



# Republic of Sierra Leone

Sierra Leone 4<sup>th</sup> Licensing Round:  
Undeveloped Discoveries and the Next  
Phase of the Deepwater Renaissance

APPEX 2018

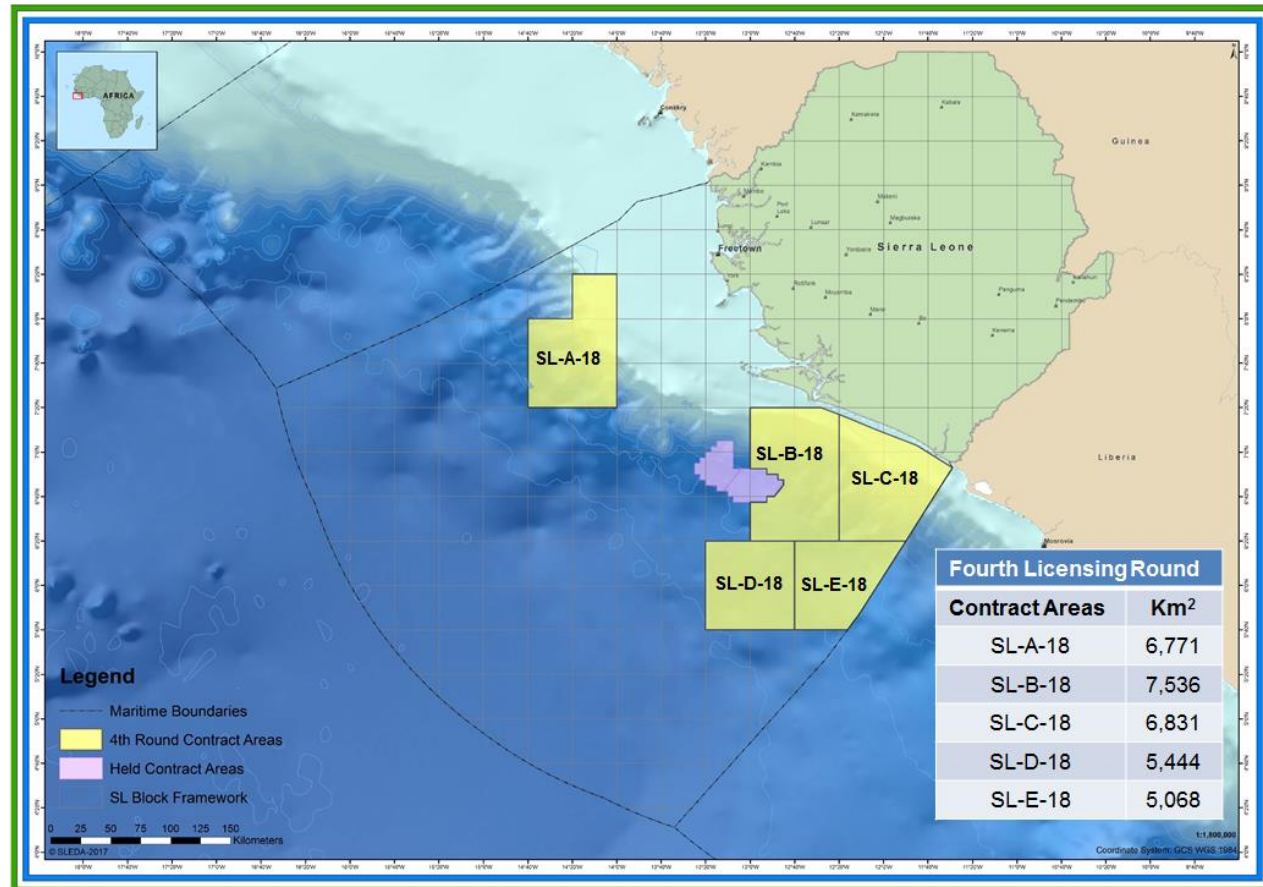
*Petroleum Directorate Sierra Leone (PDSL)*

# Sierra Leone Fourth Licensing Round



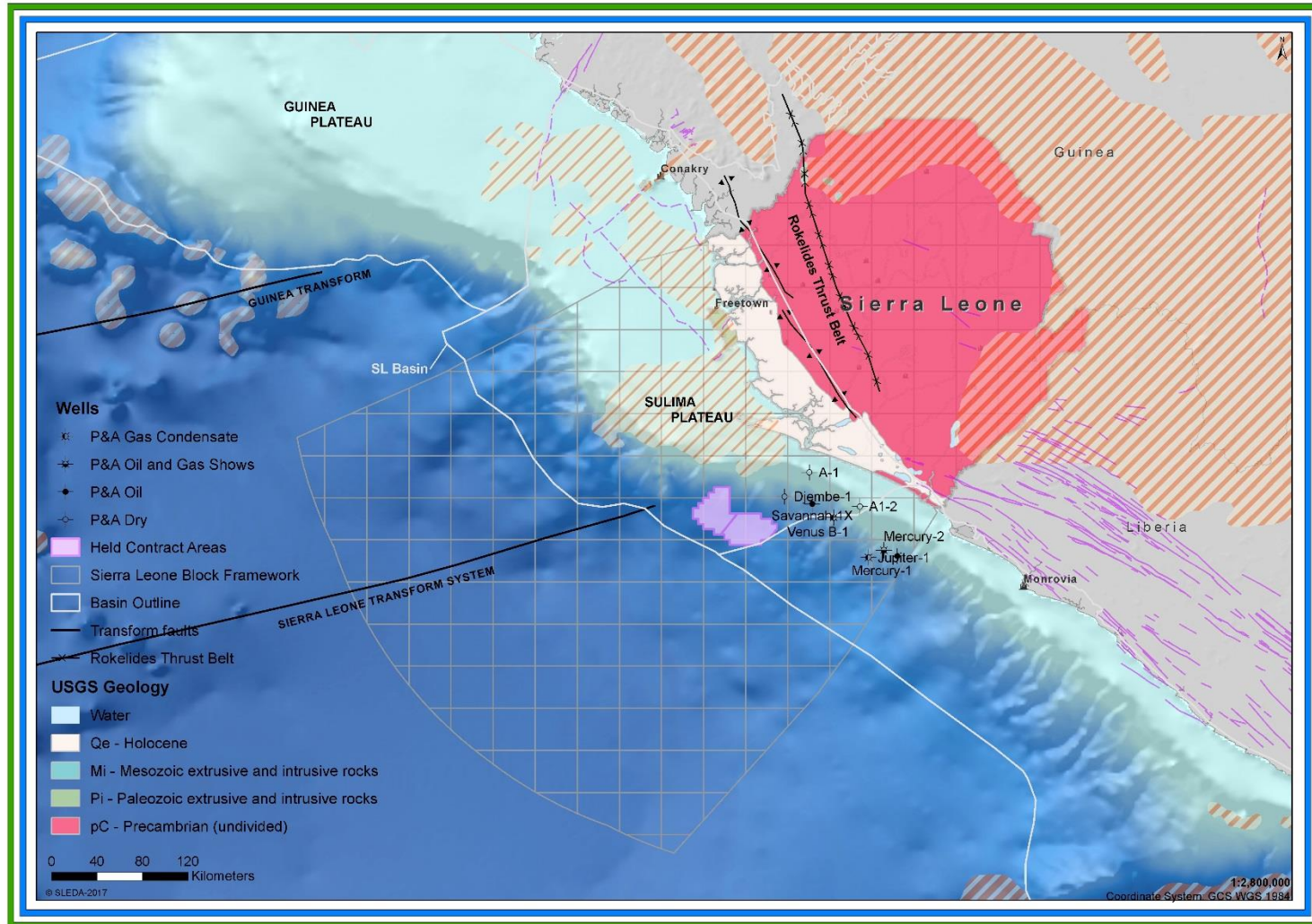
The Fourth Licensing Round is now open and will close:  
12 noon on Thursday June 28th 2018

- 5 Contract Areas on offer
- Approx. 32,000 km<sup>2</sup>
- Contract Areas cover existing hydrocarbon discoveries and prospective underexplored areas
- We invite companies to pre-qualify. All documentation can be found on the website [www.pd-sl.com](http://www.pd-sl.com)





# Sierra Leone- Structural Elements

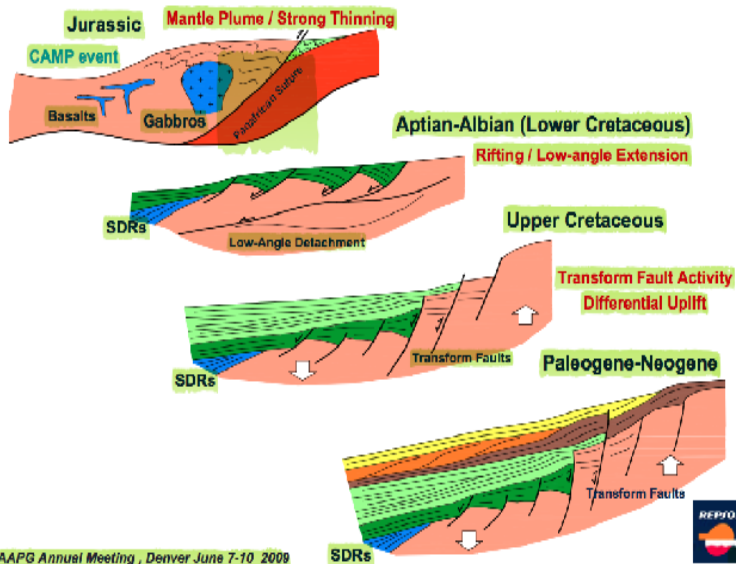


# Regional Geology



## STRUCTURAL EVOLUTION

### Structural Evolution of the Sierra Leone – Liberia Margin



- The geology of the basin is related to the opening of the Atlantic
- Forms part of the West African Equatorial Margin
- The basin is bounded by the Guinea Transform System to the north and the Monrovia Transform System to the south
- The Sierra Leone Transform Fault runs in the middle of the basin, thus giving the basin two distinct physiographic patterns in the north and south

The evolution of the basin is divided into three phases:

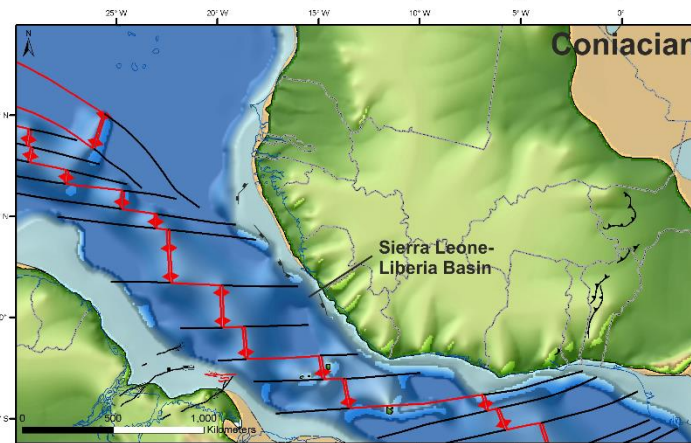
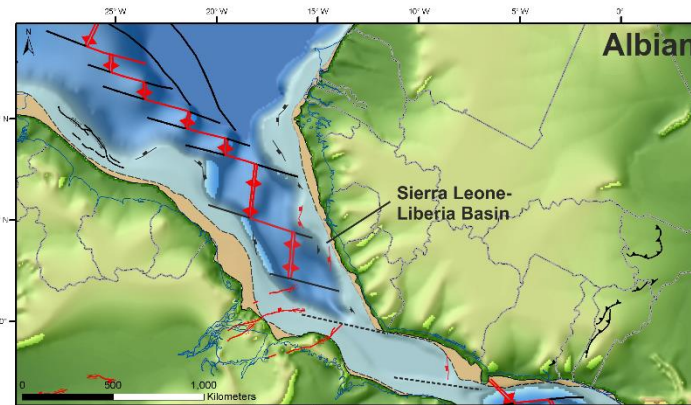
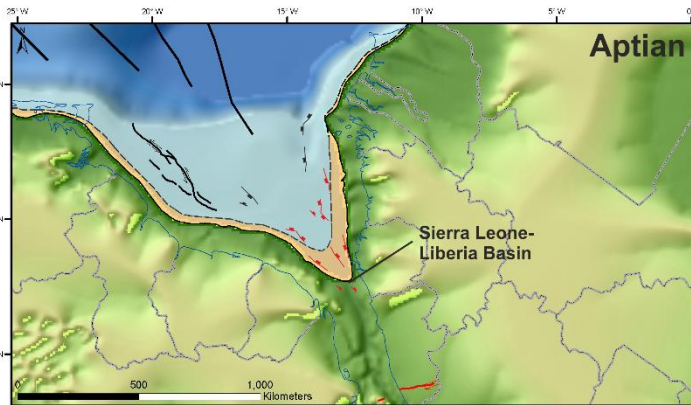
- **1. Pre-rift/Pre-transform phase:** dominated by block faulting throughout the Jurassic with associated volcanics
- **11. Syn-rift/Syn-transform phase:** characterized by NNW-SSE oriented extensional faulting, sediments of early Cretaceous age.
- **111. Post-rift/Post-transform:** represented by the passive margin.



# Sierra Leone Margin Development



## Equatorial Atlantic Opening



### Legend

#### Structural & Tectonic Elements (10M)

- (A) Active Right-Lateral Strike-Slip Fault, Certain
- (A) Active Spreading Ridge, Certain
- (A) Active Transform Fault, Certain
- (A) Inactive Thrust Fault, Certain
- (A) Inactive Right-Lateral Transtensional Fault, Certain
- (A) Inactive Right-Lateral Strike-Slip Fault, Certain
- (A) Primary Fracture Zone (Inactive Transform Fault) Certain

#### Country Boundaries

- Coastline
- Intl bnd

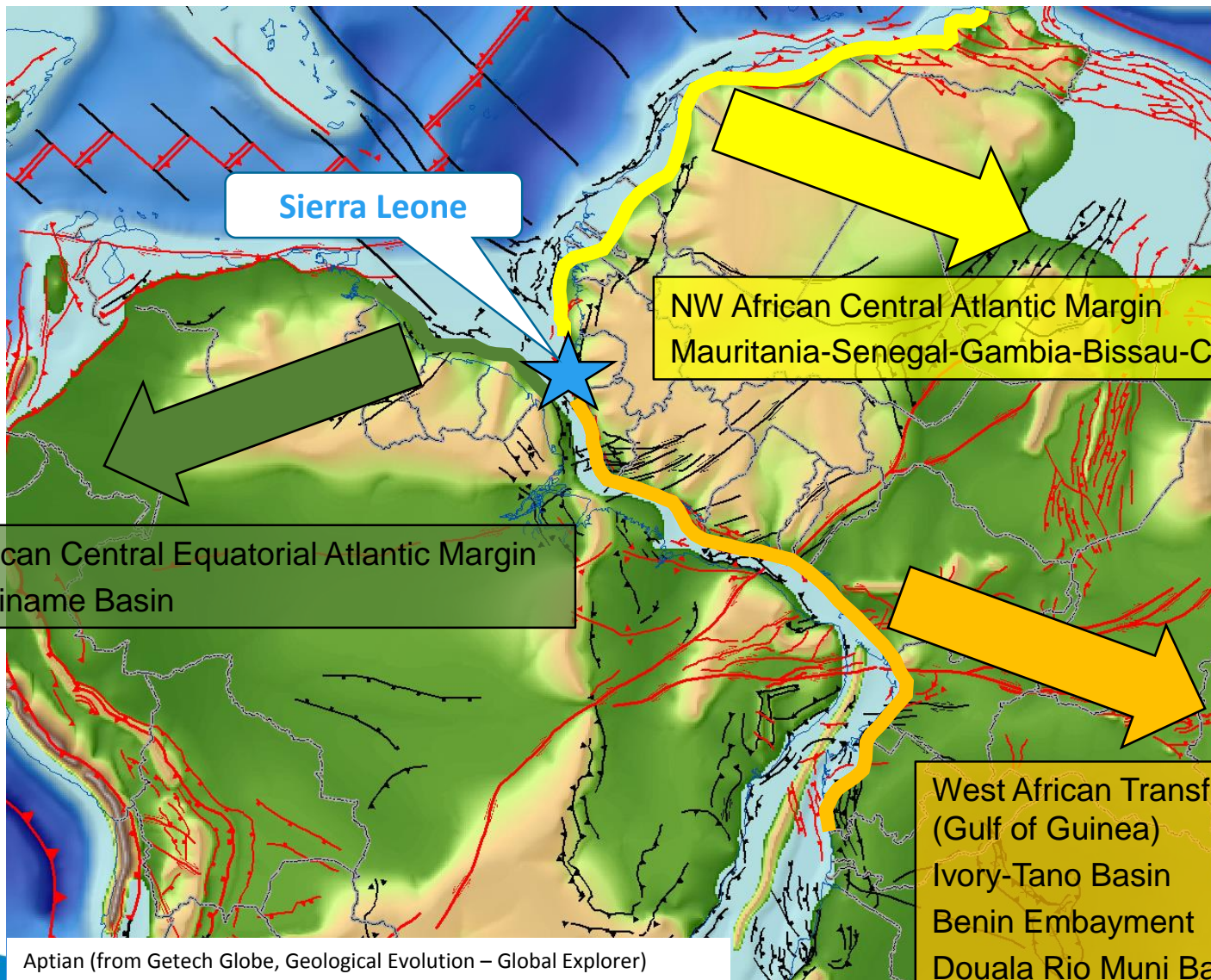
#### Sea-Level

- Highstand/Lowstand Range



# Sierra Leone- Conjugate Analogues

## Aptian Reconstruction from Globe, Getech Group 2017



Sierra Leone

NW African Central Atlantic Margin  
Mauritania-Senegal-Gambia-Bissau-Conakry Basin

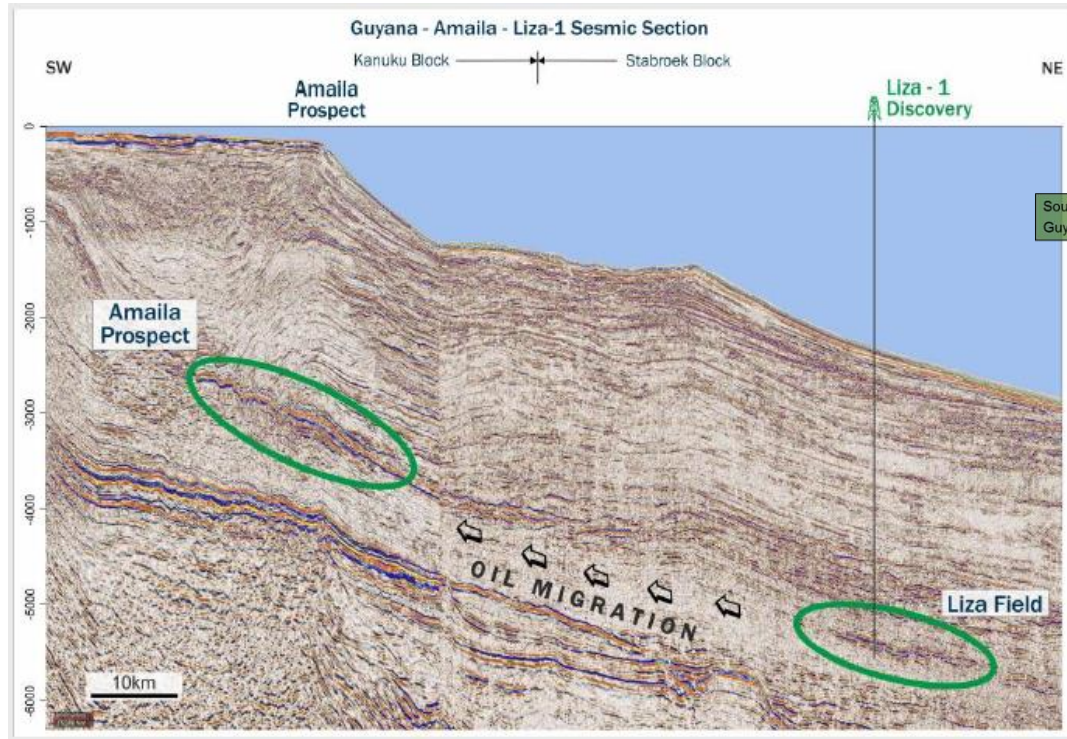
South American Central Equatorial Atlantic Margin  
Guyana-Suriname Basin

West African Transform Margin  
(Gulf of Guinea)  
Ivory-Tano Basin  
Benin Embayment  
Douala Rio Muni Basin

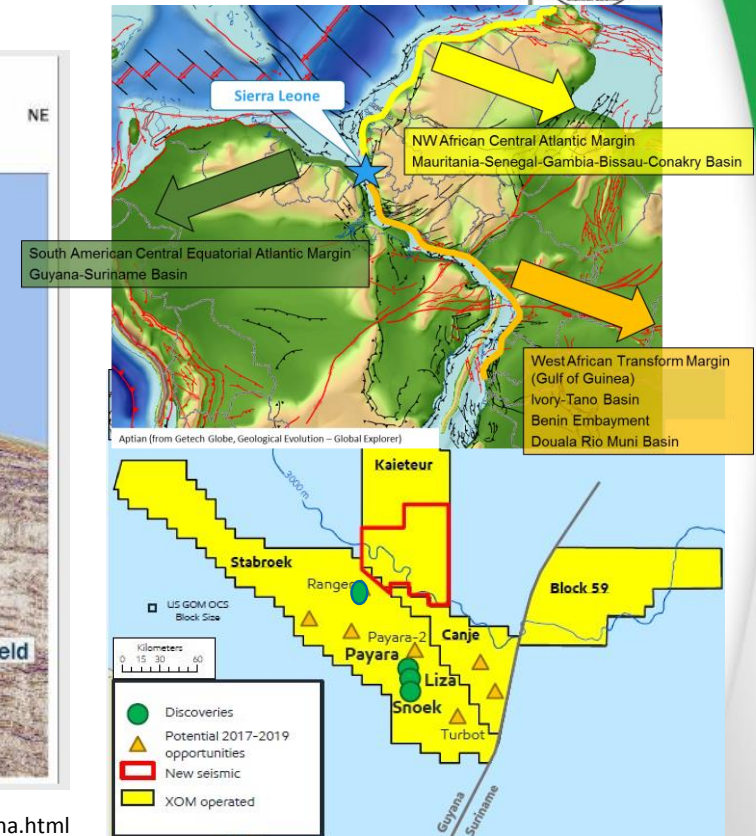
Aptian (from Getech Globe, Geological Evolution – Global Explorer)



# Recent Successes in Deepwater South America

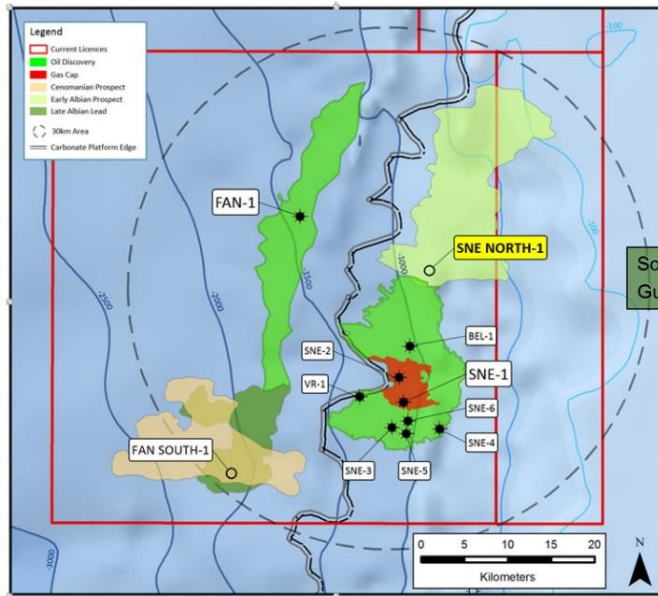


[www.offshore-mag.com/articles/2017/10/exxonmobil-makes-fifth-deepwater-oil-discovery-off-guyana.html](http://www.offshore-mag.com/articles/2017/10/exxonmobil-makes-fifth-deepwater-oil-discovery-off-guyana.html)

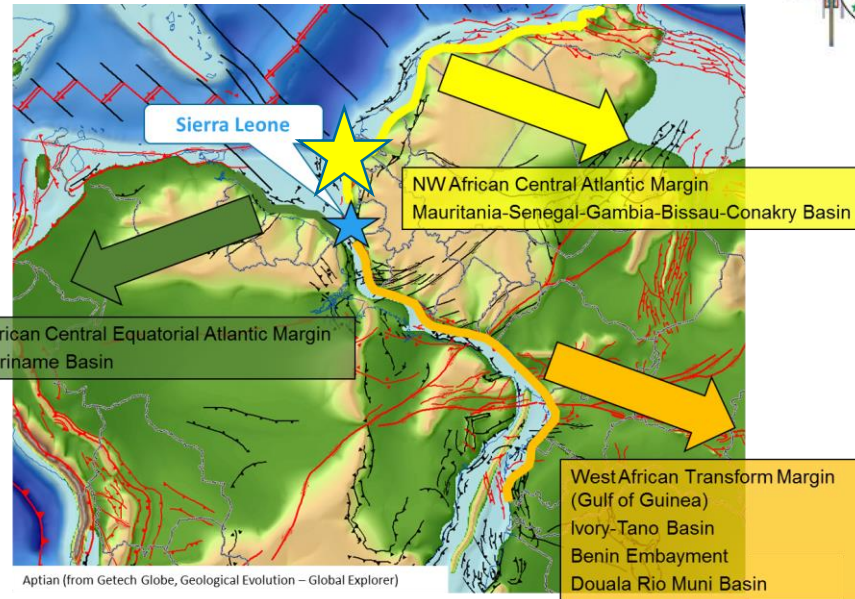
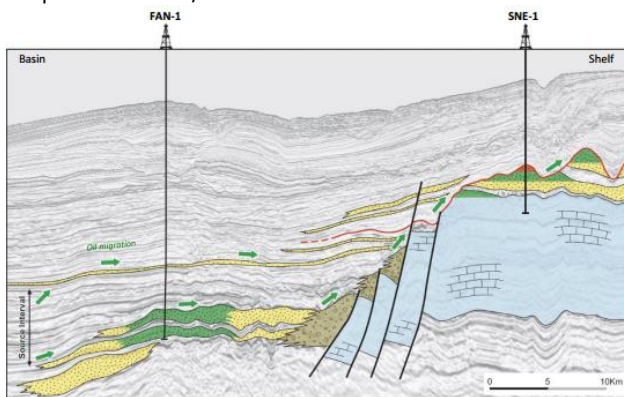


Country	Field/Discovery	Type	Age	Reservoir
Guyana	Liza (2015)	oil	Upper Cretaceous	sandstone
Guyana	Payara (2016)	oil	Upper Cretaceous?	sandstone
Guyana	Snoek (2017)	oil	Upper Cretaceous?	sandstone?

# Recent Successes in Deepwater NW Africa



<http://www.offshore-technology.com/projects/sne-deepwater-oil-field/>



Aptian (from Getech Globe, Geological Evolution – Global Explorer)

- Tortue- 2015-2016- Albian/ Cenomanian slope channel
- Marsouin- 2015- Upper/ Lower Cretaceous slope channel
- Teranga- 2016- Cenomanian slope channel
- Yakaar- 2017- Cenomanian basin floor fan
- Fan-1- 2014- Cretaceous slope/basin floor fan
- Fan South- 2017
- SNE- 2014- Albian sandstone
- Sinapa West- 2015 Guinea Bissau- Aptian sandstones

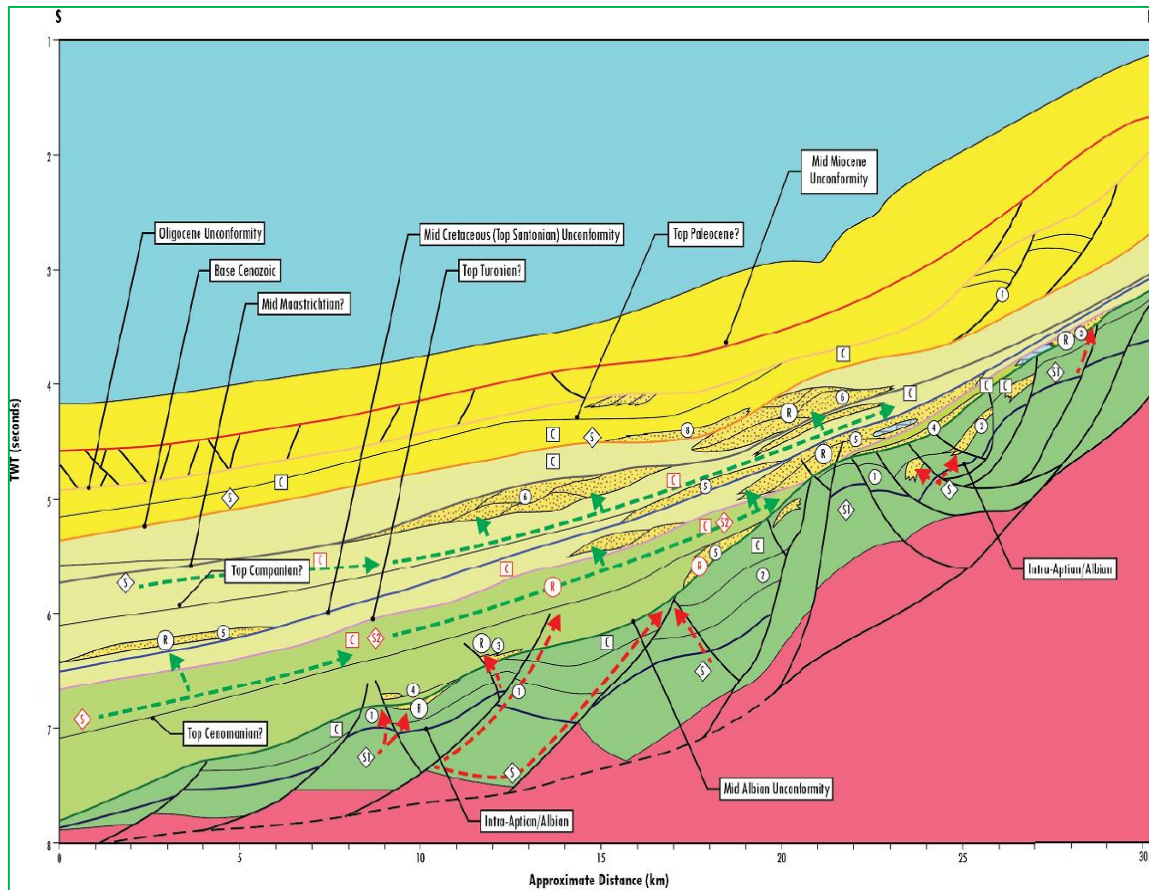


# Petroleum Systems of Sierra Leone



- SOURCE ROCK
  - Aptian to early Cenomanian lacustrine shales (HI795-482 & TOC up to 11%). Geochemical analysis has confirmed the good quality and high potential of this source zone.
  - Late Cretaceous, Cenomanian-Turonian shales (HI approx. 560 & TOC approx. 5%)
  - Aptian encountered in 2009-2013
  - Both source rocks have reached the oil/gas window (0.8 to 1.2)
- RESERVOIR
  - Potential reservoir sequences include the Aptian, Albian, Cenomanian, Maastrichtian and Paleocene to Eocene.
  - The total net sand thickness is estimated at 1,500m for all sequences. The average porosity of the sandstone series is expected to exceed 15%.

# Petroleum Systems



- TRAP
  - Stratigraphic, structural or a combination exists before the Paleocene which is ideal for generation & expulsion of HC
- SEAL
  - The seal can be lateral, transformational shales or regional pelagic/hemipelagic shales



# Undeveloped Discoveries

(Contract Areas B&C)



## Venus – B1 (2009 – Contract Area B/C)

Water Depth: 1,800m, TD: 5,636m in Albian  
Hydrocarbons: ~14m of pay in Cretaceous good reservoir quality sand (channel/fan), penetrated several source rock intervals, and several good reservoir quality intervals all way down to TD.

## Mercury – 1 (2010 - Contract Area C)

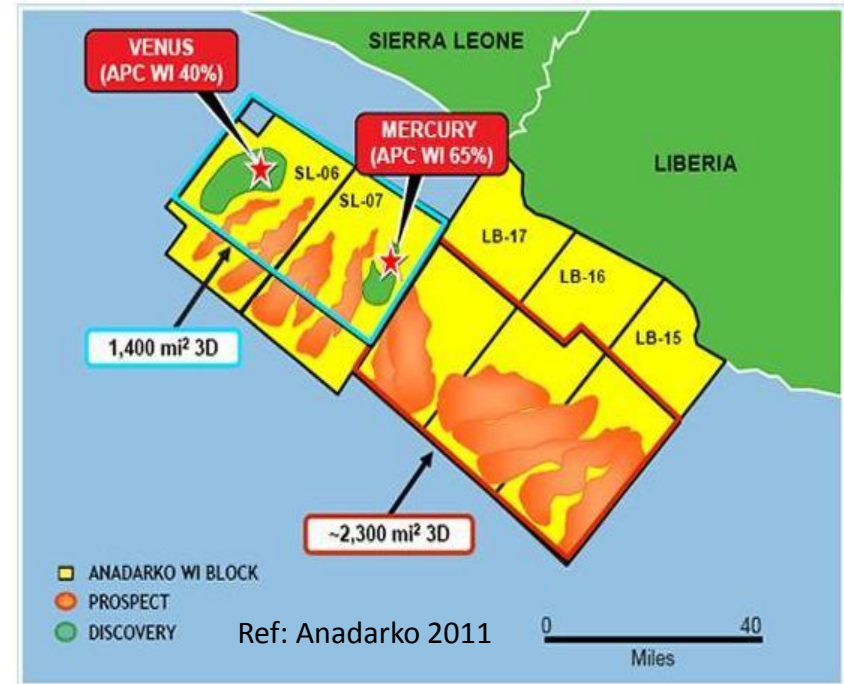
Water Depth: 1,600m, TD: 4,862m in Albian  
Oil in two Cretaceous fan systems, 34.7m of 34° – 42° API oil in the primary objective and 6.4m of 24° API oil in a shallower secondary objective.

## Jupiter-1 (2011 - Contract Area C)

Water Depth: 2,199m, TD: 6,465m  
The well intersected 30m of hydrocarbon pay in the primary Upper Cretaceous objective and did not encounter a hydrocarbon water contact.

## Savannah-1X (2013 - Contract Area B)

Water Depth: 2,153, TD 4,737m  
The well intersected ~3m oil pay in the primary objective and encountered an OWC



Data from 8 wells and interpretation reports available







# PDSL Data Portal 3D Seismic & Well Data Base



Petroleum Directorate Sierra Leone GIS WebPortal

Atlantic Ocean

BASIC WELL DATA PACKAGE																													
WELL NAME	YEAR DRILLED	LAST		DETAILS		PROFIT		DRILLING		FORM EVAL		PRESSURE		TEMP DATA		LITHOLOGY		COMPOSITE		MUD LOG		CHECK SHOT		DEVIATION		FINAL WELL REPORT		RE-ENTRY WELL REPORT	
		WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE	WIRELINE
SL	1982																												
SL-2	1982																												
SHIRAZ-1	2012																												
JUPITER-1	2011																												
MERCURY-1	2012																												
MERCURY-2	2011																												
MERCURY-3	2012																												
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PETROLEUM DIRECTORATE SIERRA LEONE

## SIERRA LEONE FOURTH LICENSING ROUND TECHNICAL DATA SUMMARY

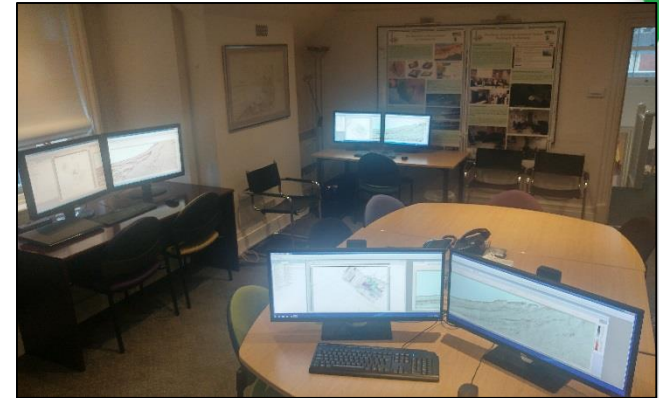
PETROLEUM DIRECTORATE OF SIERRA LEONE  
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Third Road, Off Regent Road  
Hill Station  
Freetown - Sierra Leone

[www.pd-sl.com/data-portal](http://www.pd-sl.com/data-portal)

[www.pd.gov.sl](http://www.pd.gov.sl) [www.pd-sl.com](http://www.pd-sl.com)



# UK and Freetown Data Rooms are Open



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Data room rules can be accessed at [www.pd-sl.com/documentation](http://www.pd-sl.com/documentation)

# Executive Summary



- The Sierra Leone Fourth Licensing Round was launched 15<sup>th</sup> January 2018 and runs until 28<sup>th</sup> June 2018
- 5 contract areas were made available, with ~32,000km<sup>2</sup> on offer with each Contract Area being >5000km<sup>2</sup>
- Water depth range from <100m to >4000m in the Contract Areas
- Contract areas contain multiple Cretaceous undeveloped light oil and condensate discoveries
- Basin floor fan prospects remain untested and have been identified by the Petroleum Directorates technical team in the Contract Areas on offer
- Cretaceous fault block prospects have also been identified in the Contract Areas on offer
- Aptian and Cenomanian/ Turonian source rocks identified offshore Sierra Leone
- Recent exploration success in the deep water of South America (eg Guyana) and NW Africa (eg Senegal) in analogous Upper and Lower Cretaceous plays
- These successes highlight Sierra Leone as the potential next step in the deep water renaissance





The Fourth Licensing Round is now open and will close:  
12 noon on Thursday June 28th 2018

The Petroleum Directorate  
looks forward to receiving your applications

**THANK YOU**