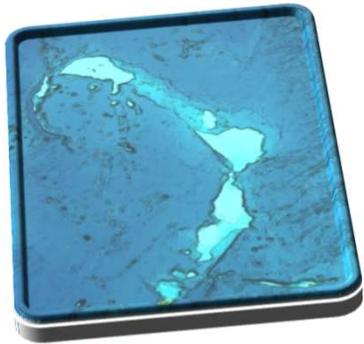




Seychelles Petroleum Potential & Exploration Opportunities



Patrick J Samson
Exploration Manager
PetroSeychelles

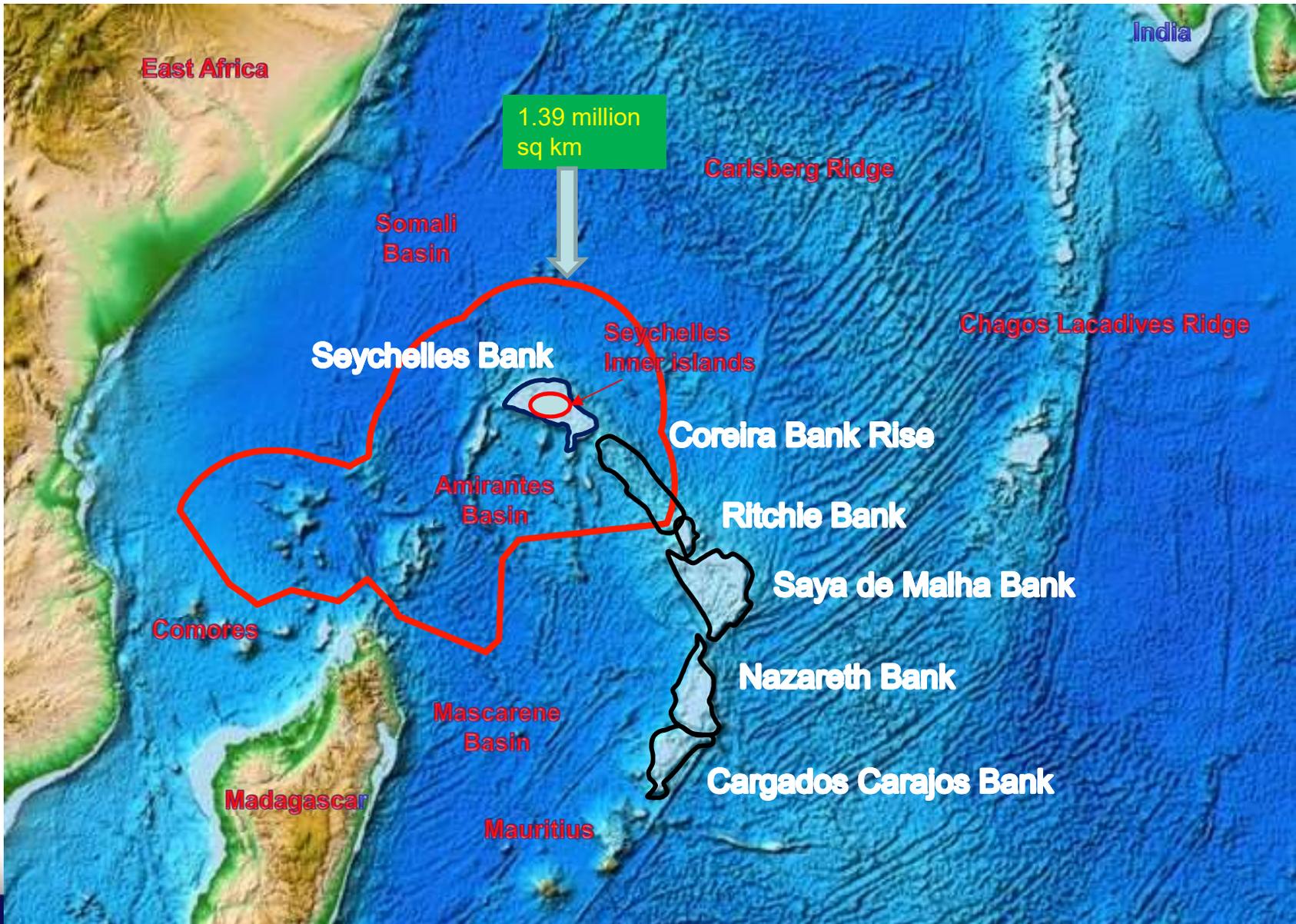
AAPG ACE 2019
19 May – 22 May 2019
SAN ANTONIO, TX
Henry B. Gonzalez Convention Centre



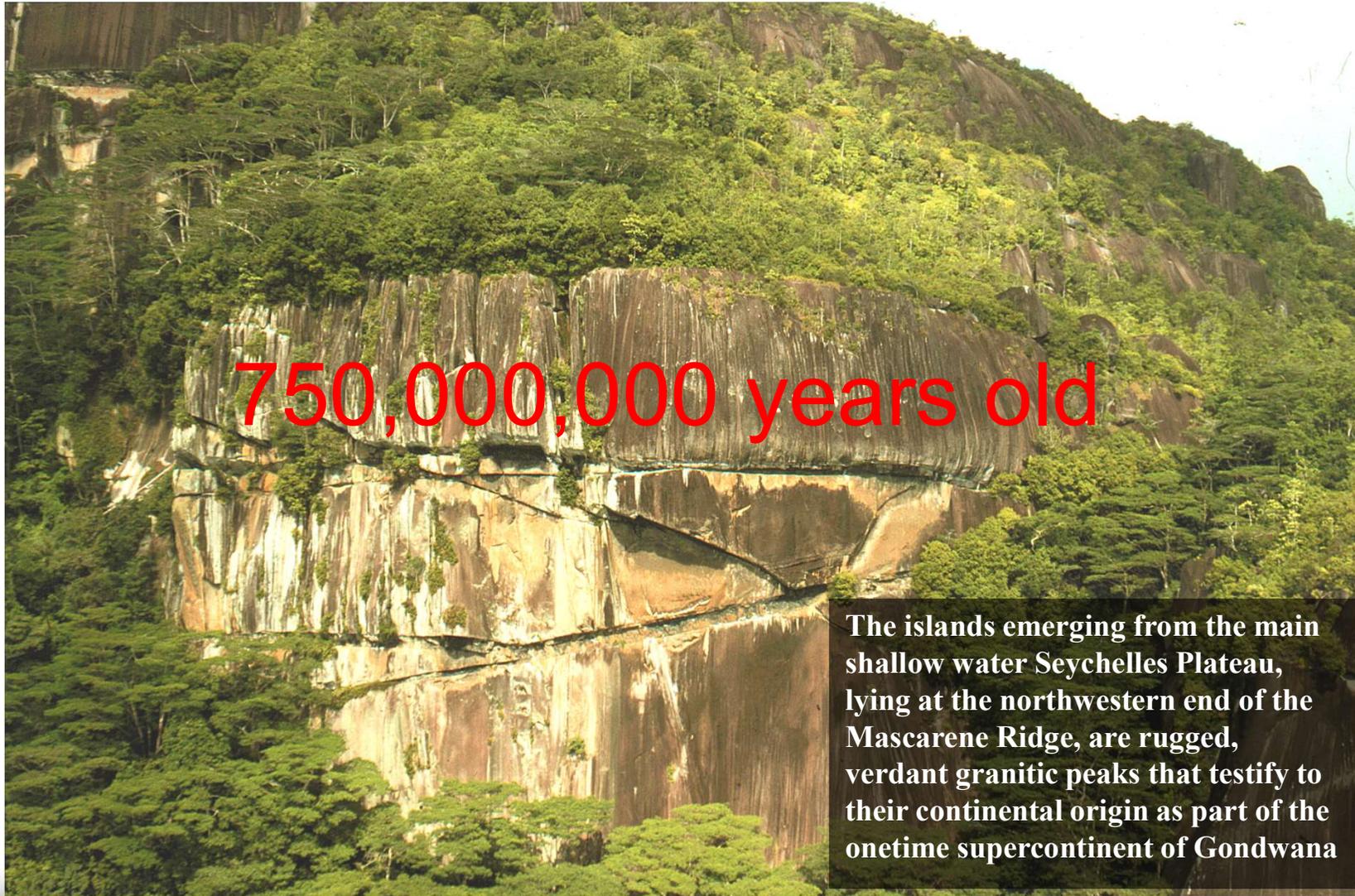
Topics

- Geographic Location and Data Availability
- Tectonic Evolution and Petroleum Potential
- Legal Framework and Fiscal Regime
- Seychelles/Mauritius Shared Extended Continental Shelf (Joint Management Area)

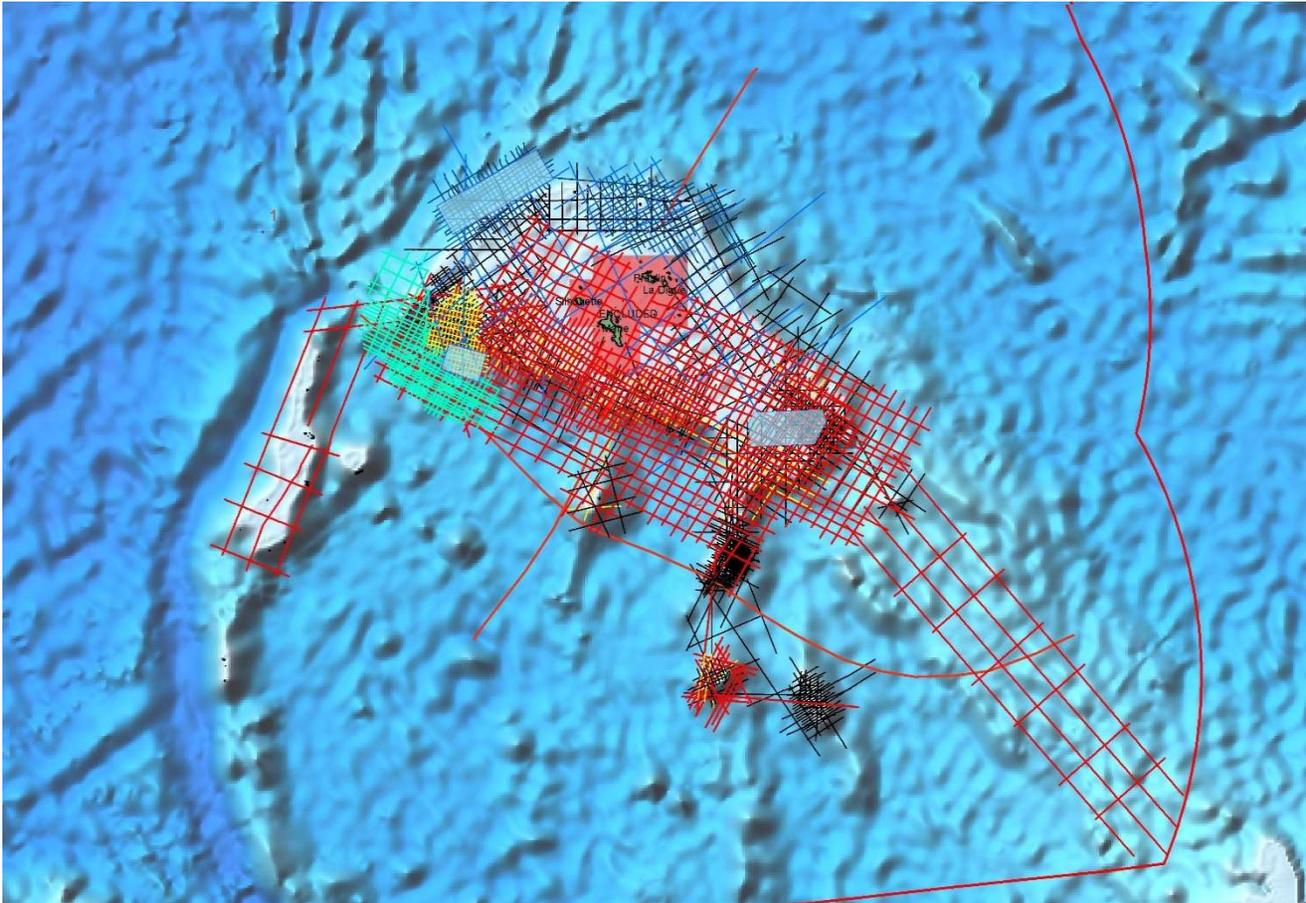
Geographical Setting of Mascarene Plateau



Outcrop Geology



Seismic Data coverage Map



Open File Data

- 23,150 line km of seismic, gravity & magnetic (available as paper copies and field data on exabyte and 3480)

Infill Data

- Several companies acquired 2D infill data in the early 2000s

Multi-client Data

- Fugro acquired 20,000 line km Of large offset high fold 2D seismic On multi-client basis in 2010

ION GXT acquired 3 regional lines SPAN project

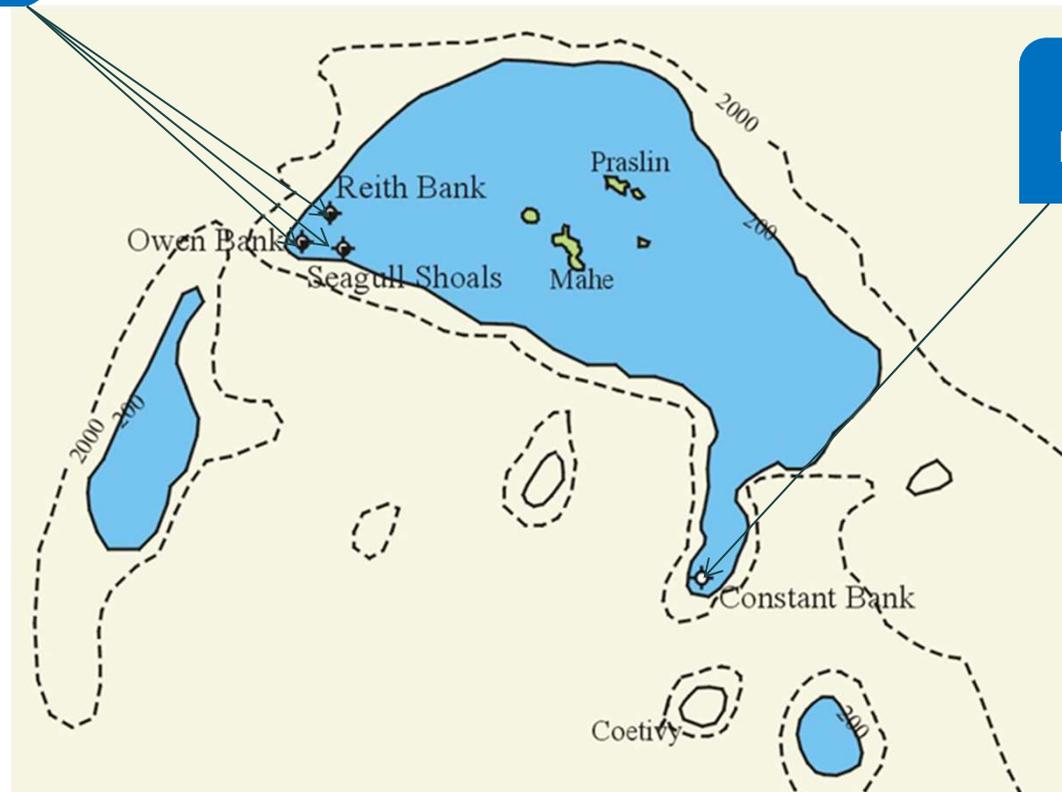
3D

Afren
Ophir

Well Control

4 Wells have been drilled so far in Seychelles

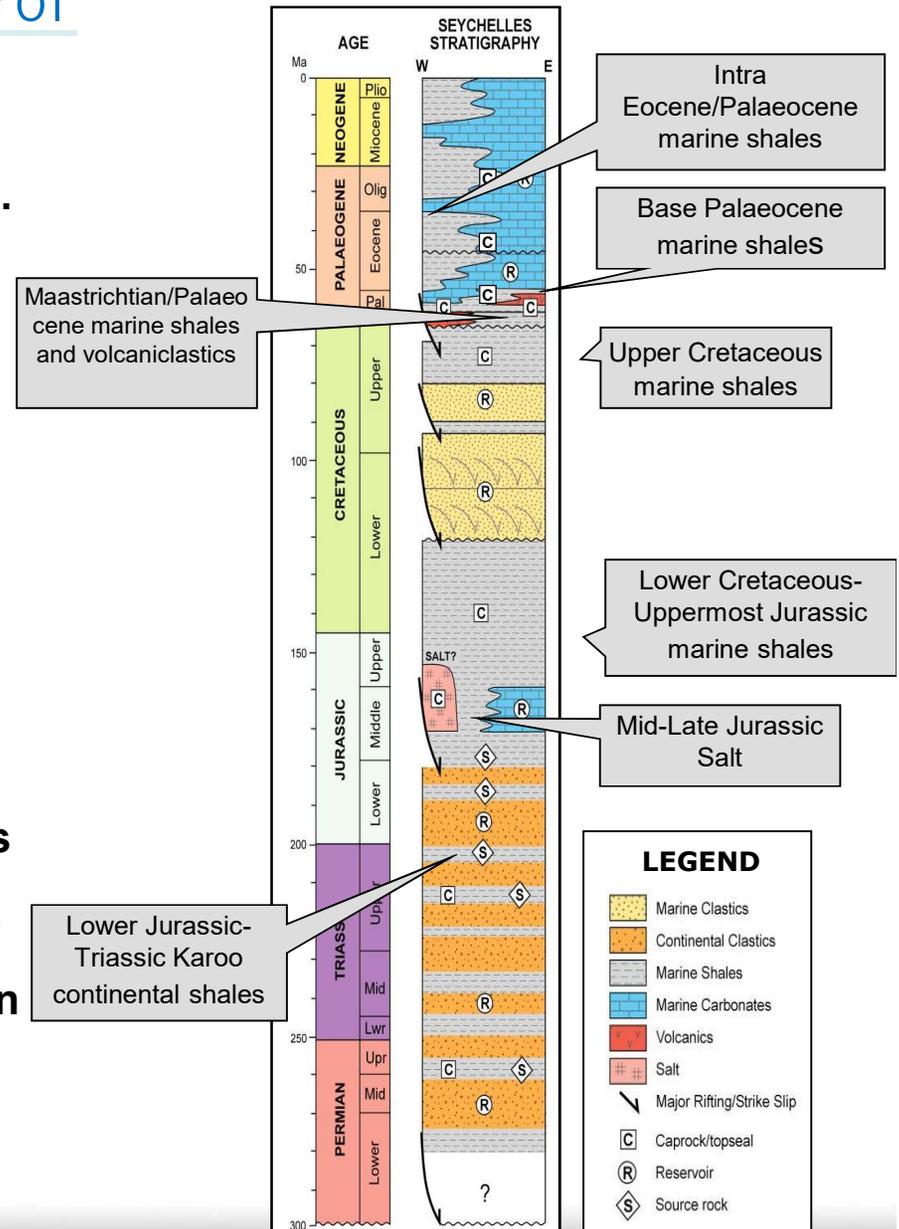
Drilled by Amoco
1980/81



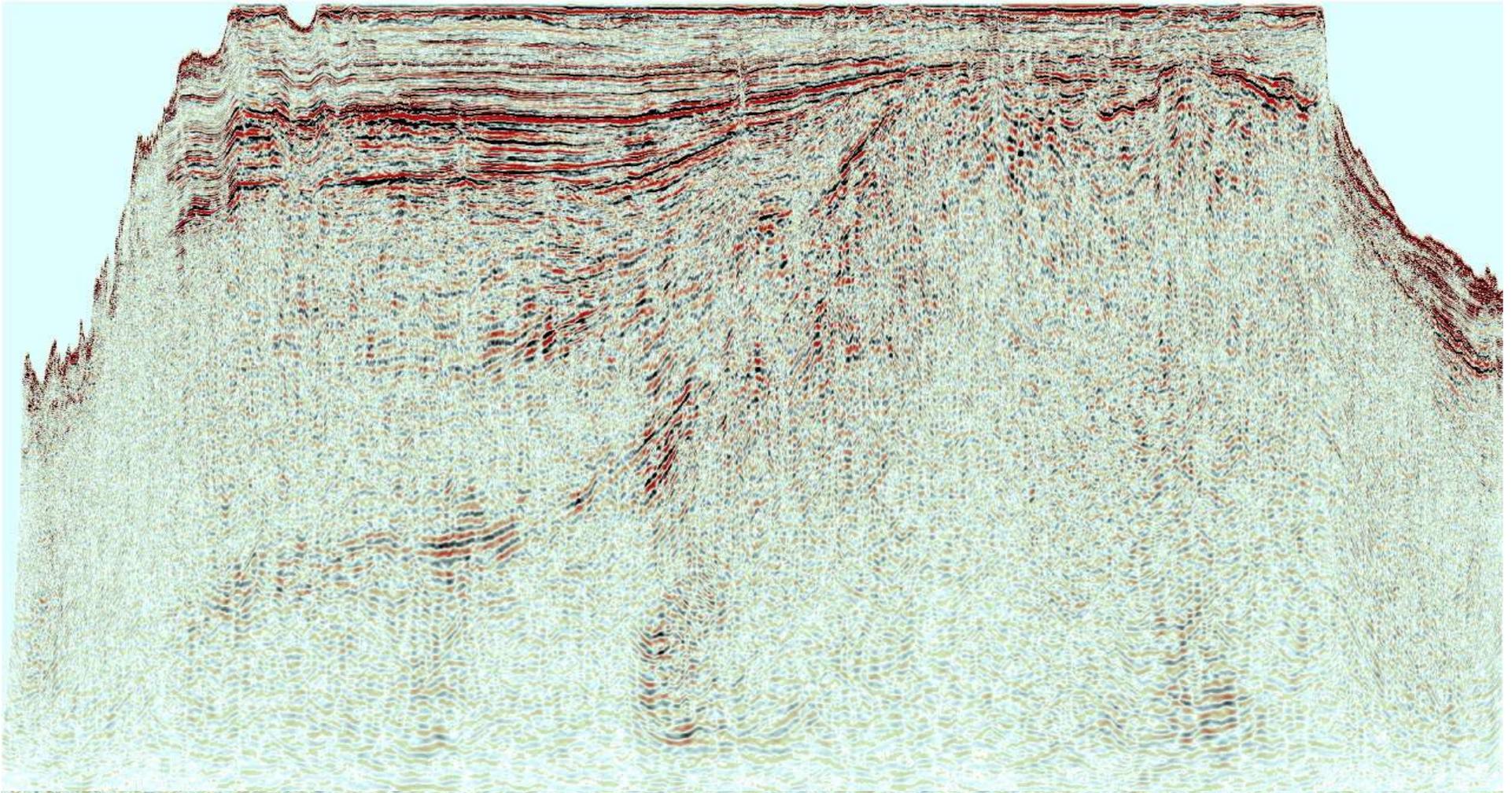
Drilled by
Enterprise in 1995

Well Control

- This stratigraphic column is a compilation from all four wells and available seismic data. It also pulls in regional elements from the Bombay High and Madagascar area, both of which were juxtaposed against Seychelles prior to plate tectonic break up.
- Age of the Jurassic salt is speculative, but is reasonable when compared against East Africa and Madagascar analogues. Distribution of Jurassic salt is also unknown
- Age of oldest sediments in the Karoo basin is unknown. In Northern Madagascar the oldest known Karoo is Permian. The oldest Permian in northernmost Madagascar is marine, and therefore it is highly likely that any Permian in Seychelles is also marine and therefore a good oil prone source rock

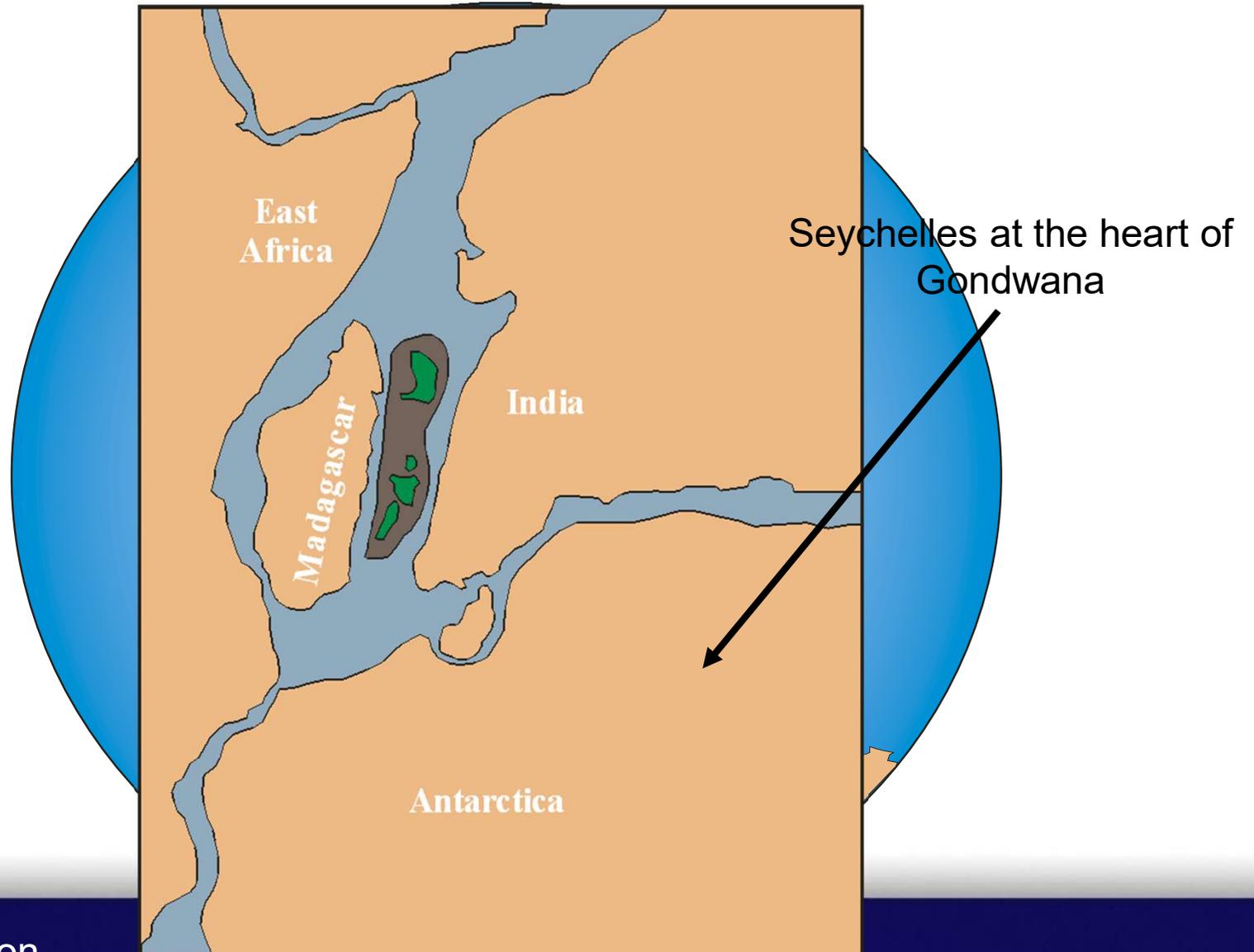


Improved Imaging



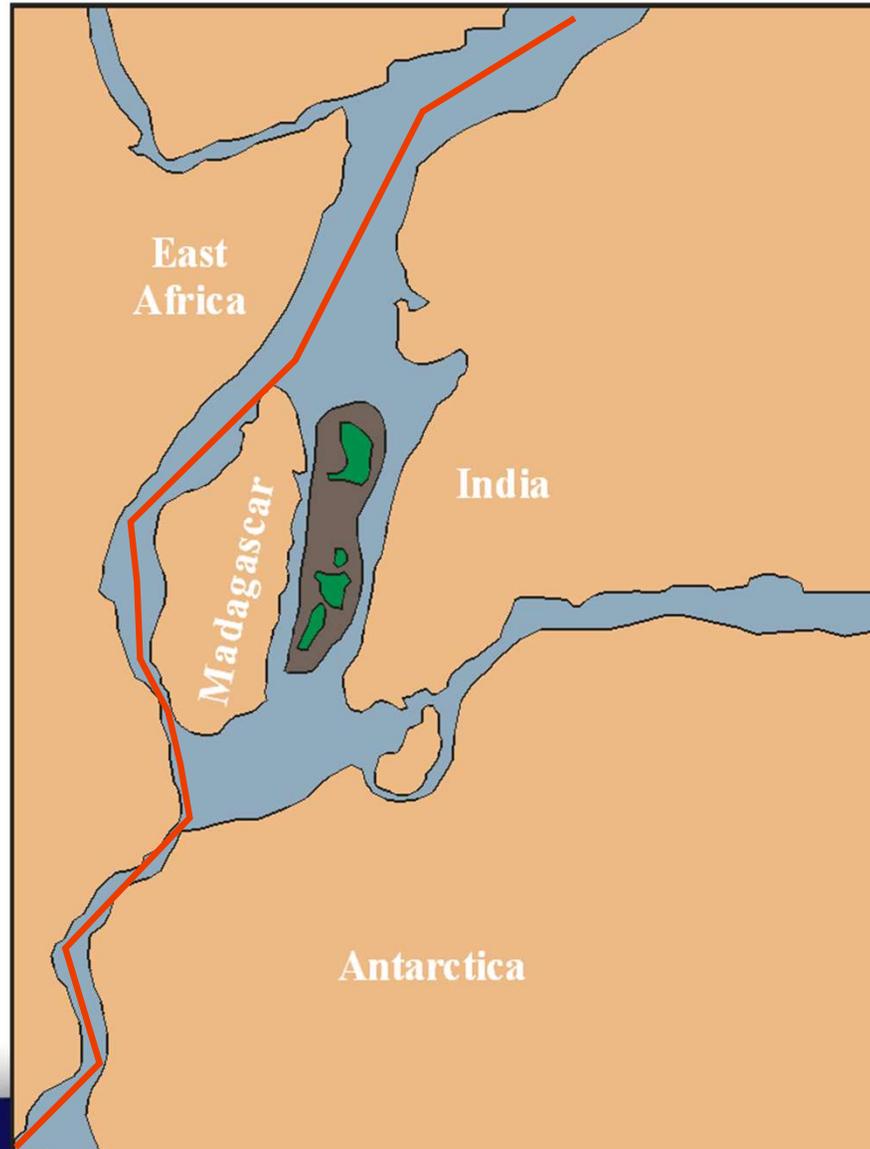
Tectonic Evolution

**Permian
300Ma**

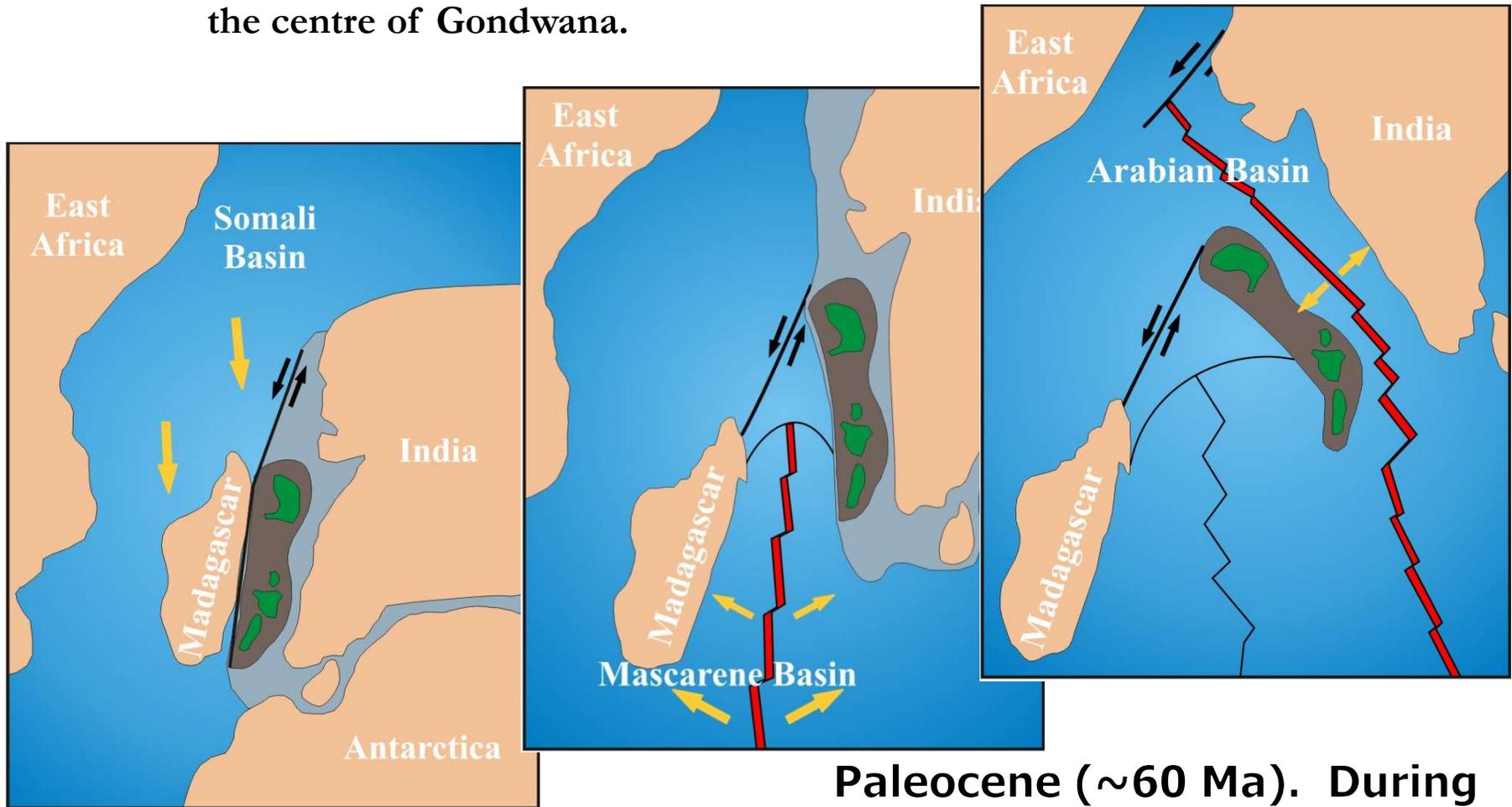


INITIATION OF PROTRACTED EXTENSIONAL TECTONISM WHICH LEAD TO THE EVENTUAL CLEAVAGE OF EAST AND WEST GONDWANA

225Ma

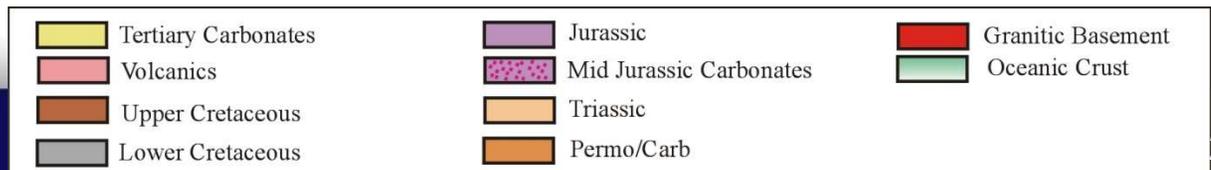
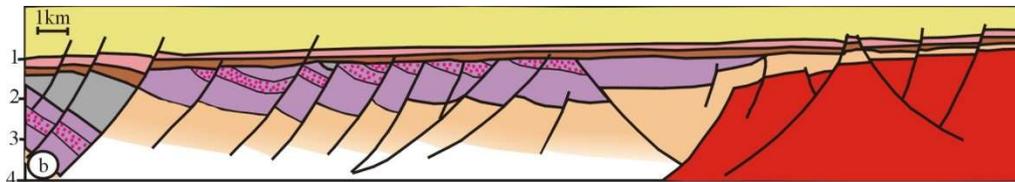
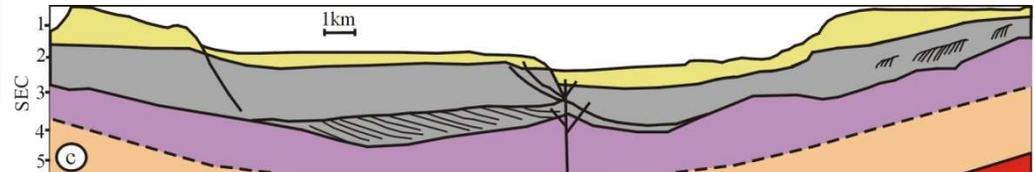
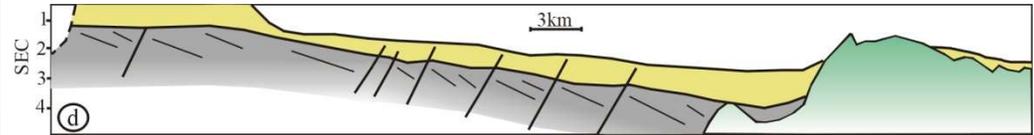
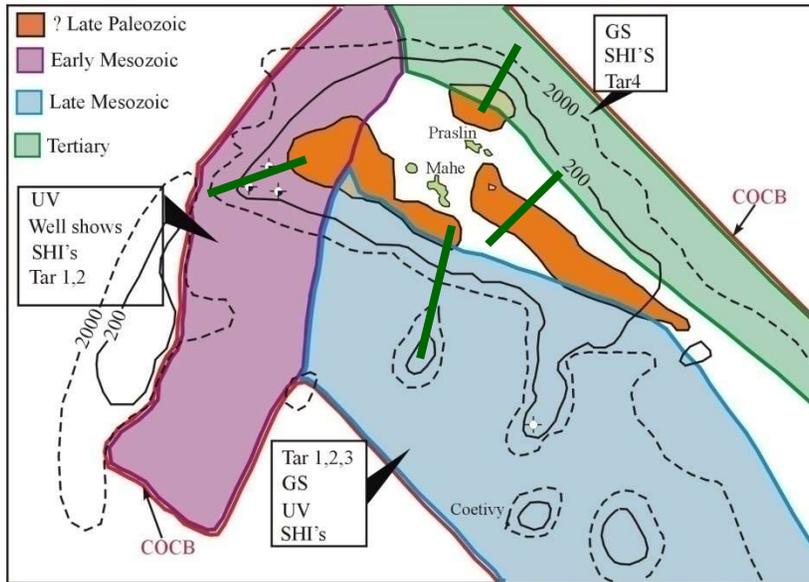


The complexity of the tectonic evolution of the Mascarene Plateau is due to the imposition of three phases of rift/drift tectonics that eventually cleaved the microcontinent from the centre of Gondwana.

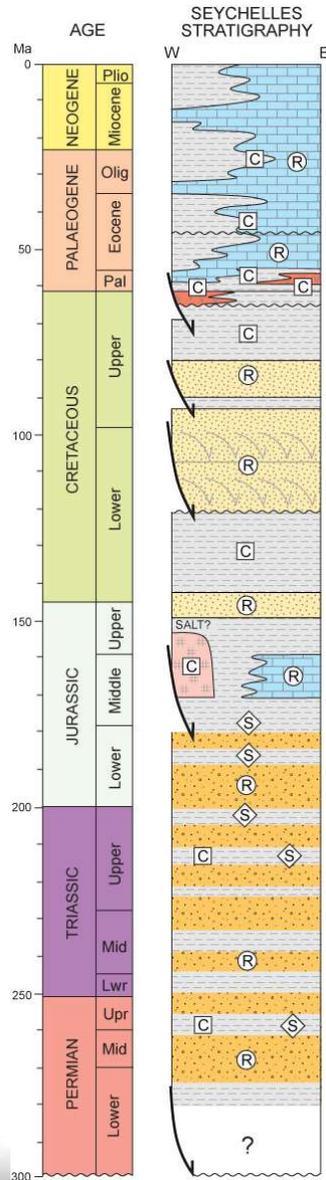


Paleocene (~60 Ma). During the separation of India from Mascarene Plateau.

Exploration Provinces/Play Styles



Source

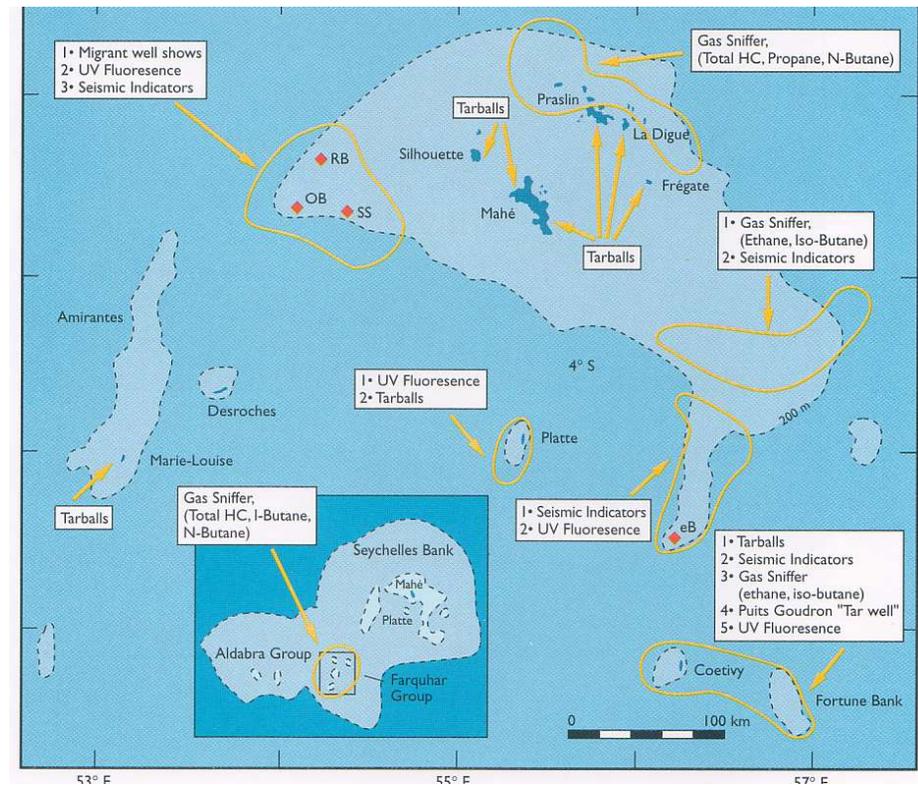


Several source horizons were encountered
In the Amoco wells within the Upper Triassic
To mid Jurassic section

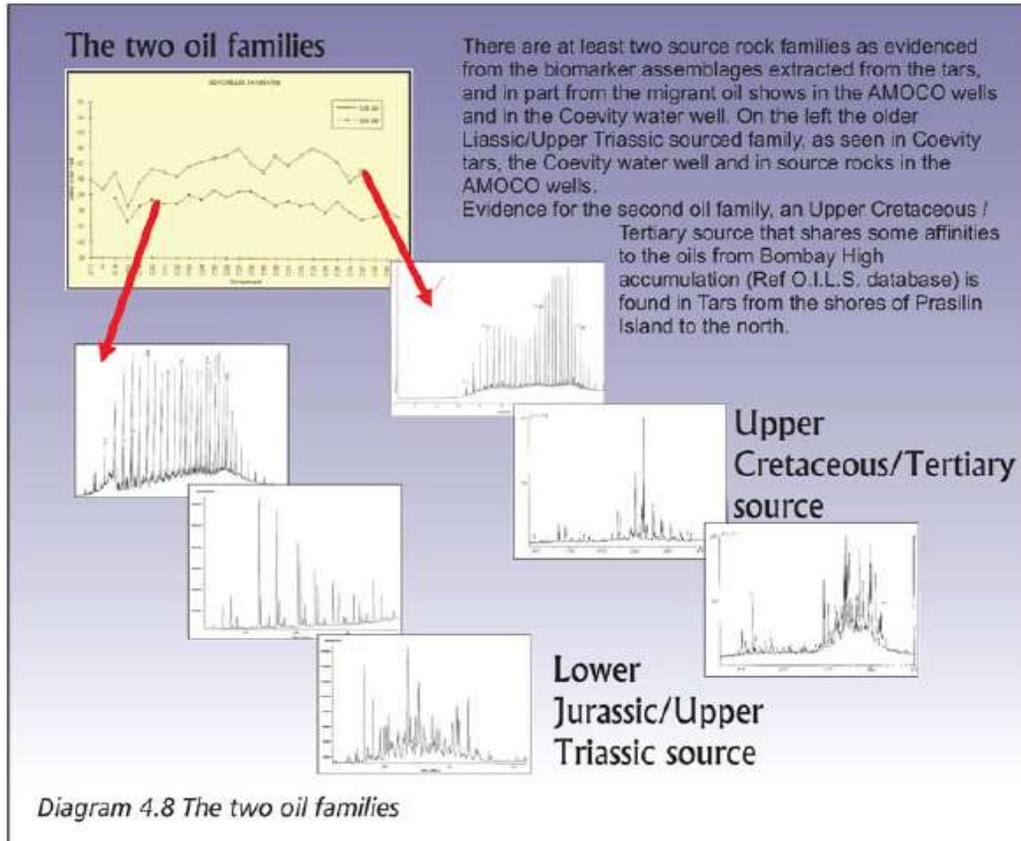
Source intervals encountered in the wells

Tar Balls

Beach standings of tar are a regular occurrence in Seychelles. The tars collected can be correlated to the local stratigraphy.



The two Seychelles oil families

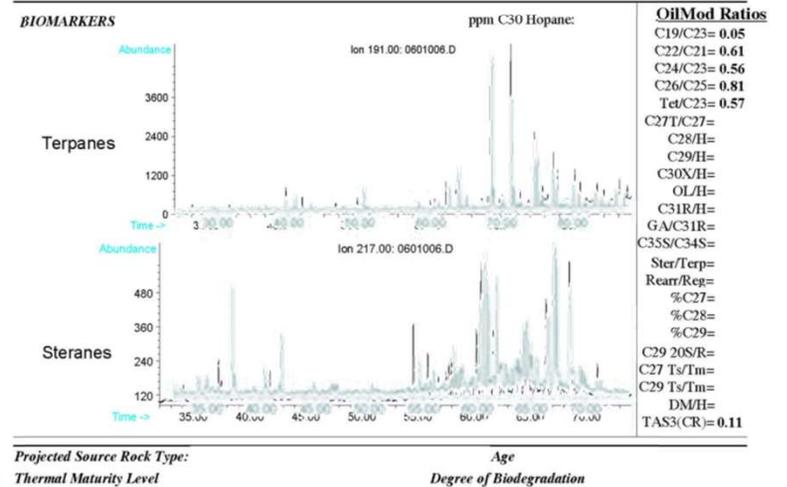
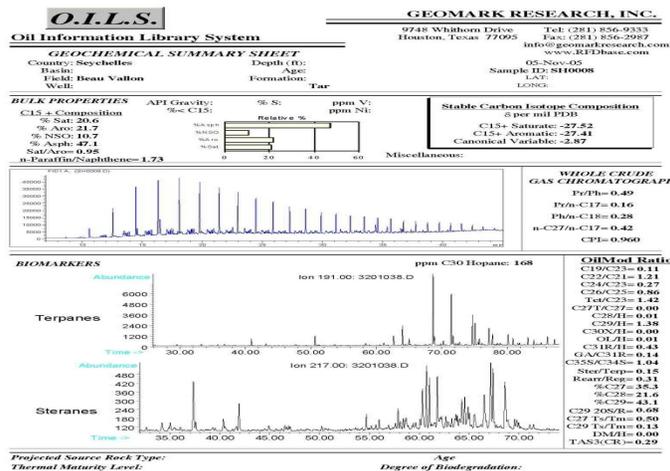
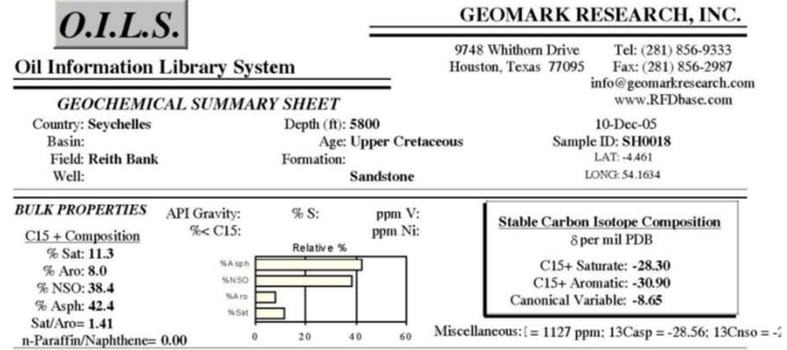
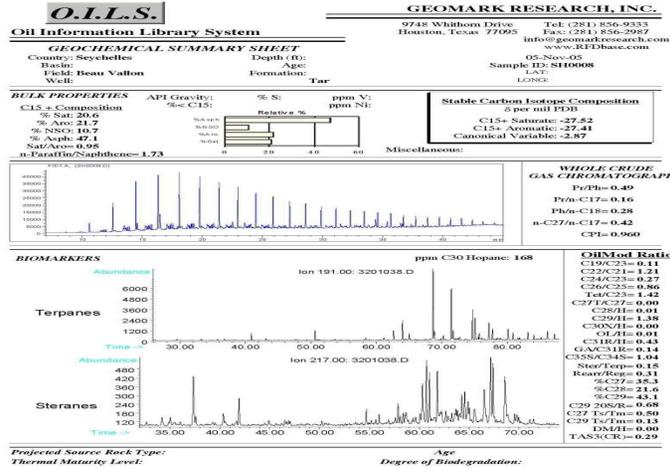


- Biomarker assemblages from tar and also from some migrant oil shows from AMOCO wells suggest at least two source rock families:

1. The first family is typed to an Early Jurassic - Upper Triassic source, as seen in Coevity tars, in the Coevity water well and in source rock analysis of the AMOCO wells
2. The second family is typed to an Upper Cretaceous/ Tertiary source, shares some affinities with oils from the Bombay High and is found in Tars from shores on Praslin Island

Tarballs source rocks correlation

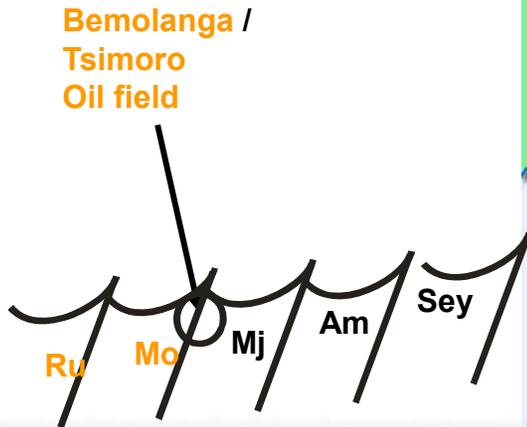
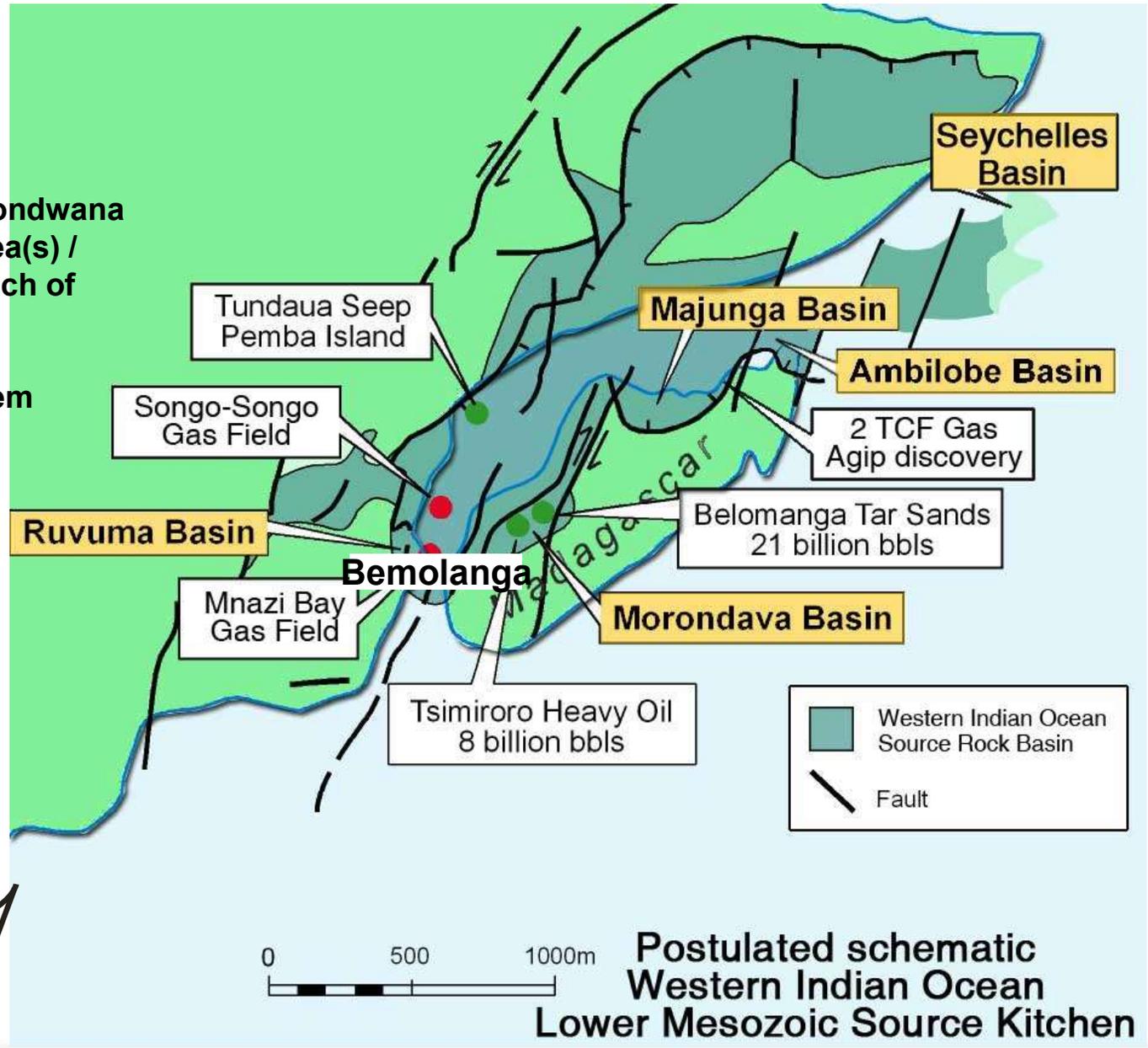
Cuttings and SWC biomarker distribution



Local tar, Seychelles

Petroleum systems

Once successful rifting of Gondwana commenced, a vast inland sea(s) / lake(s) persisted through much of the Jurassic, allowing the development of an extensive and potent source rock system

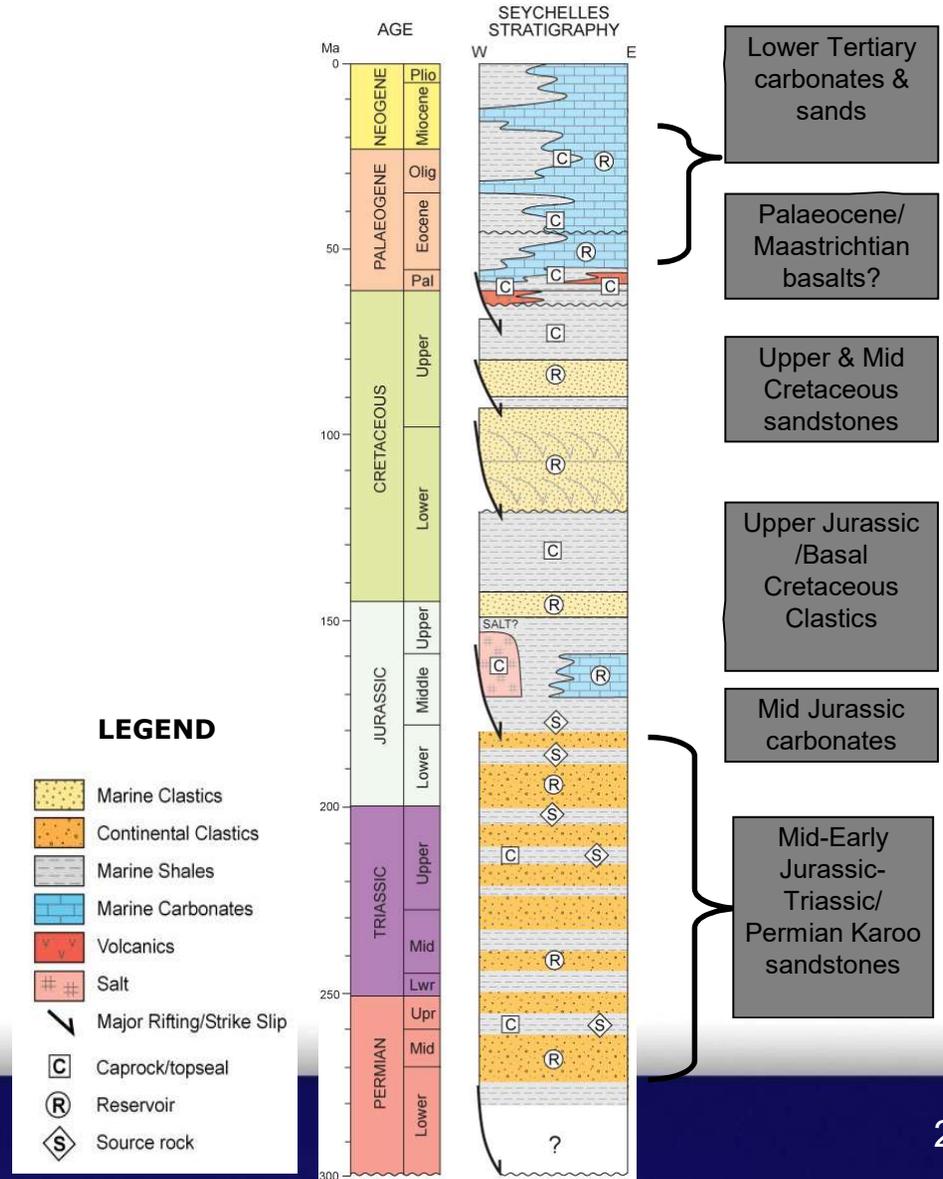


Postulated schematic Western Indian Ocean Lower Mesozoic Source Kitchen

Reservoir

Known & Inferred Reservoirs

- Tertiary carbonates & sandstones
- Basalts? and intra-basalt series volcaniclastics and sedimentary series (especially carbonates)
- Upper Cretaceous sandstones (& potential carbonate build-ups)
- Thick mid Cretaceous sandstones – strike slip basins, large prograding sequences
- Upper Jurassic carbonates & clastics? E.g. Kutch Basin
- Mid Jurassic carbonates?
- Lower-mid Jurassic/Triassic/Permian Karoo sands

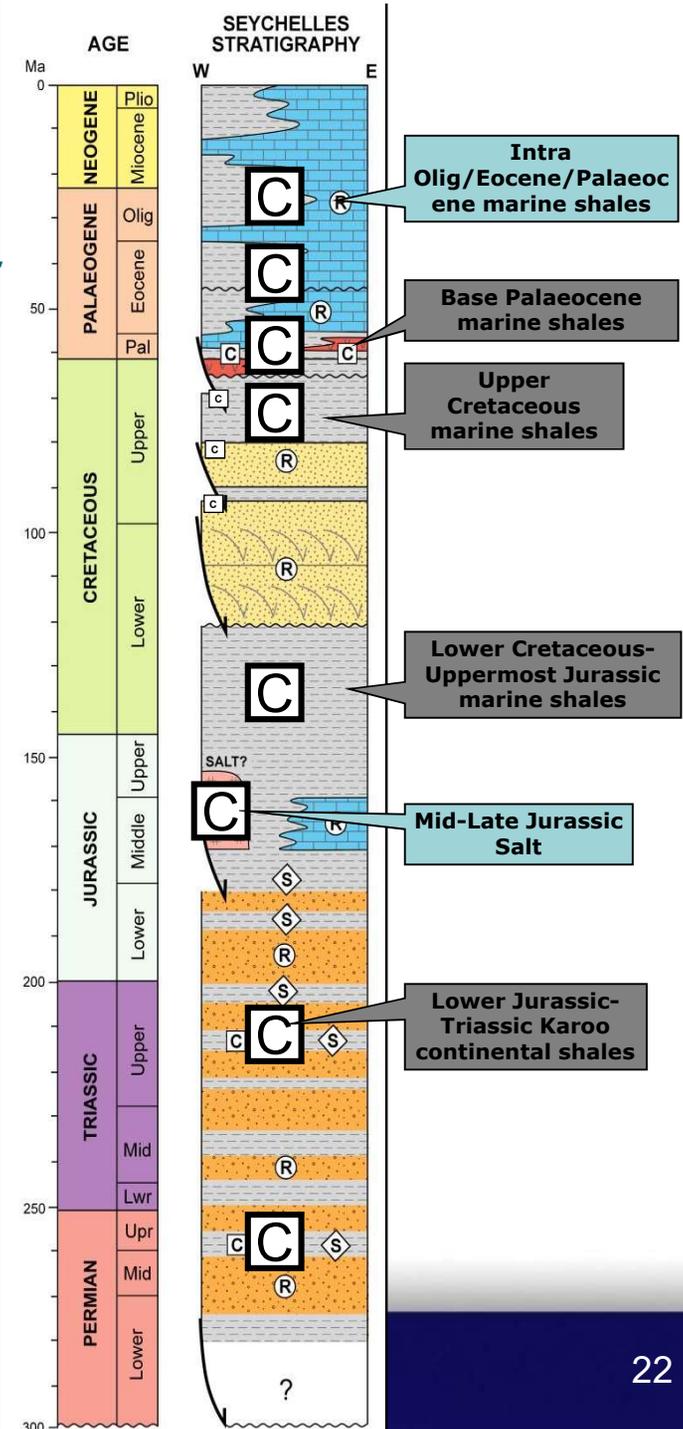
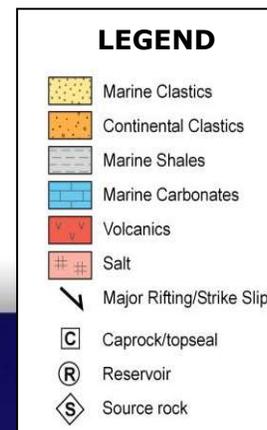


Seal

List of Seals

Seals are present both regionally, as marine shales of drift origin, and locally, as shale interbeds within fluvial and deltaic sequences

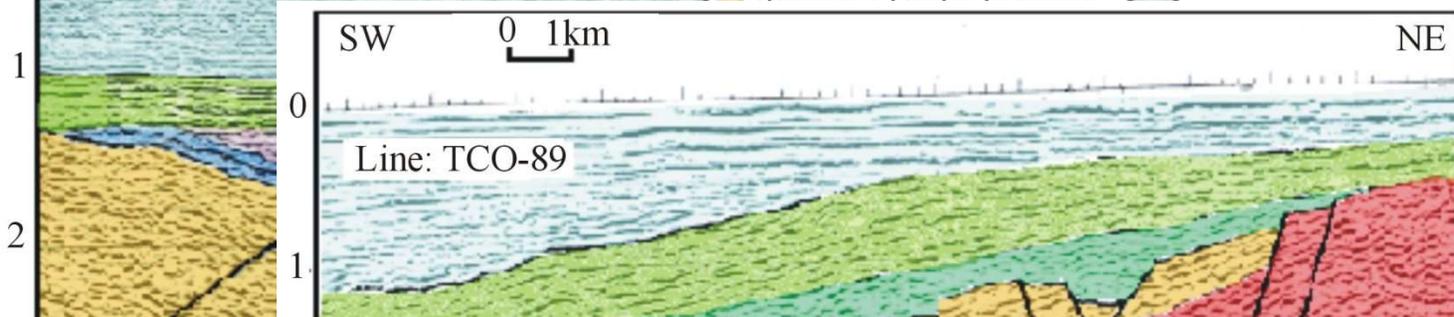
- **Seals proved by well data**
 - Basal Palaeocene Marine Shales
 - Upper Cretaceous Mudstones
 - Mid Cretaceous Mudstones
 - Upper Jurassic to Lower Cretaceous Shales
 - Lower Jurassic and Triassic Shales
- **Seals suggested in recent study, but unproven**
 - Tertiary Marine Shales (Eocene, Palaeocene, Oligocene/Miocene)
 - Middle to Upper Jurassic Salt



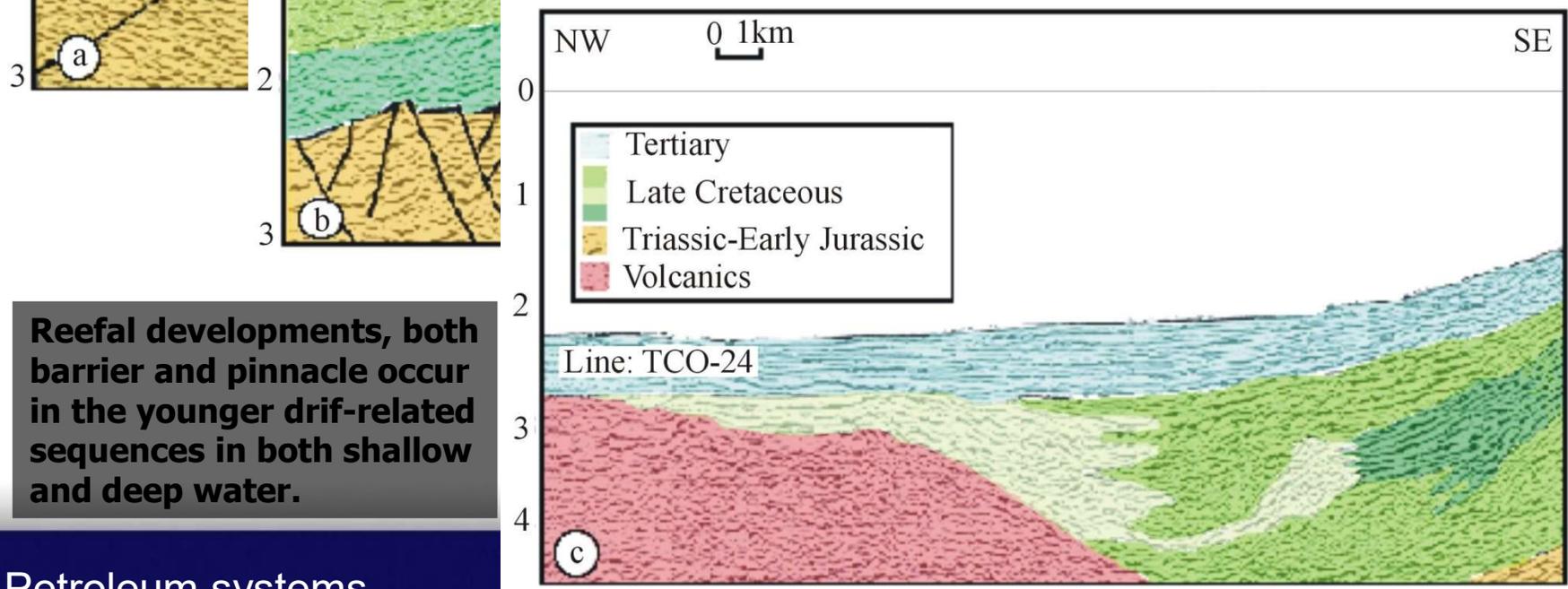
Trapping configuration



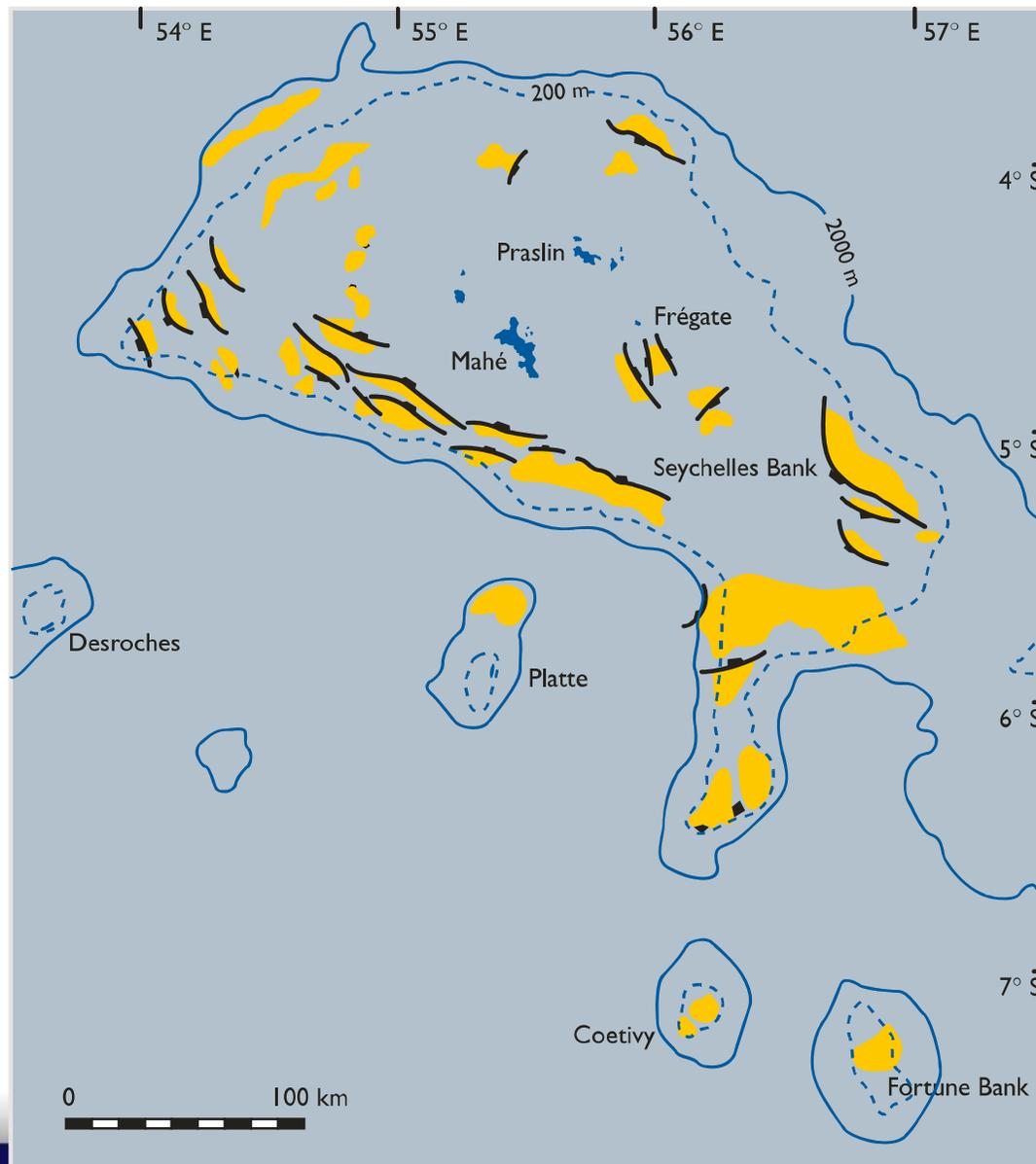
Tilted fault blocks within the rift sequences



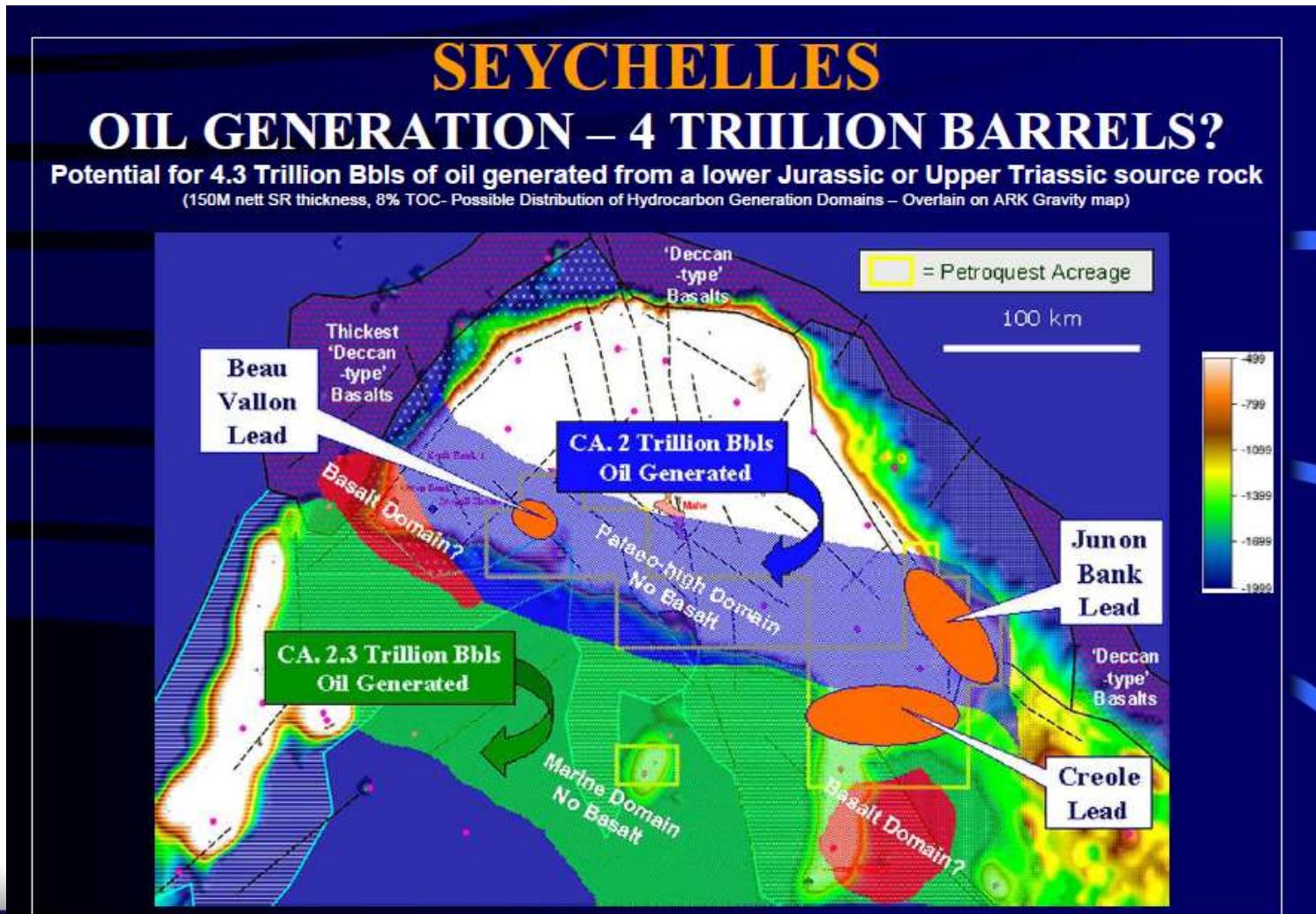
Stratigraphic pinchouts are also common



Reefal developments, both barrier and pinnacle occur in the younger drif-related sequences in both shallow and deep water.

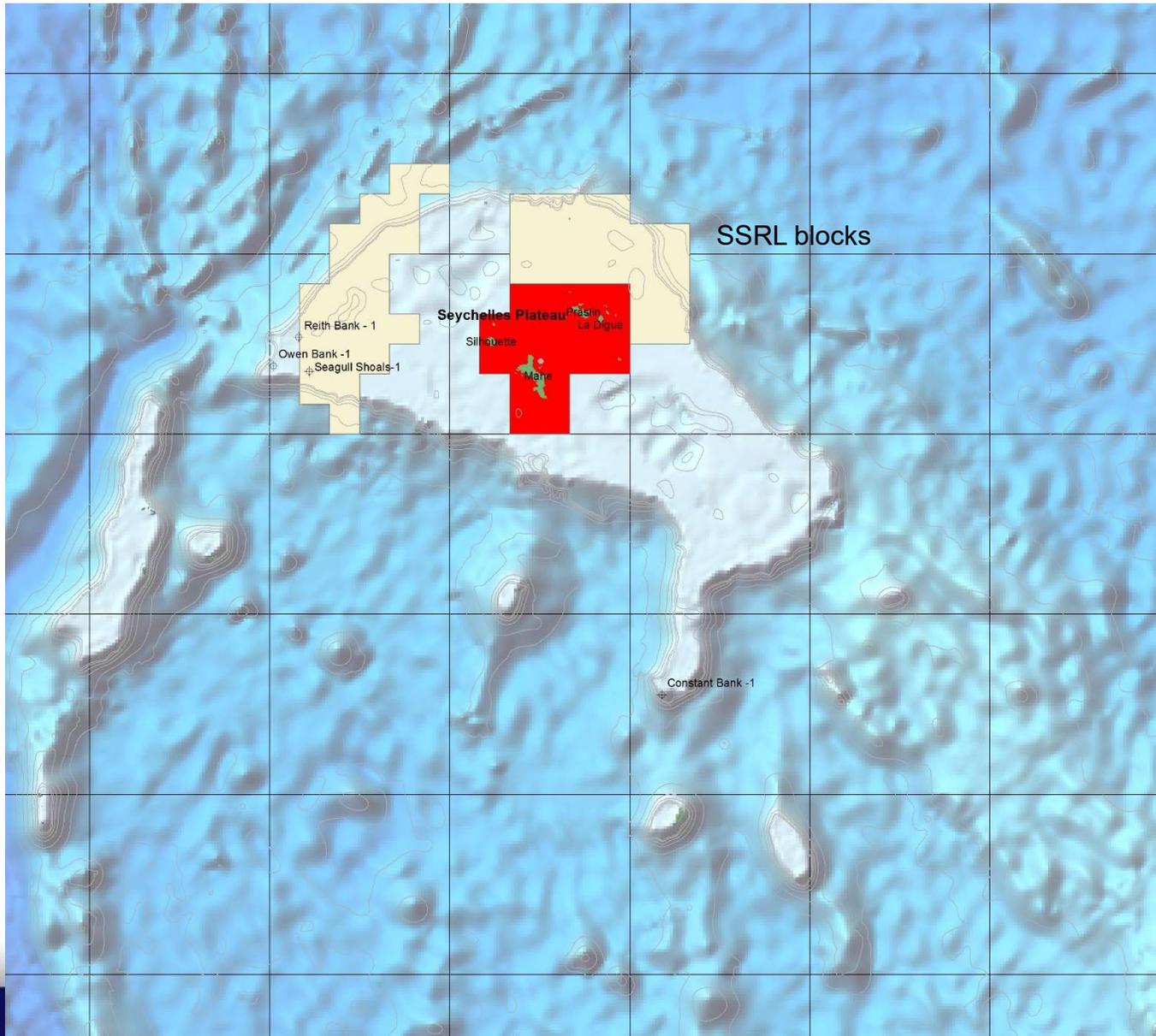


What does all this mean?



Volumes presented are calculated from kinetics of a single source rock unit – Model study by PDF

Licensing Status





Upstream Legal and Fiscal Regime in Seychelles

Legal Framework

➤ Petroleum Mining Act, 1976 (“PMA”)

- A relatively short enabling Act (16 sections) , authorizing the signing by the Minister of **any type of Petroleum Agreement** for granting exclusive E&P rights to the PA-holder
- PMA authorizes **PA** to stipulate specific terms and conditions for fees and royalties.



The Licensing Initiative

Open File award process

- Applications for a 10,000sq km (max) area may be made at anytime.
- PetroSeychelles verifies if minimum application criteria are met
- Notice of application filing & solicitation of competitive applications
- No need to reveal identity of applicants or proposed terms
- Prescribed period for competitive application filing (90 days)
- Evaluation Committee selects winning application
- Negotiations start

variables in the Petroleum Agreement ?

Negotiable	Fixed
Area	Relinquishment Terms
Work Program	Fiscal Terms
Tier 2 PAPT	Training Commitment
	Rental Payments



Minimum work program

Period 1 (Years 1-3) work program must include at least funding for seismic

Period 2 (Years 4-6) work program must include funding for at least one well

Period 3 (Years 7-9) work program must include funding for at least one additional well

Weighting criteria for evaluation of competitive bids

Work program:

Geologic prognosis	10%
Period 1 commitment	40%
Period 2 proposal	10%

Fiscal considerations:

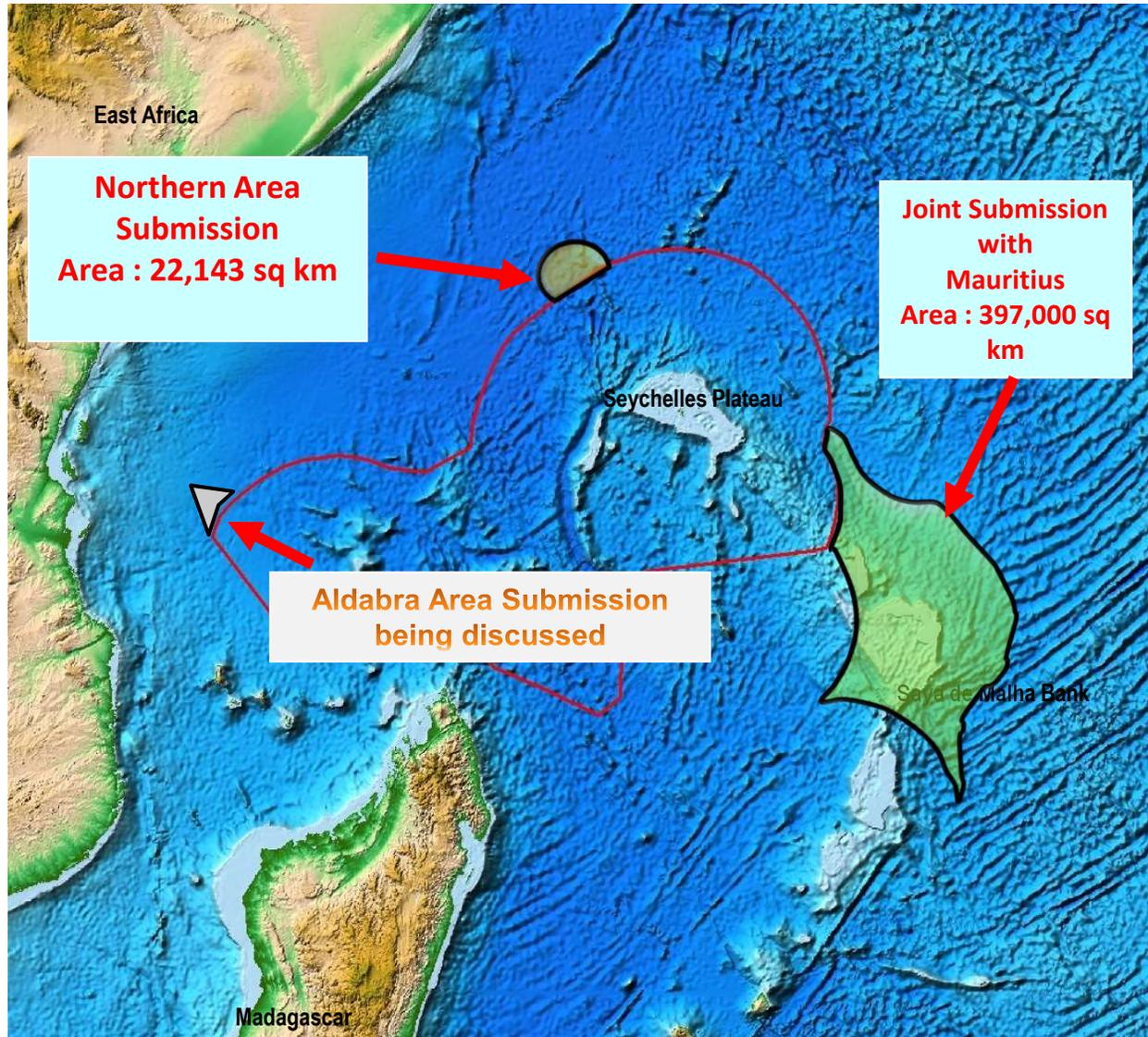
Tier 2 PAPT & any other items	10%
-------------------------------	-----

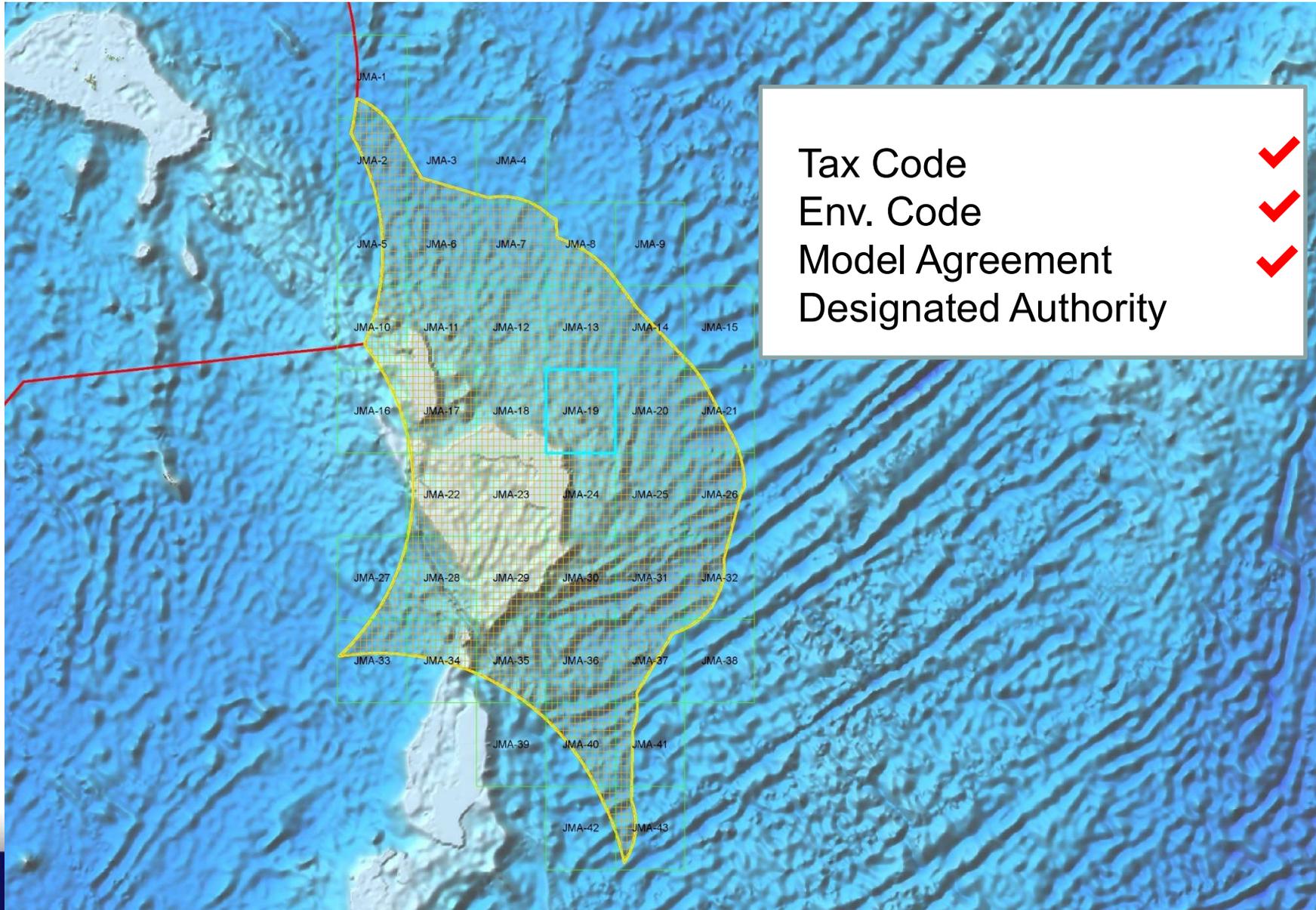
Applicant qualifications:

Technical	15%
Financial	15%

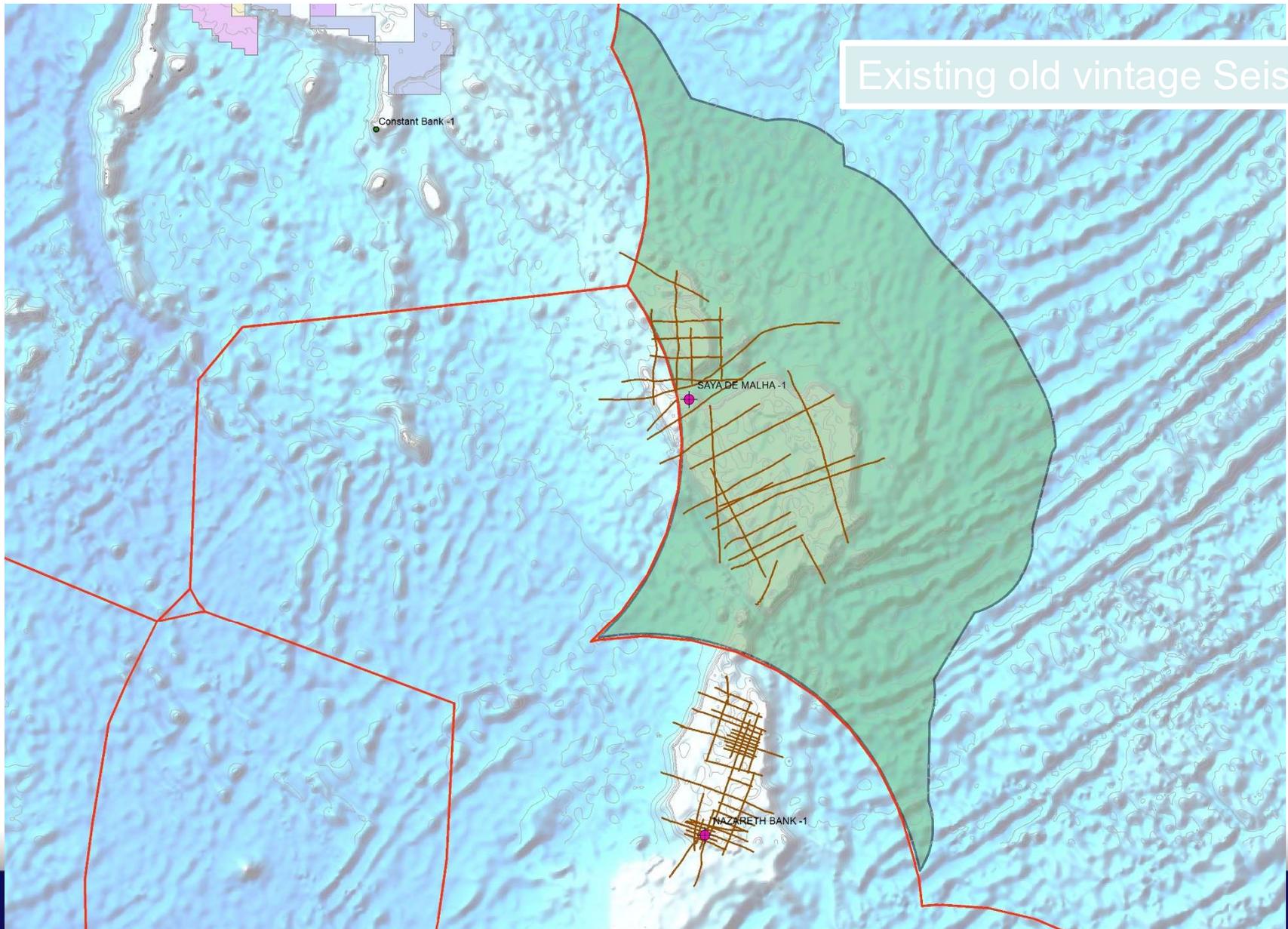
LEGAL AND FISCAL SUMMARY	TERMS
EXPLORATION PHASE	9 YEARS, 3 PERIODS
RELINQUISHMENT TERMS	FIXED
PRODUCTION PHASE	25YEARS
RENTAL	US\$10 PER SQ.KM
ROYALTY	10%
PETROLEUM INCOME TAX	35%
STATE PARTICIPATION	NO
PETROLEUM ADDITIONAL PROFITS TAX	2 TIER

Extended Continental Shelf





Existing old vintage Seismic



Giants



Will the drill bit discover other giants???



www.petroseychelles.com

The screenshot shows the homepage of the PetroSeychelles website. At the top, there is a navigation bar with the company logo on the left, a search bar on the right, and a central banner with the word "hydrocarbon" and a geological image. Below this is a large hero image of a tropical beach with the text "Welcome to PetroSeychelles ...an ocean of potential". A horizontal menu below the hero image contains links for Welcome, Geotechnical, Legal, Economic & Fiscal, Blocks licensing, Announcements, About Us, Contact Us, Downloads, and News. The main content area is divided into two columns. The left column features an "Announcements" section with a recent article titled "Two New Applications Received" dated Monday, 18 August 2014, and a "Home" section with a "Click Here" button for blocks applications. The right column has a "Latest News" section and a "Login Form" with fields for User Name, Password, and a Remember Me checkbox, along with Log in, Forgot your password?, and Forgot your username? links. A footer section at the bottom left contains a "Welcome to PetroSeychelles Website" message and a brief history of the national oil company.

hydrocarbon

PETRO SEYCHELLES

Search

Welcome to PetroSeychelles
...an ocean of potential

photo courtesy Gerard Larose - Seychelles Tourism Board

Welcome Geotechnical Legal Economic & Fiscal Blocks licensing Announcements About Us Contact Us Downloads News

Announcements

 **Two New Applications Received**
Monday, 18 August 2014
Two new applications received. PetroSeychelles has received 2 new applications for petroleum exploration blocks under the recently launched...
[Read More...](#)
more articles...

Home

Quick link for blocks applications

Click Here

For application guidelines and to download application submission documents

Latest News

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Password

Remember Me

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- [Forgot your password?](#)
- [Forgot your username?](#)

Welcome to PetroSeychelles Website

In 1984 the Seychelles Government established a national oil company, currently **PetroSeychelles**, to strengthen its capabilities to deal with exploration and other activities related to the development of the petroleum potential of the State.

Thank You



Welcome to Seychelles