Namibia Oil and Gas Conference

3rd Edition

From exploration to action:
Positioning Namibia as the next energy frontier

ENDORSED BY

Ministry of Industries, Mines and Energy, Republic of Namibia

Let's Play - The Orange and Cape Basins offshore, South Africa

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Overview

1. **Introduction** – An underexplored region
2. **Regional Setting** – From the Orange Basin to the Cape Basin
3. **Basin Architecture** – Influence on the Orange and Cape Basins?
4. **Potential Plays** – Analogues to Namibia discoveries
5. **Key Takeaways & Way Forward** – What's ahead for deepwater South Africa

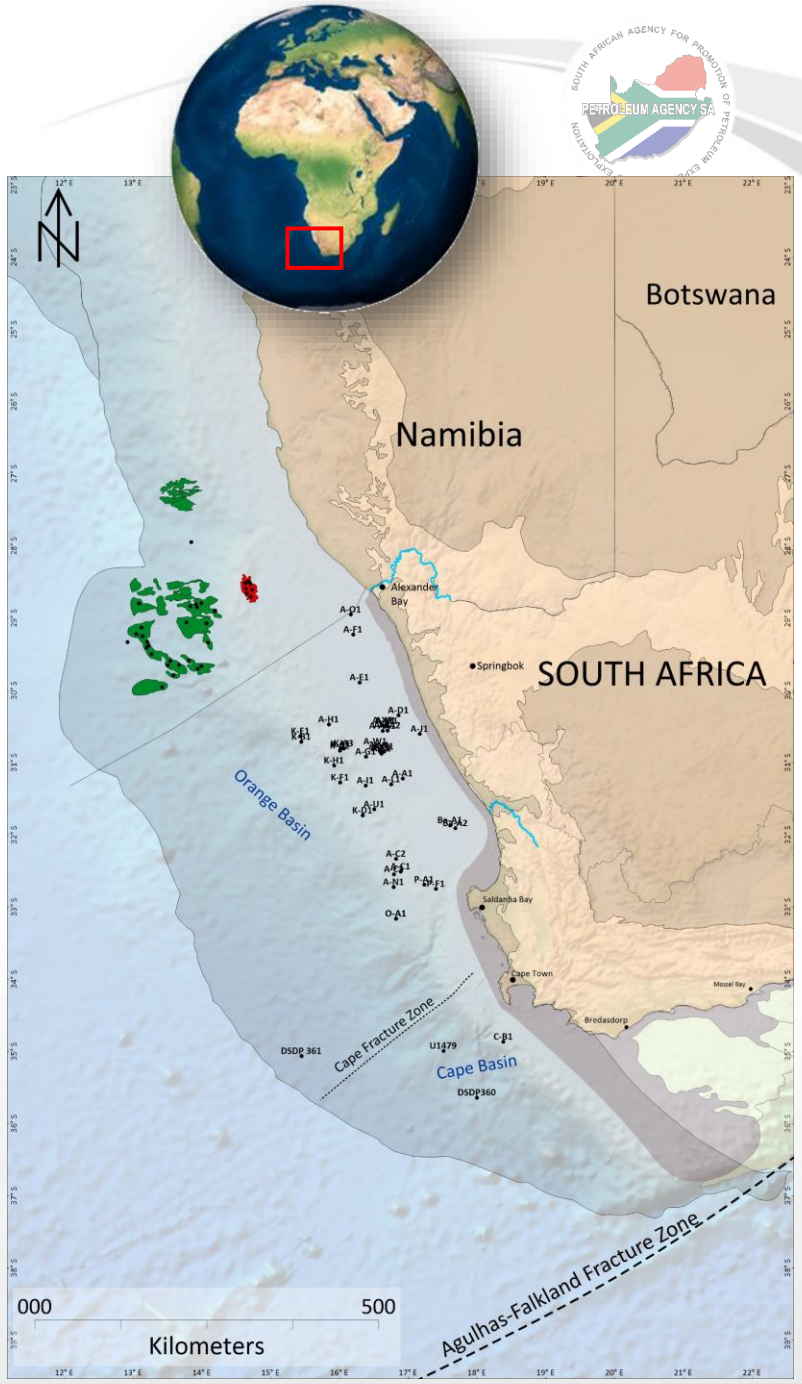
Introduction

The Orange Basin: An Underexplored Petroleum Province

- Shared across South Africa & Namibia, extending into the deep water.
- Recent Namibian discoveries confirm a working petroleum system.
- South Africa's offshore potential remains underexplored.
- A total of 41 wells have been drilled and are focused on the shelf.
- DSDP/ODP wells slope?

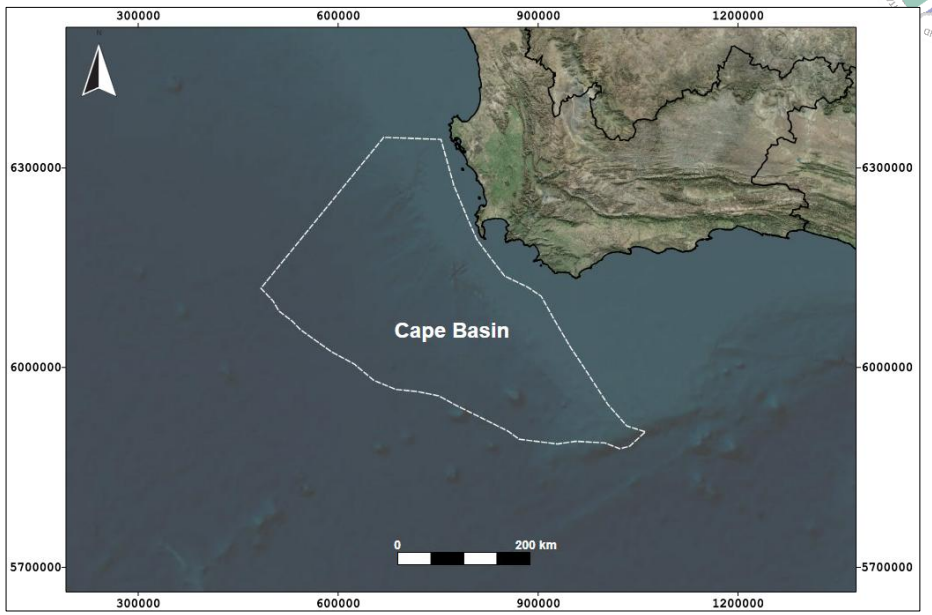
The Cape Basin: A Frontier Petroleum Province

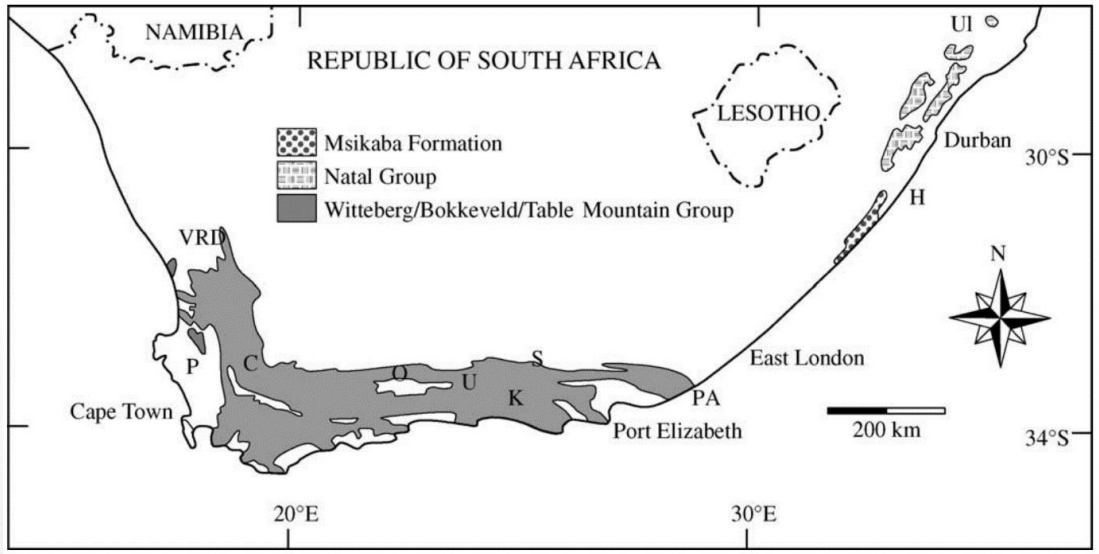
- Cretaceous-Quarternary-aged depression/basin, south of Cape Fracture Zone.
- Situated across the shelf, slope, and parts of the deep ocean floor.
- One exploration well and two DSDP/ODP wells, U-well.



Cape Basin

- Ambiguity “Cape Basin”.
- "Cape Basin" refers to several different basins, each with unique geological significance.
  - Onshore Cape Basin – Palaeozoic (Ordovician to Carboniferous)
  - Oceanic Cape Basin – Counterparts such as Argentine Basin
  - Offshore Cape Basin/Southern portion of the Greater Orange Basin.
  - Early Cretaceous to present day.



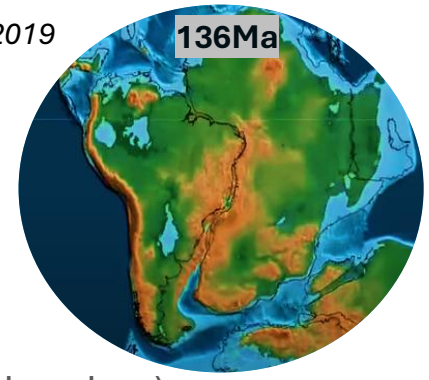


(Shone et al, 2005)

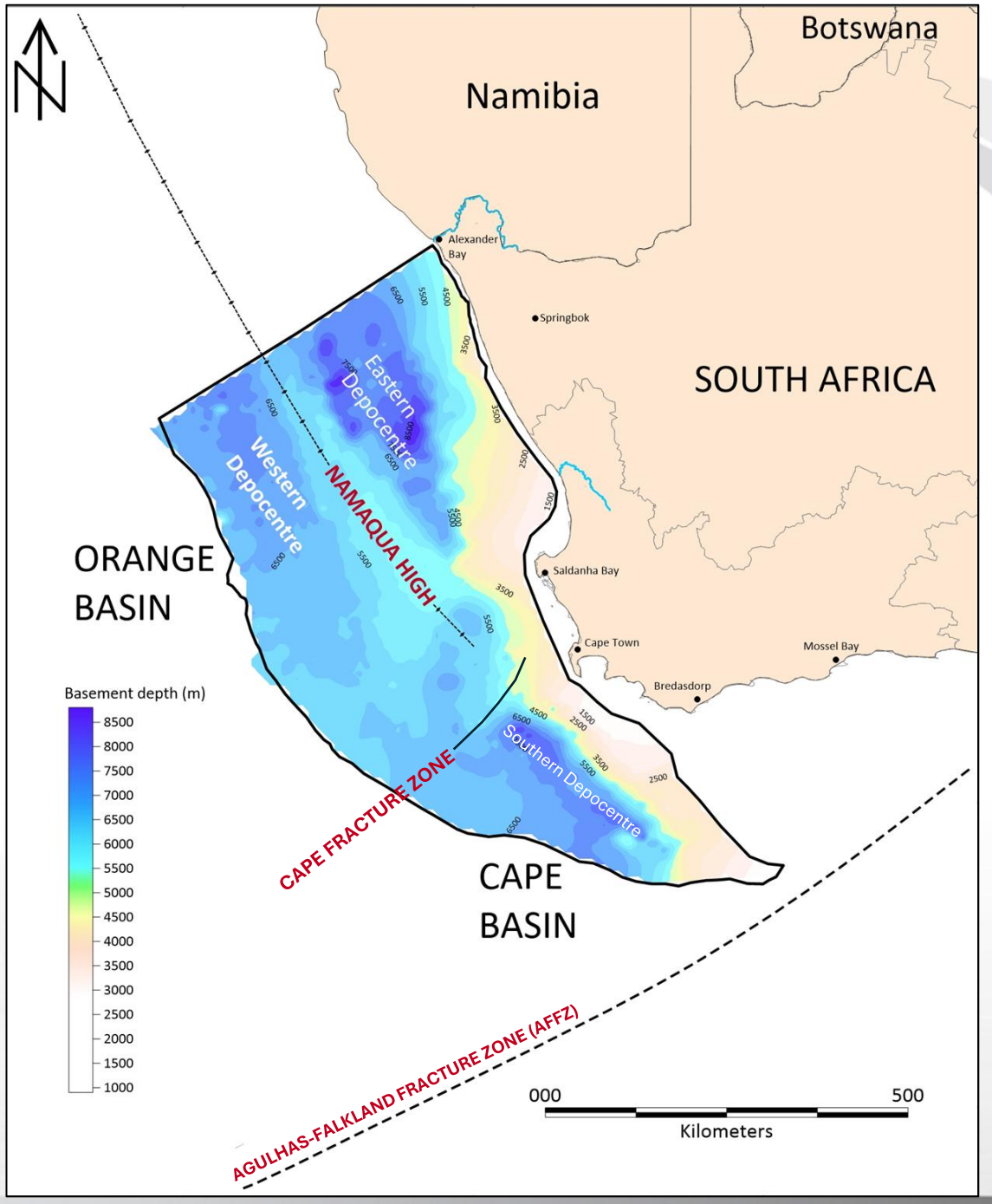
Encyclopædia Britannica

Regional Setting

Scotese, 2019

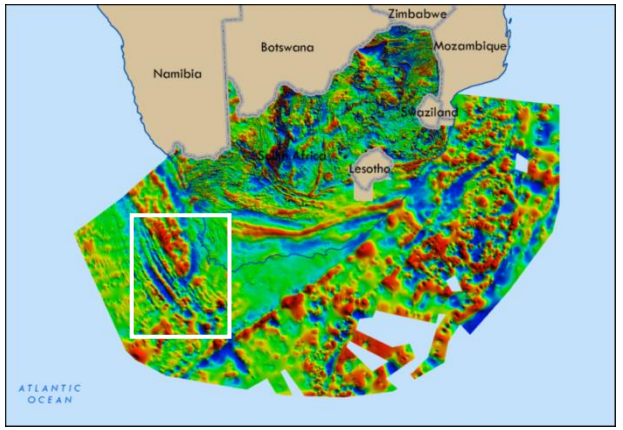


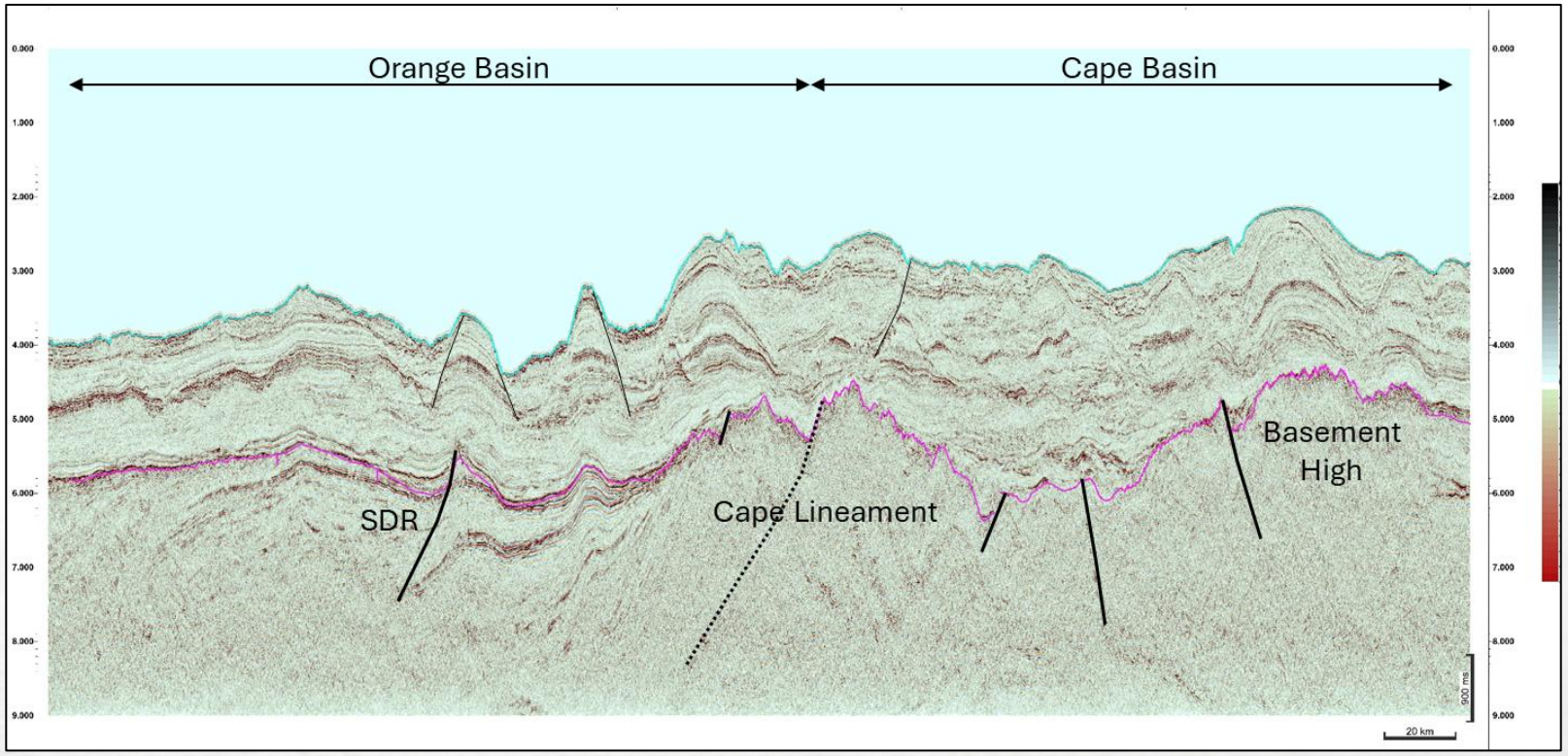
- Located along the west coast of Southern Africa.
- Formed during Early Cretaceous rifting (Gondwana breakup) approximately 136Ma ago.
- Classic rift-drift volcanic passive margin.
- **SA Portion**:
  - Spanning 320,000 km^2
  - Water depths ranging 100 to 4650m.
- **Three depocentres**:
  - Eastern & Western Depocentres (North), spanning into Namibia.
  - Southern Depocentre in the Cape Basin.
  - Sediment thickness reaches up to 8000m in OB and 4s TWT in CB.
- Basement depth ranges between 1000 m and 8500 m.
- Regional and local Basement features control basin architecture.

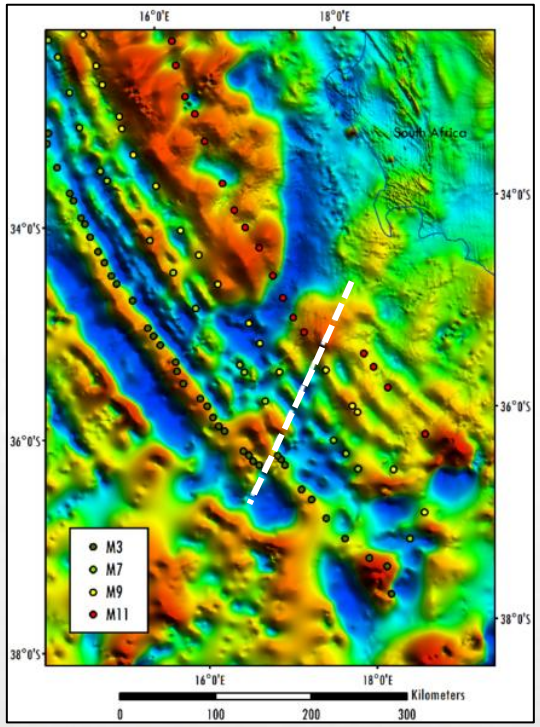


Basin Architecture: Cape Lineament / Fracture Zone

- The Cape Lineament (Cape Fracture) is a **NE-SW** trending feature.
- Formed from zones of weakness on the ocean floor and offsetting the Southern South Atlantic MOR.
- Distinguishing the Orange from the Cape Basins (Magma-rich to magma-poor).







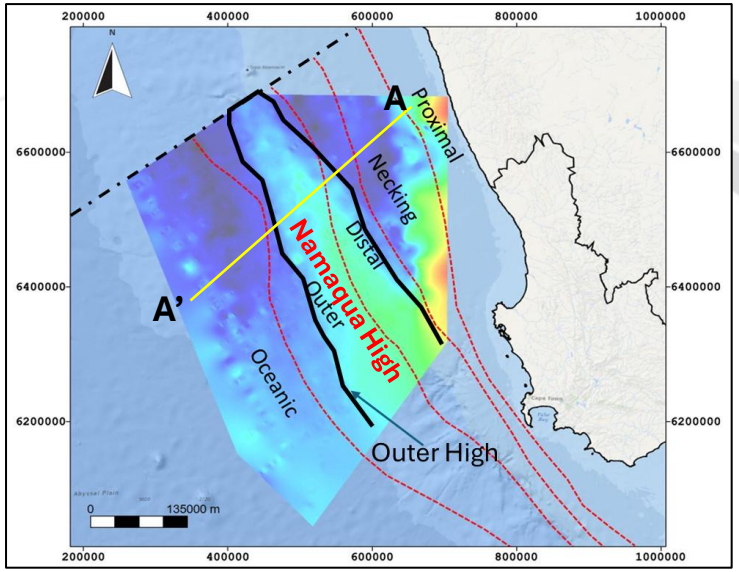
(Getech, 2018)

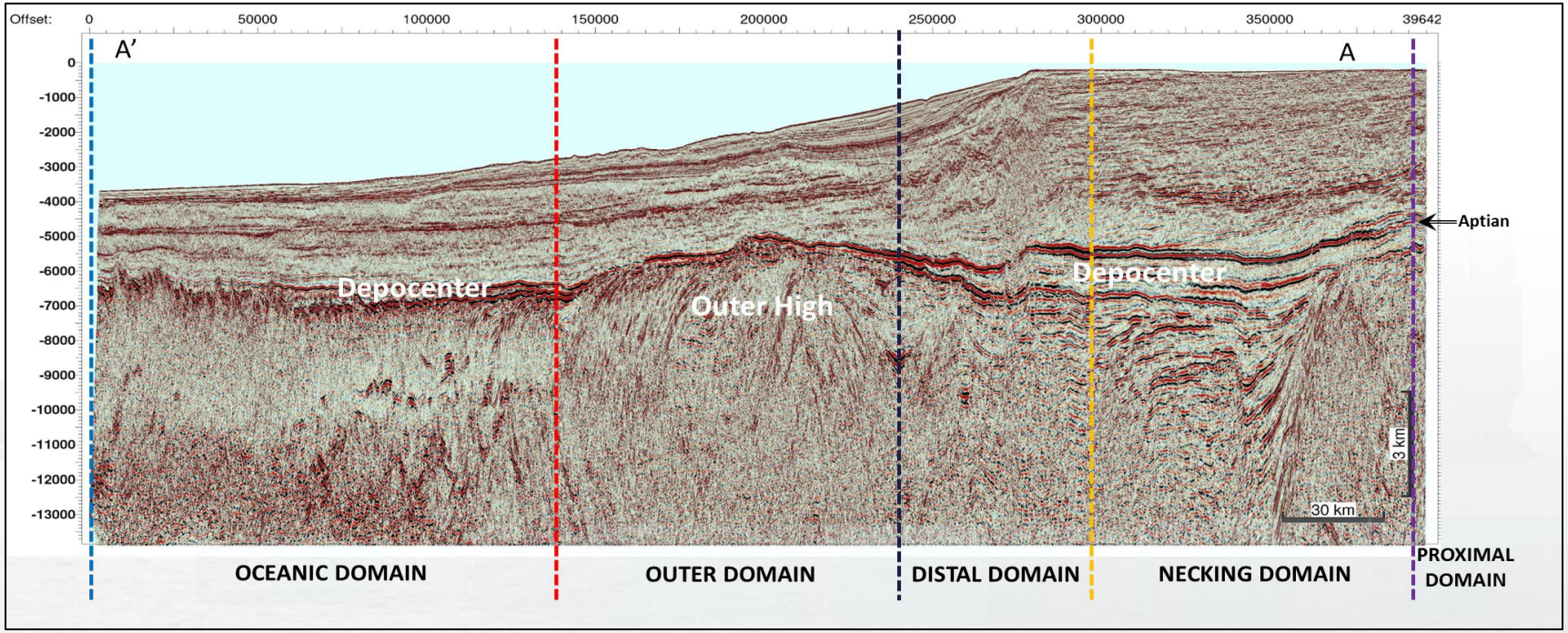
Basin Architecture: Namaqua (Outer) High

- The Regional Basement ridge separates Orange Basin into two Depocenters.
- NW-SE trending, plunging to the north at depths of 3300 to 7800 mbsl.
- Areal extent on SA side: 450km long, 50 to 150km wide.

Influence on reservoir and source rock distribution:

- Formed restricted environments for source rock development.
- Relief: Controlled potential reservoir distribution and enhanced stratigraphic trapping potential.





(Fielies et al., 2021)

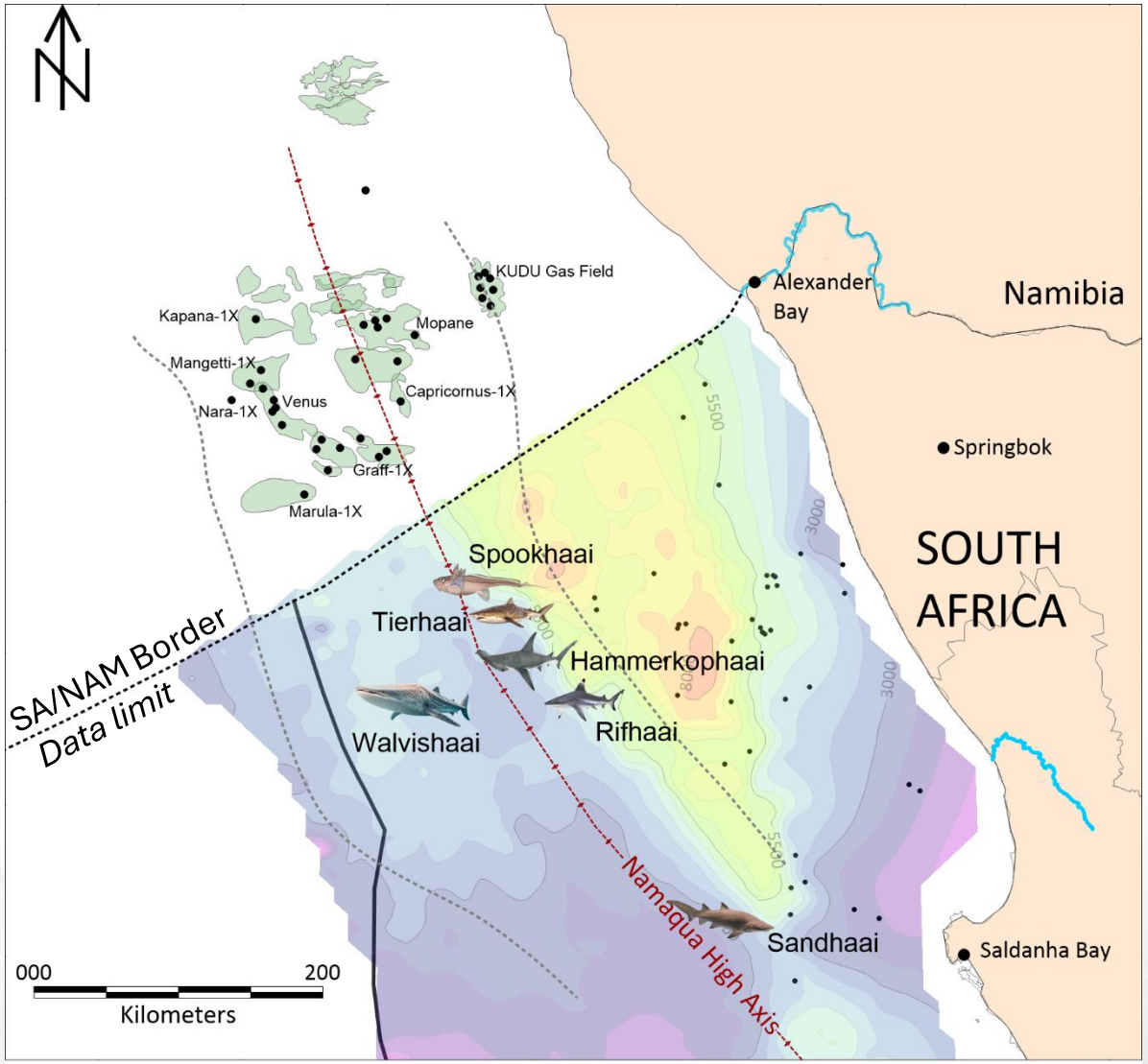
Potential Plays

Some key Discoveries Offshore Namibia:

- Venus-1X (TotalEnergies) – ~5 billion barrels of oil in place.
- Graff & Jonker-1X (Shell) – ~2,5 billion barrels of Light oil with a high gas-to-oil ratio (GOR).
- Mopane (Galp) – Estimated 10 billion barrels oil equivalent in place.
- *Capricornus 1-X (Rhino Resources) – Light oil discovery*

South African Analogues:

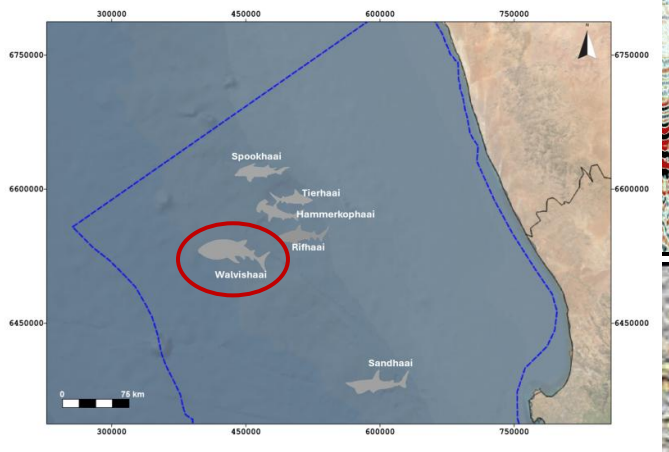
- Walvishaai (Whale Shark)
- Spookhaai (Ghost Shark)
- Sandhaai (Sand Shark)
- Numerous Cape Basin leads: Basin floor fans and Mixed depositional systems (BFFs & MDS)



Potential Plays : Walvishaai (Venus analogue)

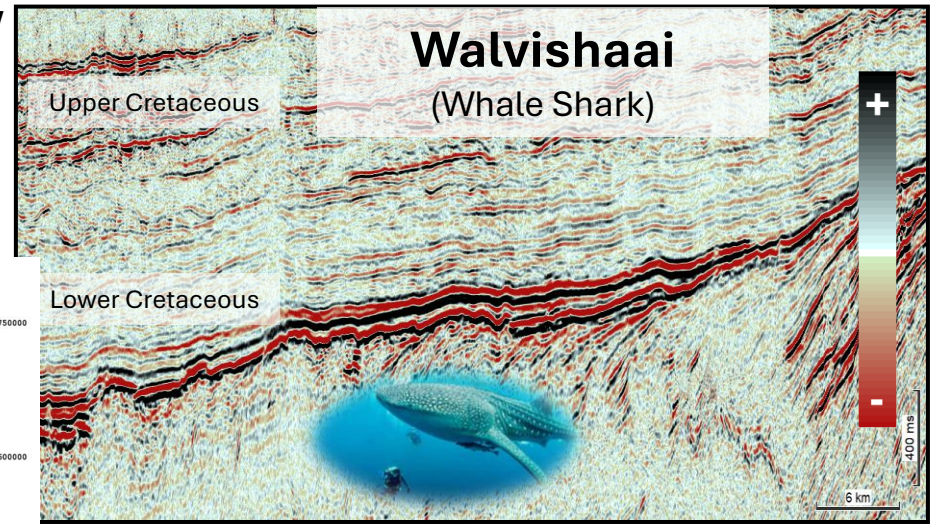
- Walvishaai prospect is a basin-floor fan onlapping onto the Namaqua High.
- Seismically akin to the Venus discovery in Namibia
- Comparable water depths, reservoir, and trapping characteristics
- Estimated resources at 7.1 Billion barrels

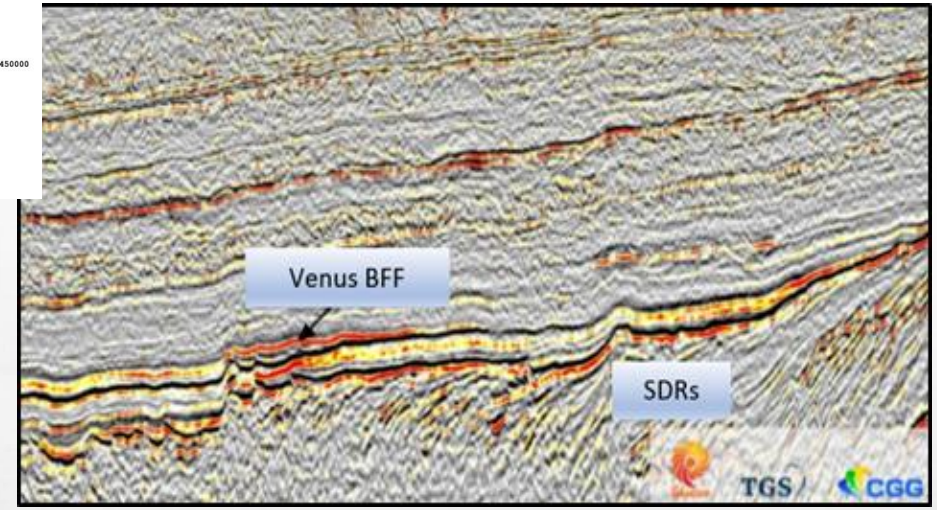
	Walvishaai	Venus
Water Depth (m)	2500-3150	~3000
Depth (m)	6365-6955	~6296
Age	Apto-Albian?	Albian
Source	Apto-Albian? Kudu Shale	Aptian
Reservoir	BFF?	BFF
Trap	Counter-regional	Counter-regional
Thickness (m)	30 – 200	84
Area (km^2)	1900-5800	600-2800
Estimated OIP	7100 mmbl	~5000 mmbl



(Salomo et al., 2022; Fielies et al., 2024)

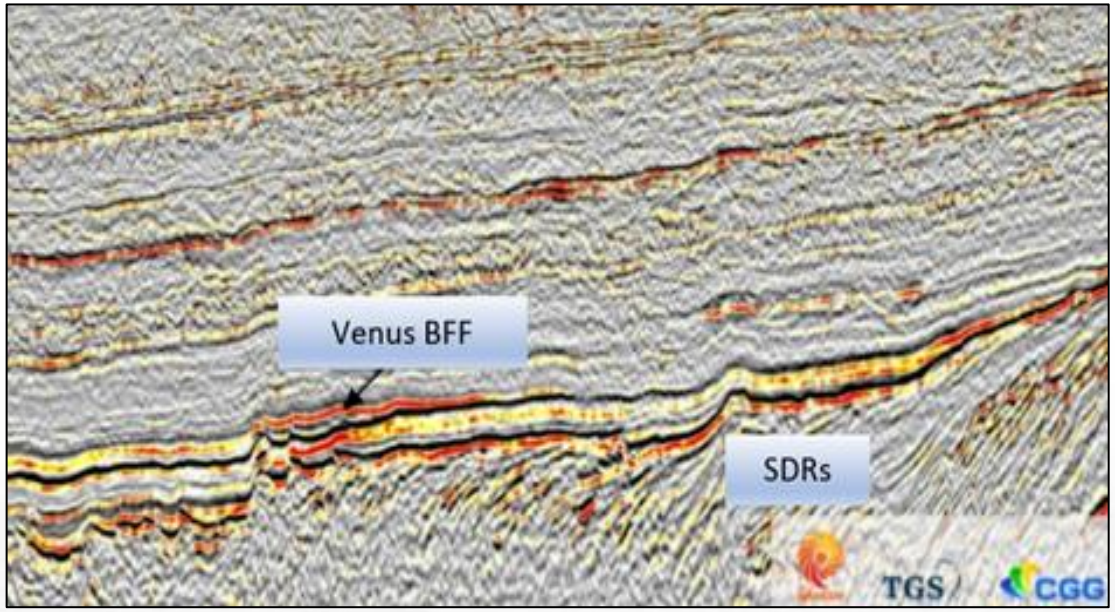
SW NE

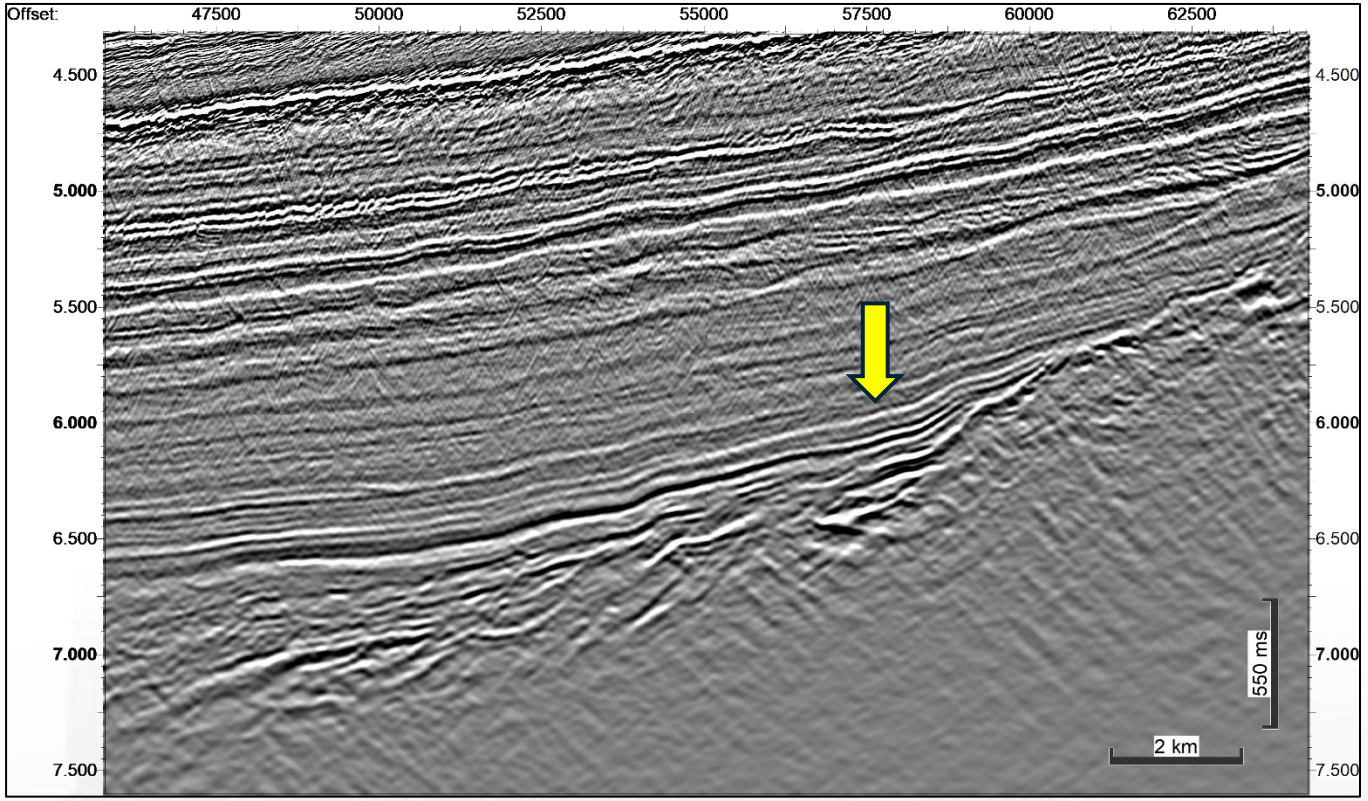




Potential Plays: Cape Basin (Venus analogue?)

- Cape Basin basin floor fan (BFF) lead.
- Lower Cretaceous age.
- Between 5,75s and 6,75s TWT.
- Similar seismic signature and trapping style onto Basement.

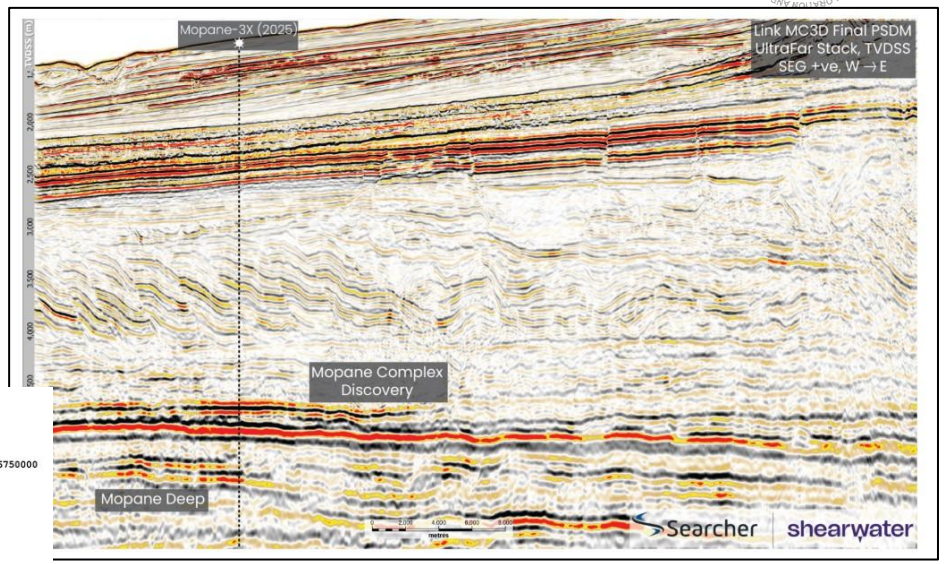


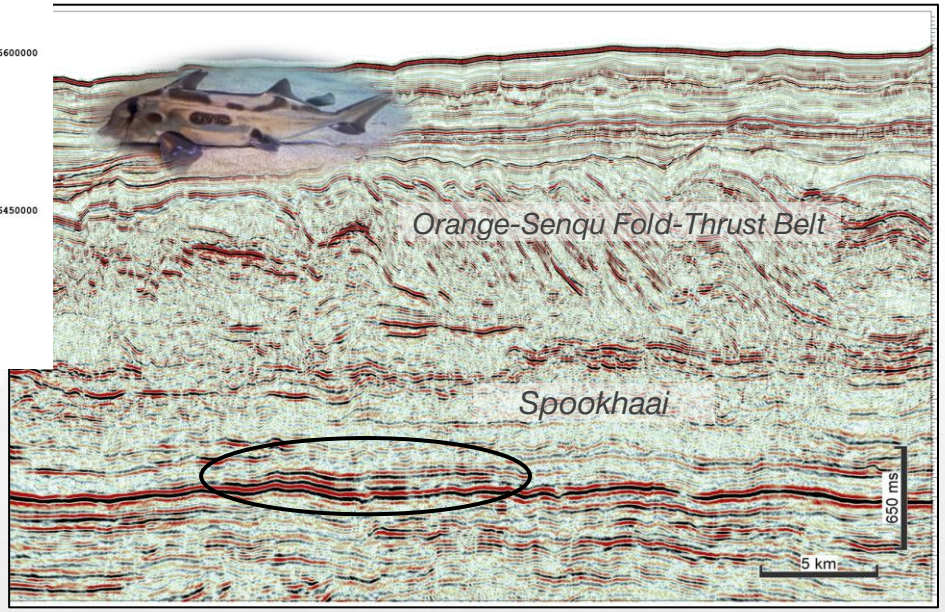


Potential Plays: Spookhaai (Mopane analogue?)

- The Spookhaai lead is a Mopane-type play.
- Found below the transitional-contractional domains of the Orange-Senqu Deepwater Fold and Thrust Belt (DWFTB).
- Above and inbound of the Namaqua (Outer) High.
- Close to postulated Aptian source rock.
- Thickness – 20m to 150m

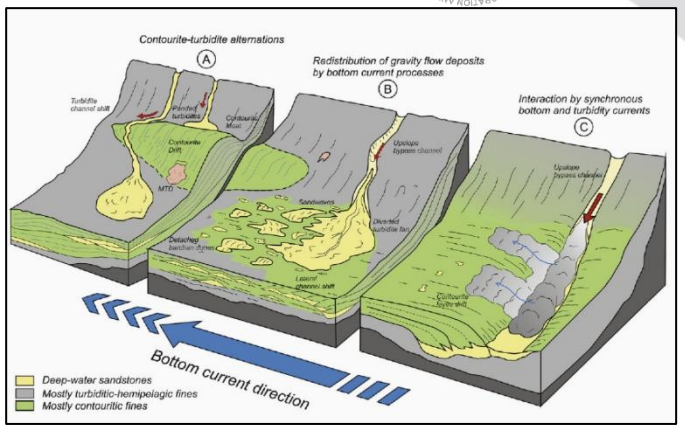
	Spookhaai
Water Depth (m)	~ 1960 m
Depth (m)	4300 – 5200m
Age	Lower K
Source	Aptian
Reservoir	BFF
Trap	Stratigraphic
Thickness (m)	~20m – 150m
Area (km^2)	~450 km^2
Estimated OIP	?





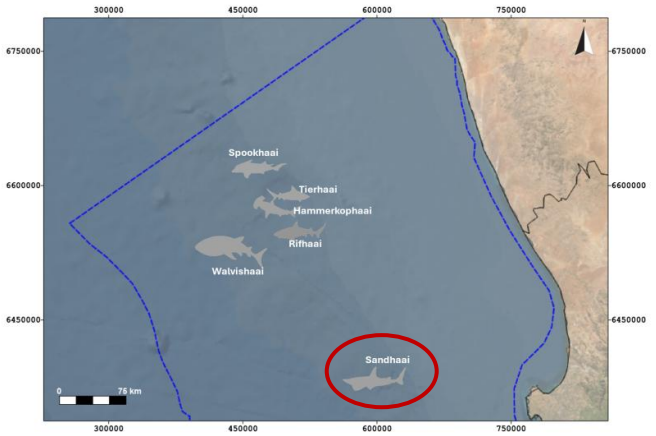
Potential Plays : Sandhaai

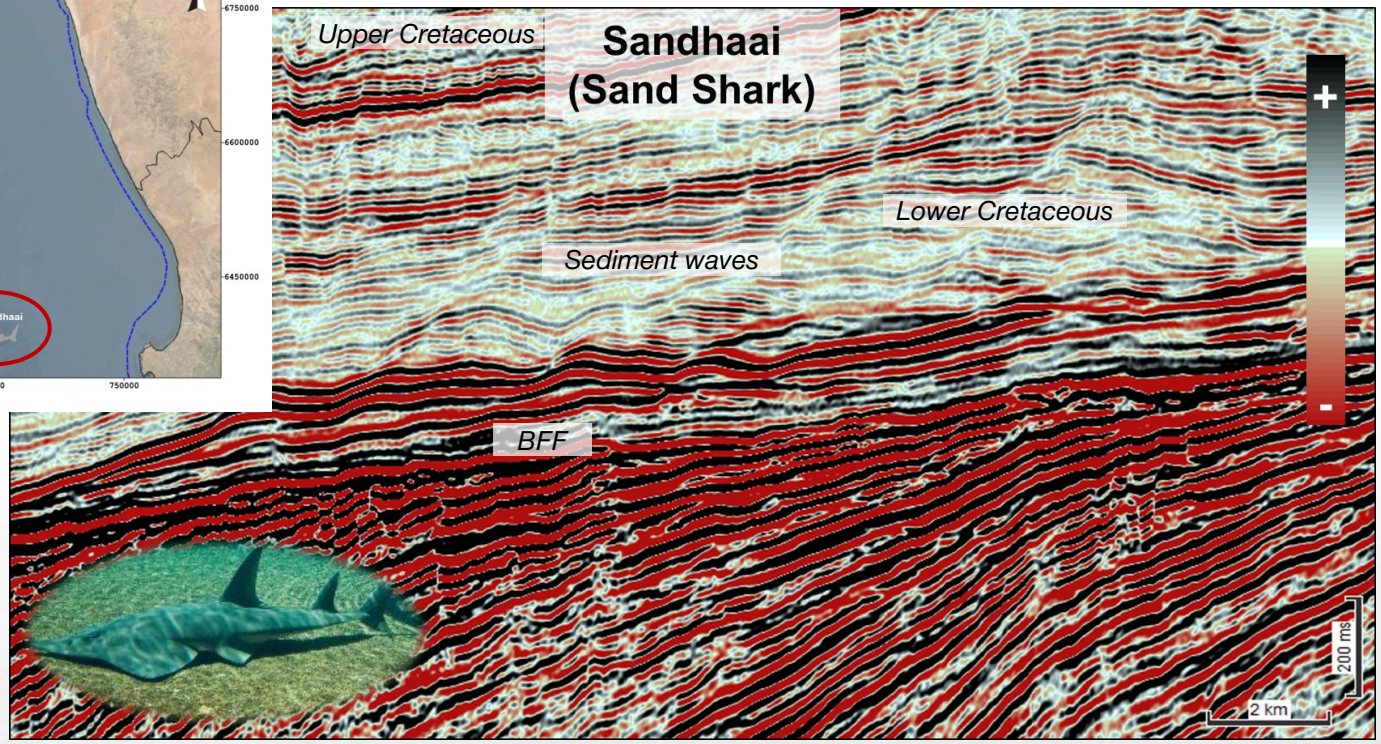
- Mixed turbidite-contourite play representing a Mixed Depositional System
- Sandhaai: Basin-floor fan reshaped by later bottom-water activity and sealed by sediment waves.
- Bottom-water currents (Contourites) can clean Turbidites, provide seals, and create pathways or pond turbidites.
- MDS has led to large global discoveries, like the Coral and Mamba super-giant gas fields in Mozambique (100TCF)



(Fonnesu et al., 2020)

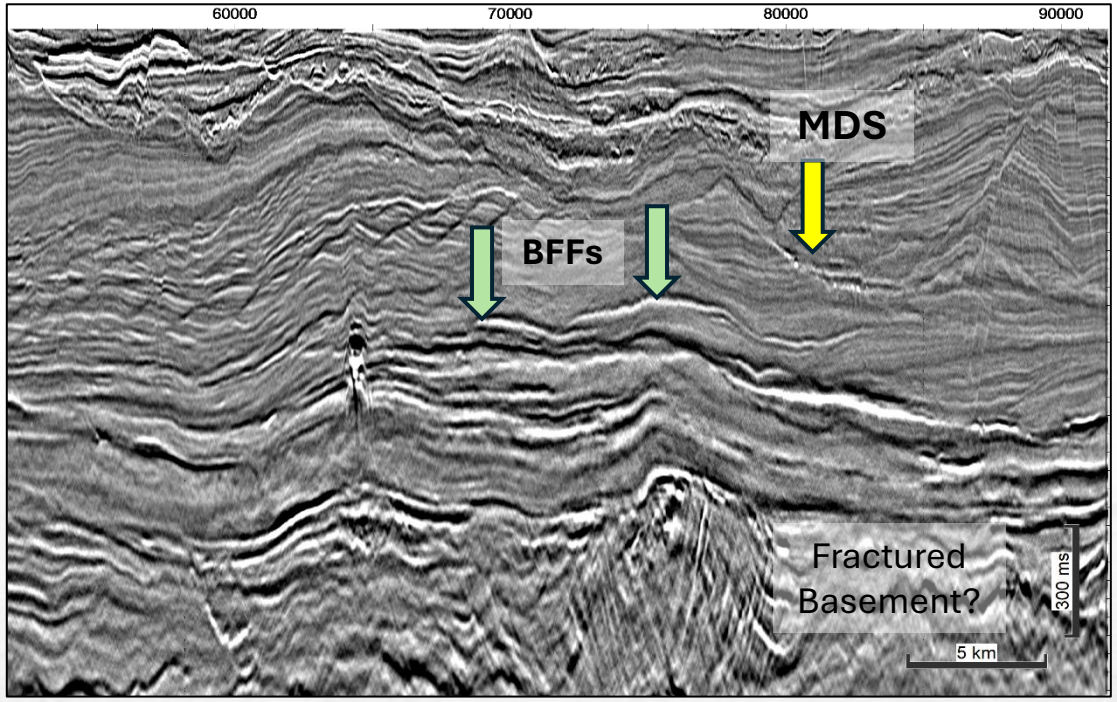
	Sandhaai
Water Depth (m)	2300-2700 m
Depth (m)	4300-4800 m
Age	Upper K
Source	Aptian
Reservoir	BFF
Trap	Stratigraphic
Thickness (m)	200 m
Area (km^2)	423 km^2
Estimated OIP	1500 mmbl

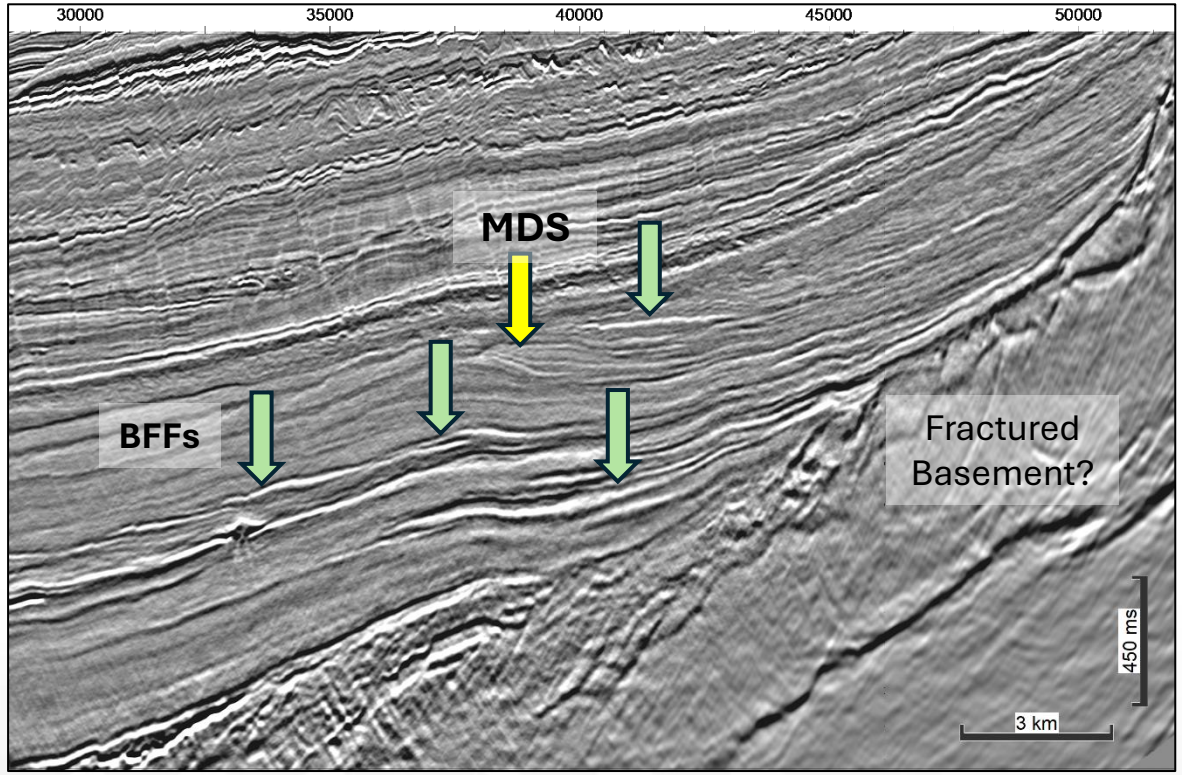




Potential Plays : Cape Basin MDS and BFFs

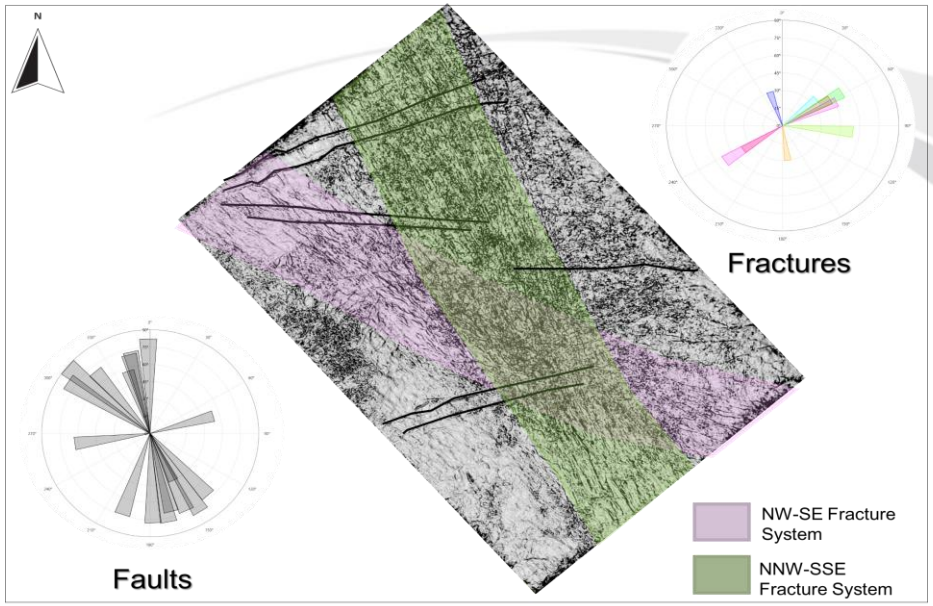
- Mixed depositional systems have been identified in the Cape Basin.
- Cretaceous stacked fans and basin floor fans
- On seismic between 5.0s to 6.75s TWT
- Covers an area between 200km^2 and 3000km^2



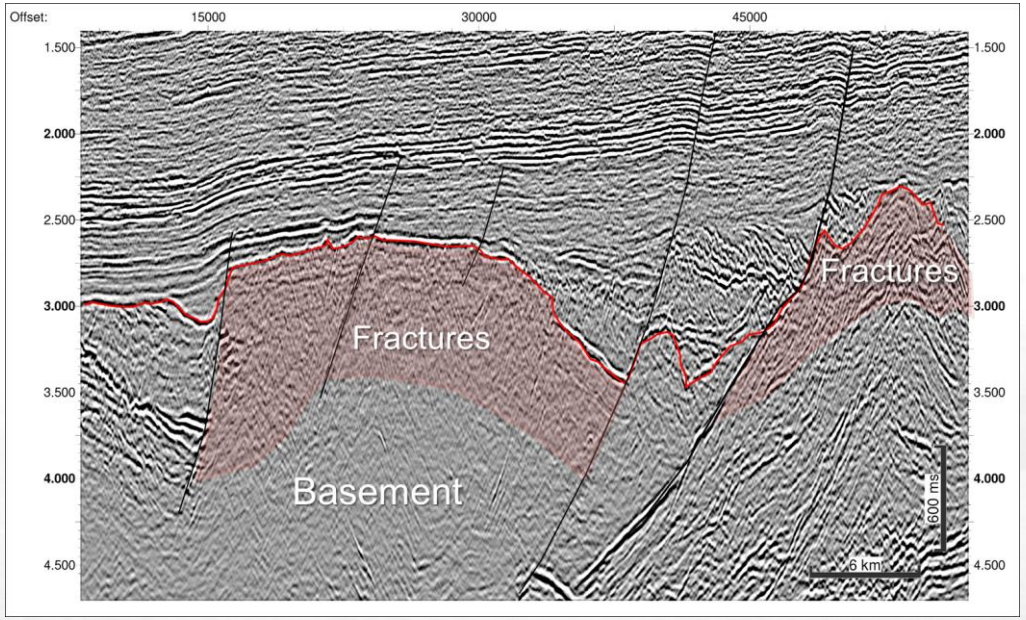


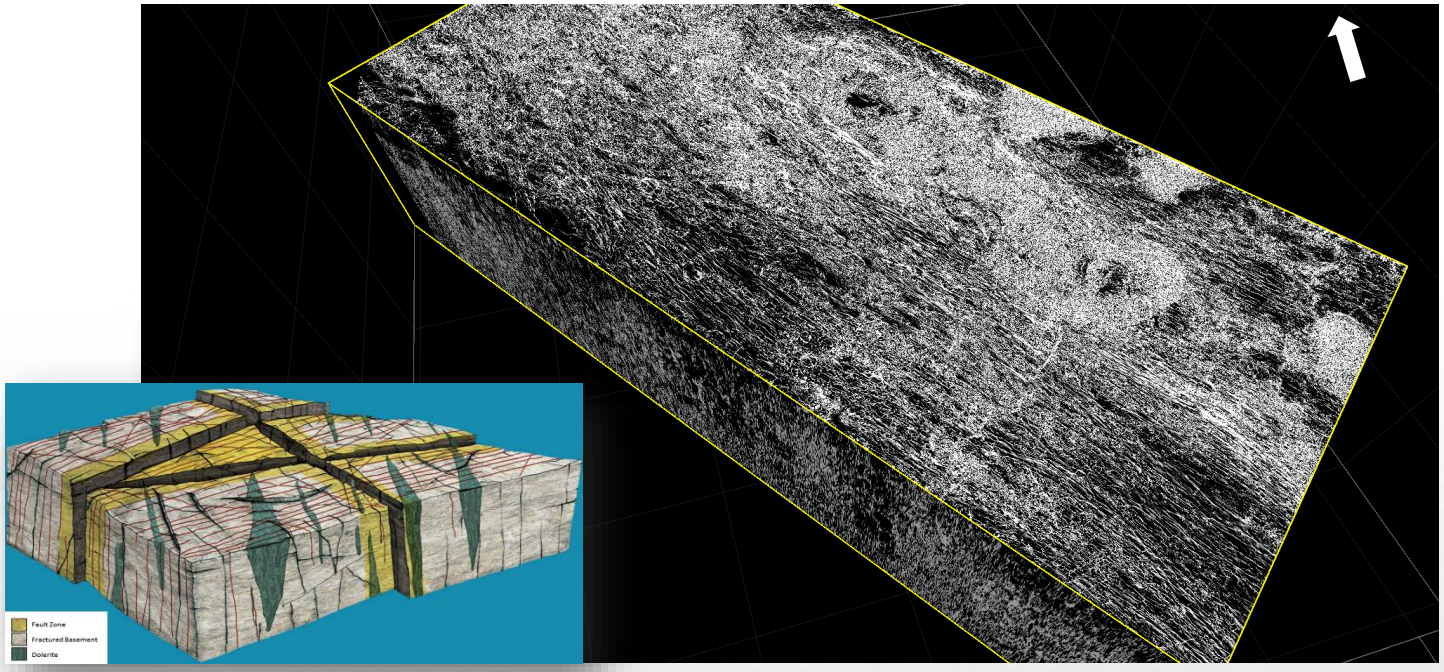
Potential Plays: Fractured Basement

- Often overlooked as a play.
- Considered predominantly as igneous (crystalline) and metamorphic rocks, subjected to faulting resulting in a natural fracture network.
- Secondary porosity via a network of fractures at various scales makes it a viable reservoir target.
- Accumulation, distribution, and flow of hydrocarbons are controlled by fracture systems.
- Identified in both Orange and Cape Basins.



Van Bloemenstein & Fielies, 2022





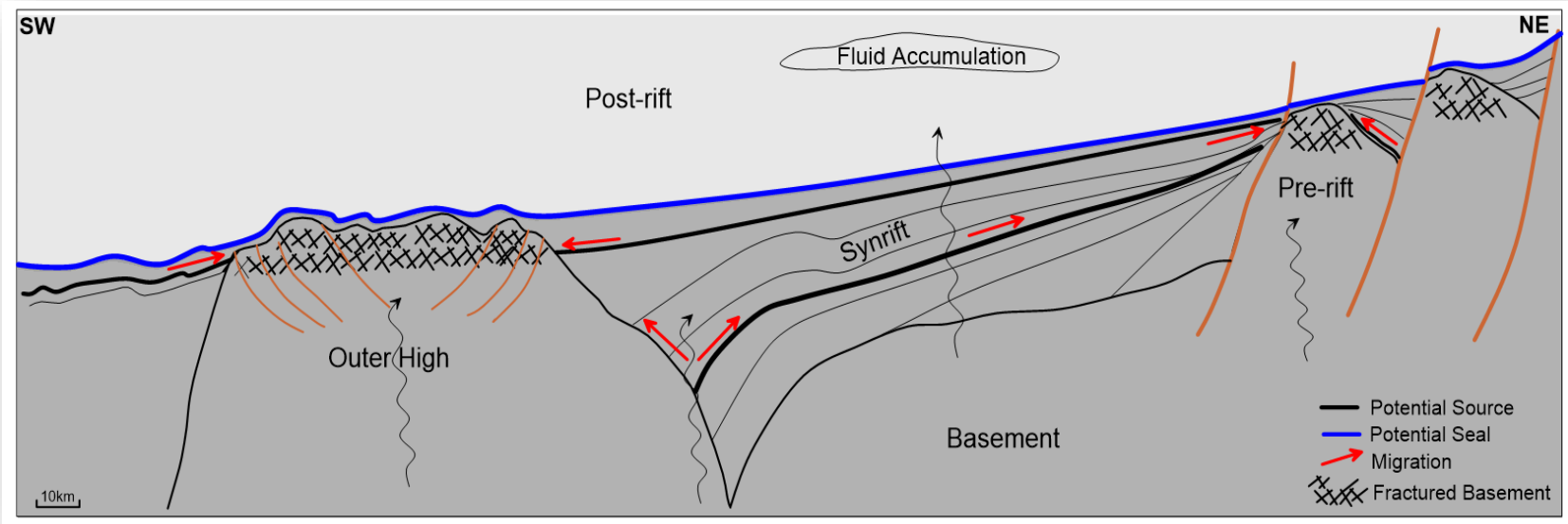
Bonter, D. and Carvajal, R., 2018

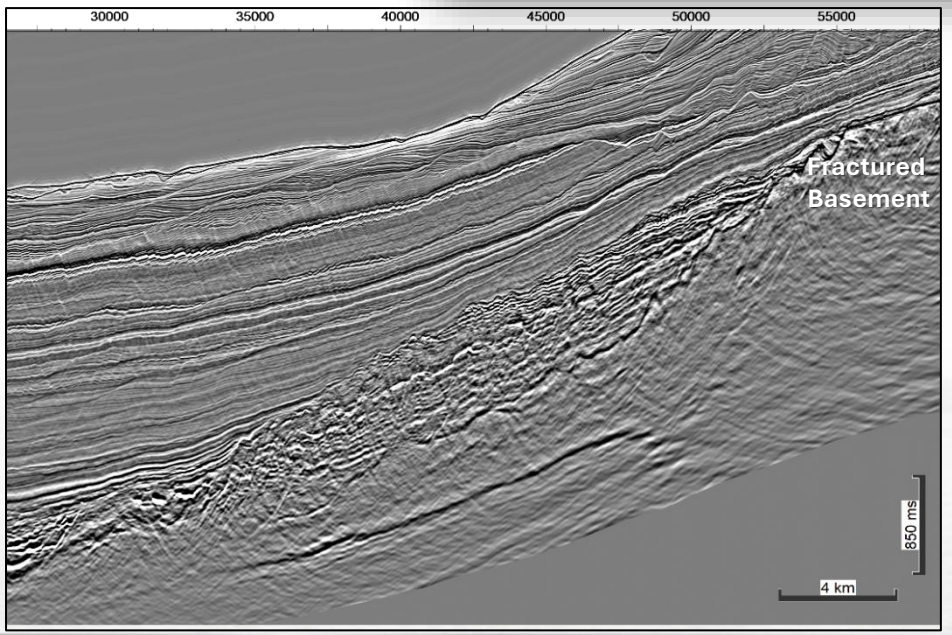
Potential Plays: Fractured Basement

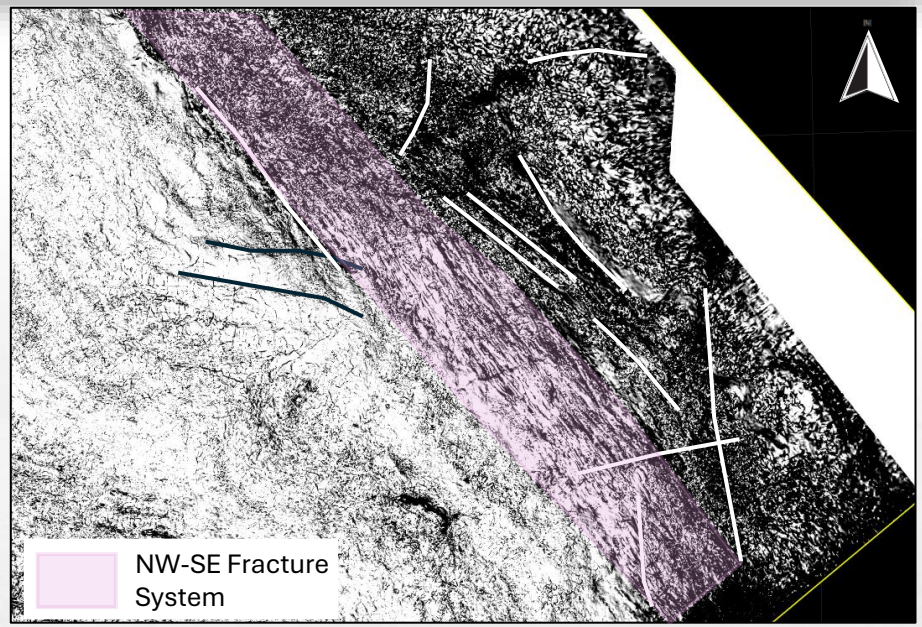
Play concept:

- ✓ Source Rock
- ✓ Basement highs (Trapping)
- ✓ Faults (migration paths)
- ✓ Fractured Basement reservoir
- ✓ Seal (regional shales)

Van Bloemenstein & Fielies, 2022







Key take-aways and next steps

A shared opportunity - The Orange Basin holds significant exploration potential for both South Africa and Namibia.

Seismic data confirms promising geological trends, but further analysis is needed to de-risk prospects.

Collaboration between governments, industry, and investors will be key to unlocking this frontier.

Why does this matter?
A discovery in South Africa could open a new deepwater frontier, attracting investment and advancing regional energy security.

Looking Forward:
Continue refining our geological understanding through seismic and geophysical studies.
De-risking key uncertainties such as the regional source rock, reservoir distribution and quality, and nature of the hydrocarbons (oil, gas or a mix).

The Orange and Cape Basins represent a unique opportunity for growth and energy security in Southern Africa. With the right partnerships and strategic decisions, we can unlock its full potential.

Thank You

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