Prospectivity of the Mauritanian margin: Tracing Cretaceous to Cenozoic reservoir fairways through a mega-regional 3D dataset

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Introduction

The Mauritania-Senegal margin has experienced significant exploration success with the discovery of the world-class Greater Tortue-Ahmeyim (GTA), Sangomar and BirAllah fields in the last 10-11 years, establishing it as one of Africa's most exciting hotspots for exploration and development.

Exploration drilling along the margin has mainly focused on the inboard Cenozoic salt-related plays (e.g. Chinguetti, Banda, Tiof, Tevet), and Upper Cretaceous to Paleogene clastic targets on the shelf (e.g. Aigrette, Pelican, Lamatin, Fregate wells). As exploration stepped out into the deepwater, the target focus shifted to Mid to Upper Cretaceous deepwater clastics (e.g. at GTA in 2015). Despite this major gas discovery and additional large discoveries at Orca and BirAllah, forming the combined BirAllah Gas Field project, the majority of the deepwater basin remains largely untested.

The Mauritanian margin contains vast amounts of remaining potential within both untested plays and undrilled structures in existing plays. These include Miocene salt-draped channels in the inboard salt basin, syn-rift plays inboard, Mid Cretaceous paleo-shelf and shelf-edge clastic and mixed clastic/carbonate plays, and Jurassic to Lower Cretaceous carbonates. Deepwater plays include Mid to Upper Cretaceous channel and fan systems often within mixed contourite-turbidite deposits.

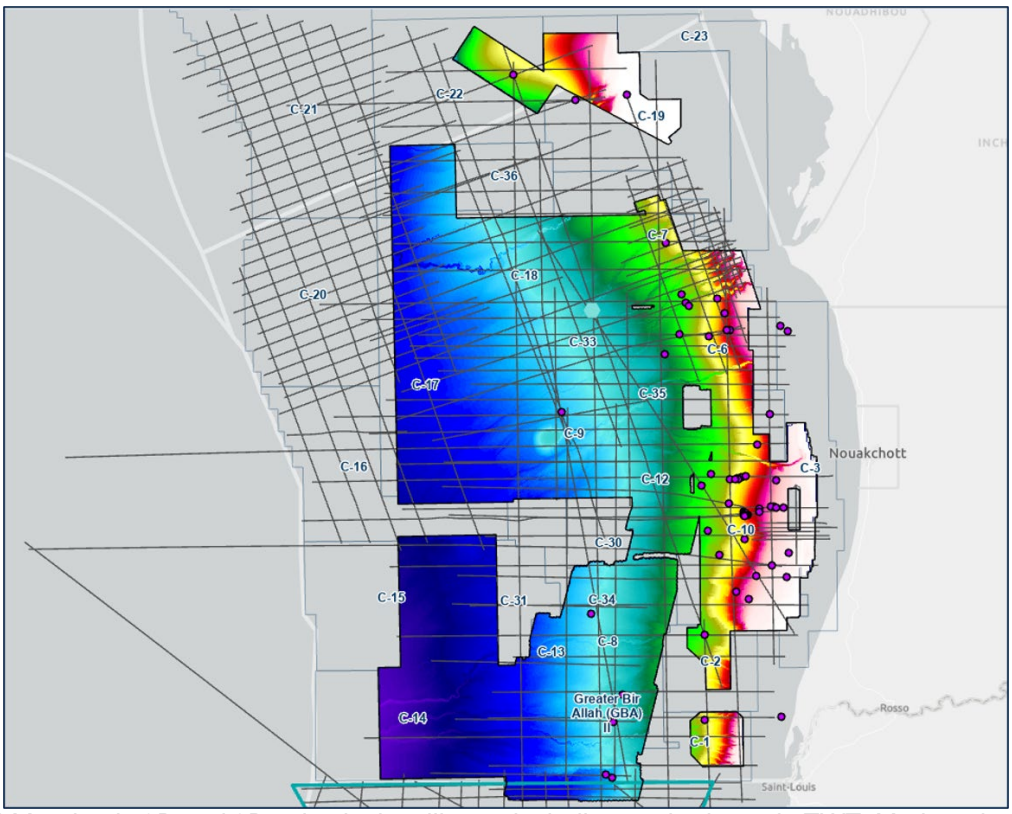


Figure 1 *Mauritania 2D and 3D seismic data library, including seabed map in TWT. Modern day canyon systems drain from the shelf-edge and transport sediments hundreds of kilometres outboard.*

Geological Setting

Along the Mauritanian margin, a Triassic rift succession is overlain by a widespread Mesozoic carbonate platform which developed across the MSGBC Basin, extending from Mauritania through to Republic of Guinea. This carbonate system exerted a fundamental control on the location of the shelf break and governed the entry points of clastic sediments into the deepwater domain throughout the Mid to Upper Cretaceous.

Triassic evaporites were deposited prior to the opening of the Atlantic Ocean. Subsequent allochthonous movement of this salt during the Upper Cretaceous has strongly influenced the tectono-stratigraphic evolution of the inboard coastal basin, generating a variety of structural trap configurations.

Following the drowning of the carbonate platform in the Lower Cretaceous, several major clastic systems began to prograde into the offshore Mauritanian basin. These systems deposited deltaic facies across the shelf, linked to downslope channel and fan complexes in the deepwater, as identified by Gillbard and Bellingham (2022).

However, due to their mega-regional extent and the historical lack of multiclient 3D seismic coverage in outboard areas, the full distribution of these depositional fairways remained poorly constrained.

Mega-regional interpretation of clastic systems

Over 100,000 km^2 of 3D seismic data have recently been amplitude balanced, phase-matched and merged into a near contiguous mega-regional dataset offshore Mauritania, complemented by 26,300 line km of regional 2D (Figure 1).

Interpretation of this integrated dataset, extending from the coastal basin to the ultra-deepwater, enables basin-scale mapping of major clastic systems and has refined our understanding of their interaction with key tectono-stratigraphic elements, including the carbonate platform, autochthonous salt, and underlying syn-rift succession. When integrated with established structural trends, this dataset provides a robust understanding of reservoir play fairways. The contiguous 3D especially allows us to resolve the relationship between fluvial-deltaic input systems, sediment bypass pathways, and the influence of the underlying carbonate platform and Triassic rift architecture.

Three river systems supplied sediment to the margin: the Senegal, Nouakchott, and Nouadhibou rivers (south to north). The data reveal a progressive northward migration of depocentres from the Cretaceous into the Tertiary, alongside clearly defined sediment bypass pathways transporting material into deep and ultra-deepwater settings.

Seismic attribute analyses, including spectral decomposition and RMS amplitude extractions, delineate the distribution and morphology of these systems. They are characterised by extensive sediment wave fields and pronounced slope bypasses in the southern and central areas, transitioning into fan-channel complexes further north (Figure 2). The coexistence of sediment waves and bypass channels indicates the development of mixed turbidite–contourite depositional systems during the Cretaceous.

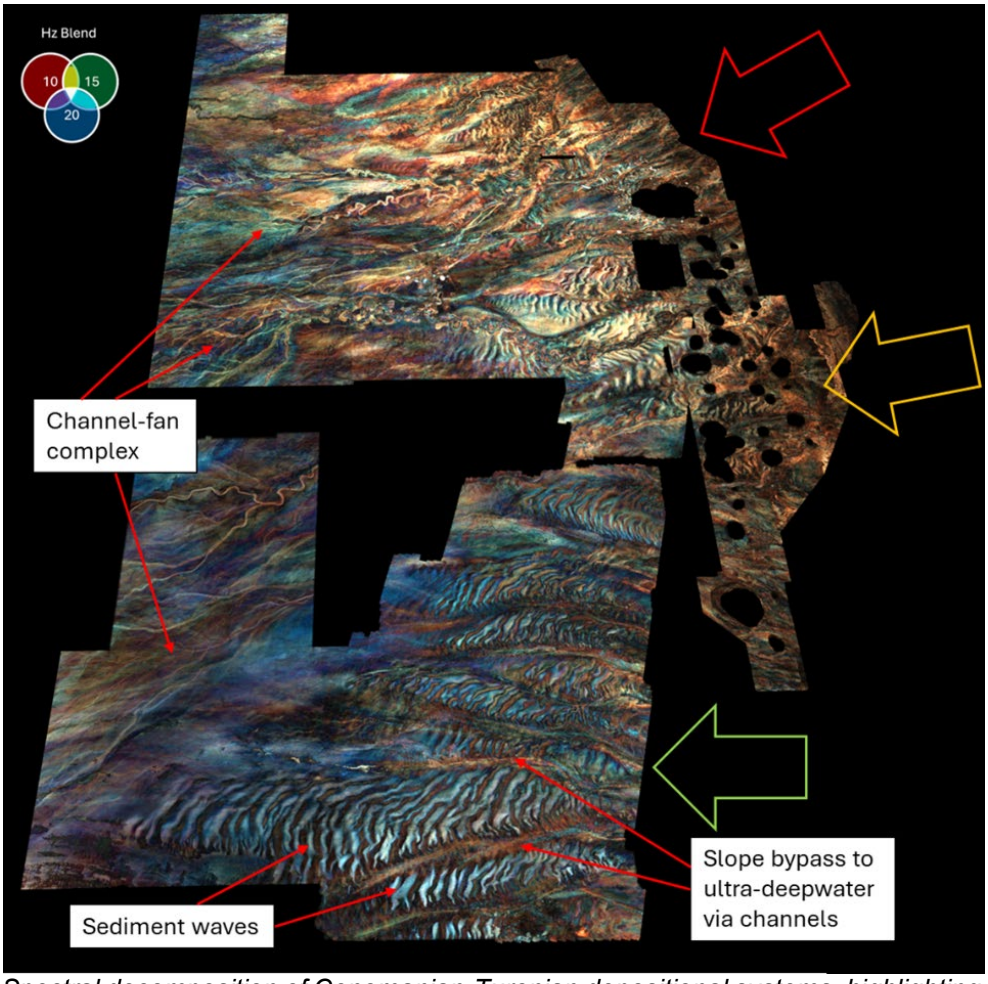


Figure 2 *Spectral decomposition of Cenomanian-Turonian depositional systems, highlighting sediment waves, channel-fan complexes and areas of slope bypass to the ultra-deepwater via channels.*

Conclusions

Interpretation of a mega-regional 3D seismic dataset has enabled development of a comprehensive stratigraphic framework from the Triassic to present day across the Mauritanian margin. This work has improved understanding of the interactions between autochthonous salt, the overlying carbonate platform, and their control on the evolution of shelfal feeder systems, allowing sediment pathways to be traced into deepwater clastic fairways.

At a regional scale, the dataset highlights major Cretaceous clastic input systems and a progressive northward shift in depocentres. Seismic attribute interpretation links existing discoveries to proven and emerging exploration plays. Exploration potential can be sub-divided into distinct geographic domains, with Neogene salt-related clastics, Mesozoic carbonates, and Triassic syn-rift plays largely confined to the inboard basin.

Extensive Cretaceous deepwater clastic systems can be mapped from shelf-edge feeder canyons into deep and ultra-deepwater settings. Understanding these spatial and temporal relationships improves confidence in play prediction, reducing uncertainty in reservoir distribution and trap timing across both proven and frontier plays.

Acknowledgements

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References

Gillbard, E. and Bellingham, P. [2022]. Chasing the many plays of the Mauritanian margin. GeoExPro