

1. Hauterivian Inner Synrift Graben Play (Proven)

Overview:

The Hauterivian synrift graben stratigraphic play is located within the eastern marginal graben province, beneath the Orange Basin Aptian transgression. Trapping results from the pinching out of the syn-rift reservoir in a half-graben structure. The reservoir comprises lacustrine, fluvial and deltaic sandstones.

The play is substantiated by a solitary small oil accumulation. The primary source rocks for oil and gas in this region are the Hauterivian lacustrine synrift shales. These shales currently fall within the oil window, and likely achieved maturity in the Late Cretaceous. The inner graben area where borehole A-J1 is situated has minimal Tertiary overburden. Oil migrated relatively short distances laterally to synrift lacustrine sandstone reservoirs located in structural-stratigraphic traps, with sealing occurring shortly after the deposition of the reservoir. To date, the petroleum system's significance is evidenced by a small sub-commercial oil discovery within the synrift.

In 2022, the Gazania-1 exploration well was drilled to a subsea depth of approximately 2,330 meters. During drilling the well, gases commonly linked to light oil were encountered, affirming that the active hydrocarbon system established by the A-J1 discovery extends up-dip to the Gazania-1 well site. The current operators of the AJ graben area are assessing and integrating the well data further to make informed decisions regarding the next steps for the block.

Petroleum System Detail (Proven)

Source Rock:

In the Upper Hauterivian, the A-J half-graben contains significant lacustrine sapropelic black shales serving as source rocks. The A-J 1 wildcat exploration revealed 60-meter-thick shales with Total Organic Carbon (TOC) up to 10%, Hydrogen Index of 600 mg HC/gTOC, and a maximum source potential of 43.0 kg HC/t (averaging 9-11 kg HC/t). The kerogen identified is oil-prone Type II, with Vitrinite Reflectance of 07-08%. While A-J1 is the only synrift oil discovery in the basin to date, it is not commercially viable. Nonetheless, the finding confirms the presence of abundant oil-prone lacustrine source rocks in the specified area of interest.

Reservoir:

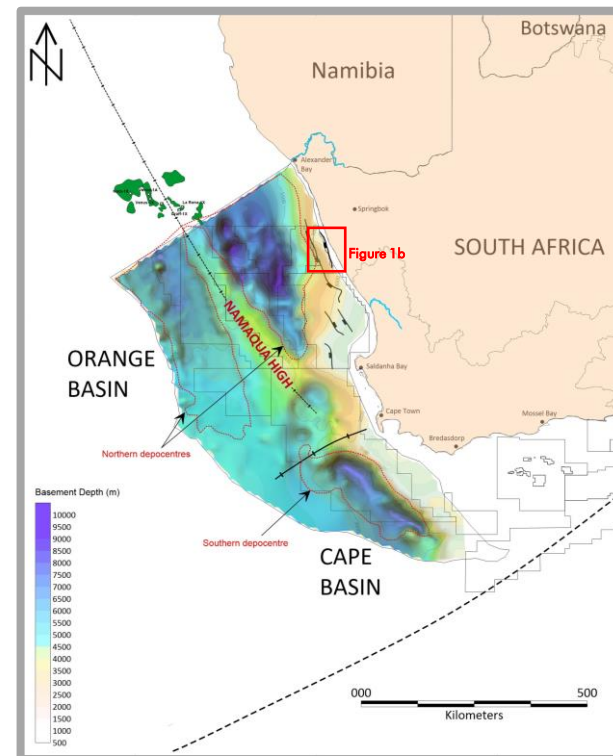
Sands are prevalent in the fluvio-deltaic and lacustrine settings during the early syn-rift phase of basin development. The reservoir containing hydrocarbons (specifically oil in this instance) within the initial syn-rift phase is the Upper Hauterivian sandstone at the A-J 1 discovery. The porosity of this sandstone reservoir falls within the range of 10% to 15%, accompanied by permeability values spanning from 0.1 mD to 438 mD.

Seal:

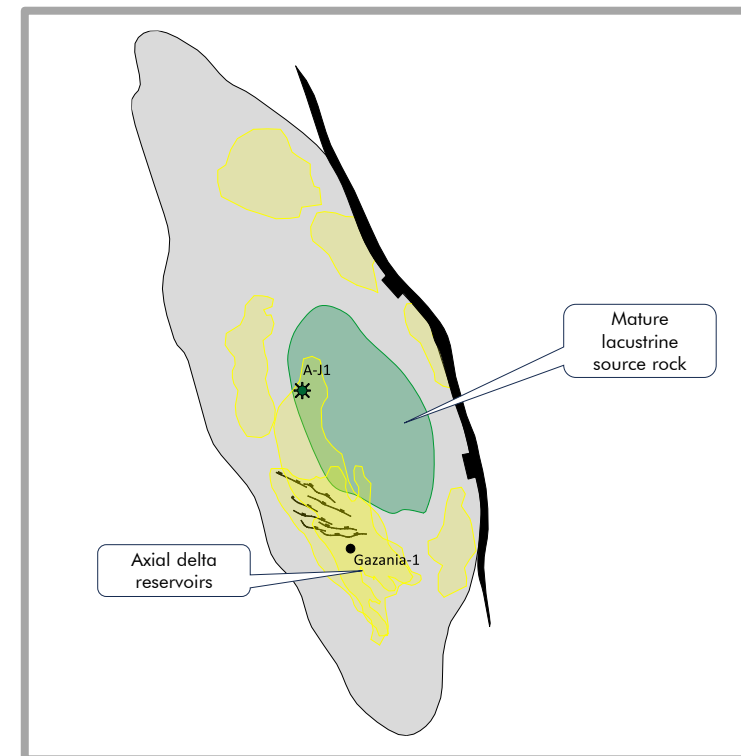
Reservoirs during the syn-rift and initial drift phases are effectively sealed by extensive shale sequences above and intraformational tight zones. The sealing process occurred early on, coinciding with the burial of the sand wedge, preceding any erosion or transgression within the drift sequence.

Generation and Migration:

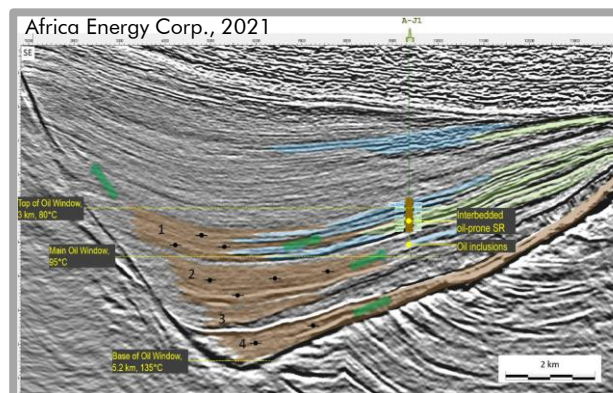
Migration over short distances is evident within the A-J Graben, where the Hauterivian source and reservoirs exist in close proximity. The source rocks likely initiated oil generation in the Late Cretaceous, and they presently remain within the oil window. A temporary halt in generation during early Tertiary uplift might have occurred, with a potential resumption of generation in the Late Tertiary period.



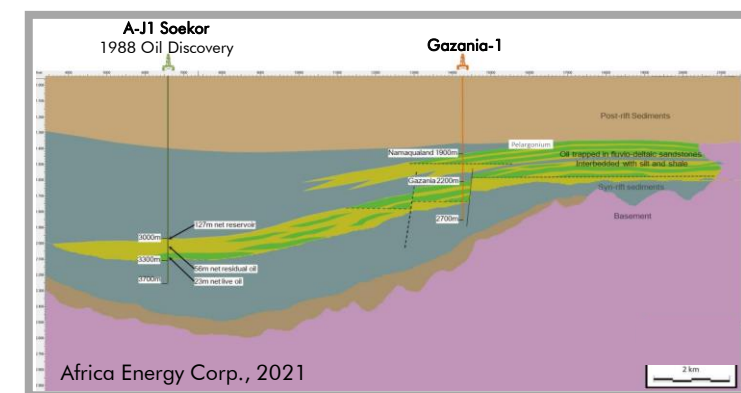
Orange Basin depth map, showing the location of the inner synrift grabens



Schematic of the A-J graben with the well A-J1 and the axial delta play targeted by the Gazania-1 well



Seismic dip section across the A-J Graben showing detail about source rock and migration



Schematic dip section through the A-J Graben showing the A-J1 and Gazania-1 wells

Exploration Opportunities

The Syn-rift play, resembling the A-J1 oil discovery, holds appeal due to its higher likelihood of containing oil rather than gas. Additionally, the proximity of syn-rift half-grabens to the coast and their location in shallow waters enhances their attractiveness. The primary challenges lie in predicting reservoir quality within the highly variable facies. Although lacustrine source rocks, currently mature for oil, pose a lower risk, reservoir-related uncertainties persist. A secondary but enticing target involves syn-rift sourced accumulations within the overlying thermal sag wedge, provided traps can be clearly defined. This dual focus on the primary Syn-rift play and the secondary target in the thermal sag wedge present a comprehensive exploration strategy.