then, that this issue highlights both the rich geology of Africa and the innovative work emerging from its geoscientists.

Deep-water exploration in Africa is expanding rapidly, driven by high-profile discoveries in frontier areas such as Namibia, Senegal/Mauritania, and Côte d'Ivoire, alongside established hubs in West Africa. As explorers move into acreage where complex sedimentary systems hold untapped potential, the traditional focus on classic turbidite plays is widening to include the role of contourites: reservoirs, seals, and migration pathways every bit as critical as downslope systems. This shift is illustrated in this issue's *Technical Article* on mixed turbidite–contourite systems offshore South Africa and the *Feature Article* on Namibia's Orange Basin. Yet, sedimentary processes are only part of the story: crustal architecture and thermal history govern source-rock maturation and migration just as powerfully, a theme also underscored in this issue's extended abstract from Nigeria.

This holistic perspective- looking at both what is deposited and what lies beneath -echoes beyond hydrocarbons. In Senegal, for example, a Geoscientists Without Borders project featured in this *Bulletin* issue, used geophysics to locate scarce groundwater in crystalline terrain while training the next generation of geoscientists. It is a reminder that exploration is ultimately about

finding resources, and in the end, whether we are mapping contourite drifts offshore or aquifers onshore, the goal is the same: to deepen our understanding of the Earth and to use that knowledge to build a more resilient world.

INSPIRED BY CONFERENCE INSIGHTS AND DESIGNED TO BENEFIT HGS MEMBERS

I am excited to introduce a new feature in the *Bulletin*, inspired from networking experience during IMAGE. At the conference, participants were sharing traditional business cards, but increasingly QR codes are being used to connect directly to professional profiles. This sparked the idea to include a similar concept in the *Bulletin*.

Members now have the opportunity to feature their own business cards with live links to their LinkedIn profile, allowing colleagues to

connect directly. This feature is designed to help HGS members showcase their expertise and network more effectively. As always, the *Bulletin* is created for our members, and contributions to this section are welcome.

INTRODUCING GEO-PICKS

Geo-Picks is a new section showcasing recommendations from HGS members. Whether it's a fascinating museum exhibit, an insightful book, a thought-provoking documentary, or any resource that inspires or informs, Geo-Picks highlights tips and reviews from our geoscience community.

This section is all about sharing discoveries, and providing practical or creative ideas that members can explore. Contributions are always welcome! If you have a favorite geoscience-related find or experience, let me know.

IN THIS ISSUE OF THE BULLETIN

- *Mapping Mixed Turbidite–Contourite Systems for Hydrocarbon Prospectivity in South Africa*

The first *Technical Article* from the Petroleum Agency of South Africa, uses high-resolution seismic data to map Mesozoic–Cenozoic, mixed turbidite–contourite systems off the country's

*exploration is ultimately
about finding resources*

east coast, showing how structural highs and currents shaped sediment pathways and created features important for hydrocarbon prospectivity.

- ***Continent-Ocean Transition and Hydrocarbon Prospectivity of the Deep-water Niger Delta Margin, West Africa***

From the IMAGE conference, an extended abstract on the Niger Delta Basin reveals three distinct crustal types beneath the basin. By integrating deep-penetrating seismic, gravity, magnetic and well data, the study shows how these domains control heat flow and source-rock maturation. It highlights newly mapped rifts and extensive proto-oceanic crust offshore, pointing to untapped Cretaceous deep-water fairways with significant oil and gas potential.

- ***The Seven Sisters of the Orange Basin, Namibia: Guiding Hydrocarbon Exploration***

A study from Namibia examines seven distinct depositional systems of Cretaceous sands in the Orange Basin and their significance for hydrocarbon exploration. This Feature Article narrates how turbidity currents, slope processes, and structural highs, controlled sand accumulation from the shelf to the basin floor, creating complex sequences of potential reservoir sands. Recognizing these systems, the authors argue, is key to identifying drilling targets in this geologically dynamic region.

- ***Geoscientists Without Borders: Advancing Groundwater Research and Student Training in Senegal***

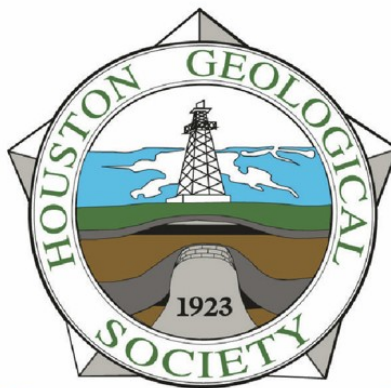
In this Feature Article from Senegal, a Geoscientists Without Borders project mapped groundwater potential in the south-eastern crystalline terrain using electrical resistivity tomography, transient electromagnetic methods, and long-range wireless sensors. The project paired technical surveys with hands-on training for master's students at Cheikh Anta Diop University, supporting sustainable water management, quality education, and international partnerships.

- ***Pivot Profile: From Environmental Geology to Real State***

Meet Atif Hariz, a geoscientist-turned-realtor who brings a unique perspective to real estate by applying his background in geology, environmental consulting, and procurement. This profile highlights Atif's career pivot, global experience, and data-driven approach to helping clients make informed, confident property decisions.

- ***Geo-Picks: Inaugural Recommendation***

Our first Geo-Picks comes from Bill DeMis, who takes us to the Wyoming Dinosaur Center in Thermopolis, Wyoming. Thank you, Bill, for inspiring this new section of the *Bulletin* and for sharing a recommendation that members can enjoy and explore!



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HGS Member \$65.00 | Non-HGS Member \$75.00 | Student \$40.00

Fiber-optic sensing technologies, particularly Distributed Acoustic Sensing (DAS), are transforming geophysics by repurposing existing fiber-optic cables into dense arrays of strain sensors. This approach enables long-range, long-duration, and cost-effective monitoring across diverse environments. By exploiting the ultra-dense sampling of the seismic wavefield along telecommunication cables, fiber-optic seismology has advanced high-resolution seismic source characterization and subsurface imaging.

REGISTER NOW



Dr. Jiaxuan Li

Continent-Ocean Transition and Hydrocarbon Prospectivity of the Deepwater Niger Delta Margin, West Africa

By Jumoke Akinpelu and Paul Mann

Department of Earth and Atmospheric Sciences, University of Houston, Houston, Texas

The Niger Delta Basin of Nigeria, West Africa is a prolific hydrocarbon province based on decades of exploration and production of its Cenozoic plays. While the Eocene and younger petroleum system have been the mainstay for many years in the Niger Delta, the steady decline in production from the inland, coastal, and slope fairways raises the question of whether deeper water plays based on Cretaceous source rocks will provide the path to increased production.

This comprehensive study integrates deeply penetrating regional 2D seismic reflection data, gravity, magnetic and well data for the 300,000 km² on- and offshore area of the Niger Delta. The objective is to determine the crustal types underlying the basin and the influence of these variably buried crustal types on source rock maturation and hydrocarbon potential within the basin. We identified three crustal types beneath the Niger Delta: 1) continental crust (CC) characterized by broad, orogenic-related magnetic anomalies; 2) transitional proto-oceanic crust (POC) characterized by variable crustal lithologies and weakly developed fracture zones; and 3) oceanic crust (OC) characterized by uniform crustal structure and well-developed fracture zones and spreading ridge anomalies (**Figure 1**). The CC-POC and OC-POC boundaries were delineated using seismic reflection data, wells, and potential fields data. These three crustal types provide important controls on source rock maturation in the Niger delta basin.

Two-dimensional gravity modeling along the deep-penetration seismic reflection lines show alternating vertical blocks of variable density values in the proto-oceanic crust domain. From the gravity modeling, we infer localized blocks of exhumed mantle with a density of 3.2 g/cc, thickened volcanic rocks with a density of 3.0 g/cc, and continental crust with a density of 2.8 g/cc. The oceanic crust domain formed at an organized spreading ridge and exhibits a distinct density value of 2.85 g/cc and negligible mantle variability in areas that match transparent seismic facies on seismic reflection data.

Reflection seismic data shows CC in the study area is characterized by large-offset, listric normal faults which become more planar and with smaller offsets as the CC transitions from full-thickness CC (>35 km) to the necking zone. The CC thins up to 8-10 km in the stretched CC in the necking zone of the northwestern Niger Delta as the Moho steadily rises with minor undulations. We mapped continental rifts 120 km seaward of the previous

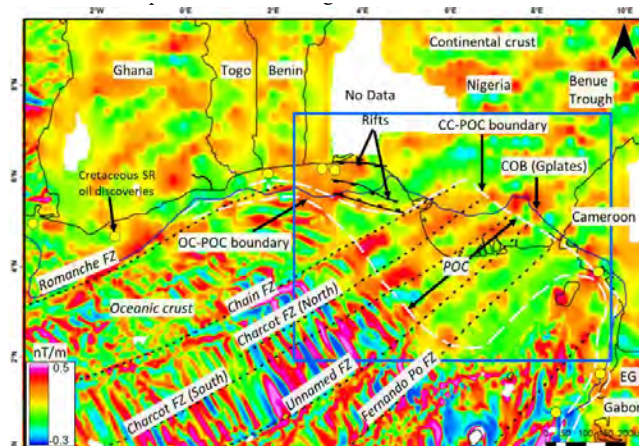


Figure 1. EMAG 2 v.2 Magnetic Reduced to Pole (RTP) map with a vertical derivative filter showing the different crustal domains in the Niger delta area (blue box outline). The continent-ocean boundary (COB) from Müller et al. (2018) Gplates study is shown in a dark blue line. Normal faults bounding rifts in the CC of the northwestern Niger Delta are shown and identified using 2D seismic lines and well data.

continent-ocean boundary (COB) along with newly identified tracts of POC crust that underlies 75% of the Niger Delta basin offshore (**Figure 1**). The transitional POC domain is characterized on seismic profiles by closely-spaced, small-offset, planar faults at the top of the crust and semi-continuous and high-amplitude seismic facies of thinner sediments directly overlying the crust. The absence of the syn-rift wedge and crustal thinning up to 2-4 km along seismic profiles further differentiates the POC area from the stretched continental crust domain. We interpret the presence of POC along the Niger Delta margin as a record of very slow oceanic opening of the Equatorial Atlantic margin during the Aptian-Albian. The 5 to 7.6 km thick OC is less faulted with high seismic amplitude and rugosity at the top of the crust. An Aptian-Albian plate reconstruction shows the protruding COB of eastern Brazil, provides a good pre-rift fit with the deeply recessed COB in the Niger Delta area.

Continental rifts mapped near the northwestern Niger delta (**Figure 1**) expands the deep-water, exploration fairway for Cretaceous-sourced oil and gas as observed in analogous basins to the west of the Niger Delta in Ivory Coast and Ghana. The 1D basin models in this study, which take into account variations in crustal thickness, radiogenic heat production, and overburden thicknesses, predict that Aptian-Albian source rocks in the continental rifts and Late Cretaceous post-rift are oil and gas mature. ■

EARTH SCIENCE WEEK

OCTOBER 12 - 17, 2025

ENERGY SCIENCES FOR OUR FUTURE



With the Houston Museum of Natural Science, the **Houston Geological Society (HGS)** will be sponsoring an ESW event at the Museum on *Saturday, October 11, from 10:00 a.m. to 2:00 p.m.* in the Paleontology Hall Lobby. This event is free with admission to the Museum.

The HGS event will have stations that will help participants of all ages explore Texas Geology, Micropaleontology, Fossil Wood, and Everyday Uses of Common Rocks and Minerals. There will also be rock and mineral giveaways for youngsters and a limited number of Earth Science Week resources kits available to educators.

For more information about the global event or to obtain a free educator's resources kit from the American Geological Institute go to <https://www.earthsciweek.org/>.

If you are interested in volunteering to help during the HGS event at the Museum, please contact Barbara Hill at bhill13090@gmail.com.

The Houston Museum of Natural Science Committee and the Educational Outreach Committee present:

SCOUT STEM DAY

October 4, 2025 | 9:00 am – 1:00 pm.

Grand Hall and Glassell Hall

Join us for this annual event on **October 4th from 9:00 am – 1:00 pm**. STEM Day Community Booths will be in the Grand Hall and Glassell Hall, providing interactive activities and giveaways. Past STEM Days have included touchable museum specimens, drone flying demonstrations, and more! With admission to the museum, Scouting America members will also have the opportunity to complete activities tailored for their group by HMNS STEM Scouting staff. More information coming soon.



HOUSTON MUSEUM
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Mixed Depositional Systems Along the Eastern Margin of South Africa: Implications for Hydrocarbon Exploration

By Reagan Africa and Anthony Fielies
Petroleum Agency SA

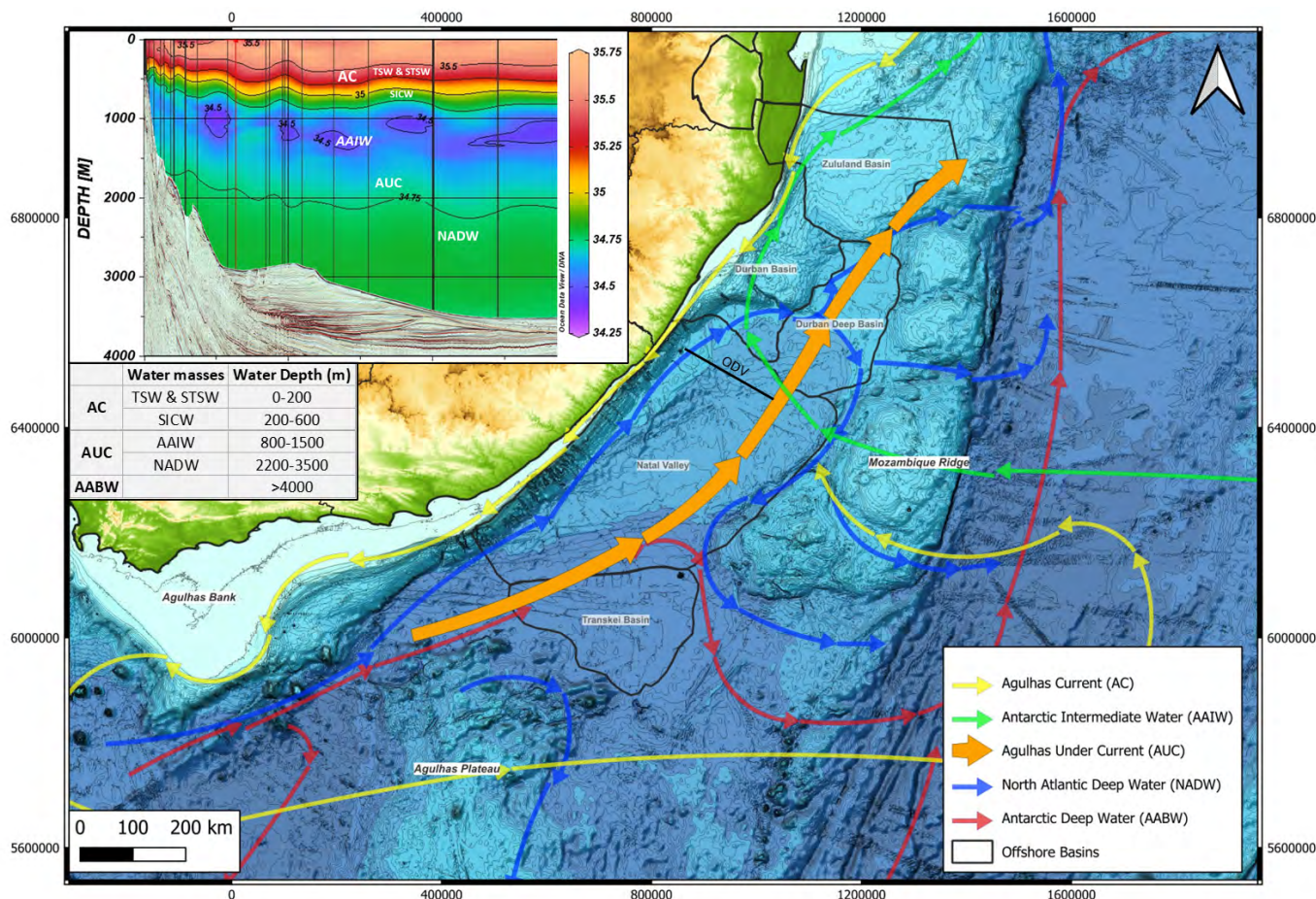


Figure 1. Oceanographic setting along the eastern margin depicting the locations of the Agulhas Current (AC), Antarctic Intermediate Water (AAIW), Agulhas Under Current (AUC), North Atlantic Deep Water (NADW), and Antarctic Bottom Water (AABW).

The eastern margin of South Africa is characterized by a complex interplay of oceanographic, tectonic, and depositional processes that have influenced sedimentation since at least the Early Cretaceous. This study employs 2D and 3D high resolution broadband seismic data to delineate and characterize Mesozoic and Cenozoic turbidite-contourite mixed depositional systems (MDS) along the east coast of South Africa. It specifically considers the Durban Basin with its eastern (Durban-Deep) and western depocenters, as well as the Natal Valley, where MDS are most prevalent. Given the limited research on Mesozoic and Cenozoic MDS in this region, this work represents a significant advancement in understanding the evolution and hydrocarbon prospectivity of these systems. The results highlight that structural highs, such as the South Tugela Ridge (STR) (Bhattacharya & Duval, 2016) and Mozambique Ridge, played a crucial role in influencing bottom current hydrodynamics and contourite

deposition during the Mesozoic, forming mounded contourite drifts and sediment waves, creating paleobathymetry and providing favorable pathways for turbidite deposition. During the Cenozoic, the interplay of downslope and along slope currents is expressed by the pronounced deltaic fan and canyon system, the Tugela Cone and Canyon, along with ubiquitous contourite depositional and erosional elements across the margin.

INTRODUCTION

The offshore basins along the east coast of South Africa, especially the Durban, Durban-Deep, and Natal Valley Basins, host a range of mixed depositional systems shaped by the interaction between downslope and along-slope processes (Africa and Fielies, 2023). These systems record a complex and protracted sedimentary history from the Mesozoic to the present day, heavily influenced by paleo- and modern bottom currents and basin morphology.

Mixed Depositional Systems Along the Eastern Margin of South Africa

Modern currents include the southward-flowing Agulhas Current (AC) and the northward-flowing Agulhas Under Current (AUC) (**Figure 1**) (Thiéblemont, 2019).

Contourites are sediments deposited or significantly reworked by bottom currents (Rebesco et al., 2014) and comprise depositional (e.g., Mounded/Plastered Drifts and Sediment waves) and erosional elements (e.g., contourite channels and abraded/basal surfaces). Their development is significantly influenced by basin morphology. Bottom currents are intensified by steep slope gradients and bathymetric highs (potentially resulting in “flow confinement” & “overflows”) (Stow and Smillie, 2020; De Weger et al, 2021; Roque et al., 2022).

The interaction between contourites and downslope processes, such as turbidites, forms mixed depositional systems (MDS). They are of particular interest in deep-water hydrocarbon exploration owing to significant hydrocarbon discoveries, in Brazil and Mozambique (Rodriguez & Hodgson, 2021). This study focused on the seismic characterization of these systems within the Durban Basin, Durban Deep Basin, and Natal Valley along the eastern South African margin, spanning an area of ~455,000 km² from

the South African–Mozambique maritime border to the Agulhas Plateau. The eastern margin is defined as a narrow passive margin formed by complex rifting and transform movement during the breakup of Gondwana and is represented by five distinct basins (**Figure 2**).

METHODOLOGY

Seismic interpretation was performed using Petrel and Kingdom software, which integrates 2D and 3D seismic data with sparsely available well data limited to the shelf for stratigraphic calibration. Seismic facies analysis focuses on identifying the external geometry (mounded, lenticular, or wavy geometries) and internal architecture (parallel, semi-continuous reflections with variable amplitudes).

RESULTS: MIXED DEPOSITIONAL SYSTEMS

Mixed depositional systems (MDS) arise from the interaction of bottom currents and gravity-driven sedimentation (turbidites or mass transport deposits). These systems play crucial roles in shaping the morphology of deep-water sedimentary environments. MDS is identified in seismic data through the main diagnostic elements (Rodrigues et al., 2022), which comprise depositional

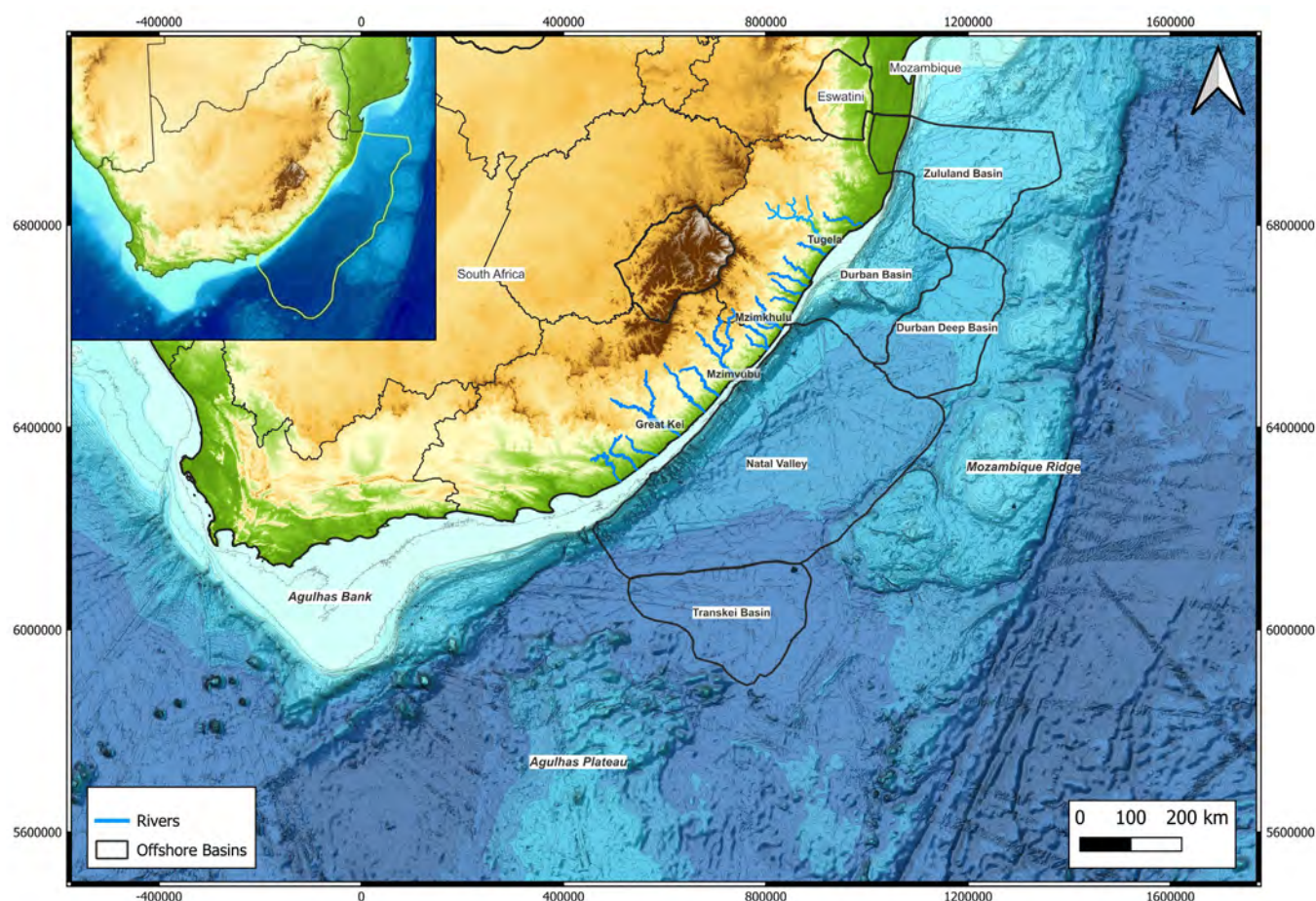


Figure 2. Offshore Basins along the eastern margin of South Africa. From north to south: the Zululand Basin, Durban and Durban-Deep basins, Natal Valley, and the Transkei Basin.

Mixed Depositional Systems Along the Eastern Margin of South Africa

features such as elongated mounded drifts, asymmetrical channel-levees, and re-worked submarine fans/lobes. Erosional features, are expressed as submarine canyons, channels, and lateral migration.

MDS are evident within the Mesozoic and Cenozoic sedimentary

successions (Figure 2). In the eastern depocenter of the Durban Basin or Durban Deep Basin (Figure 3), contourite drifts and sediment waves have created variations in the relief of paleobathymetry, facilitating depositional pathways for turbidites and creating mixed sedimentary facies. Additionally, there is evidence of bottom current reworked sands (BCRS) in localities where

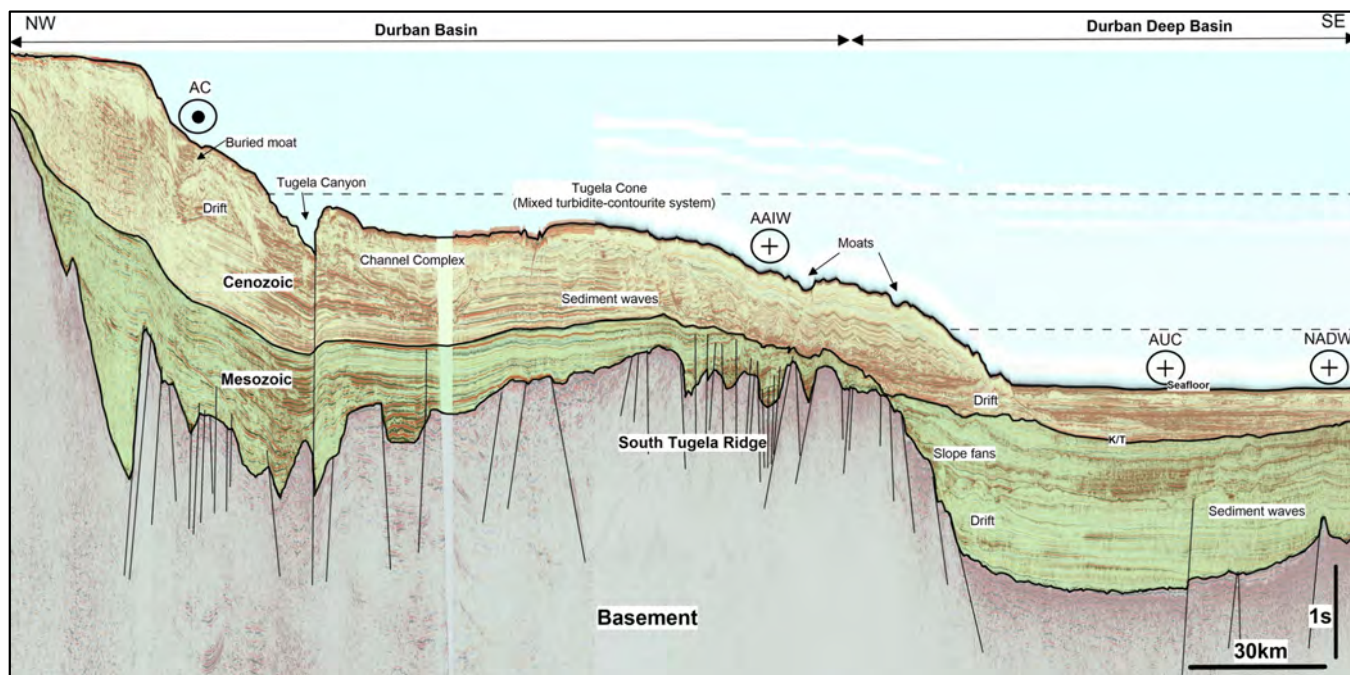


Figure 3. Transect showing sedimentary succession and contourite distribution of the Durban and Durban-Deep. Evidence of contourite features is apparent from the slope to the deep within the Cenozoic, with older drifts and sediment waves situated in the Mesozoic succession of the Durban Deep Basin.

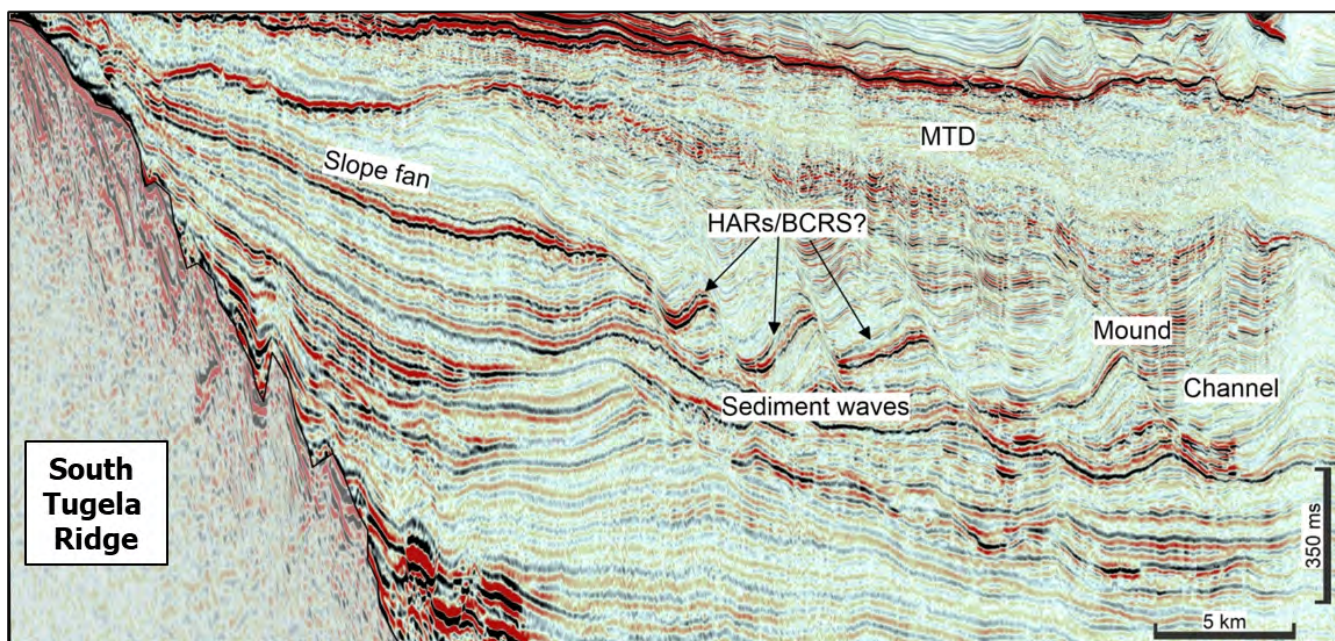


Figure 4. Example of a Mixed depositional System from the Durban-Deep Basin. Turbidites indicated by high amplitude reflections interpreted as slope fans shedding off the STR and being axially reworked by bottom currents and deposited with contourite-induced relief.

Mixed Depositional Systems Along the Eastern Margin of South Africa

bottom current velocities were strong enough to redeposit slope fans (Figure 4). These interactions can further enhance reservoir quality (Fonnesu et al., 2020).

The Natal Valley (Figure 5) exhibits large-scale contourite depositional and erosional elements in the form of mounded drifts and sediment waves. The contourite systems are abundant during the Cenozoic and more localized in the Mesozoic in relation to bathymetric and structural features.

Mesozoic (Cretaceous) mixed depositional systems were identified as asymmetrical levee-channel systems. During the Mesozoic, the

influence of bottom currents modified turbidite deposition, which could also create a reservoir potential. Seismic interpretation revealed various mixed depositional diagnostic elements, such as asymmetrical mounded drifts intermingled with downslope deposits, such as turbidites and MTDs (Figure 6).

The modern (Cenozoic) Tugela Cone and Canyon system (Wiles et al., 2013) in the western depocenter of the Durban Basin (Figure 7) and the Mzimvubu canyon and drift system are key turbidite-contourite mixed depositional system on the seafloor analogous to Mesozoic (Cretaceous) aged systems. The Tugela Cone and Canyon system exhibit clear interactions between bottom currents

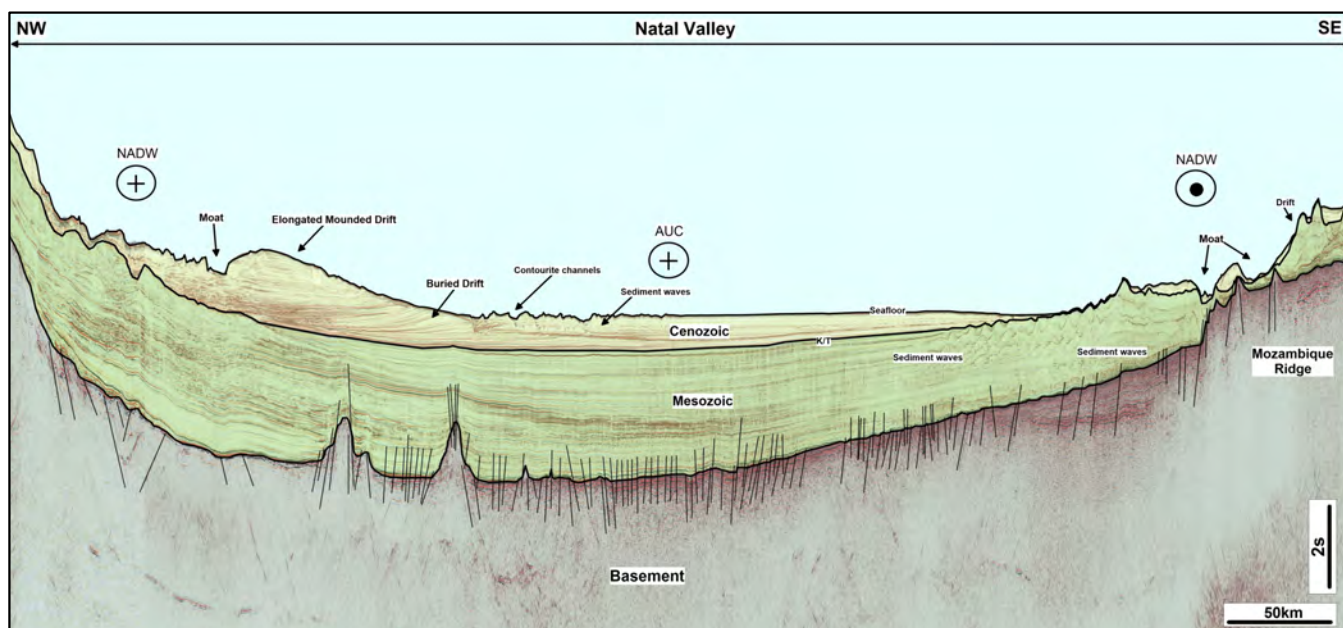


Figure 5. Transect showing contourite features and their distribution within the Mesozoic and Cenozoic sedimentary successions in the Natal Valley. Note large-scale sediment waves within the Mesozoic and giant, elongated mounded drift within the Cenozoic.

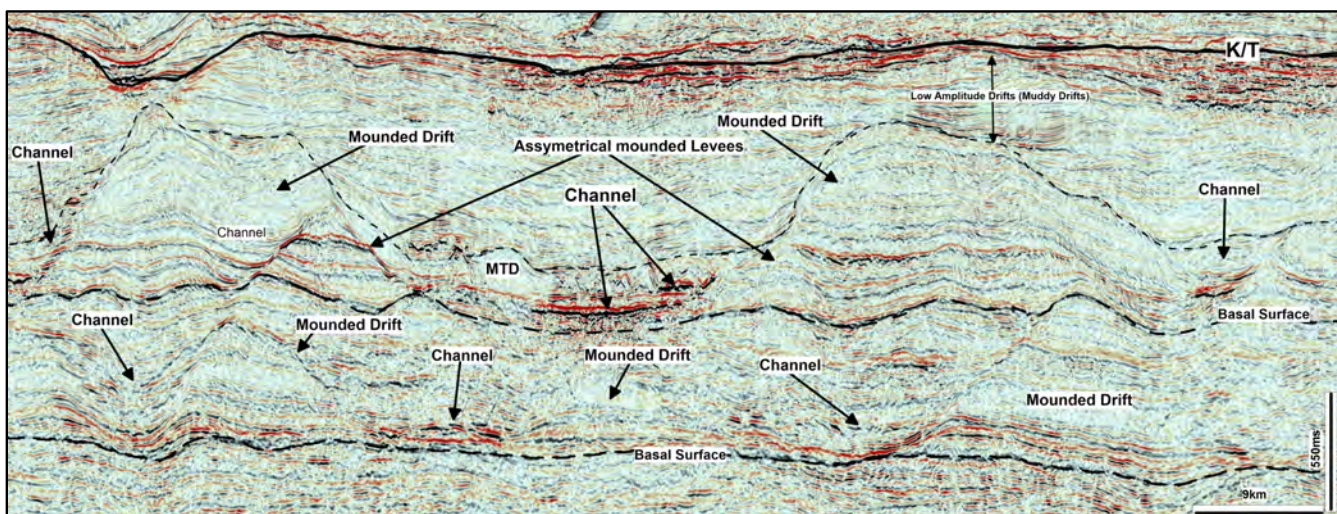


Figure 6. Cretaceous-aged mixed depositional systems shown by mounded drifts and channels in the Natal Valley. Different systems are separated by Basal surfaces.

Mixed Depositional Systems Along the Eastern Margin of South Africa

and turbiditic processes, which are evident within the Durban Basin, where the pronounced system shows the main diagnostic elements of an MDS. Bottom currents not only influenced the deposition and erosion of the Tugela Cone but also significantly influenced its morphology. The Tugela Canyon system displays asymmetrical levees, consistent with the influence of bottom currents sweeping downslope sediments in the direction of flow.

DISCUSSION

Mesozoic-aged contourite features, particularly within the Durban- Deep Basin, where the STR has impacted the hydrodynamic conditions of bottom currents and facilitated the deposition of gravitational sedimentary deposits, that is, turbidites, enhancing sediment deposition and reworking. The interplay between contourite processes and turbiditic systems is evident, creating mixed depositional environments that can host stratigraphic hydrocarbon traps. The Natal Valley exhibits well-preserved sediment waves and contourite drifts that reflect dynamic oceanographic conditions. The basin also contains large-scale asymmetrical levee-channel systems, which indicate active interactions between turbidite flows and bottom currents, further supporting the presence of mixed depositional environments. The recognition of mixed depositional systems within these basins provides new insights into palaeoceanography changes and their role in hydrocarbon prospectivity, as these mixed depositional facies often result in high-quality reservoirs with enhanced permeability.

CONCLUSIONS

This work documents MDS within the Mesozoic and Cenozoic along the eastern margin, and their hydrocarbon potential. The results underscore the role structural highs play in shaping bottom-current hydrodynamics and influencing sedimentation. These findings contribute to global models of ancient thermohaline circulation and highlight potential underexplored stratigraphic traps along South Africa's eastern margin. The identification of mixed depositional systems further enhances our understanding of reservoir distribution and potential hydrocarbon accumulation.

From an exploration standpoint, these mixed systems provide both reservoir and sealing potential. Coarse-grained contourites and turbidite channels can serve as effective hydrocarbon reservoirs, whereas fine-grained contourite deposits have enhanced sealing potential. The influence of contourites on paleobathymetry and the interplay of these systems enhance stratigraphic trapping mechanisms, increasing the likelihood of hydrocarbon accumulation. Seismic data from the Durban-Deep Basin and Natal Valley suggest that high-amplitude reflectors are associated with potential reservoir facies interbedded with contourite facies.

Global analogs, such as the contourite-related reservoirs in the Santos Basin, offshore Brazil, and the gas-bearing turbidite-contourite systems of Mozambique's Rovuma Basin, highlight the hydrocarbon potential of similar depositional settings. Given the comparable depositional architecture along the east coast of South Africa, further exploration could unlock significant hydrocarbon

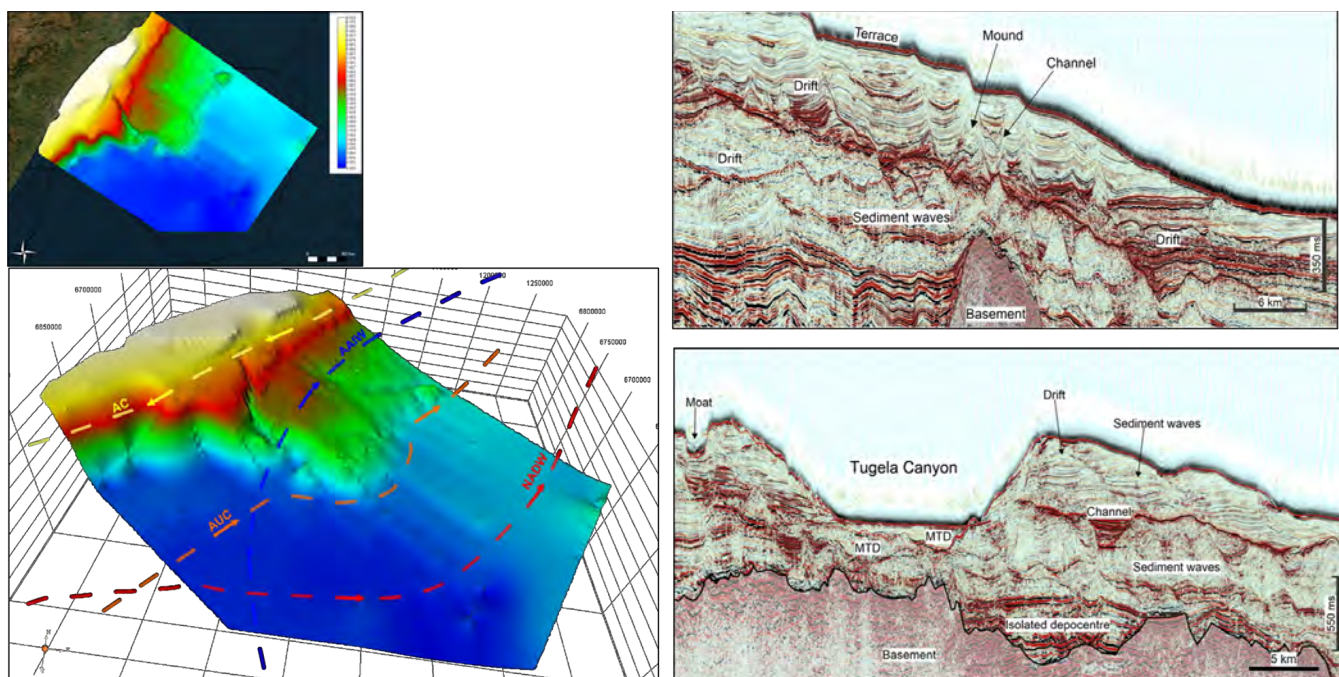


Figure 7. 3D seafloor map showing the Tugela Cone with bottom currents and seismic profiles exhibiting the interplay of downslope and along slope processes form mixed depositional systems. On seismic asymmetrical mounded levees (drifts) are found at the flanks of channels. Large mounded drifts exhibit internal sediment waves and evidence of contourite scours are present which have been subsequently filled by turbidites, mass transport deposits and drifts.

Mixed Depositional Systems Along the Eastern Margin of South Africa

resources. Advancing seismic facies analysis and depositional process models is crucial for identifying viable exploration targets in deep-water environments. ■

ACKNOWLEDGMENTS

The authors acknowledge the Petroleum Agency SA for providing data access and support during this study.

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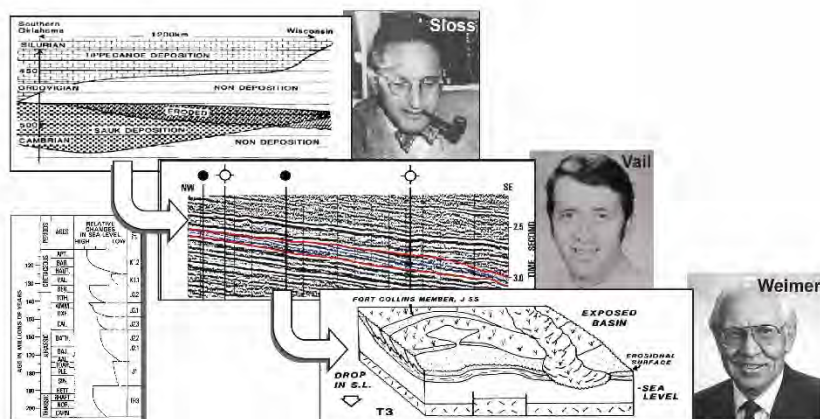
The GCSSEPM Foundation 41st Annual Perkins-Rosen Research Conference

17-19 November 2025 Houston, TX



Cycles and Sequences, So What?
A 21st century perspective in memory of Peter Vail, Bob Weimer, and Larry Sloss

Announcement and Call for Papers



With the recent passing of Pete Vail and Bob Weimer and the approaching 50th anniversary of the publication of AAPG Memoir 26, not to mention the recent retirements of the 1st generation that grew up with Memoir 26 and the rise of new generations of practitioners and innovative techniques, it is a propitious time to take stock of sequence stratigraphy in particular and applied stratigraphic analysis in general: where it came from, where's it going, and what's it good for...and to pass along hard-won practical lessons.

This year's conference features a hybrid program of short talks by practitioners who worked with Vail, Weimer, and Sloss, as well as those who

have applied and expanded their concepts, hands-on exercises, discussions, case-study talks, and panel discussions that illustrate each of four focus areas:

- **Historical Perspectives** on the development of present-day integrated stratigraphic analysis since Sloss (e.g., incorporation of high-resolution age control and seismic, expansion to non-marine systems, etc.).
- **Regional- to basin-scale** concepts and applications (e.g., cycle chart uses and abuses, tectonic influences, systematic changes in reservoir-target age across a basin, etc.).
- **Play- to field-scale** concepts and applications (e.g., incised valleys, resource plays, sub-unconformity plays).
- **Practical applications** and tools for energy and other resources (groundwater, GCS/CCUS, H₂ storage) and planets.

This program will offer opportunities to examine classic data sets in a series of collaborative exercises, affording a shared experience to focus discussion of foundational concepts...and assumptions...considering more than 50 years of application, experience, and innovation. We welcome industry and academic practitioners who have tested, applied, improved, and expanded these concepts, students and practitioners who would benefit from understanding their development and application, and researchers looking for new opportunities to advance these concepts.

We invite a diverse set of papers illuminating the history of integrated stratigraphic analysis and the near-term and long-range future, especially those that explore the practical application of such analyses to hydrocarbon and critical mineral exploration, groundwater, geothermal, and emerging resource exploitation, and the interpretation of the geological history of Earth and Mars. Student posters and presentations are encouraged.

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Important Dates and Deadlines Perkins-Rosen Research Conference 2025:

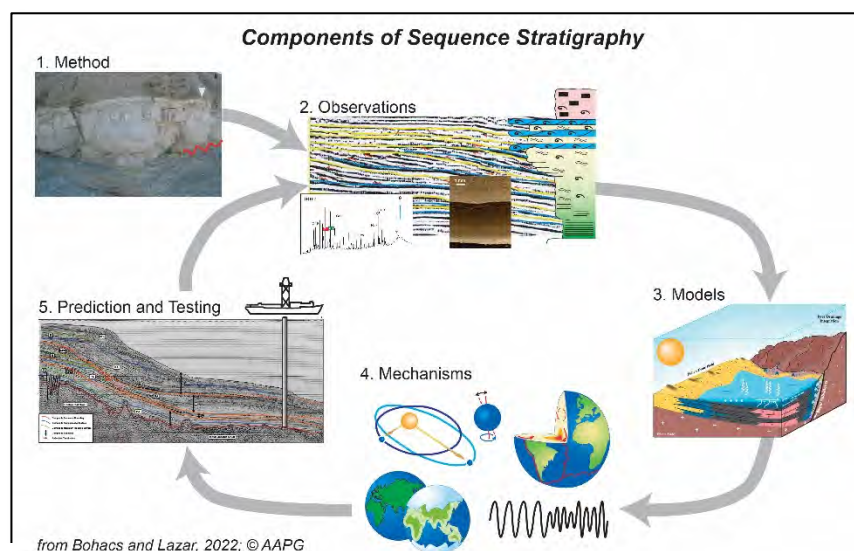
June 1, 2025	Expression of interest: Provide title of presentation and brief abstract
June 30, 2025	Preliminary Program Announced
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October 3, 2025	Final revised manuscript and illustrations due
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The Houston Museum of Natural Science Committee and the Educational Outreach Committee present:

GEMS Day

November 8, 2025 | 9:00 am – 1:00 pm.

Grand Hall and Glassell Hall

Join us for this annual event on **November 8th from 9:00 am – 1:00 pm**. GEMS (Girls Exploring Math and Science) Community Booths will be in the Grand Hall and Glassell Hall, providing interactive activities and giveaways. Past STEM Days have included touchable museum specimens, virtual reality experiences, and more! With admission to the museum, Girl Scouts will also have an opportunity to visit booths run by local troops and schools, competing for Scholarship Award! Girls Exploring Math and Science (GEMS) is presented by CITGO Petroleum Corporation.



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The Seven Sisters of the Orange Basin: How Sands were Delivered from the Shelf to the Basin Floor, and What that Means for Prospectivity

By Neil Hodgson*, Karyna Rodriguez* and Lauren Found*

* Searcher

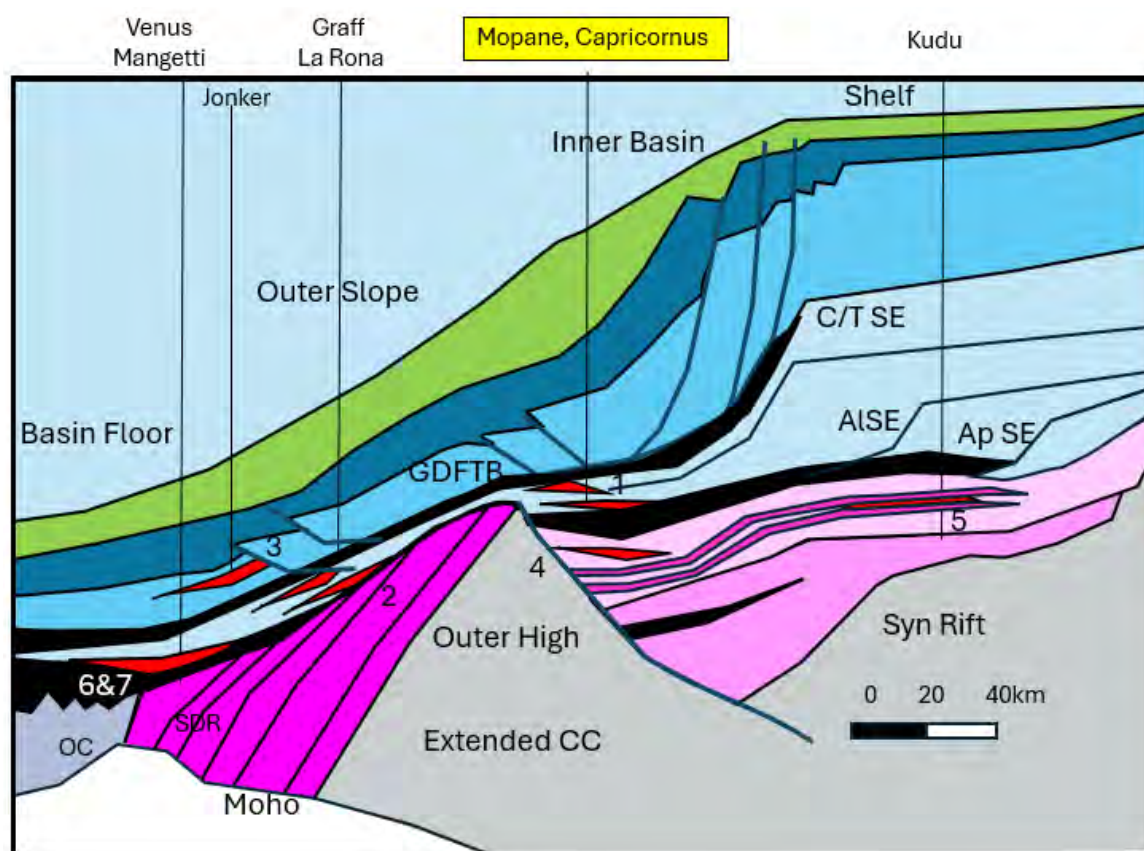


Figure 1. Orange Basin tectonic framework. Depositional settings 1-7 as discussed in the text, shelf edges (SE) for Aptian (Ap SE), Albian (Al SE) and Cenomanian/Turonian (C/T SE) indicated.

Across the Bantu languages of Southern Africa, the Pleiades (Seven Sisters) are associated with agriculture, and in Swahili they are the “ploughing stars”, as their visibility was taken as a sign that the onset of the rain is near. In the Orange Basin of Namibia, the seven distinct depositional systems for sand accumulation and reworking between the oldest Upper Cretaceous shelf and the basin floor carry a similar portentous significance. Only when they are recognized does one know exactly where to start drilling.

When the oldest Upper Cretaceous sands in gravity’s thrall fell off the shelf in the Orange Basin of Namibia and South Africa, seven distinct fates could befall them. High- and low-density turbidity currents flowing down incised canyons in the upper slope of the “Inner Basin” (between the shelf and the “Outer High” (**Figure 1**)), encountered the first traps for sand. These are represented by stacked meandering channel, levee and overbank deposits in addition to backstepping lobate frontal splays (Depositional Setting (DS) 1 in **Figure 1**). These systems built out repeatedly

across the Inner Basin, stacking up Mopane and Capricornus, until the Outer High could be breached or navigated around, and then turbidites could access the lower slope.

Here, confined channel levee systems interacted directly with slope slumping, contourite-influenced topology, and debrites from levee margin slumping, leaving a very complex sequence of sand bodies as potential reservoirs: Lesedi, Graff, La Rhona and Enigma (DS 2 in **Figure 1**).

Finally, the lucky few sand-rich turbidites that reached the basin floor were deposited as large, amalgamated sand sheets in ponded systems and backstepping frontal splays, each successive lobe deposited in sympathetic topology lows, stepping progressively north (DS3, **Figure 1**). As these sands are the youngest Upper Cretaceous, their up-dip trap is provided by the Orange Basin’s most famous expression of instability: the Latest Cretaceous and Early Cenozoic Gravity Driven Fold and Thrust Belt (“GDFTB” or

The Seven Sisters of the Orange Basin: How Sands were Delivered

sometimes known as the “mega slide”). Jonker is a good example of the trapping mechanism in this depositional setting.

This then is the setting for the youngest Upper Cretaceous clastic system in the Orange Basin. However, it's not quite the whole story. In fact, the oldest Cretaceous sands that we know of in the Orange Basin belong to two systems: 1) the eldest, comprised of

aeolian sands deposited within flood basalts of the syn-rift to transitional drift series below Kudu (DS 5 **Figures 1** and **3**), and 2) the pre-Aptian source rock syn-rift sands in the Inner Basin reported by Galp from their Mopane-3X well (DS 4 **Figures 1** and **3**)

The second set of pre-late Upper Cretaceous sands are the Albian age sands deposited on the basin floor that comprise the reservoir

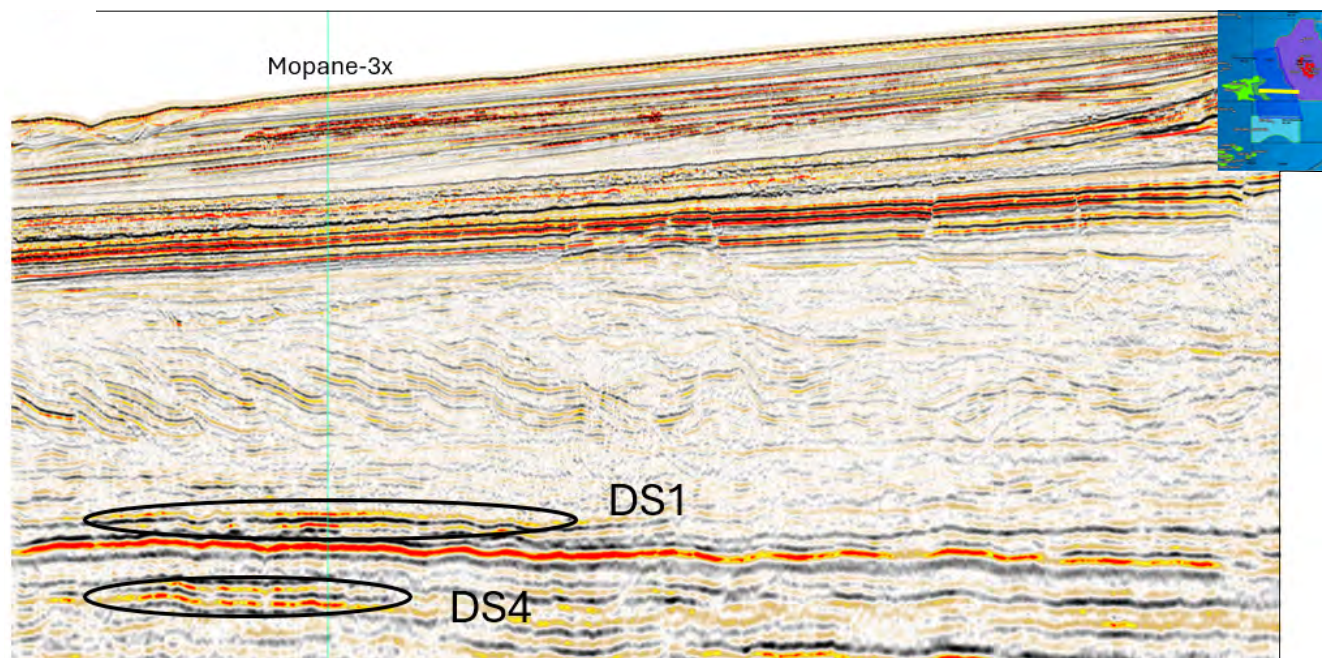


Figure 2. East-West ultra-far angle stack dip line through Mopane 3x discovery, showing DS1 and DS4 depositional systems. The high amplitude in the ultra-far angle corresponds to hydrocarbon accumulation in both systems.

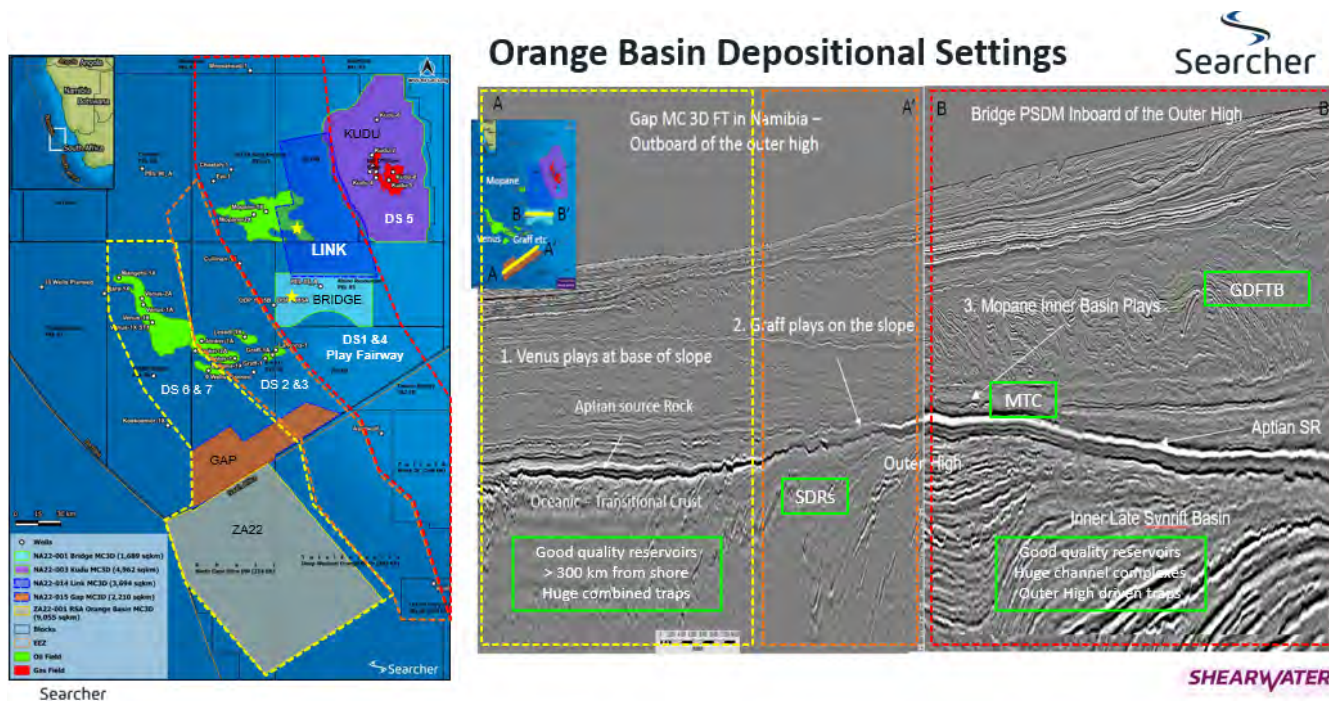


Figure 3. Map on the left showing Searcher's Multiclient 3D Datasets in the Orange Basin. The dashed lines show the extension of the depositional systems illustrated in Figure 1. The corresponding depositional setting is illustrated on the seismic arbitrary dip line through the Gap and Bridge surveys as shown in the inset map. The character of the crustal transition from the inner late syn-rift basin where basalts and clastic sediments coexist, to SDRs and finally to oceanic crust, can be observed.

The Seven Sisters of the Orange Basin: How Sands were Delivered

of the Venus field. These sands sit directly atop Aptian source rock, deposited in the nadir of the nascent Aptian basin. These comprise both sand accumulations at break of slope on the basin floor (DS 6, **Figures 1** and **3**) or the remobilized and redeposited contourite derivatives, fining northward (DS 7 **Figures 1** and **3**). These “Venus” sands are located over extended continental crust (CC) that transitions through subaerial oceanic crust to marine subaqueous oceanic crust (OC) of Penrose or MORB affinity. The transition from rift to volcanic drift is rarely seen on Earth today, with the exception of the Afar Triangle in Africa, and can be hard to unravel. At some point, lava flows that deposited with a mix of sub-aerial clastic sediments into syn-rift half grabens, transition into subaerial flood basalts that deposited onto the last extended fragments of continental crust (**Figure 3**). Subsidence of the volcanic sites causes the lava flows on the edges to tilt away from land, forming Seaward Dipping Reflectors (SDRs). As magma erupted, loading and subsidence of dyke swarm into the depleting magma chamber give the SDRs their characteristic “curved” shape. We can observe at some point a change in character of these volcanics as they suddenly stop being SDRs and start being rugose MORB style oceanic crust (**Figure 3**). This change is not caused by a tectonic event, but from the first marine incursion into the basin. Oceanic crust is formed by the submarine eruption of basalt that is immediately quenched in a shallow restricted and mostly anoxic basin stretching from South Africa to Brazil’s Pelotas basin.

As Albian sands entered the basin at the end of the Aptian, they accumulated as basin-floor deposits between the tips of oceanic crust fault blocks, until they were eventually incorporated into and covered by the influx of clastic sediments. And yet, these Albian sands did not go gentle into that good depositional system - they were reworked by strong contourite currents dragging the finer sands of these basin floor, coarse-clastic deposits into long, north-south deposits along the basin nadir axis. Contourite currents in the Cretaceous can be understood by studying their depositional architecture, to determine sediment grain size, the influence of gravity-driven processes, and the strength of the currents. Modern MC 3D is producing some astonishing results in the Orange Basin, particularly on the multi-billion-barrel prospectivity observed at Venus level in the blocks on the South African-Namibian border.

So, this begs a couple of questions – how deep was the basin when Venus sands were deposited, and where was the Albian shelf? Many wells drilled on the shelf have allowed this to be pinpointed with some precision – and that is only “slightly inboard” from the youngest Upper Cretaceous shelf, which shows a steady progradation and aggradation right through the Upper Cretaceous. So why didn’t the Venus sands get entangled with the Inner Basin and the Outer High? There are strong opinions around these questions. The Aptian source rock appears to onlap onto the Outer High, suggesting that the Aptian-Albian basin was no more than 200 m deep, and that the shelf was indeed also marine before the Outer

High was flooded. The Inner Basin has a 50 m-thick, Aptian source rock (the Kudu Shale) - deposited during this time outboard of the shelf-, which onlaps westward onto the Outer High. What appears to have happened in the Albian is that the Outer High subsided very rapidly, creating a steep slope so that turbidites coming off the Orange shelf bypass the Inner Basin -which was sediment starved by this bypass-, and reached straight out onto the Albian basin floor. By Upper Cretaceous, the shelf itself begins to subside, the shelf edge aggrades, reducing the slope and allowing sands to be caught in the Inner Basin.

The relative arrangement of splays, channels, and contourite-reworked deposits across inner basin, slope, and basin-floor settings (all influenced by contourite currents) records the transition from an active rifting continent, through chaos and instability, to the old age of passive-margin sessility, with one last ignominy to come. After these oldest Upper Cretaceous sequences were deposited, the slopes of the youngest Upper Cretaceous clastic prisms just repeatedly built-out and collapsed in a series of terrifying cataclysms. These are preserved as a series of at least seven massive, stacked, mass transport deposits (MTCS), incising and cannibalizing previous mass transport systems, creating a very thick mass transport system sequence of up to 2.5 km-thick. What initiates these collapses after a period of relative stability, distinguishes the Orange Basin from the larger Pelotas basin, its conjugate twin. Searcher believes this is a dynamic topology effect under the Orange Basin related to mantle convection changing the angle of repose of the youngest Upper Cretaceous sediments. This MTC blanket provides the top seal for the Early Cretaceous Venus target, and no doubt provided episodic pulses of loading and thermal blanketing onto the source rock, particularly useful during the late Cenozoic thermal pulse from mantle derived volcanic intrusions.

The Seven Sisters of Pleiades ignited about 100 million years ago from a giant gas and dust cloud that collapsed under gravity. The seven sisters of Orange were born at the same time from sands that were escaping from the Cretaceous shelf again, under the influence of gravity, but modified by tectonics and contourite currents. Decades of exploration of the Orange Basin have finally achieved extraordinary success in these sand rich systems, yet this journey has only been achieved by the use of the industries technological superpower – 3D imaging. Just as in astronomy, modern illumination and imaging is unlocking the stories of these unique parts of the universe. ■

ACKNOWLEDGEMENTS

We would like to thank our partners Shearwater Geoservices for their amazing acquisition and processing skills, and we are glad also to partner NAMCOR in Namibia, and PASA in South Africa in our recent acquisitions. We would also like to acknowledge Bryan Cronin for his visionary sedimentological illustrations that have inspired our tectonic-sedimentological interpretations.

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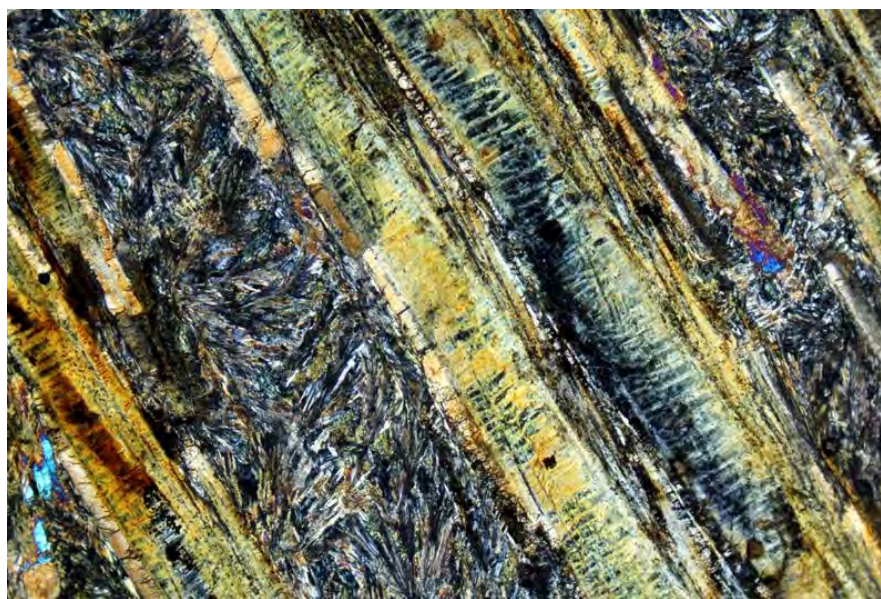
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1. Larimar: A Caribbean Treasure

Only found in a small region of the Dominican Republic, Larimar is a rare blue variety of pectolite formed by volcanic activity and mineral-rich hydrothermal fluids.

2. Shiprock (Navajo Nation, New Mexico)

Shiprock, an example of a volcanic neck, is composed of fractured volcanic breccia and black dikes of igneous rock called minette, a type of lamprophyre.



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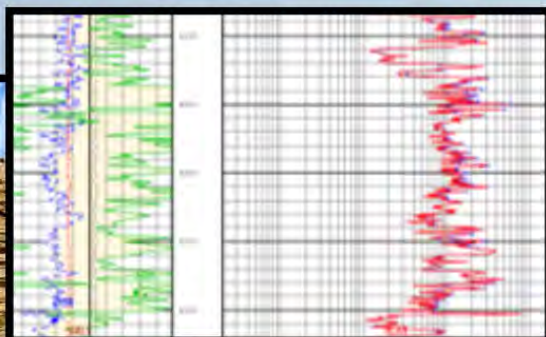
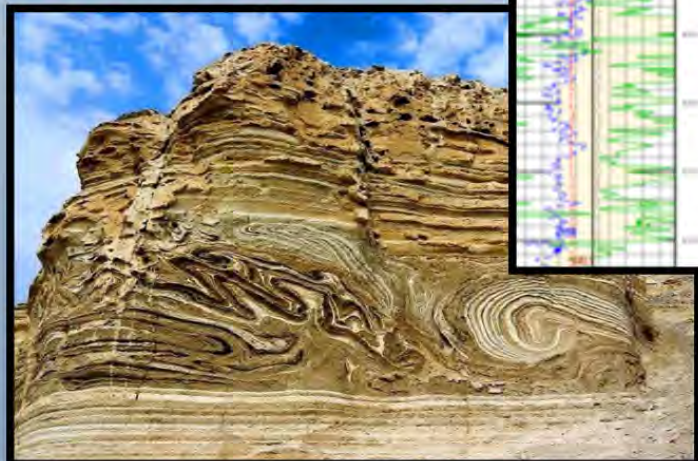
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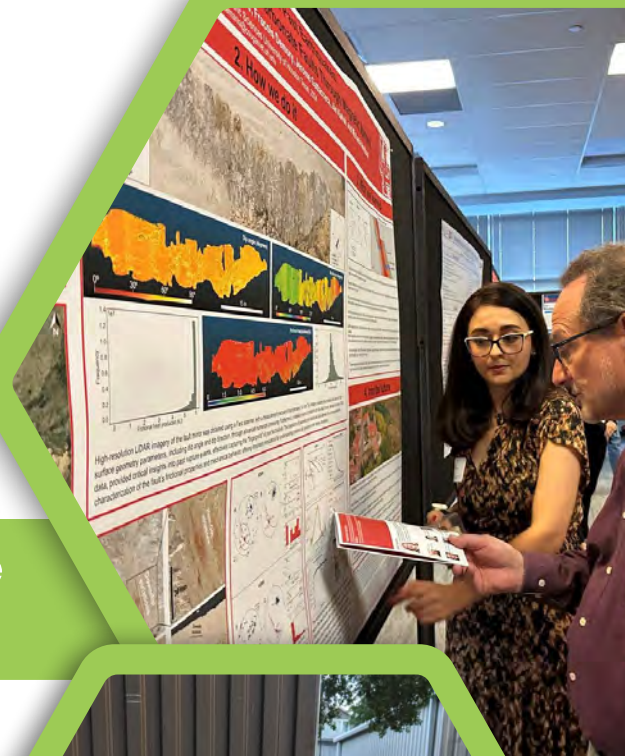
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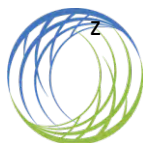
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Sustainable Development
Geophysics (SDG) Lab

Geophysical and Hydrogeological Investigations of Groundwater in Crystalline Environment in South-Eastern Senegal: Linking Research, Students and Community Training, and Sustainable Development

Mame Diarra Fall ^{1*}, Jean André Ndiaye ¹, Axel Tcheheumeni Djanni ¹, Paul Jack McLachlan², Denys Grombacher³, Sebastian Uhlemann⁴, Nimna Dème ¹, Ndeye Penda Gaye ¹, Serigne Mar ¹

¹ (Sustainable Development Geophysics Lab (SDG.Lab), Department of Geology, Cheikh Anta Diop University (UCAD),

² Université technique du Danemark (DTU), anciennement Groupe hydrogéophysique (HGG)

³ Aarhus University (HGG, Denmark),

⁴ Université de Brême et Laboratoire national Lawrence Berkeley (LBL)

Geoscientists Without Borders (GWB) funded its first environmental geophysical collaborative project in Senegal, West Africa. Coordinated by Tcheheumeni Danni Axel Laurel, Sebastian Uhlemann, Paul MacLachlan and Denys Grombacher, the project focused on mapping groundwater resource potential in south-eastern crystalline environment of Senegal, deploying Long Range (LoRa) sensors for groundwater quality monitoring, and building student capacity. This project directly responds to “SDG 6: clean water and sanitation”, which aims to ensure universal access to sustainably managed water.

It offered a unique opportunity for master’s students in geosciences at UCAD, enabling them to strengthen their skills and professionalism in hydrogeology applied to geophysics, thus also contributing to “SDG4: quality education, through hands-on learning experiences”.

One of the major objectives was to introduce participants to geophysical prospecting techniques, in particular electrical tomography (ERT) and transient electromagnetic methods (TEM). By combining theory and field practice, students acquired the ability to effectively locate and evaluate groundwater resources. This approach bridged the gap between academic courses and real-life situations, demonstrating the concrete impact of geophysical methods in sustainable water management.

Looking beyond SDG 6, the project also illustrates the scope of “SDG 17: Partnerships for achieving the goals”, by bringing together researchers, institutions and students around a common challenge.

INTRODUCTION

Groundwater is the main source of drinking water and an essential resource for human life. In the past, water was seen as an unlimited resource, available to everyone, which any user could freely appropriate and exploit according to their needs (Honegger & Tabarly, 2011). It is essential not only for direct consumption, but also for agricultural, industrial, and domestic activities. Access to water is a major issue for many rural communities in West Africa, where the availability and sustainable management of groundwater resources is a constant challenge in the face of climate change and population growth (DGPPE, COWI; 2001).

In the Kédougou region, located in southeastern Senegal, access to water is a major challenge. This area rests entirely on a crystalline bedrock with a very hostile climate. Unlike sedimentary aquifers, bedrock areas retain water only in fractures and weathered areas, which means that water distribution is uneven and uncertain (Santos et al., 2017). This geological context, characterized by a long dry season and a short but intense rainy season, makes regular access to drinking water difficult (Lucey et al., 2021). Access to water reveals significant inequalities not only between rural and urban areas, but also between different villages and even within households themselves. In rural areas such as the Kédougou region, these disparities can be explained in particular by the poverty of the population, the inadequacy or even absence of water infrastructure, but above all by the distance to water supply points (Fall et al., 2024). The most disadvantaged households, particularly those located far from existing facilities, are the most vulnerable. Their access to water therefore relies on alternative solutions, which are often costly, unreliable, or insufficient to

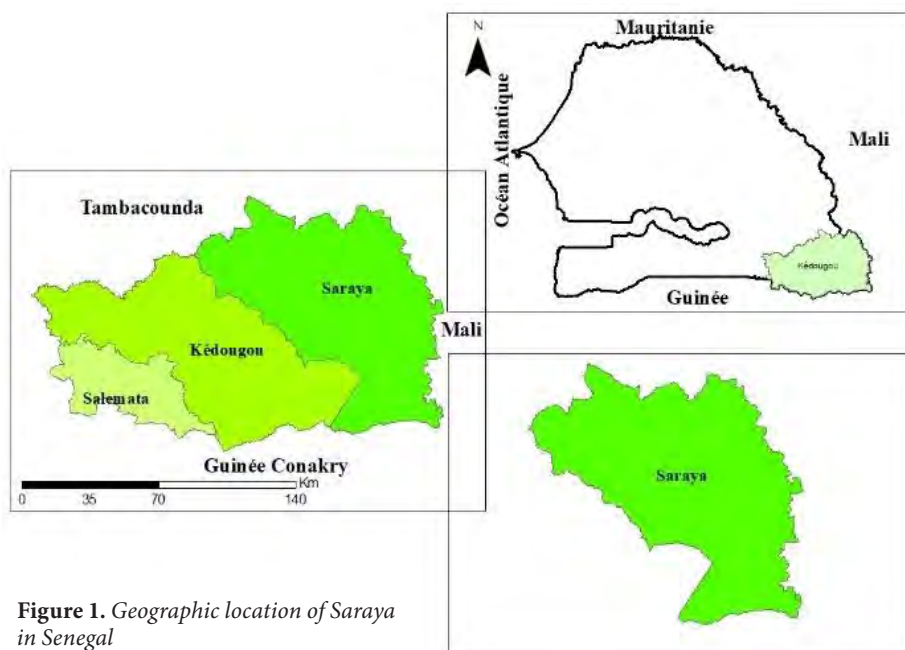


Figure 1. Geographic location of Saraya in Senegal

meet their daily needs. Similarly, water governance, institutional weakness, and lack of investment in infrastructure exacerbate the situation. Centralized policies struggle to meet the specific needs of base regions such as Kédougou, where tailored, decentralized solutions are needed. Furthermore, access to water is also influenced by social dynamics, such as population growth, seasonal migration linked to mining, and the stigmatization of certain local resources (Lucey et al., 2021).

In the context of water resource management for the achievement of the Sustainable Development Goals (SDGs), scientific approaches that provide a better understanding of the hydrogeological potential of territories are becoming essential, while also integrating social and educational dimensions. It is of territories are becoming essential, while also integrating social and educational dimensions. It is with this in mind that an integrated geophysical and hydrogeological study of groundwater resources was initiated in Saraya, in the Kédougou region, with the aim of combining rigorous scientific research with a participatory and educational approach involving local communities.

GEOGRAPHICAL AND GEOLOGICAL CONTEXT

The Kédougou region is one of Senegal's 14 administrative regions. Located in the far southeast of the country, it borders Mali and Guinea, it forms the western part of the Precambrian West African craton. The age and nature of the geological formations give the Kédougou region great mining potential, with valuable resources such as gold, iron, uranium, marble, and more.

METHODOLOGY

The research methodology was organized into two main stages. The first took place in Dakar and consisted of



Figure 2. Demonstration at the Dakar campus



Figure 3. Welcome by Saraya authorities and installation



initial training. This was held at Cheikh Anta Diop University, where master's students in geosciences received in-depth theoretical instruction. This phase was supplemented by practical work that enabled them to familiarize themselves with the use of the equipment. These exercises laid a solid foundation for the rest of the project, particularly for the planned field activities.

The second stage took place in Saraya, in the department of Kédougou, located about 700 km from Dakar (**Figure 3**). This site was chosen because of the complexity of its geological formations, providing an ideal setting for applying and testing the knowledge acquired during the first phase. Upon arrival, the team members were welcomed by local authorities and proceeded to set up the equipment for field surveys.



Figure 4. Electrical tomography methodology

The main geophysical method used in this study is electrical tomography (**Figure 4**). Its implementation began with defining the spacing between the electrodes, determined according to the desired depth of investigation. The electrodes were then implanted in the ground at regular intervals and connected to each other by a measuring cable. When the soil resistivity was too high, salt water was used to improve electrical conductivity. The ends of the cables were then connected to the acquisition system and to a battery.

The measurements were taken using different configurations, including Wenner, Schlumberger, and pole-pole arrays. The use of these different setups provided a comprehensive view of the distribution of resistivity in the subsurface. The principle is based on the fact that the greater the spacing between the injection electrodes, the deeper the current lines penetrate, thus providing information on geological structures located at deeper levels.

Once the data had been collected, it

Geophysical and Hydrogeological Investigations of Groundwater

was processed using an inversion process. This essential step transformed the raw measurements into an image representing the distribution of underground resistivities. These results provide valuable information on the local geological structure and facilitate the identification of potential areas.

While electrical tomography provided detailed information on underground structures, the electromagnetic method (**Figures 5 and 6**) offered additional advantages for exploring the subsoil. This technique can reach depths of up to 70 meters, depending

on the characteristics of the terrain. It relies on the ability to detect variations in electrical conductivity within different geological formations.

The electromagnetic device operates using a centralized configuration: all cables are connected to a main box, which transmits and receives signals. This organization makes the system both efficient and accurate for mapping underground conductivity contrasts.

To supplement the geophysical data and obtain direct information on the characteristics of the groundwater, water samples were taken from several boreholes in the Saraya area (**Figure 7**). The aim was to select representative boreholes distributed throughout the study area in order to ensure the most comprehensive spatial coverage possible.

Sampling was carried out using sterilized equipment to avoid any risk of contamination. In each borehole, the water was allowed to flow for several minutes before being collected, which eliminated any stagnant water in the casing and ensured that the sample was truly representative of the aquifer.

The samples were then collected in clean, pre-sterilized bottles. Each bottle was carefully labeled with a unique identifier, the date of collection, and the geographical coordinates of the site. At the same time, field measurements were taken immediately after collection using portable instruments to determine certain physical and chemical parameters such as temperature, pH, and electrical conductivity.

After this stage, the samples were stored in accordance with standard protocols: placed in coolers to maintain optimal storage conditions, then transported to the laboratory. There, they underwent physical analyses.

An educational awareness program was organized with the aim of involving the local community, particularly school-age children (**Figure 8**). The main objective of this initiative was to raise awareness



Figure 5. Electromagnetism methodology



Figure 6. Data collection device

Geophysical and Hydrogeological Investigations of Groundwater

of the importance of groundwater and promote its sustainable management.

The program was implemented in several schools in the Saraya region, targeting students aged 10 to 16. The sessions were designed to be interactive and engaging, combining different teaching aids: visual presentations, practical activities, and simplified explanations adapted to the students' level.

THE TOPICS COVERED INCLUDED:

- The role of groundwater in everyday life,
- Its importance for drinking water supply,
- The risks associated with poor management, and
- Good practices that promote its protection and sustainability.

To make the lessons more concrete, the researchers incorporated local examples and case studies showing how groundwater directly influences the lives of Saraya's inhabitants.

In addition, practical activities adapted to the age of the

participants were organized. For example, the students built small models representing underground systems using transparent plastic containers, sand, and water. These simple experiments provided a visual illustration of fundamental concepts such as the water table and circulation.

CONCLUSION

The study conducted in Saraya demonstrated the effectiveness of an integrated approach combining geophysical methods, hydrogeological sampling, and educational activities with local communities. Geophysical investigations, based mainly on electrical tomography and supplemented by electromagnetic methods, provided a detailed picture of the distribution of underground resistivity and identified areas with high aquifer potential in a complex crystalline bedrock context. Physicochemical and microbiological analyses of water samples taken from representative boreholes provided direct information on the quality and characteristics of the groundwater.

At the same time, the educational dimension of the project played a major role. Awareness-raising activities carried out with students and local communities helped to strengthen their understanding of the importance of groundwater and its sustainable management.

The active involvement of master's students in geosciences, trained in both theory and practice, ensured the transfer of scientific skills while strengthening their autonomy.

This successful combination of scientific research, academic training, and community awareness-raising is an innovative model for participatory and sustainable groundwater resource management in West Africa. It highlights the relevance of multidisciplinary collaboration. ■

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Figure 7. Measurements of static levels and physicochemical parameters

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Figure 8. *Primary school visit*

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Pivot Profile

How Atif Hariz Turned His Passion for Geology into a Thriving Career in Real State

By Lucia Torrado



If you're looking for a realtor who can talk knowledgeably about what lies beneath a property – from flood risk and soil conditions to zoning and sustainability – look no further than Atif Hariz, also known as “Hariz the Realtor” on social media. With a background in geology, environmental consulting, and procurement, he brings a scientist's eye and a problem-solver's

mindset to every real estate transaction.

Born in Houston, raised in Lagos, educated in Beirut, and seasoned by work in Jeddah, Atif embodies a truly global perspective. That journey taught him to adapt quickly, read cultural nuances, and connect with people from all walks of life. “Each place had its own rhythm, its own way of doing business,” he recalls, “and navigating those contrasts gave me a deep appreciation for diversity and perspective. It also taught me how to stay resourceful when plans shift, and how to see challenges as opportunities rather than obstacles.”

A QUIET INTEREST THAT PIVOTED INTO A FULFILLING CAREER

Atif's adaptive mindset proved invaluable when, after years of working as an environmental geologist, he began to feel the pull toward something new. “There came a pivotal moment when I realized I wasn't doing the best thing for myself or for my future,” he says. “I had genuinely enjoyed my time as an environmental geologist, but over time, I began to feel stuck. The next step up the ladder would have led to a project manager role, and that path simply didn't spark any excitement in me.”

Real estate had been a quiet interest of his since moving back to Houston. “When I first moved back here, I was eager to explore real estate and even enrolled in courses. But at the time, I was also pursuing my master's degree at the University of Houston with a full-time job, and the task proved challenging. With so much on my plate, real estate had to take a back seat... for the moment, it became an idea waiting on the back burner.” But the spark never went away.

As Atif grew more settled in his career and life in Houston, his curiosity about real estate kept resurfacing... gently at first, then with a desire he just couldn't ignore. Eventually, he decided it was time to stop putting it off and finally take the leap. Becoming a real estate agent felt like a bold step, but it turned out to be exactly what he needed. For Atif, the career change was less of a leap as he first thought, but rather more of a natural evolution. As he sums it up: “Trusting my intuition was one of the best decisions I've ever made. I've never been happier with the road I chose.” Becoming a real estate was also a deliberate choice, as he made sure he had enough savings to keep him going until he had some traction. “I do take risks, but I try to do so responsibly,” he says.

*I approach each deal
with curiosity, empathy,
and a global lens ...
behind every decision is
a unique vision
of “home.”*

DEPTH, DATA, AND DUE DILIGENCE

Although the industries may seem worlds apart, Atif's analytical mindset, risk awareness, and people skills have given him a unique edge.

Today, Atif applies his geoscience training to evaluate properties with uncommon depth. “My background in geoscience gives me a perspective that most people in real estate don't typically bring to the table. As a geologist, I learned to study what lies beneath the surface: literally and figuratively. That means I'm naturally inclined to look beyond the visible

features of a property and assess the underlying factors that can affect its long-term value. That scientific approach also makes me very data-driven... I'm comfortable analyzing market trends and property metrics the same way I once analyzed geological data.”

His years in environmental management taught him to navigate regulations, assess risks, and think long-term about sustainability, all crucial when guiding clients through due diligence or property improvements. And his time in procurement sharpened the negotiation and relationship-building skills that are at the heart of every real estate transaction. “While the industries seem worlds apart, the analytical mindset, risk awareness, and people skills I carried over have given me a unique edge” which made his career pivot feel like a natural evolution rather than a leap.

GROUNDING IN SCIENCE, FOCUSED ON PEOPLE

I've seen Atif in action with clients and even received a bit of his practical advice myself. Clients describe him as hardworking, meticulous, and trustworthy: a professional who combines data-

driven analysis with genuine care for people’s goals. “In real estate, where no two clients or transactions are the same, that mindset has become invaluable,” he explains. “I approach each deal with curiosity, empathy, and a global lens, understanding that behind every property is a personal story, and behind every decision is a unique vision of ‘home.’”

We conclude this interview with Atif’s appreciation of the geosciences, which taught him to see the big picture while attending to the smallest details: a mindset that enables him to provide clients with clear, informed guidance, helping them make confident, future-proof decisions, and standing as a testament to his skill and professionalism. ■

WELCOME TO NEW MEMBERS, EFFECTIVE SEPTEMBER 2025

EMERITUS MEMBER
Edwin Goter

HGS NEOGEOS

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We Are The HGS



SHAILEE BHATTACHARYA, HGS member since February 2025

Born and raised in Kolkata, West Bengal in India, Shailee Bhattacharya grew up surrounded by the arts: music, literature, cinema, and theater. Her parents' love of travel also played a defining role in shaping her outlook. "My love of exploration (...) can be traced back to my parents. Perhaps those extensive traveling experiences have inspired an appreciation for the unknown and a desire for new experiences," she says. That early curiosity about the world would later guide her toward

geology and a career built on exploration in many forms.

*By joining the HGS,
Shailee looks forward to
connect with like-minded
geoscience-loving folks*

Her concern for the environment began at a young age. "In the seventh grade, I used to get disturbed learning about water and air pollution in environmental science classes," she recalls. With encouragement from her mother, Shailee pursued earth system sciences and soon found her passion in sedimentary geology and geochemistry. Research at IISER Kolkata and Goa introduced her to challenging projects, including leaching experiments on river bed sediments to trace the provenance of vanadium and rare earth elements (REEs). These experiences prepared her for doctoral work that focused on the geochemistry of lithium and REEs within black shale in basins across the United States. Her research investigated fluid-rock interactions in low-temperature sedimentary and low-grade metamorphic settings, uncovering how these processes mobilize Li and REE and enrich them along specific pathways. Shailee notes that this work may "assist in identifying potential enrichment mechanisms of Li and promote the development of oilfield brines (produced waters) as a key source of Li."

Today, Shailee enjoys a career that blends field and analytical work with problem-solving across disciplines. From collecting groundwater samples in the field to writing abstracts for conferences and supporting business development efforts, she thrives on the diversity of challenges her role brings. "No work week is the same," she says, and that variety keeps her engaged as both a scientist and an environmental enthusiast. Beyond her professional pursuits, she enjoys reading, writing, singing, and playing badminton. As a new HGS member, she looks forward to connecting with "like-minded geoscience-loving folks" and building a community that shares her enthusiasm for discovery. ■



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We Are The HGS is a series that highlights the careers and contributions of HGS members with the intention of building community. Would you like to be featured in We Are The HGS? Send a note to editor@hgs.org.

WORD BRECCIA - A GEOLOGY WORD JUMBLE

Unscramble the words below and rearrange the
circled letters to find the answer to the clue.

SIFIPEXN __ _ ○ __ _

ELVNIOI ○ __ _

AITUCRMFLA __ _ ○ __ ○ __

ELLTASEK __ ○ __ _ ○ __

NOXEPEYR __ _ __ _ __ _ ○

HINT: Originally described in South Africa,
_____ is found in some of the
Earth's most ancient lava.

Volunteer with HGS



Annual Events

Every year the HGS has annual social events, and we need volunteers to help us organize and set up on the day of!

These include events such as:

- Golf Tournament
- Shrimp Peel & Crawfish Boil
- Skeet Shoot
- Pickleball Event
- Field Trips



Committees

HGS committees such as Educational Outreach and Continuing Education provide geoscience learning resources to students and the local geoscience community. These groups are always looking for volunteers! If you or someone you know is interested in lending a hand, please contact the HGS Office!



Interested in Volunteering?

The HGS is always looking for energetic members to become volunteers for the society! As the largest local geological society in the country, we depend on the support of our members to help us organize and execute our many activities. Committees such as Educational Outreach, Continuing Education, and our annual social event committees are always looking for extra helping hands! Contact the HGS Office at office@hgs.org to learn more!

Unlocking Lithium Potential: The Smackover Formation's Role in the Future of Energy Storage

The Smackover formation of the Gulf Coast region is a legacy oil and gas reservoir deposited in a late Jurassic carbonate ramp setting. The Smackover in southern Arkansas is also known for its Bromine brine fields and its high Lithium content. The formation's lithium concentration, strategic location, and strong community support make the trend highly favorable for a first-of-its-kind direct lithium extraction (DLE) project.

The electric vehicle and energy storage markets are driving long-term lithium demand. Government incentives to onshore lithium supply, and demand from EV manufacturers, and gigafactories seeking to secure domestic lithium supply through offtake contracts are creating significant market momentum.

Smackover Lithium is a joint venture between Standard Lithium and Equinor. Formed in May 2024, Smackover Lithium is developing two DLE Project Companies in southwest Arkansas and east Texas. Standard Lithium has 55% interest and retains operatorship, while Equinor holds the remaining 45%.

The Southwest Arkansas project is in Lafayette and Columbia counties in southwestern Arkansas and is nearing final investment

decision for the Phase 1 unit area. The East Texas projects are lithium exploration and appraisal areas for resource expansion along trend. ■

BIOGRAPHICAL SKETCH



STEPHEN O'LEARY is currently Asset Manager for East Texas and leads Equinor's US Lithium subsurface team. Stephen holds a MS in Petroleum Geoscience from Imperial College, London and began his career with BHP Billiton in 2001. His early career with BHPB encompassed minerals and oil and gas operations within Australia.

In 2006, Stephen joined Norsk Hydro and became involved in oil and gas exploration projects in Cuba, the Barents Sea, and the Gulf of Mexico. Stephen has been based in Houston since 2009, serving in Exploration and Production leadership roles for subsurface projects in the Gulf of Mexico and Angola. In 2024, Stephen commenced roles in lithium exploration and development with partner Standard Lithium across Arkansas and Texas.

Panelists:

Amanda Rico,

Bob Aylsworth,

Sarah Pietraszek-Mattner

The Art of the Pivot: Geoscience Careers

The geoscience business landscape is evolving faster than ever—and so are the career opportunities for geoscientists. Join us for a dynamic panel discussion featuring professionals who have successfully navigated career transitions and coached geoscientists to find their next career move. Our panelists will share candid insights on recognizing when it's time to pivot, identifying transferable skills, and personal branding for your next role.

Whether you've been impacted by workforce reductions or are reimagining your professional future, this conversation will provide strategies, inspiration, and practical advice for building resilience and staying relevant in a changing landscape. ■

BIOGRAPHICAL SKETCHES



elevate their careers.

DR. AMANDA RICO specializes in resume building, editing, and career solutions for senior and executive professionals. With 15+ years of experience — from crafting materials for TEDx speakers to optimizing profiles for oil, gas, and energy leaders — she helps forward-thinking executives

A former career columnist for the *Houston Business Journal* and *Oilwoman Magazine*, Dr. Rico has collaborated with public officials, diplomats, and E&P executives including Houston Mayor Sylvester Turner, Ambassador Kay Bailey Hutchison, Jeff Immelt, Jeff Shellebarger, and Jeff Miller. She has taught resume writing at the University of Oklahoma and Texas A&M University, presented workshops for NASA, served on an OTC panel, and volunteered as a SunCast Clean Energy Mentor. Recognized as one of Houston's Top 15 LinkedIn Experts (2023) and among Transition

Economist's Top 100 Women in Energy Transition (2021), she is a trusted voice in career strategy and energy transition.



BOB AYLSWORTH is the Business Development Manager at RevoChem. He is a geologist with over 16 years in the oil and gas industry. Bob began his career at Ingrain, a digital rock physics laboratory, where he developed a workflow for imaging and characterizing rocks at the pore-scale.

He then joined the unconventional resources exploration team at Apache where he was a geologist and petrography subject matter expert working exploration projects throughout the Permian, Rockies, Egypt, Suriname, and others. In 2021, Bob moved to RevoChem, a geochemical laboratory where he uses his technical background and start-up experience to lead the business development efforts. Bob earned both his BS and MS in Geological Sciences from Michigan State University.



SARAH PIETRASZEK-MATTNER has over 25 years experience in the Energy industry as a geoscientist and manager, working assets and opportunities around the world in onshore conventional, deep water, unconventional, CCS and Lithium. Now in the twilight of her Energy career, she has

shifted her focus to end-to-end career coaching for geoscientists and considers it a natural extension to the people management roles she has held. Sarah specializes in coaching mid-career transitions and has a keen interest in meeting people in geoscience industries of all types. She holds a MS in Geology from the Colorado School of Mines and a PhD in Biogeochemistry from Indiana University.

Monday, November 10, 2025

5:30 – 9:00 p.m.

HGS Members/Emeritus/Honorary Life \$65

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HGS General and North American Dinner Meeting

Dr. Jiaxuan Li

Assistant Professor of Geophysics,
University of Houston

The 27th Anniversary Lecture

The Robert E. Sheriff Lecture Series

**Sponsored by the Department of Earth and Atmospheric Sciences
at University of Houston and the U.H. Geoscience Alumni Association**

Learn about University of Houston geoscience program with Dr. Tom Lapen, Department Chair, Dr. Robert Stewart and Dr. Paul Mann. As well as the departmental Outstanding Alumni Award. There will be a poster session early in the evening on current thesis and dissertation research of the U.H. students.

Join the meeting early to meet the next generation of geoscientists from the University of Houston!

The Robert E. Sheriff Lecture Series was initiated in 1999 by the University of Houston Geoscience Alumni Association to honor Dr. Sheriff as an educator, scholar, and proponent for the geosciences. The series has recently been co-sponsored by the Houston Geological Society.

The Sheriff Lecture mission is to

**bring some of the best known geologists and geophysicists in the world to the Houston community
to share ideas relevant to exploration geology and geophysics, and to showcase geoscience activity
at the University of Houston.**

A full list of the Student Posters will be available on the HGS Website.



Department of Earth
and Atmospheric Sciences

College of Natural Sciences
and Mathematics

R.E. Sheriff Lecture

From Fiber-Optic Seismology to Geodesy: Operational Early Warning and Real-Time Imaging of Volcanic Eruptions

Fiber-optic sensing technologies, particularly Distributed Acoustic Sensing (DAS), are transforming geophysics by repurposing existing fiber-optic cables into dense arrays of strain sensors. This approach enables long-range, long-duration, and cost-effective monitoring across diverse environments. By exploiting the ultra-dense sampling of the seismic wavefield along telecommunication cables, fiber-optic seismology has advanced high-resolution seismic source characterization and subsurface imaging.

Recently, we introduced fiber-optic geodesy, a method that leverages low-frequency DAS (LFDAS) recordings to monitor quasi-static ground deformation caused by magma intrusions. Compared to conventional ground- or satellite-based geodetic measurements, fiber-optic geodesy offers lower noise levels and higher spatiotemporal resolutions, enabling real-time monitoring and imaging of magmatic processes.

We applied this approach to the ongoing eruption sequence near Grindavík, southwest Iceland, through two phases of DAS deployments. In the first phase (Nov 2023 to Nov 2024), we converted a 100-km telecom cable into a DAS array. Distinct LFDAS signals consistently emerged tens of minutes before each eruption. Since April 2024, we have operated an LFDAS-based early warning system in collaboration with the Icelandic Meteorological Office (IMO), successfully issuing alerts for two eruptions while avoiding false alarms for non-eruptive ones. Geodetic inversions of LFDAS signals enabled unprecedented spatiotemporal resolution of magma intrusions. In the second

phase (from February 2025), IMO deployed an ASN OptoDAS interrogator to monitor two telecom cables, with a total length of 150 km, integrating early warning with real-time imaging. The addition of a 50-km northern cable further improved azimuthal coverage and inversion resolution.

These results demonstrate fiber-optic geodesy as a powerful tool for monitoring ground deformations. It shall find wide applications both onshore and offshore, using existing telecommunication infrastructure or dedicated fiber deployments. ■

BIOGRAPHICAL SKETCH



DR. JIAXUAN LI joined the University of Houston as an Assistant Professor of Geophysics in January 2025. Prior to this appointment, he was a Postdoctoral Scholar at the California Institute of Technology (2020–2024). He earned his PhD in Geophysics from the University of Houston in 2020 and his BS in

Geophysics from Peking University in 2015.

Dr. Li's research focuses on applying fiber-optic sensing technologies to study seismic and geodetic processes and to image subsurface structures across diverse environments, including crustal, volcanic, and glacial settings. His broader interests also encompass geothermal energy development, carbon sequestration monitoring, and the dynamics of deep earthquakes.



GOLF TOURNAMENT

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Thursday, October 23, 2025
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RESERVATIONS The HGS prefers that you make your reservations online through the HGS website at WWW.HGS.ORG. If you have no internet access, you can e-mail OFFICE@HGS.ORG, or call the office at 713-463-9476. **Reservations for HGS meetings must be made or cancelled by the date shown on the HGS website calendar, normally that is 24 hours before hand or on the last business day before the event.** If you make your reservation on the website or by email, an email confirmation will be sent to you. If you do not receive a confirmation, contact the HGS office at OFFICE@HGS.ORG. Once the meals are ordered and name tags and lists are prepared, no more reservations can be added even if they are sent. **No-shows will be billed.**

2

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Make
your reservations
online at
hgs.org

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HGS Earth Science
Week Event

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**HGS General
Dinner Meeting**
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INSTRUCTIONS TO AUTHORS

Materials are due by the first of the month for consideration to appear in the next month's publication. Submissions should be emailed to editor@hgs.org. The Editor reserves the right to reject submissions or defer submissions for future editions.

Text should be submitted as a Word file. Figures or photos may be embedded in the document or submitted separately. The following image formats are accepted: tif, .jpg, .png, .psd, .pdf.

Feature submissions, e.g., GeoPicks, should be approximately 600 words. Technical papers should be approximately 2000 words or less (excluding references).



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Published 10 months out of the year and available digitally on the HGS website, the HGS Bulletin is an outstanding technical journal sent electronically to all current members and to subscribing libraries around the world.



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The HGS Weekly Newsletter is published digitally every week, and reaches a global community of 8,000+ people. HGS will promote your business with an ad of your design or your logo and a link to your website or social media.

To learn more about advertising rates and how you can promote your business with us, visit our website or contact the HGS Office at 713-463-9476 or office@hgs.org.



HGS Celebrated Another Successful Year at the Past Presidents' Luncheon on September 10, Taking Time to Honor and Remember Those Who Could not be Present.



Back: Steve Brachman, Steve Levine, Martin Cassidy, Jeff Lund, Walter S. Light Jr., Mike Erpenbeck, Charles Sternbach, John Tubb, Craig Moore, Bryan Guzman, Barry Katz, Craig Dingle, Paul Britt, and Dick Bishop.
Front: Sandy Barber, Patty Walker, Penny Patterson, Linda Sternbach, and Deborah Sacrey.



Left to right: Patty Walker (HGS President, 2025-2026) and Penny Patterson (past HGS President, 2024-2025)



Bryan Guzman (HGS President-Elect, 2025-2026)

Thank You to all the HGS Members who Volunteered at our Booth During this Year's IMAGE!



Mark Herkommer (left) with HGS President-Elect 2025-2026 Bryan Guzman.



Robert Bahme and Robert Schneider at the HGS booth.



David Perez, Keith Reeves and Daniel Akinyemi.



Booth guest, Tim McShane, and Oyie Ekeng.

HGS-SPONSORED SUMMER INTERN PRACHI NATOO AND HER FATHER, PARAG NATOO HAD THE OPPORTUNITY TO VISIT IMAGE'S EXHIBIT HALL!



Sue Pritchett/Lumina generously donated IMAGE Exhibition passes to Prachi Natoo (HGS 1st Place Senior Division at SEFH and HGS supported summer intern at HMNS) and Parag Natoo (her father). From left to right Larry Welch (HGS Science Fair Committee), Dorene West (HGS Science Fair Committee), Prachi Natoo, and Parag Natoo.



From left to right: Dorene West (HGS Science Fair Committee), Prachi Natoo (HGS 1st Place Senior Division at SEFH/HGS summer intern at HMNS), Parag Natoo. Prachi and her father were excited to visit the Exhibit Hall and see earth science posters/presentations and industry applications.

Geo-Destinations: Wyoming Dinosaur Center, Thermopolis-Wyoming

By William DeMis



Figure 1. The Thermopolis Archaeopteryx is on permanent display at the Wyoming Dinosaur Center..



Figure 2. Stegosaurus and T. Rex are two of the many dinosaurs on display.



Figure 4. Driftwood log covered with bivalves. Three Crinoid stems extend to the left

Telling geologists, they should visit Yellowstone Park is a bit like telling ducks to fly south in the fall — it's in their blood. But along the way lies a beautiful geo-destination that deserves special mention because it is so often overlooked: the Wyoming Dinosaur Center in Thermopolis.

This is no ordinary stop. The Wyoming Dinosaur Center is a world-class museum, and you might ask, “How world-class?” Well, it houses one of the 13 known Archaeopteryx fossils (**Figure 1**). The “Thermopolis Specimen” was the only Archaeopteryx in the Western Hemisphere until 2024, when the Field Museum in Chicago acquired one.

Beyond that, the museum features a stunning array of fossils. Of



Figure 3. Jurassic Ammonites from Germany. The specimen is about 3 feet across.



Figure 5. Spectacular Mississippian Crinoids from the famous Prestonville Locality of Indiana. The display is about 4 feet across.

Geo-Destinations: Wyoming Dinosaur Center

course, you'll see perennial favorites like T. Rex and Stegosaurus (**Figure 2**), but you'll also encounter exceptional specimens of ammonites (**Figure 3**), trilobites, bivalves (**Figure 4**), crinoids (**Figure 5**) stromatolites/microbialites, and Cenozoic fossils. My personal favorite is a breathtaking display of floating crinoids attached to a log, spectacularly articulated and stretching nearly 20 feet in length (**Figures 6 and 7**).

GETTING THERE: HALF THE FUN

Getting there is part of the adventure. The best route is to fly into Steamboat Springs during peak season, rent a car, and drive north through the classic Rocky Mountain uplifts and basins on the way to Yellowstone. Cody, the eastern gateway to Yellowstone, sits within the Big Horn Basin, making this drive not only practical but geologically rewarding.

The route takes you across the Rawlins Uplift, through Muddy Gap, and into the Wind River Canyon. Along the way, you will see glorious exposures of strata on the flank of the Rocky Mountain uplifts: a treasure in their own right and a bonus reason to drive.

The southern entrance to the Big Horn Basin comes via Wind

River Canyon. The good folks of Wyoming have posted signs marking each formation as you traverse down the stratigraphic section to the Precambrian core in Wind River Canyon. (Is this a trip made for geologists, or what?) Just beyond the canyon lies Thermopolis, and its extraordinary museum.

TRAVEL TIPS AND SUGGESTED ITINERARY

Commercial flights are available into Steamboat Springs during peak travel seasons (summer and winter), with direct service offered from select cities such as Houston. Alternatively, travelers can fly into Casper, typically connecting through Denver.

For this trip, it is recommended to bring geologic maps of Wyoming along with a copy of Roadside Geology of Wyoming.

Plan to spend at least two partial days and one night in Thermopolis to allow sufficient time to visit both the Wyoming Dinosaur Center and the region's noted hot springs. Options include a public park, several private facilities, and local motels that offer hot spring access exclusively for guests.

The town of Thermopolis retains a rustic western character, and dining options can be found with the help of online resources. For those continuing their travels, Cody is located only 90 minutes north of Thermopolis. ■

For more information, visit the museum's website: <https://wyomingdinosaurcenter.org/museum/>



Figure 6. Floating Crinoid display with person for scale. Crinoids are attached to driftwood log, on right, which is covered with bivalves. Three crinoid crowns are on the left. The entire display is over 20 feet.



Figure 7. Close-up of three crinoid crowns in floating crinoid display.

GeoPicks features recommendations from fellow geoscientists like resources, experiences, or tools. Do you have a favorite you'd like to share? Send it to us at editor@hgs.org.

Remembrance

JAMES LAMAR WILLIAMS

January 23, 1936 – August 22, 2025



JAMES LAMAR WILLIAMS peacefully passed away on August 22, 2025. He was born on January 23, 1936 in Amite, LA and grew up in Baton Rouge, LA where he graduated from Baton Rouge High School in 1954. After graduating from Louisiana State University (LSU) with a Bachelor of Science degree in Geology in 1959, Lamar was accepted into the U.S. Navy, where he attended Officer Candidate School. After a few years in active duty, Lamar transitioned to the Naval Reserve and began a career in the oil and gas industry as a geophysicist for Humble Oil/Exxon. He retired from Exxon and the U.S. Navy (as a Commander) in 1994 and 1996, respectively.

Lamar was married to Marinell (Watts) Williams for 59 years, living in a variety of locations including Pacific Beach WA, Ventura CA, Roswell NM, Midland TX, Sydney Australia, and Houston TX. He was an active member of Tallowood Baptist Church in Houston TX and enjoyed various hobbies including Little League Baseball umpiring, wedding videography, traveling, and watching Houston Astros baseball.



HGS Membership Application

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Active Membership

In order to qualify for Active Membership you must have a degree in geology or an allied geoscience from an accredited college or university or, have a degree in science or engineering from an accredited college or university and have been engaged in the professional study or practice of earth science for at least 5 years. Active Members shall be entitled to vote, stand for election, and serve as an officer in the Society. Active Members pay \$40.00 in dues.

Associate Membership

Associate Members do not have a degree in geology or allied geoscience, but are engaged in the application of the earth sciences. Associate Members are not entitled to vote, stand for elections or serve as an officer in the Society. Associate Members pay \$40.00 in dues.

Student Membership

Student membership is for full-time students enrolled in geology or an allied geoscience. Student Members are not entitled to vote, stand for elections or serve as an officer in the Society. Student Member dues are currently waived (free) but applications must be filled out to its entirety. Student applicants must provide University Dean or Advisor Name to be approved for membership.

Membership Benefits

Digital HGS Bulletin

The HGS Bulletin is a high-quality journal digitally published monthly by the HGS (with the exception of July and August). The journal provides feature articles, meeting abstracts, and information about upcoming and past events. As a member of the HGS, you'll receive a digital copy of the journal on the HGS website. Membership also comes with access to the online archives, with records dating back to 1958.

Discount prices for meetings and short courses

Throughout the year, the various committees of the HGS organize lunch/dinner meetings centered around technical topics of interest to the diverse membership of the organization. An average of 6 meetings a month is common for the HGS (with the exception of July and August). Short courses on a variety of topics are also planned throughout the year by the Continuing Education Committee. These meetings and courses are fantastic opportunities to keep up with technology, network, and expand your education beyond your own specialty. Prices for these events fluctuate depending on the venue and type of event; however, with membership in the HGS you ensure you will always have the opportunity to get the lowest registration fee available.

Networking

The HGS is a dynamic organization, with a membership diverse in experience, education, and career specialties. As the largest local geological society, the HGS offers unprecedented opportunities to network and grow within the Gulf Coast geological community.

**Please fill out this application in its entirety to expedite the approval process to become an
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Preferred Address for HGS mail _____
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Annual dues Active & Assoc. for the one year (*July 1st-June 30th*) **\$40.00** _____

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Company Address _____

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Year Graduated _____

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Please submit a brief statement regarding your work experience in the practice or application of earth science or an allied
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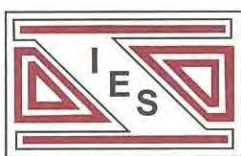


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Mount Lebanon, in the Koura region of Lebanon, is a prominent mountain range running parallel to the Mediterranean coast. Formed during the Alpine orogeny, related to the convergence of the African and Arabian plates with the Eurasian plate. The range consists primarily of limestones, dolomites, and marls from the Mesozoic and Cenozoic, with local Quaternary deposits in valleys and coastal areas. Photo courtesy of Atif Hariz.