Structural Development and Depositional History of the Lower Congo and Kwanza Basins, Salt Tectonic Province, Angola*

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Abstract

The Angolan margin is a classic example of salt tectonics influencing subsequent sedimentation and reservoir architecture. The margin is dominated by post-Aptian salt movement brought about by the separation of Africa from South America in the Early Cretaceous and by Cenozoic sedimentation. Interpretation of 8 regional horizons over 24,000 km² of merged 3D seismic data located in blocks 15-19 and 34 in the deepwater Lower Congo and Kwanza basins, offshore Angola, has helped us understand how these processes have varied through time, with fluctuations of sediment input from the Congo Drainage Basin.

Northeast-southwest profiles across the area show that there is a series of northwest-southeast-trending structural zones characterised by variations in salt geometry. Grabens in the east formed by listric faults detaching in the salt layer are filled by Miocene sediments. The salt itself has largely been expelled from this zone. Towards the centre, salt pods begin to appear at high levels on the listric faults and may be disconnected from the triangular salt pedestals below them. Finally, in the southwest, salt domes extend continuously from the original salt layer upwards to shallow levels but their locations are still controlled by extensive listric faulting.

Mapping the interpreted horizons has given us an insight into the regional structural trends, tectonic evolution and the changing patterns of sand deposition, which give rise to numerous large oil and gas fields and discoveries in blocks 15 - 18. The Tertiary
turbidite channels affected by these structures are well imaged on RMS amplitude maps on which their variable relationships with the structures can be deciphered. Isochrons through each interval indicate the change through time of depocentres and sediment sources.

References


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Presented by: William Jones
Merged 3D survey: structural setting

The 23 000 km² merged 3D survey lies on stretched continental crust between the Atlantic Hinge Zone basement high and the ocean/continent boundary.

Bouguer gravity map (Karner 2003), showing the ocean/continent boundary and the Atlantic Hinge Zone

- Edge of basement outcrop (red)
- Atlantic Hinge zone (red)
- Merged 3D survey (purple)
- Ocean/continent boundary (Blue)
Congo Basin Stratigraphy

(USGS 2006)
Merged 3D survey: bathymetry

3D seabed interpretation superimposed on seabed contours (GEBCO)

- Graben faults
- Angola Escarpment
- Ocean/continent boundary (Karner 2003)
- Regional seismic profile (Marton et al. 2000)
- Salt walls

Congo Canyon

Atlantic hinge zone (Karner 2003)

50 km
Merged 3D survey compared with licence blocks

- ENI
- BP
- AP Moller
- Total
- Sonangol
- Petrobras
- Vaalco
Regional 2d Seismic Profile

Marton et al. (2000)

Sag phase Aptian salt Syn-rift Post salt

Width of 3D survey

(Marton et al., 2000)
Top salt seen from the south of BI 34
Upper Cretaceous listric faulting

Aptian salt rollers
Allochthonous salt

Salt layer

Cretaceous listric faults

Miocene listric fault

5 km
Top salt in Bl 18 & 5
Upper Cretaceous and Oligocene isochrons

- Green = thick
- Red = thin
Turtle structures in BI 17

- Oligocene sands
- Miocene sands
- T U Mio
- T M Mio
- T L Mio
- T Olig
- T Cret

10 km
BI 17: Top Oligocene with salt and fields
Top Middle Miocene TWT

- Salt domes
- Rafts
- Salt walls
- Trough formed by NW-SE separation of rafts
Fault terraces

troughs

rafts
Trough and rafts

Terrace faulting

Upper Cretaceous and Oligocene missing in trough

Rafts

Trough

10 km
RMS amplitude 200ms interval below top Miocene
Top Miocene sand channels, BI 17
Thank you for listening

Please refer to related abstract:
[The Subsalt Play in the Lower Congo and Kwanza Basins, Angola: A Seismic Study](#)