Introduction

The Namibian margin has been an exploration hotspot since the 2022 play-opening discoveries of Venus and Graff within the Orange Basin. Subsequent exploration of these deepwater play trends has yielded mixed success, primarily due to variable reservoir quality in the distal targets. The most recent wave of exploration drilling in 2024/25 has been more successful, targeting prospects inboard of the Outer High (e.g. Mopane, Sagittarius-1X, Capricornus-1X, Volans-1X) with good petrophysical properties encountered. As exploration focus is anticipated to move northwards into the lesser explored Walvis and Lüderitz basins, it is important to have a good understanding of hinterland sediment sources, entry points and the effects of contourite currents, in order to de-risk reservoir presence and quality away from known well penetrations.

Linking deepwater Cretaceous fairways to hinterland sources

This paper uses a regional 2D seismic database to map the main depositional fairways of the Walvis and Lüderitz basins, identifying sediment depocentres and major incision points (Figure 1) in the Cretaceous and Tertiary. Sediment entry points along the shelf can be traced to depositional fairways down-dip and linked to hinterland source areas onshore. Published information on sediment provenance in combination with available shelfal well data provides an indication of potential reservoir quality in untested regions of the offshore.

The paleo-Orange River was the dominant source of sediments to the Namibian margin, with a much larger volume of sediment input into the Orange Basin compared to the Walvis and Lüderitz basins (Wildman et al. 2021). These were primarily sourced by seasonal rivers (e.g. Ugab, Swakop, Huab, Tsauchab rivers) which drained through Proterozoic meta-sediments, Karoo clastics, flood basalts and volcaniclastics (Ziegler et al., 2022). Drainage areas were tectonically controlled through NE-SW trending lineaments, focusing deposition and limiting hinterland catchments.

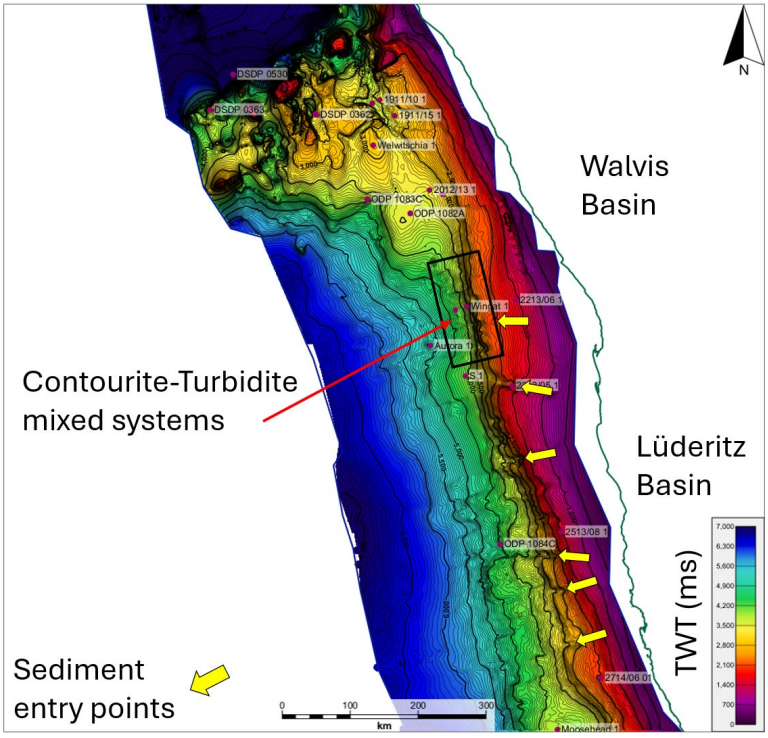

Figure 1 *Top Cenomanian TWT map showing sediment entry points on the shelf and highlighting the presence of a mixed contourite-turbidite system along-strike of the Wingat-1 well.*

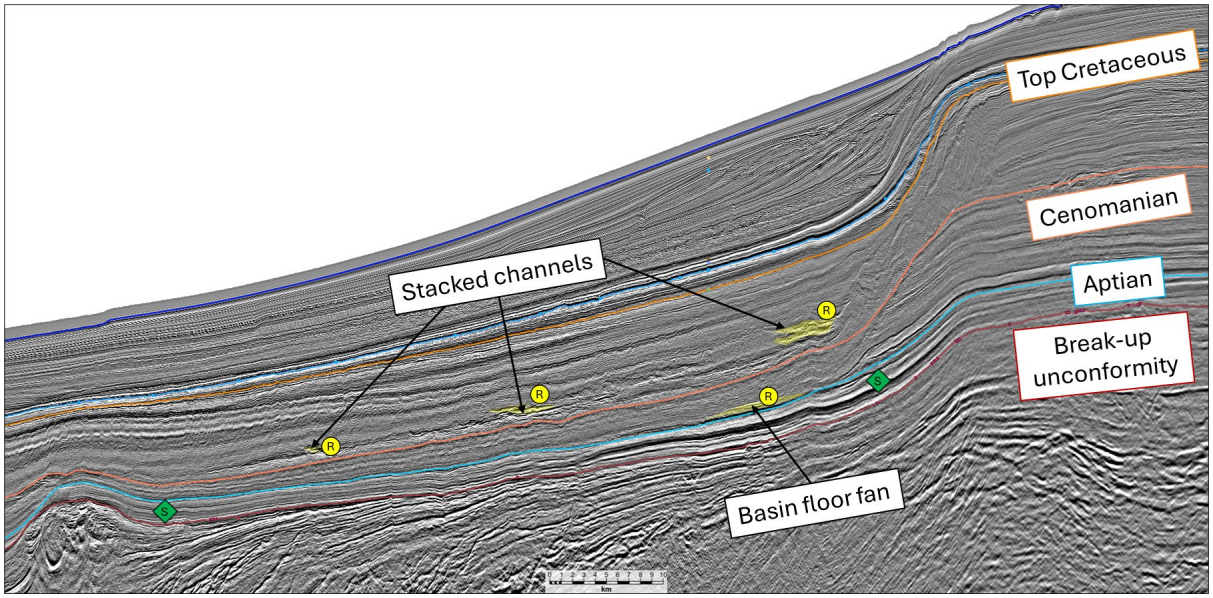

Figure 2 *Dip example in TWT across the Walvis Basin showing play elements and potential stratigraphic traps in the Albian and Upper Cretaceous.*

Within the post-rift Cretaceous section, two distinct depocentres can be seen along the shelf representing the main shelf-edge deltas of the Walvis and Lüderitz basins. A singular depocentre exists outboard of the Outer High which contains sediment input from both basins. The Walvis Ridge was a prominent structural high since the Aptian, forming a barrier which has influenced the outboard sedimentation in the Walvis basin towards the southwest. In the Tertiary, the Walvis delta is more developed and laterally extensive in comparison to Lüderitz, indicating a higher level of sediment input from northern Namibia relative to Lüderitz at this time.

Conclusions

A range of fairways have been identified within the Walvis and Lüderitz basins including basin floor fans, slope fans and channel systems (Figure 2). We also observe evidence for the presence of mixed contourite-turbidite systems in the Albian to Maastrichtian which will have implications for the quality and distribution of reservoir sands. The study provides examples of undrilled targets and untested plays based on regional-scale mapping of the subsurface in combination with sediment provenance studies and available well data, showcasing the potential to optimise exploration in these relatively frontier basins and de-risk reservoir quality of future targets.

Acknowledgements

We extend our thanks to NAMCOR for their partnership in Namibia and rights to show the data.

References

Wildman, M., Gallagher, K., Chew, D. and Carter, A. (2021) From sink to source: Using thermochronometric data to extract onshore erosion signals in Namibia. Basin Research, 33, 1580-1602.

Ziegler, J., Hofmann, M., Gärtner, A., Gerdes, A., Marko, L. and Linnemann, U. (2022) Tracing southern Gondwanan sedimentary paths: A case study of northern Namibian late Palaeozoic sedimentary rocks. Sedimentology, 69, 1738-1768.