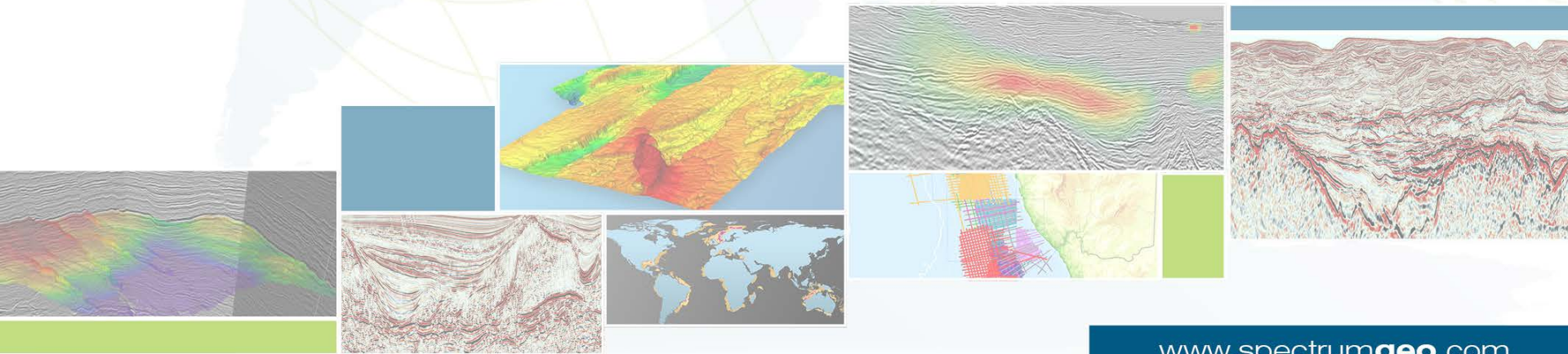




MULTI-CLIENT • SEISMIC IMAGING

Future giant discovery in the Outeniqua Basin, offshore South Africa

Anongporn Intawong & Neil Hodgson

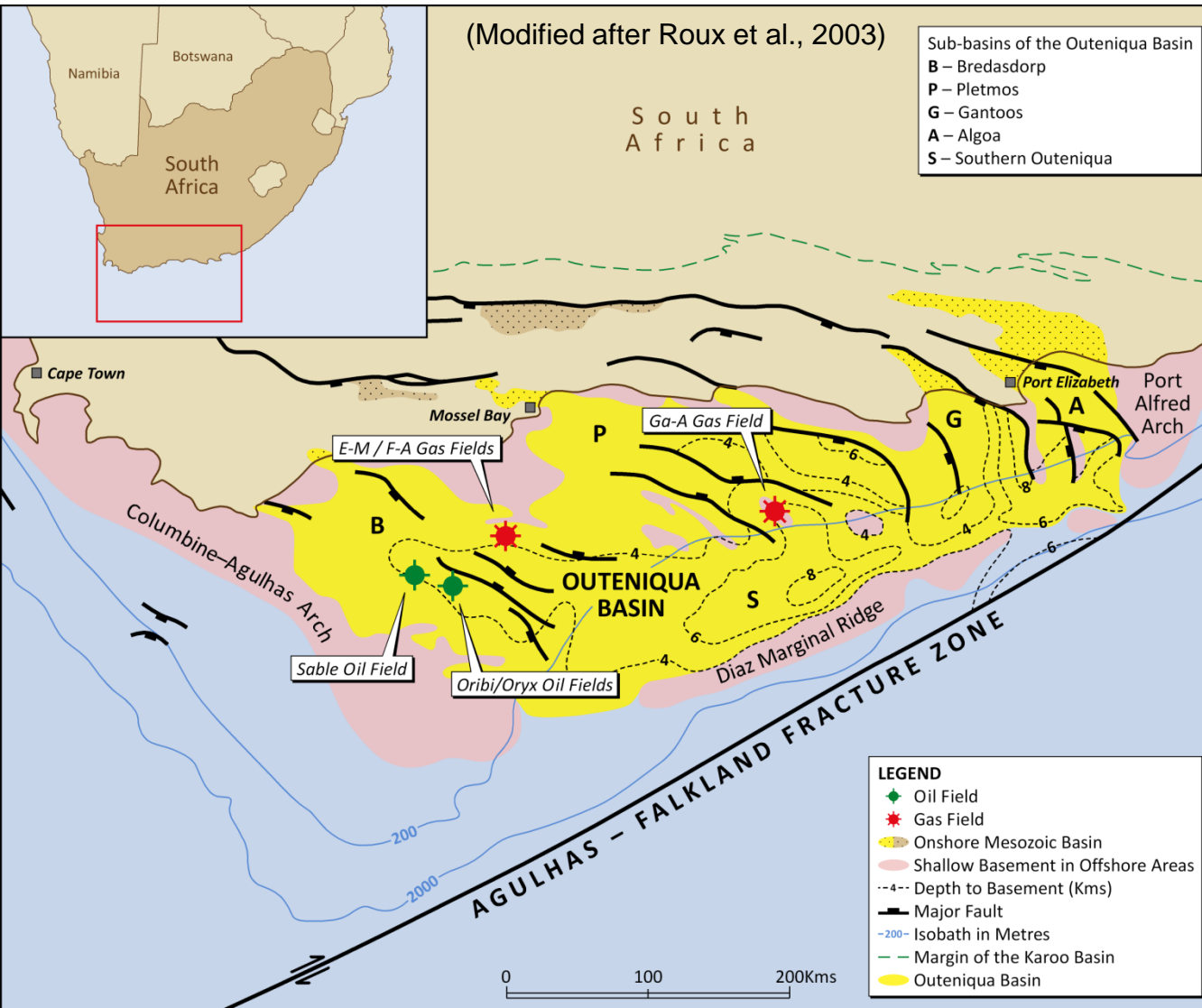


www.spectrumgeo.com

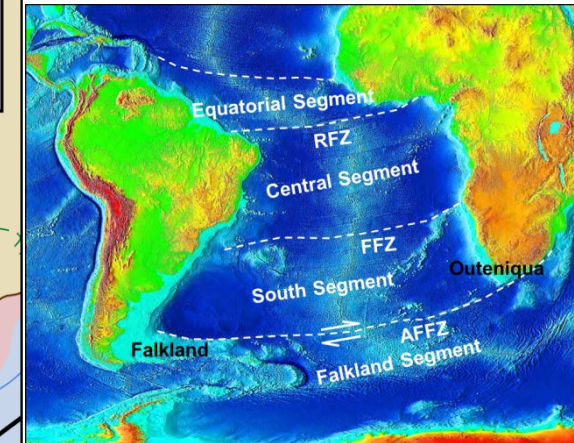
Talk Outlines

- Structural framework & Evolution of the South Atlantic
- Structural architecture of Cape fold Belt – Pre existing fabric in the Outeniqua Basin
- Petroleum system
- Proven plays - Analogues
- Giant prospects - To be tested
- Summary

Structural Framework



South Atlantic



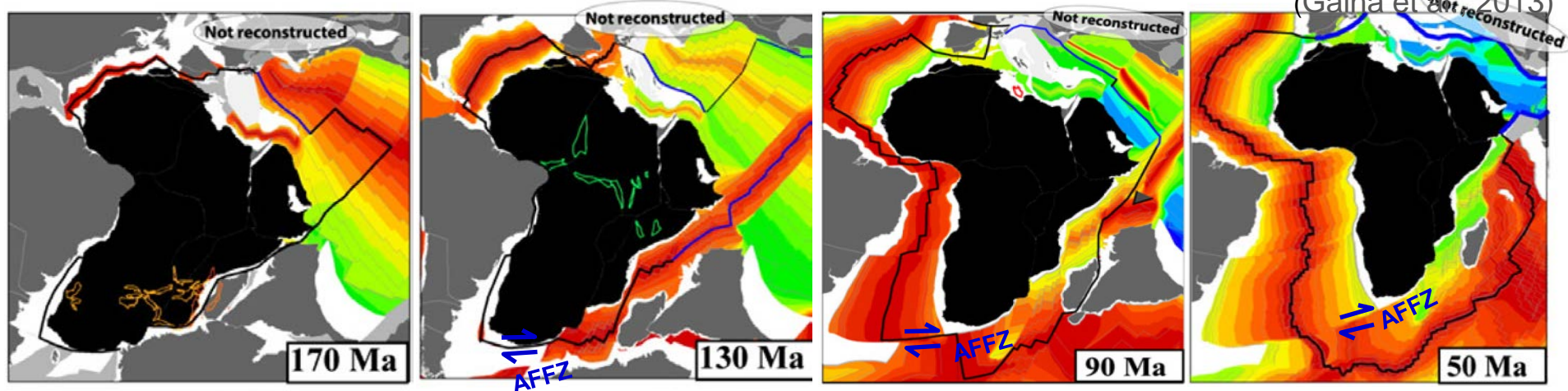
(Source: NOAA)

Recoverable Reserves:

Ga-A 85 MMboe
 E-M/F-A 314 Mmboe
 Oribi/Oryx 55 MMboe
Sable 50 MMboe

Evolution of the South Atlantic

(Gaina et al., 2013)



Mid Jurassic:

- After Gondwana break-up: India-Madagascar – E. Africa separation

Late Jurassic – Valanginian South Atlantic Rifting divided S. America & Africa along the South Atlantic ridge

Hauterivian - Barremian:

- Beginning seafloor spreading in the southern South Atlantic
- AFFZ accommodated strike-slip motion between Africa & S. America

Turonian - Coniacian:

- Seafloor spreading propagated northward and connected with the Central Atlantic and the mid oceanic ridge south of the AFFZ

Eocene:

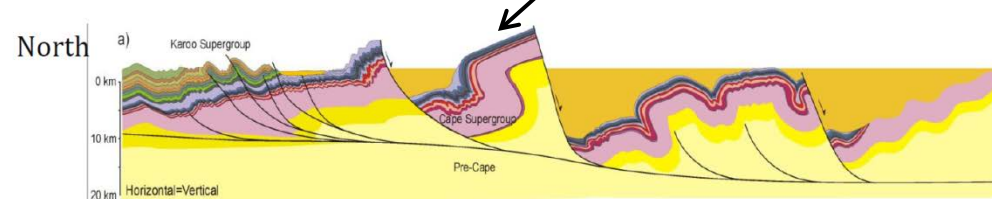
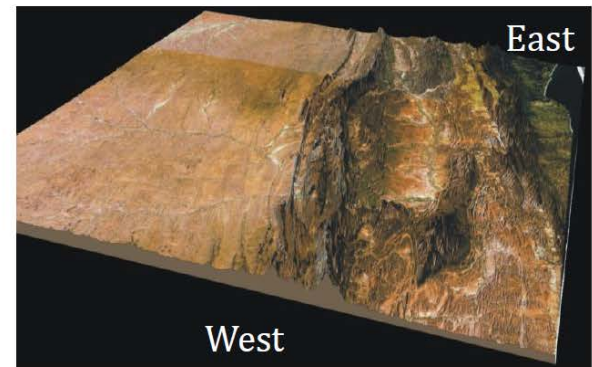
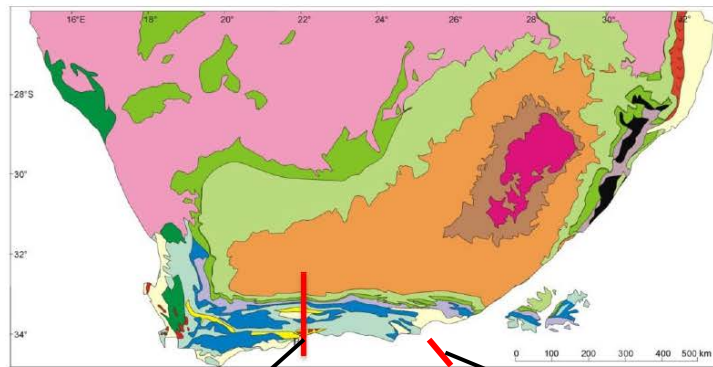
- Ridge jumped toward the African plate (~60 Ma) ended the strike-slip motion of the AFFZ



Age of LIPS & Oceanic lithosphere (Ma)

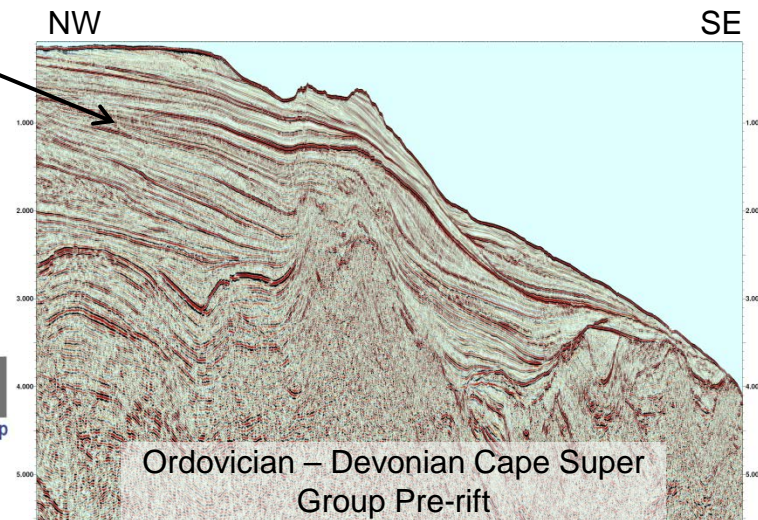
Structural Architecture of Cape Fold Belt – Pre-existing fabric in the Outeniqua Basin

- Onshore geology dominated by E-W trending Permian-Triassic fold belt (Cape Super Group)



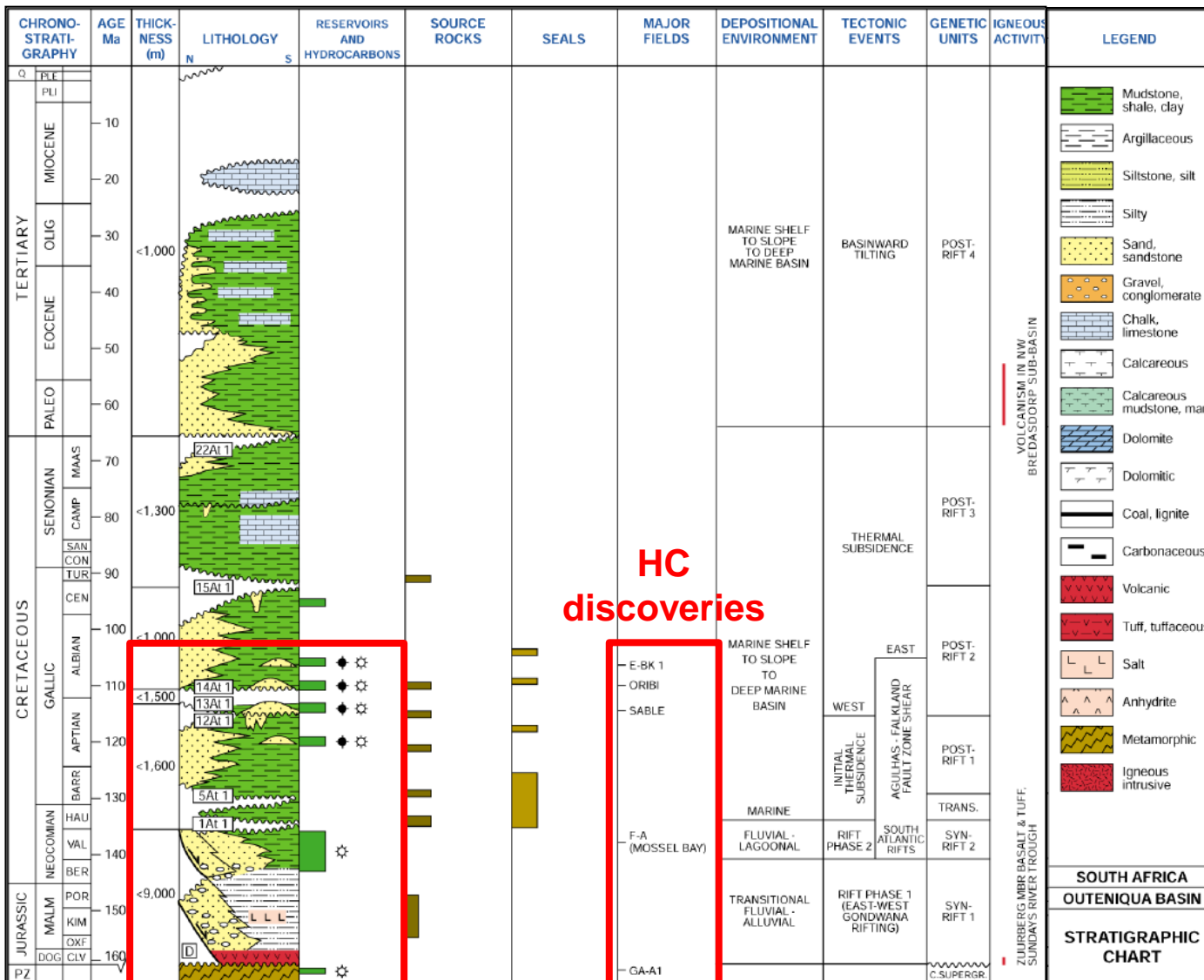
South

Paton et al 2002



2D Repro 2015 100 km

Petroleum System

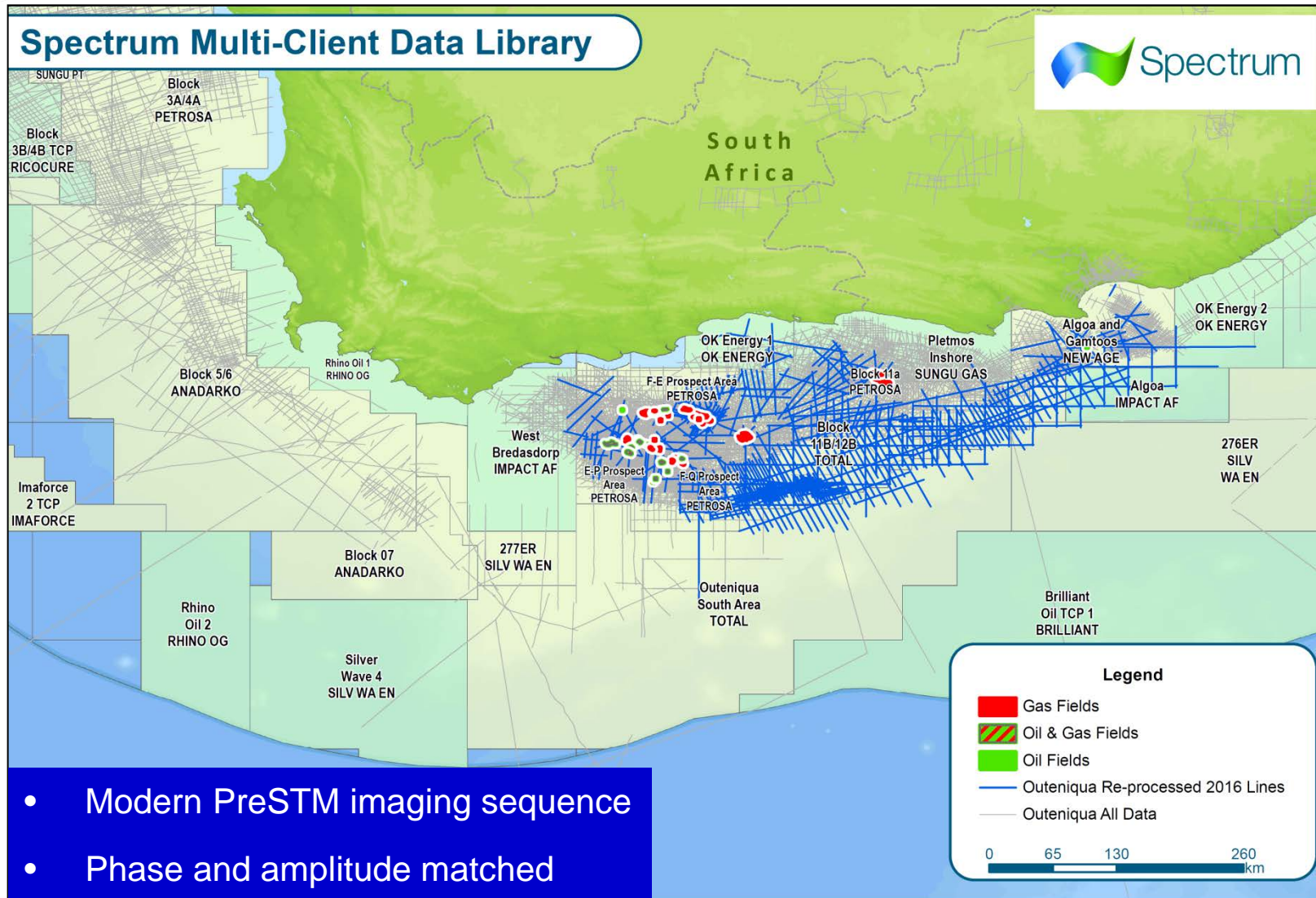


Main source rocks:

- Syn-rift Late Jurassic lacustrine mudstone
- Hauterivian – Barremain restricted marine mudstone
- Aptian-Albian anoxic restricted marine mudstone (source rock of made discoveries in the Orange basin): TOC 2.8% - >5% (locally), HI 450-600

(Source: IHS, 2012)

Reprocessed 2016 (Blue) & All Data Available to Reprocess in S. Africa (Grey)



- Modern PreSTM imaging sequence
- Phase and amplitude matched

Proven Plays - Analogues

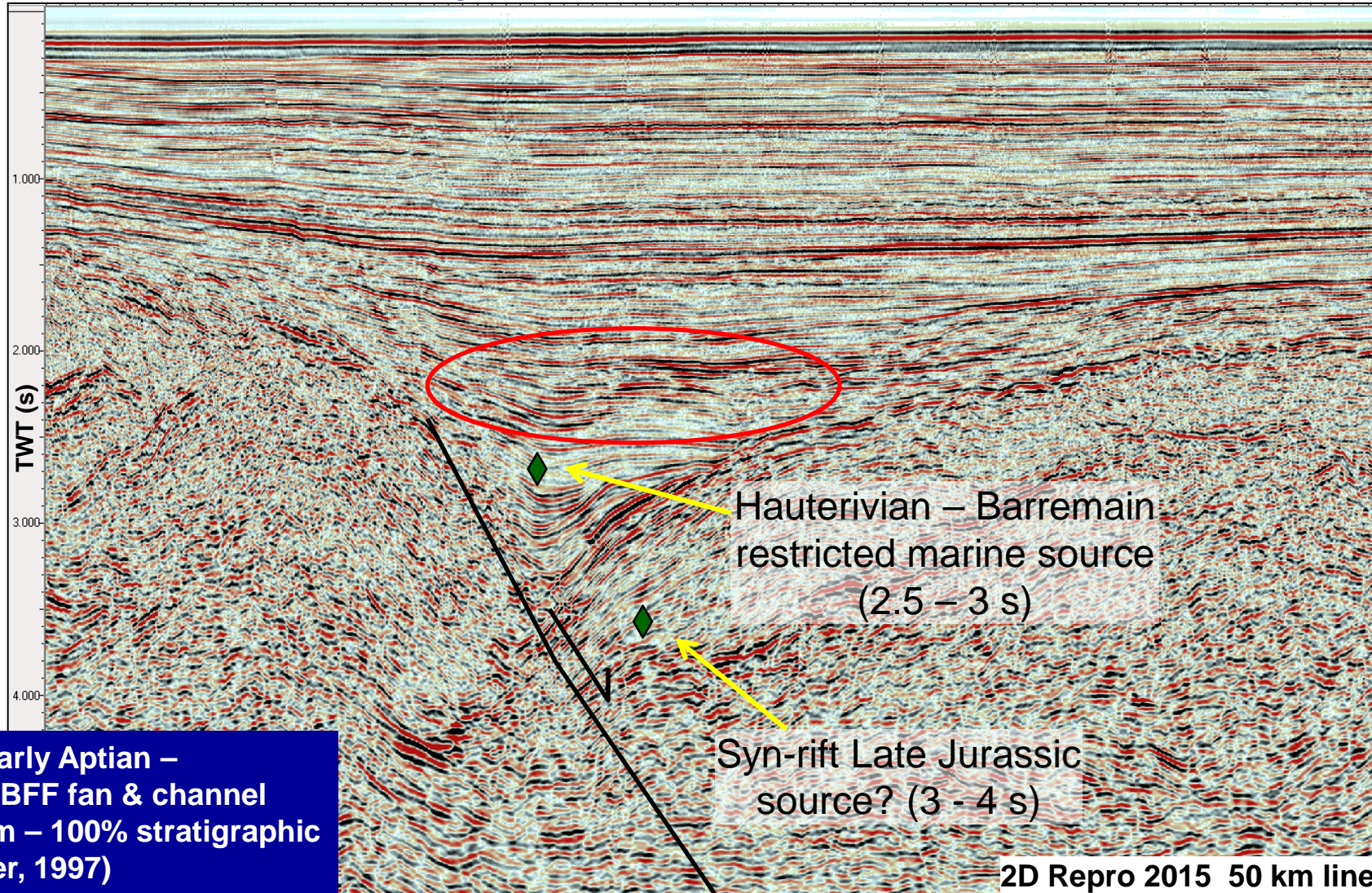
- **Bredasdorp Sub-basin**
 - Basin floor fan and channel (e.g. Sable, Oribi and Oryx)
- **Platmos Sub-basin**
 - Fractured & sub-aerial quartzite Table Mountain Fm. (Ordovician - Devonian Cape Super Group) – GA-A1
 - Draped sands on syn-rift structural high – GA-A1

Bredasdorp Sub-basin: Sable BFF & Channel Plays



Sable (1990)
oil & gas (Reserve 50 MMboe)

NE



Stacking Early Aptian –
Barremian BFF fan & channel
lobe system – 100% stratigraphic
trap (Socker, 1997)

Bredasdorp Sub-basin: Oribi Albian BFF & Channel Plays

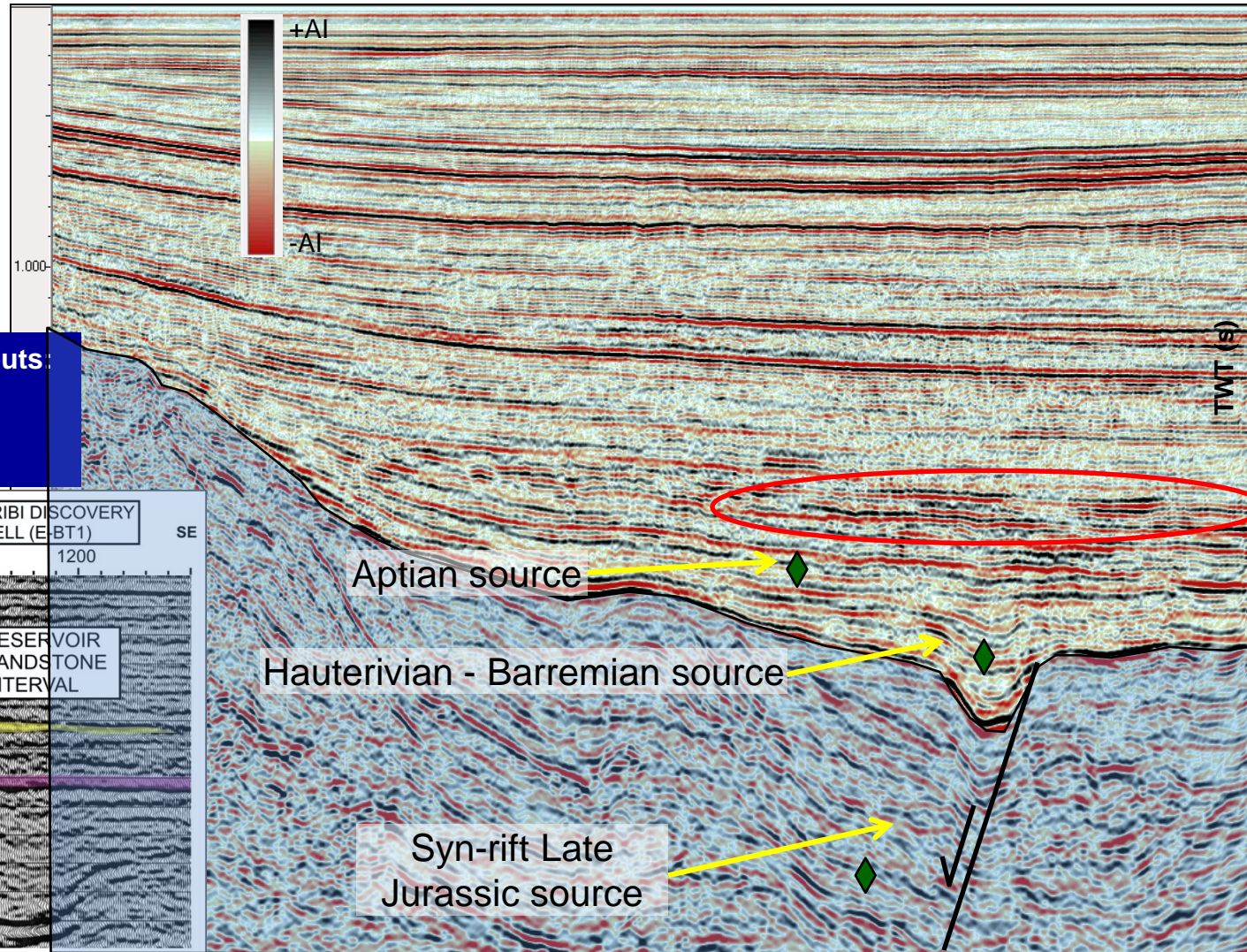


E-BT1 (1990)

2D Repro 2015 35 km line

oil & gas (Reserve 41 MMboe)

NE



Albian turbidites sand pinch outs

- 27 m net
- Porosity 13-24%
- Permeability 500 mD - 2 D

(Source: PASA)

ORIBI DISCOVERY WELL (E-BT1)

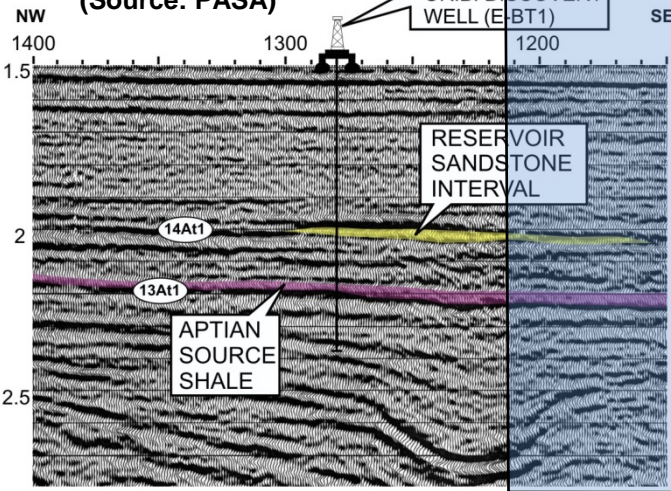
RESERVOIR SANDSTONE INTERVAL

14At1

13At1

APTIAN SOURCE SHALE

TWO-WAY TRAVEL TIME IN SECONDS



Large Syn-rift structural trap, BFF & Channel in Platmos Sub-basin



◆ = Source rk

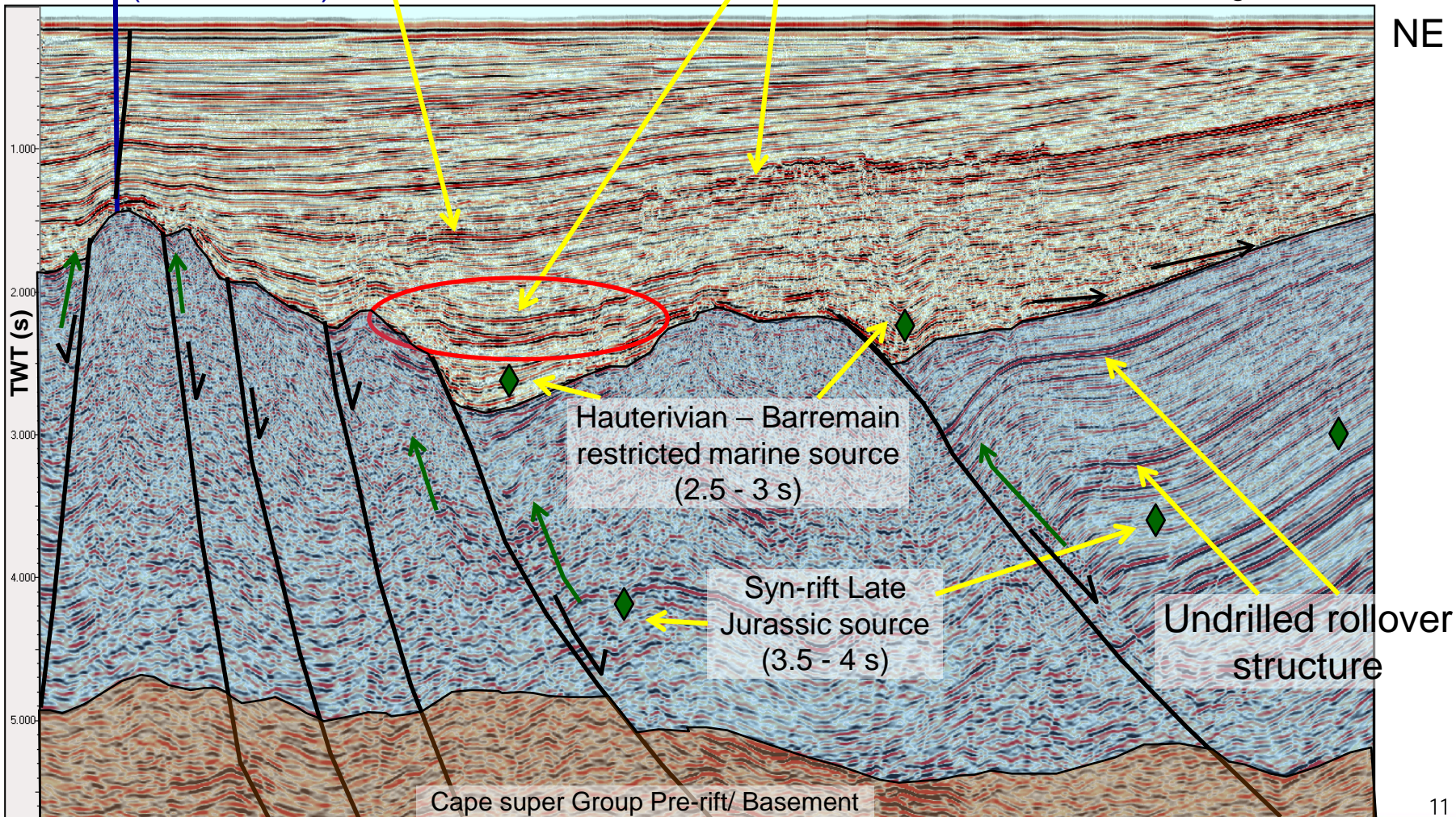
Line length 75 km

GA-C-1
gas show (fault breach)

Undrilled Early Cretaceous basin floor fan & channel – **Sable & Oribi analogue**

SW

NE



Platmos Sub-basin: Pre-rift Fractured & Sub Aerial Plays & Drape on Structure High

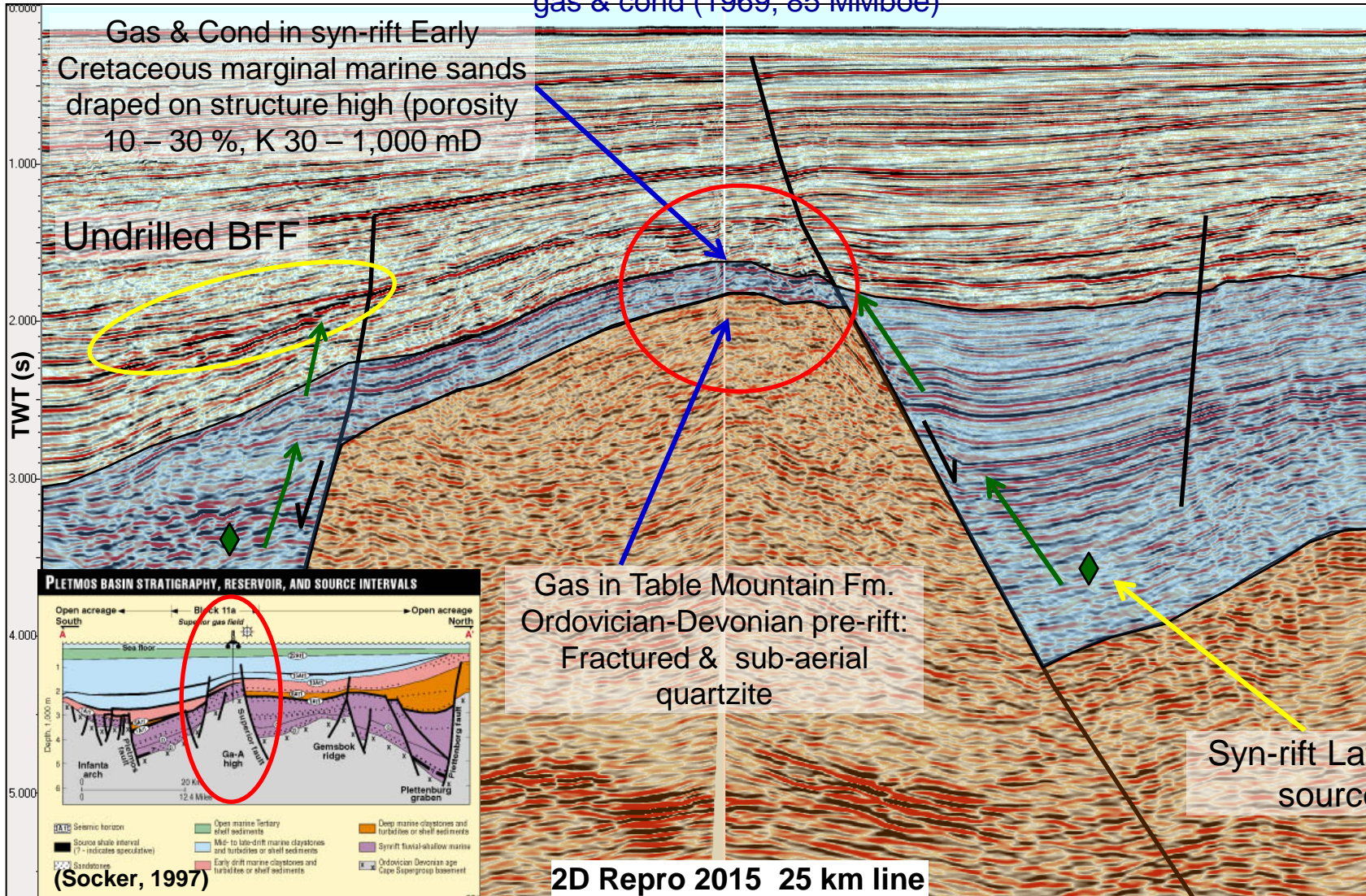


SW

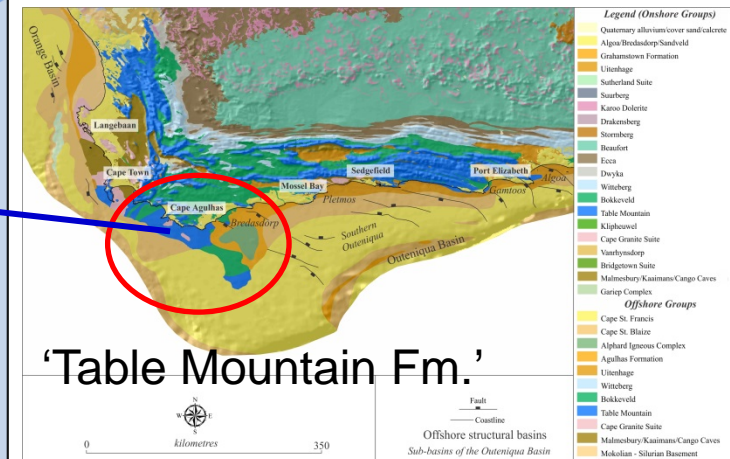
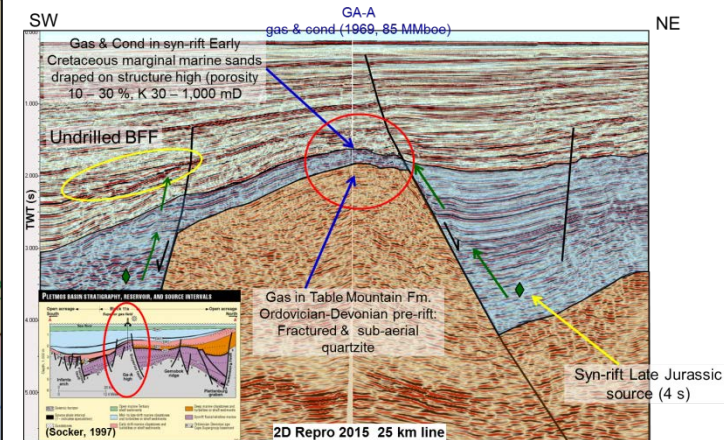
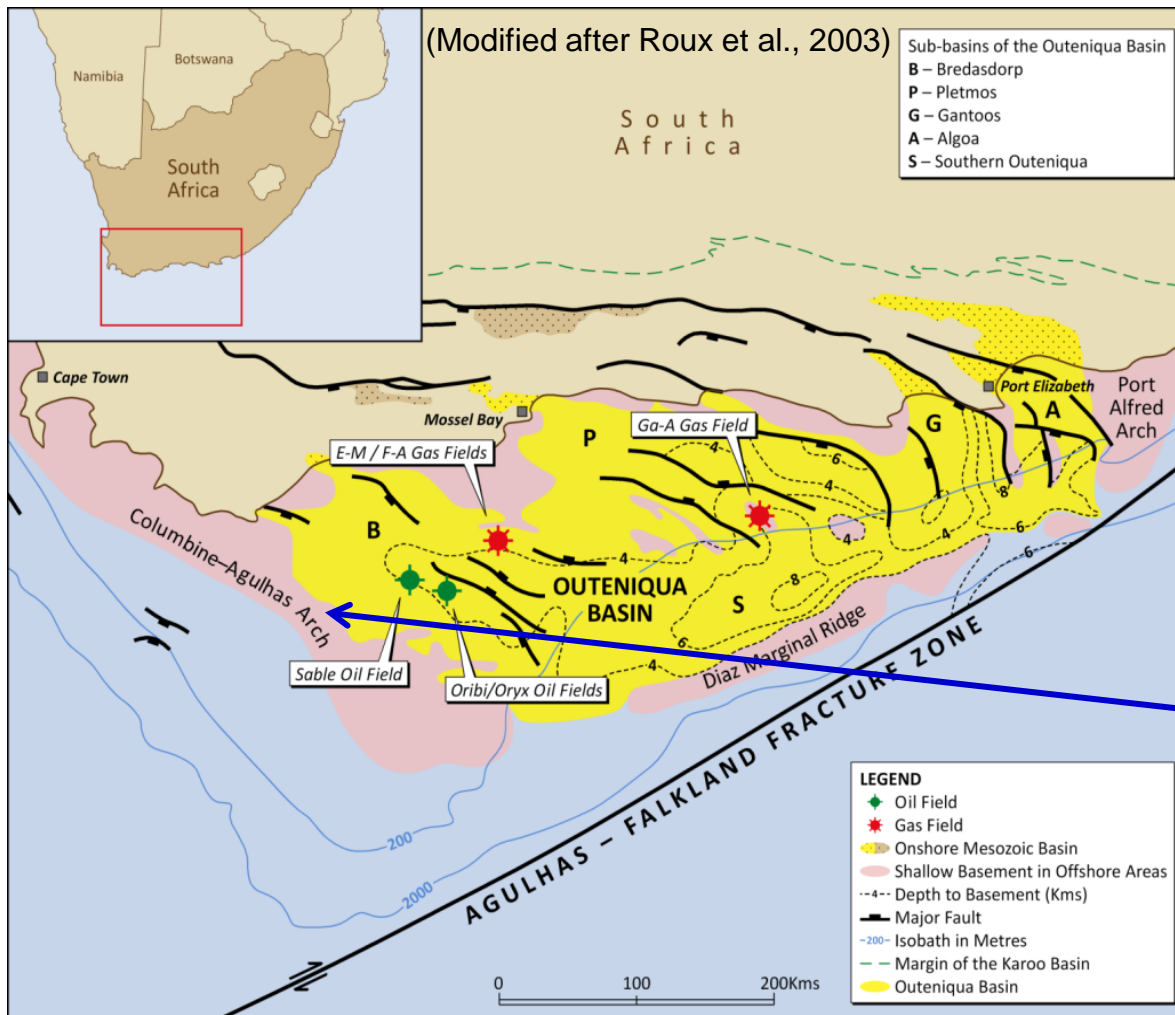
GA-A

gas & cond (1969, 85 MMboe)

NE



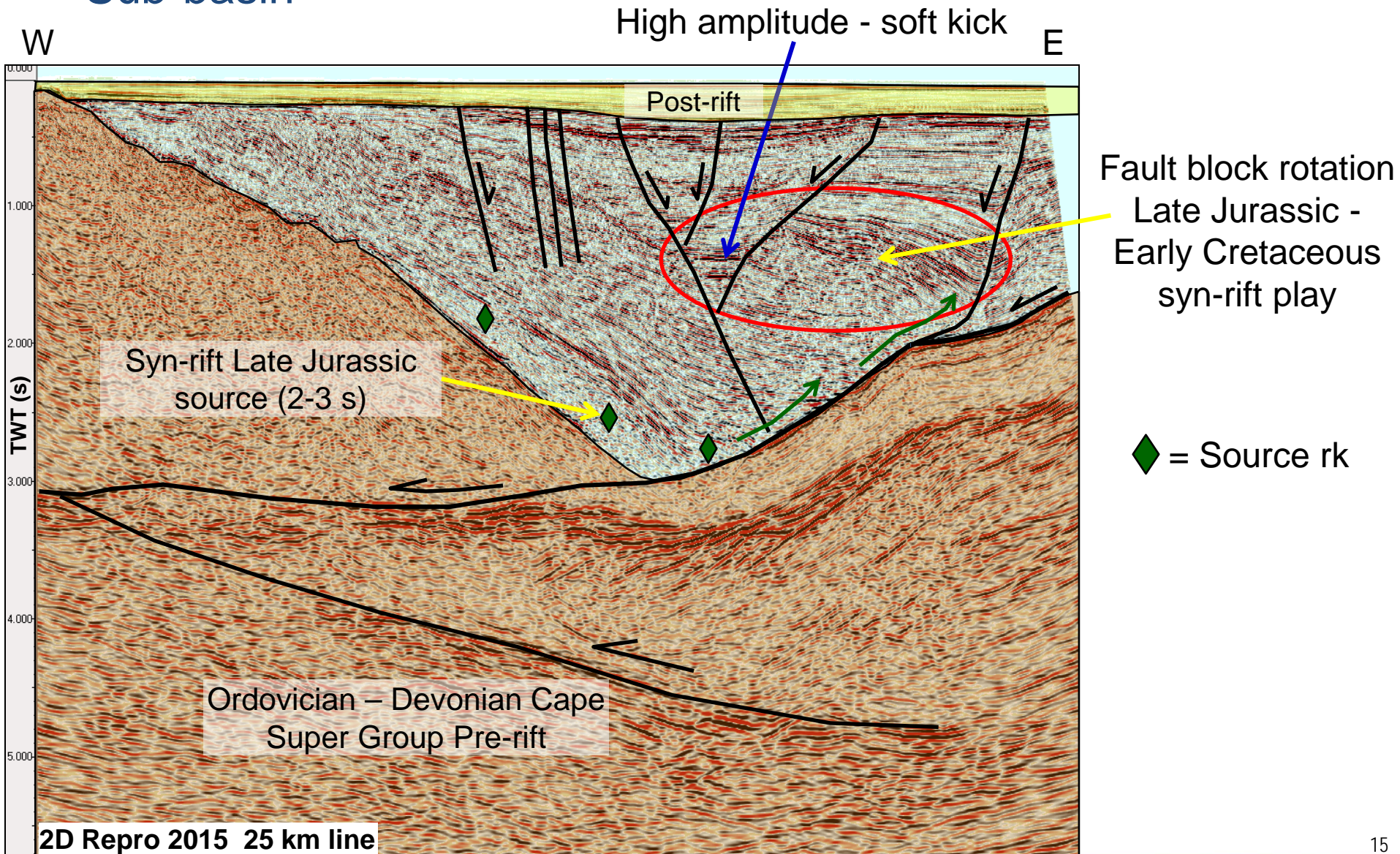
Fractured & Sub-aerial Quartzite Table Mountain Fm. Play



(Cawthra, 2014)

What remains to be tested?

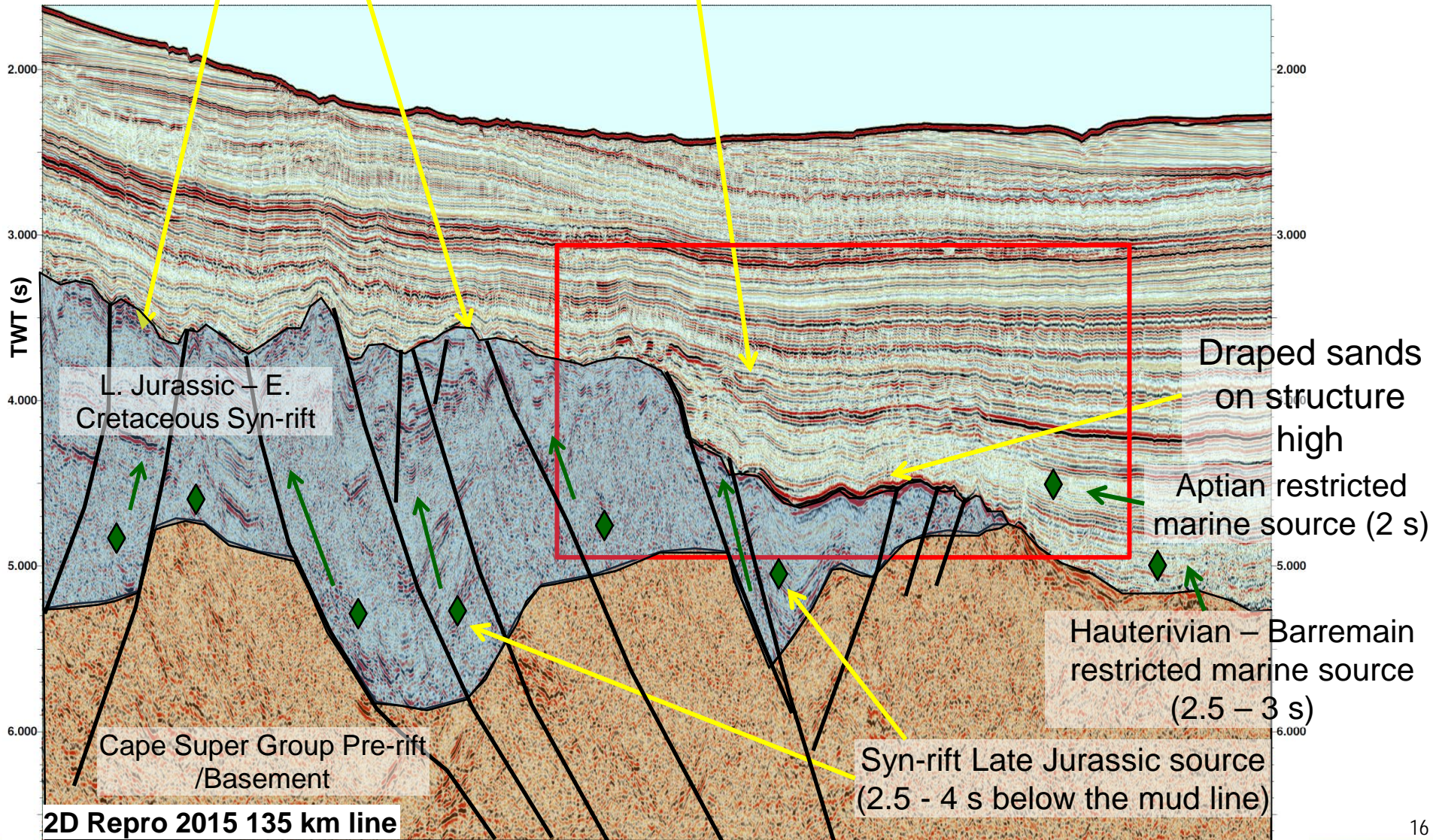
Syn-rift Fault Block Rotation Play in Algoa Sub-basin



Large Syn-rift Structures & BFF in S. Outeniqua



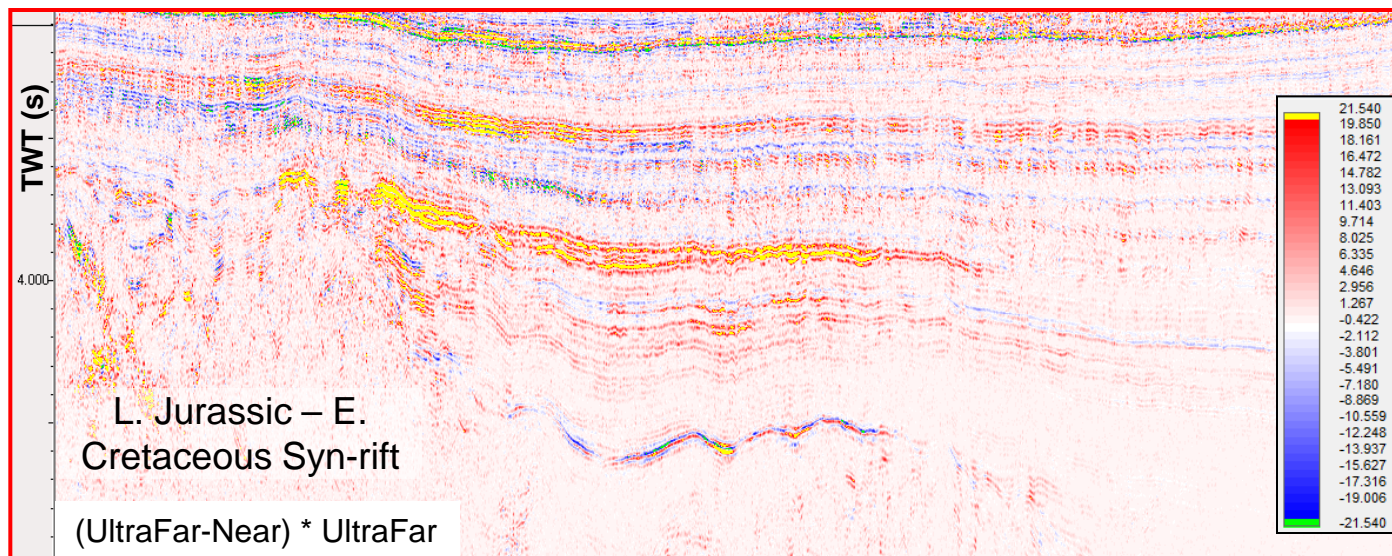
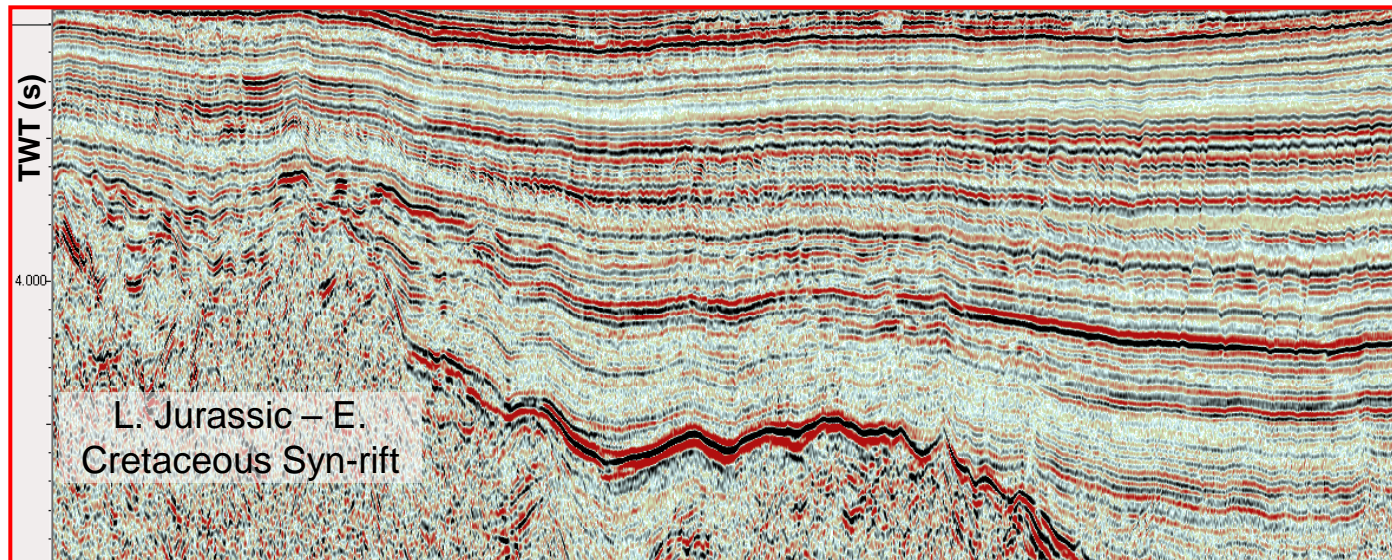
SW



Large Basin Floor Fan – S. Outeniqua

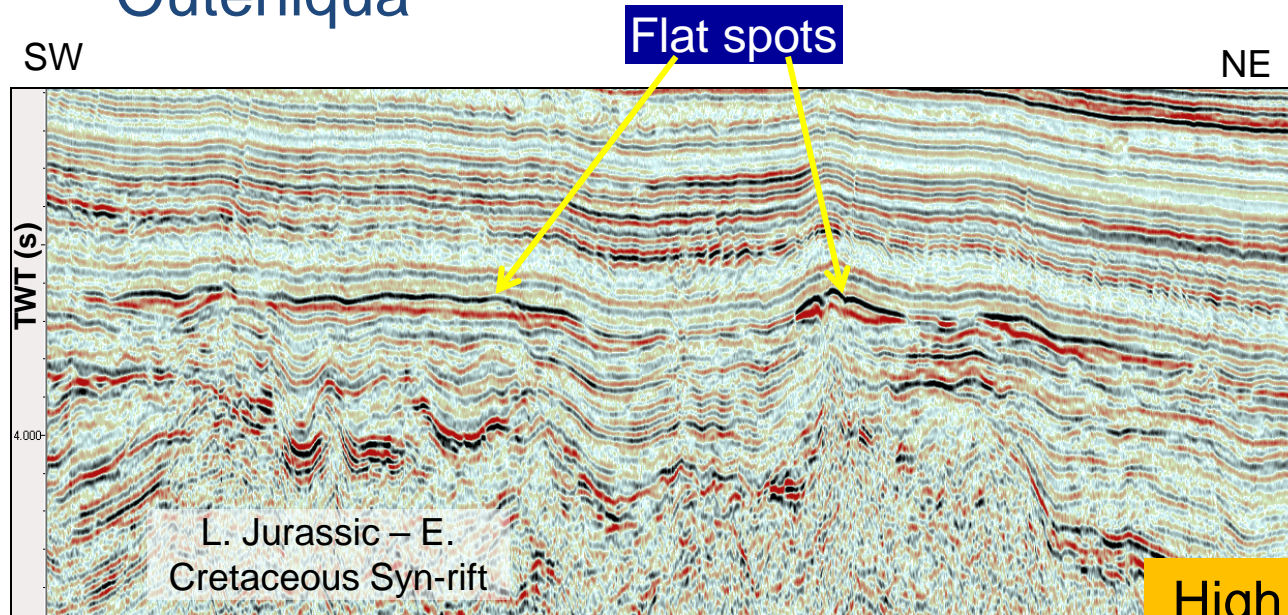
SW

NE

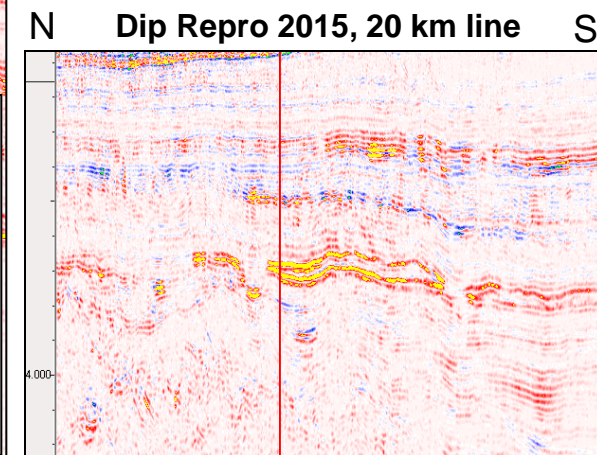
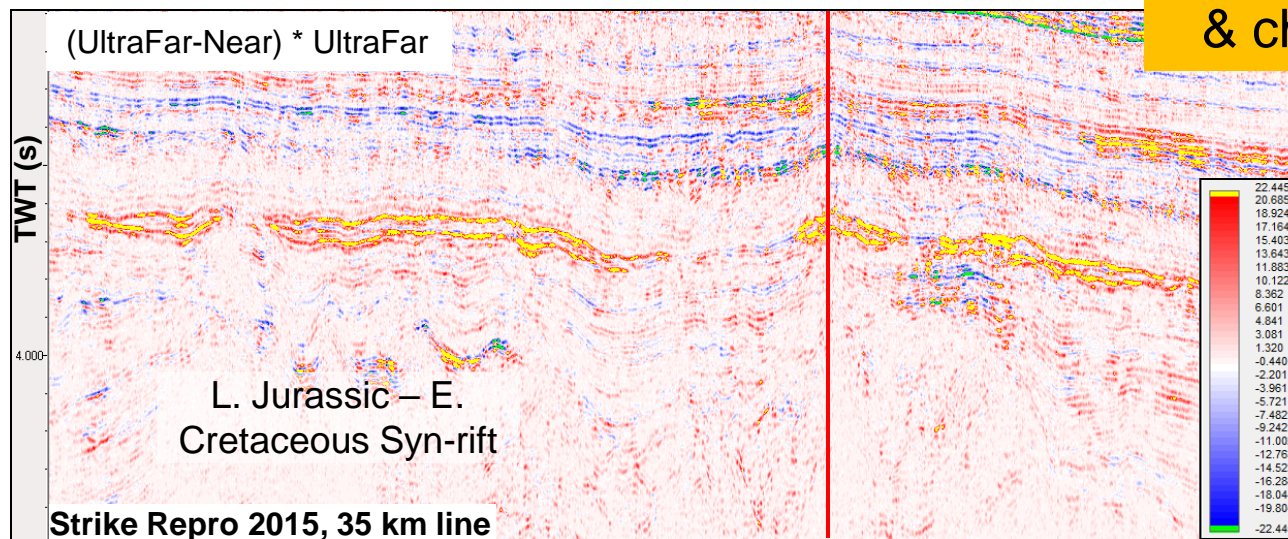


High amplitude
Basin floor fan
with positive AVA

Large Basin Floor Fan & Channel Plays – S. Outeniqua



High amplitude Basin floor fan & channel with positive AVA



Summary Prospectivity

- Fractured & sub-aerial Quartzite Table Mountain Fm. play in the shallow pre-rift basement highs
- Large syn-rift structures: fault block rotation, roll-over anticline & drape sands on structural high
- Large basin floor fan & channel plays with high amplitude supported by AVA analysis

New Petroleum Laws to be approved in mid-year 2017
– more favourable to oil company.

