

# **Play Types and Hydrocarbon Potential of Deep-Water NW Egypt\***

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## **Abstract**

The offshore basins of NW Egypt represent a very underexplored region of the eastern Mediterranean Basin to date. The Matruh Trough is located along this segment of the Egyptian offshore covering an area of about 10,000 km<sup>2</sup>. This trough, trending almost perpendicularly to the coastline, is located west of the Nile Delta province and north of the Western Desert and its offshore part extends across a relatively narrow shelf into the deepwater.

The Obaiyed Offshore block, covering most of the Matruh Trough, is considered as a prospective undrilled deepwater block down dip from the numerous gas and oil fields of the Western Desert petroleum province. In fact, one of the plays in the block is the offshore extension of the onshore Western Desert Cretaceous play. The offshore play extension model is similar conceptually to the Sirte Basin in Libya where offshore plays are merely extensions of proven onshore concepts.

However, at least five other deepwater play types have been identified in the block. Most of them are related to a large shale detachment system and therefore are considered unique to the Matruh Trough. As to the prospectivity, just the numerous listric fault bounded supra-detachment structures, providing repeatability and low finding costs, have a combined unrisks resource potential in excess of 1 BBO or 5 TCF of gas. This particular play type is very similar to the classical raft play of the Lower Congo Basin providing a very useful analogue for the Obaiyed Offshore block. Significant oil and gas shows from the onshore Mersa Matruh-1 well, located near the coastline, support the offshore extension of the Matruh Trough with a working petroleum system.

### **Selected References**

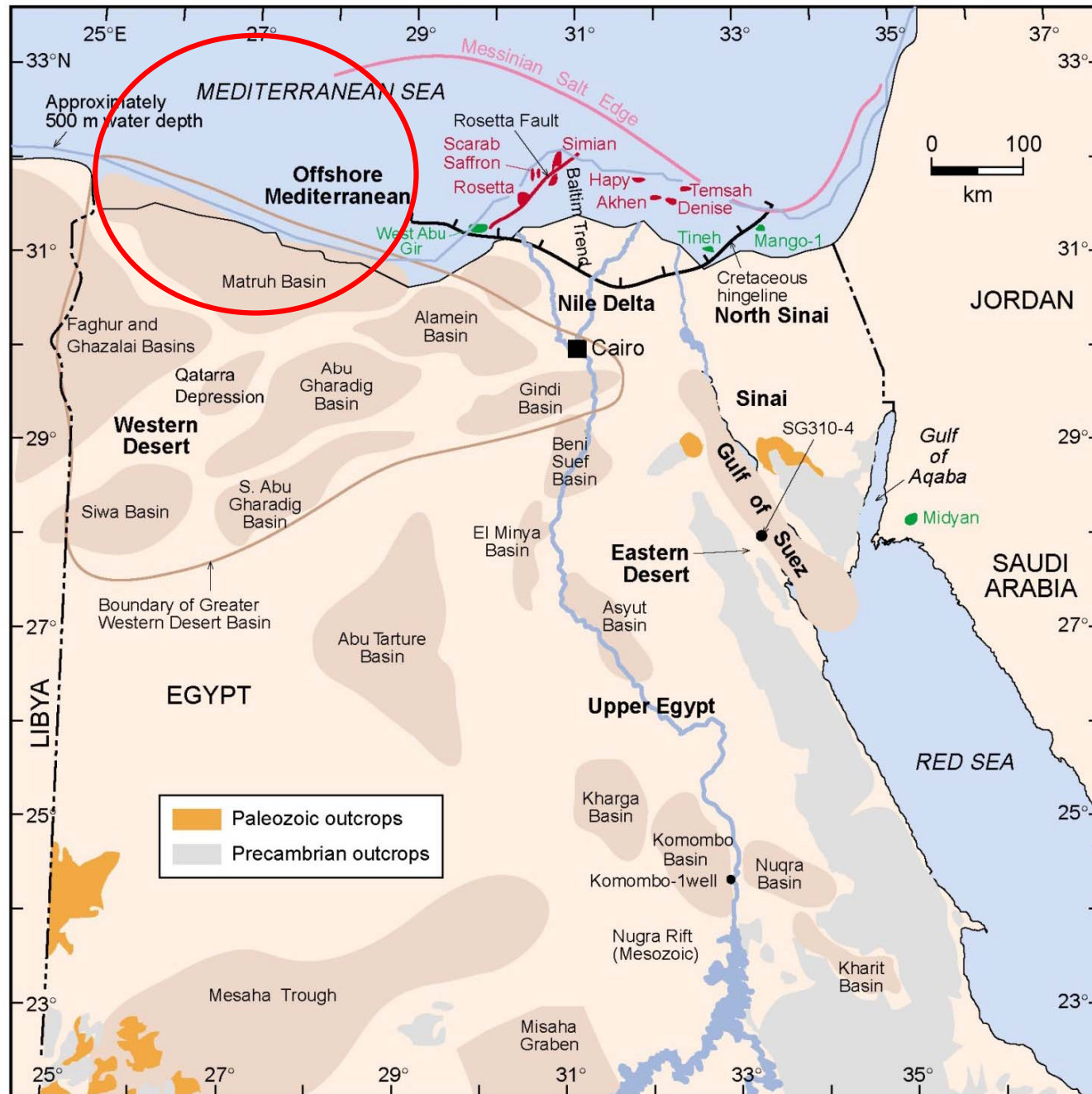
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# Play types and hydrocarbon potential of deepwater NW Egypt

Gabor Tari, Hussein Hussein and Bernhard Novotny  
Denver, AAPG Meeting, June 8, 2009



# Sedimentary basins of Egypt



Dolson and others (2001)

Move & More.



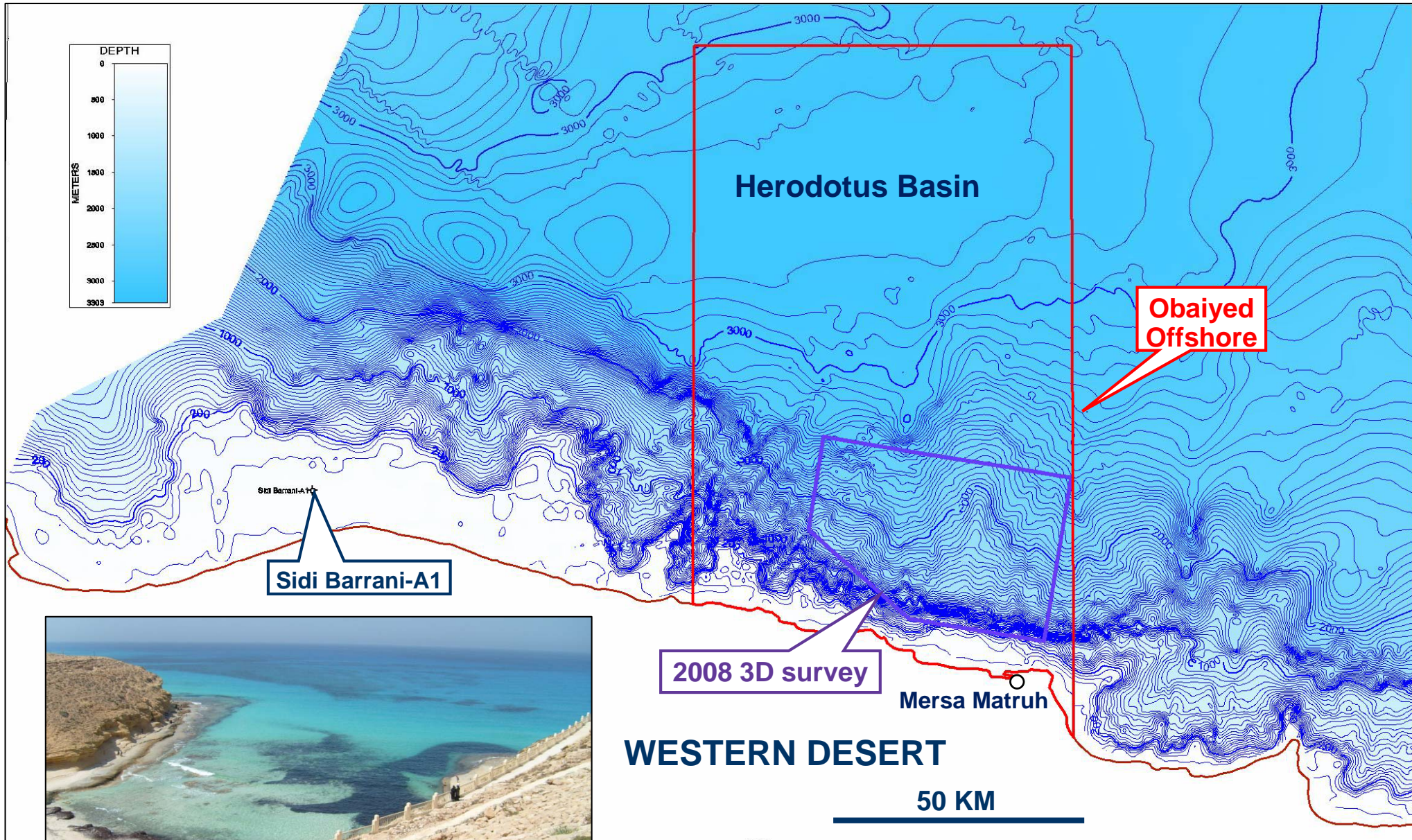


# Outline

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- **Regional setting, offshore NW Egypt**
- **Deepwater play types**
  - **Rafts**
  - **Hinge zone (or marginal ridge?)**
  - **Messinian subsalt**
- **2D seismic examples**
- **Examples based on recent 3D seismic data**
- **Analogues**
- **Conclusions**

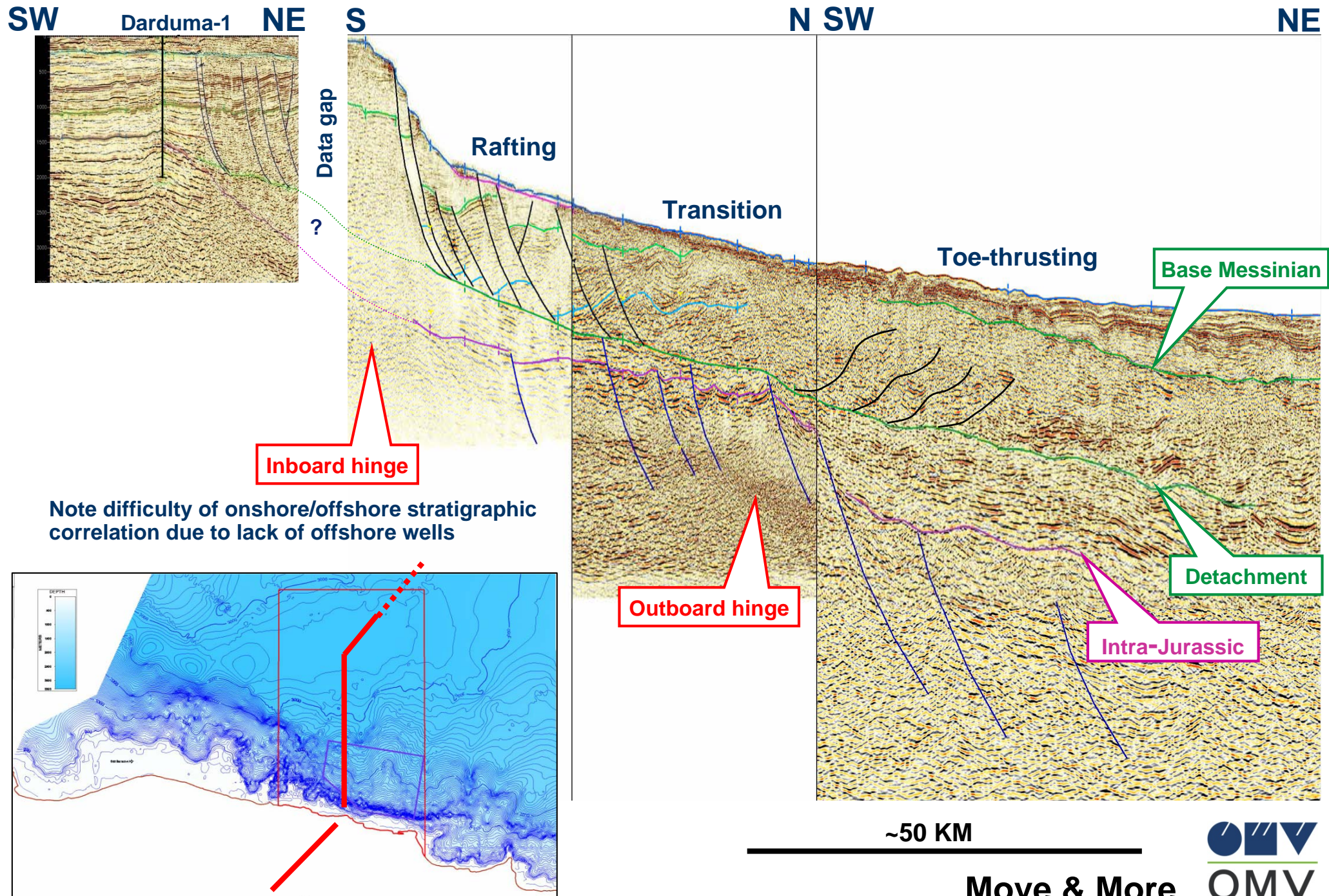
# Bathymetry, NW Egypt



Beach at Mersa Matruh,

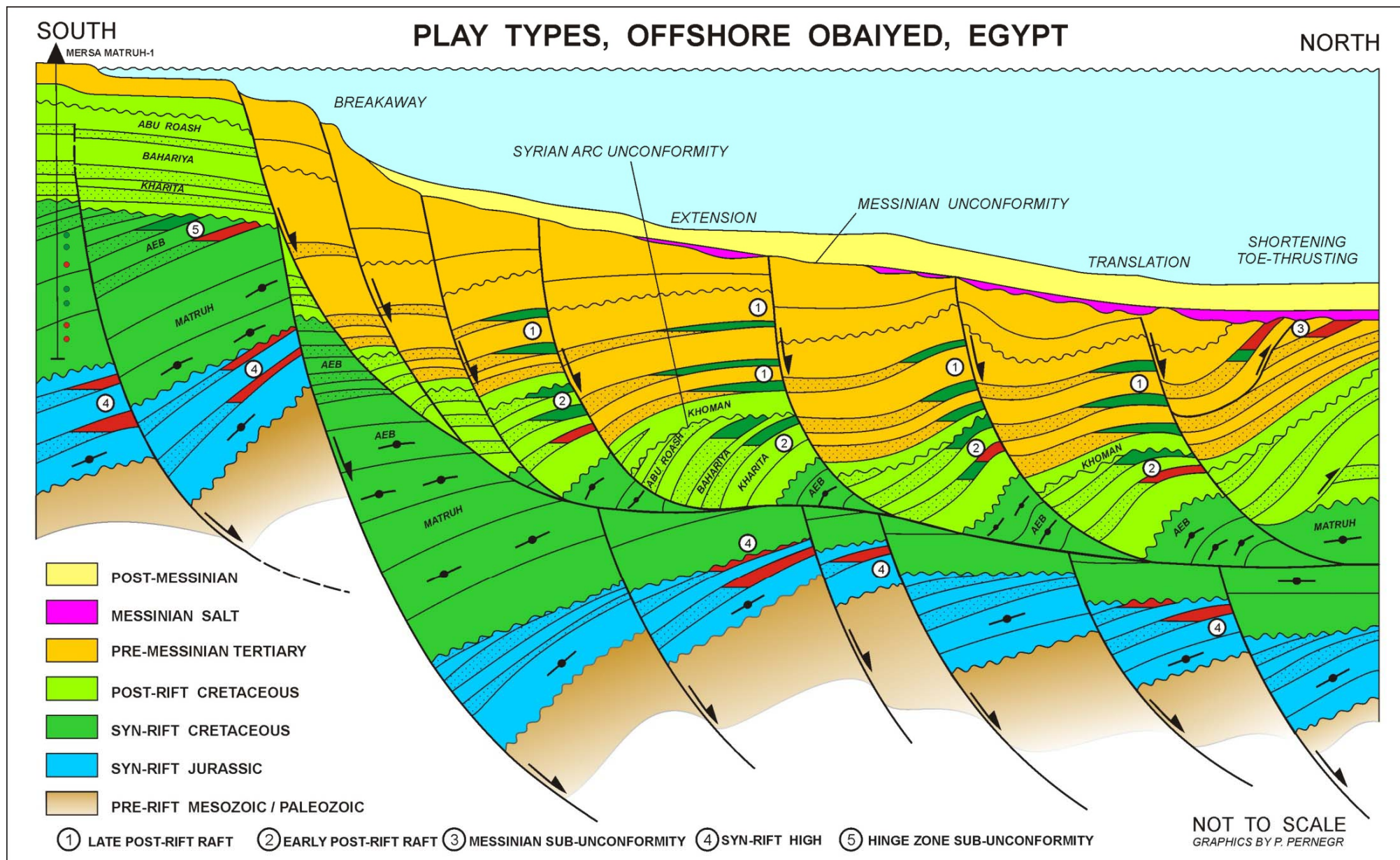


# Regional onshore/offshore 2D seismic transect





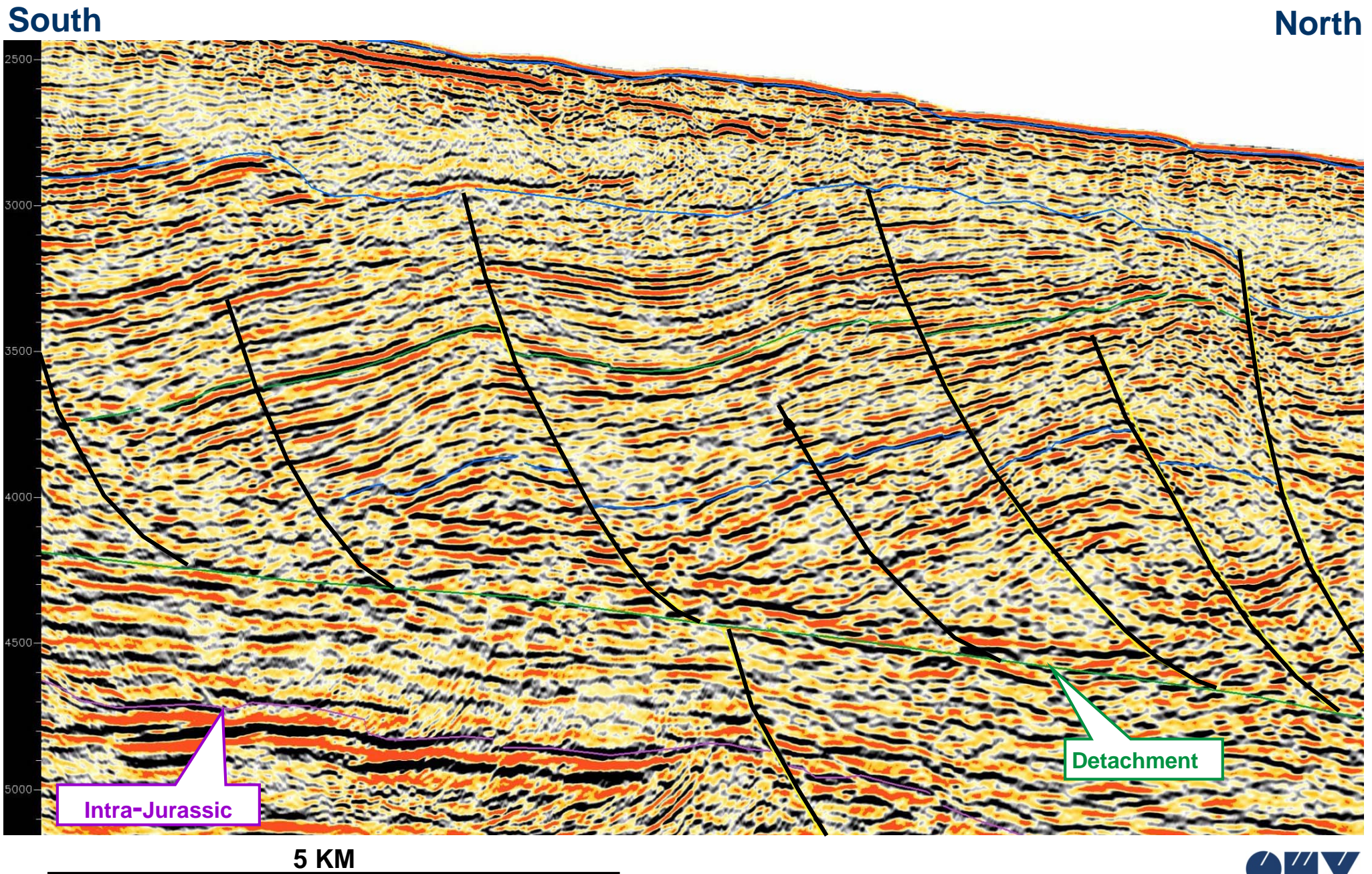
# Play types, shelf and upper slope



The Alpha Trend is associated with the supra-detachment “rafts”



# Seismic expression of rafting on vintage 2D seismic



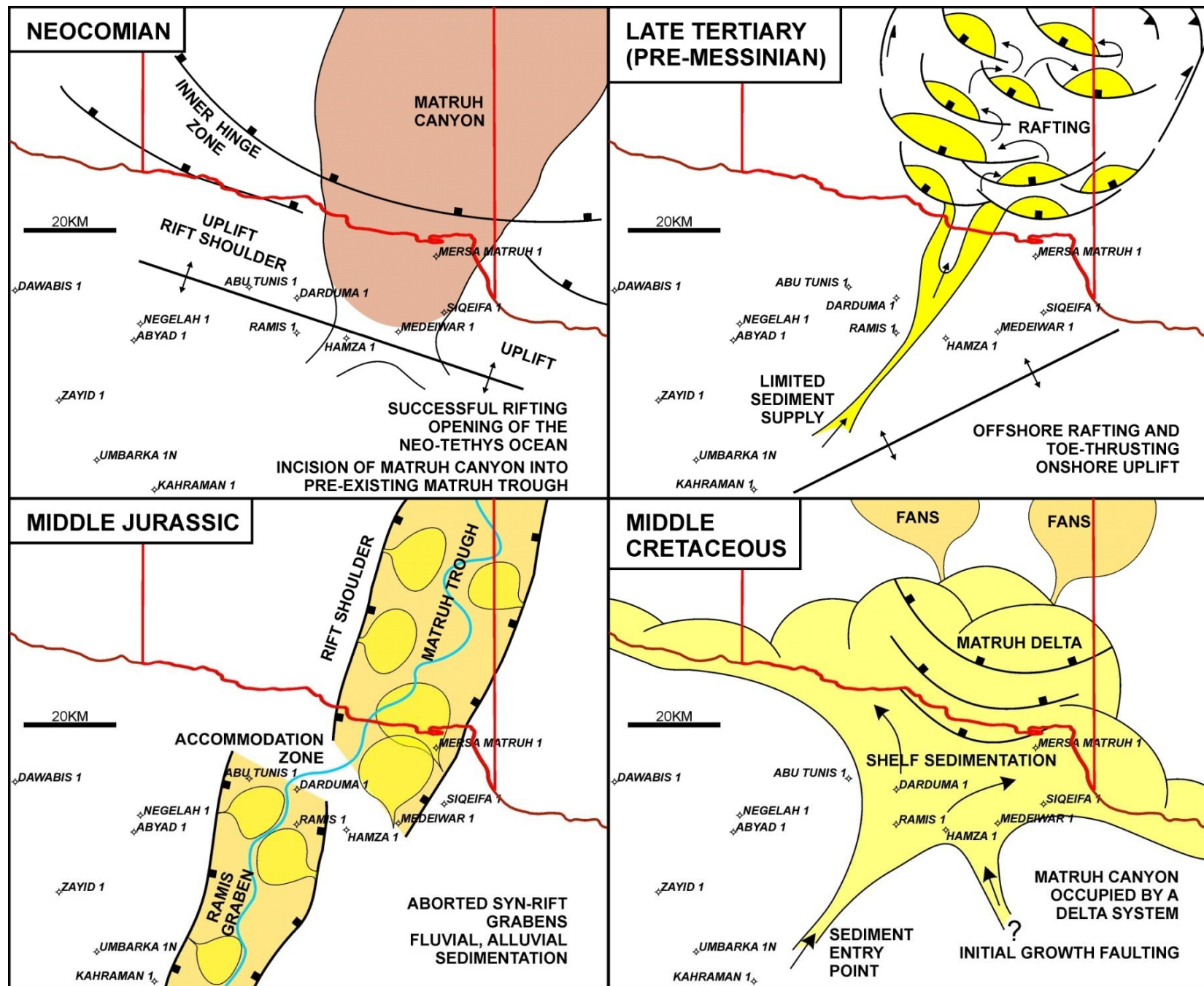


The map displays the Matruh Canyon Time Structure and surrounding geological features. Key elements include:

- Coastline:** Indicated by a red line along the top and right edges.
- 3D survey:** A purple outlined area in the upper left quadrant.
- Rafted domain:** A large red outlined area in the upper right quadrant.
- Obaiyed Offshore:** A red outlined area in the lower right quadrant.
- Depth Structures:** Labeled areas include "Kharita(?) Depth Structure", "Bahariya(?) Depth Structure", and "Matruh Canyon Time Structure".
- Scale:** A scale bar at the bottom left indicates 20 KM.
- Projection:** The map uses a Transverse Mercator Projection, with coordinates in UTM (Universal Transverse Mercator) system.

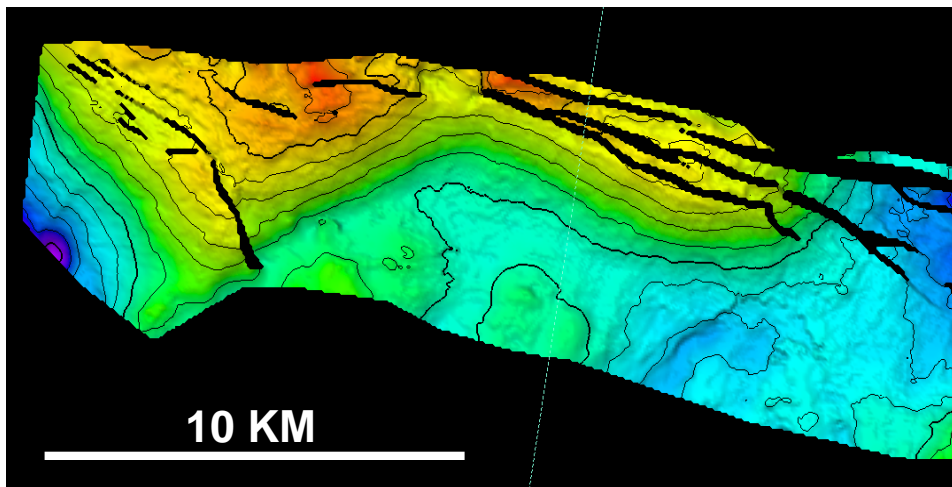
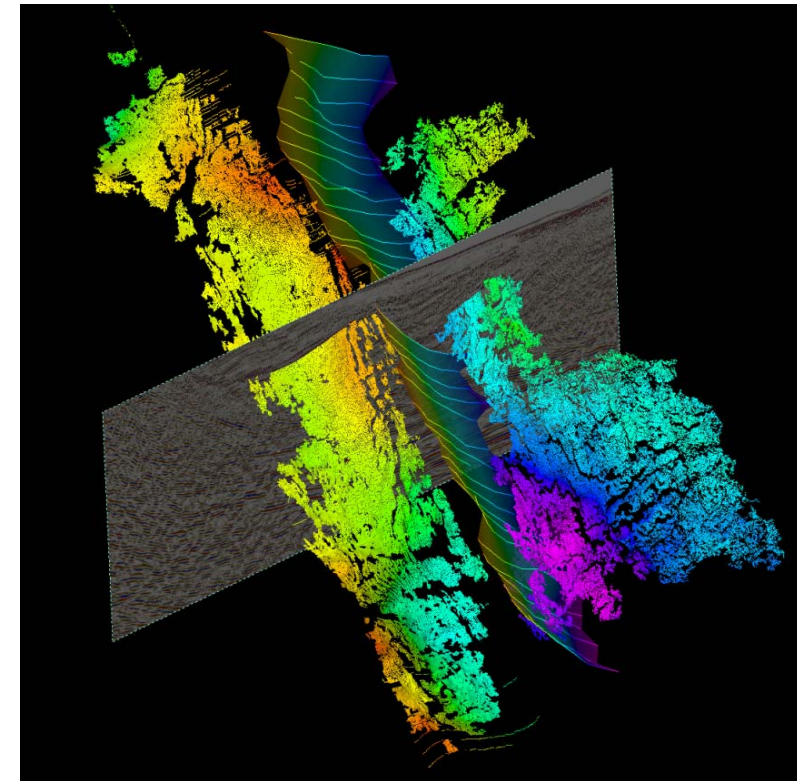
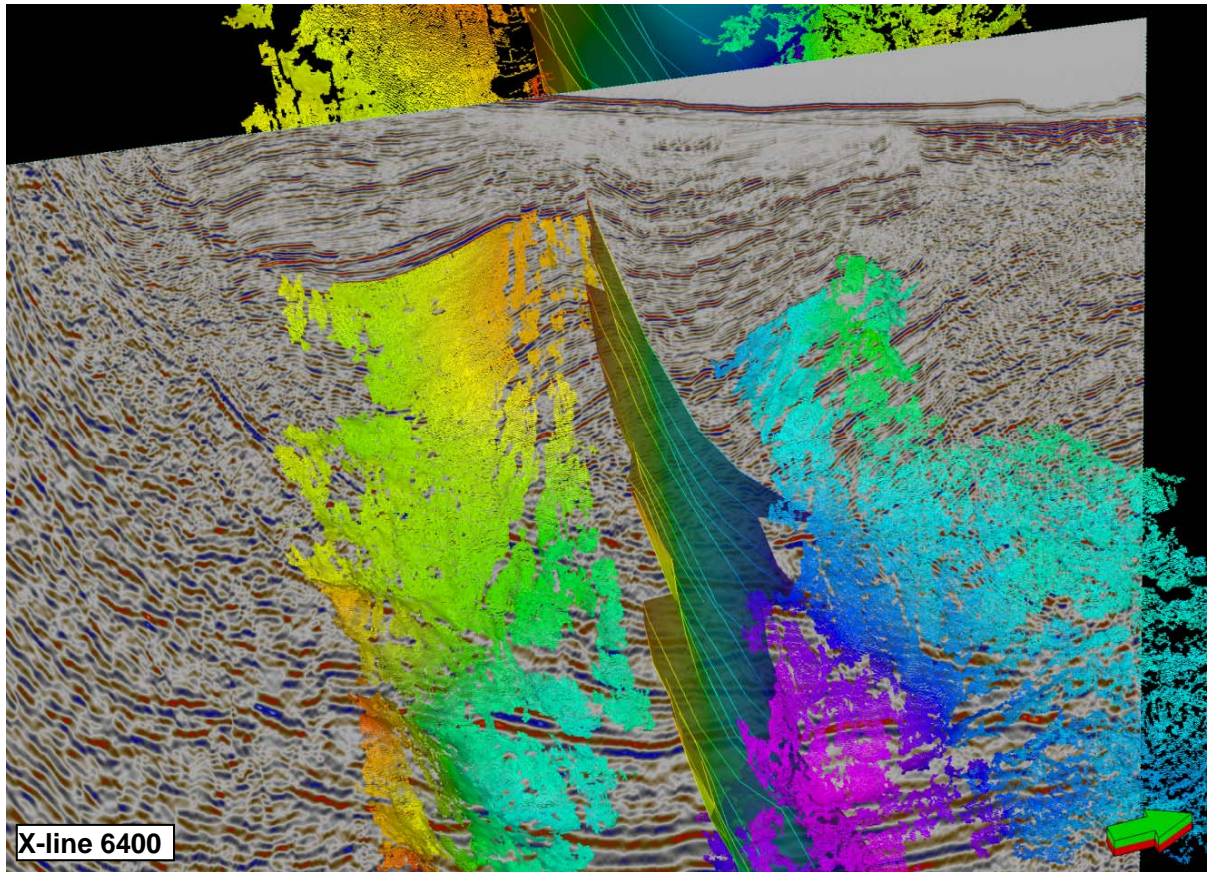


# Matruh "Basin", map-view summary of evolution





# Raft Gamma imaged on 3D seismic data



Depth structure,  
CI: 50m, crest at 1,910 m



# Multiple low-angle normal faults, Block 0, Cabinda, Angola

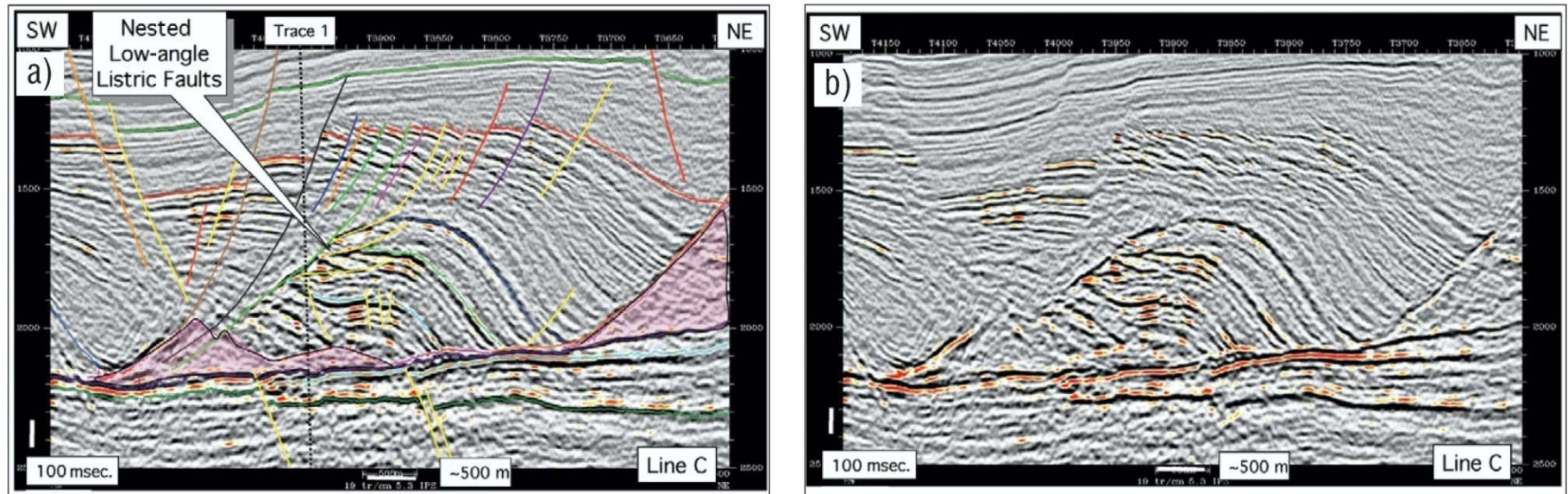


Figure 7. (a) Dip-oriented line C from Kali 3D survey, with horizon and fault interpretation. Line shows several stacked low-angle listric faults. (b) Same line as (a) without interpretation.

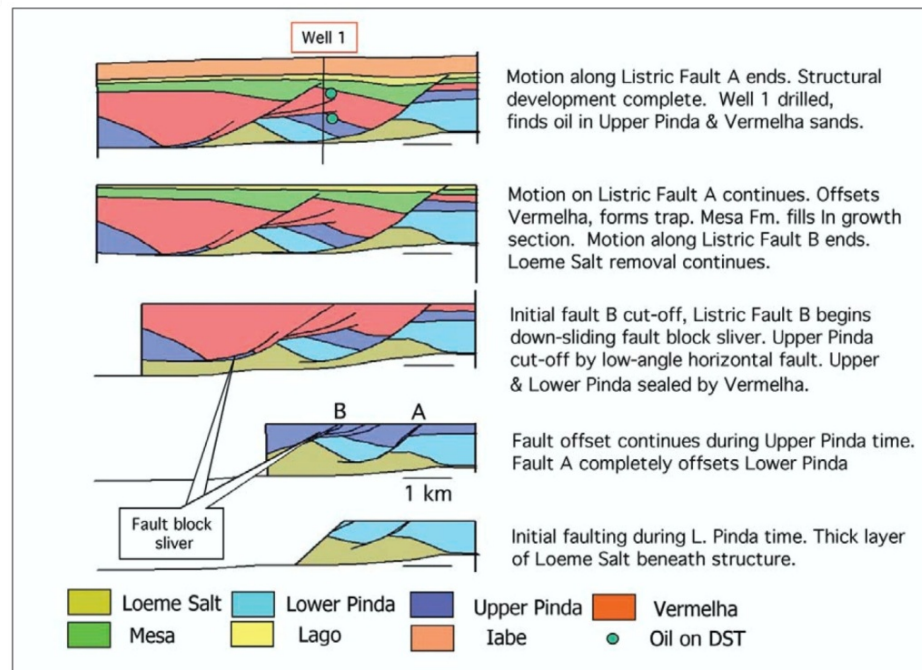


Figure 15. Lithotect depth reconstruction of line A from Kali 3D survey.

Chimney and Kluth (2002)

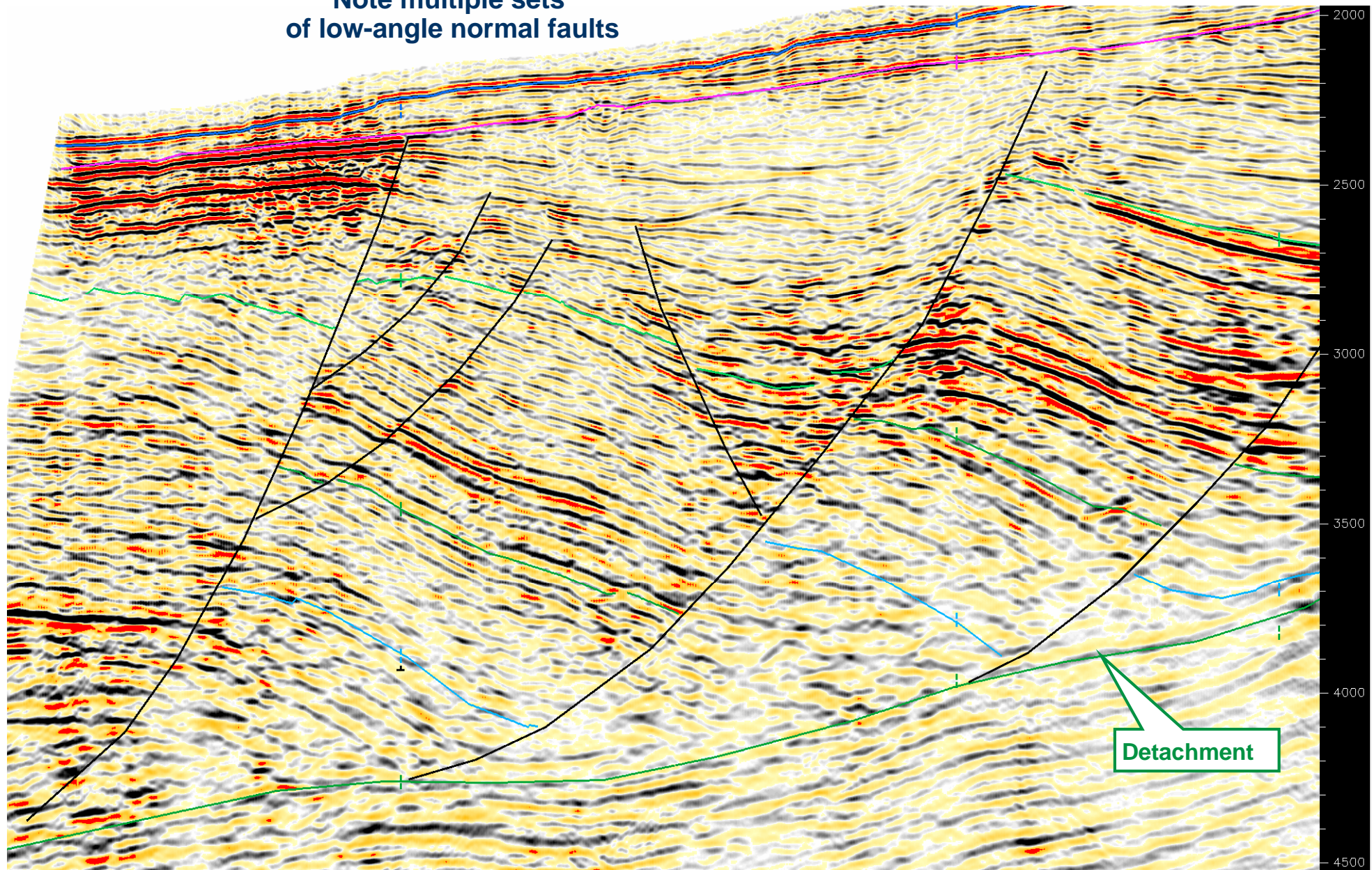


# Multiple low-angle normal faults, Obaiyed Offshore, Egypt

North

South

Note multiple sets  
of low-angle normal faults

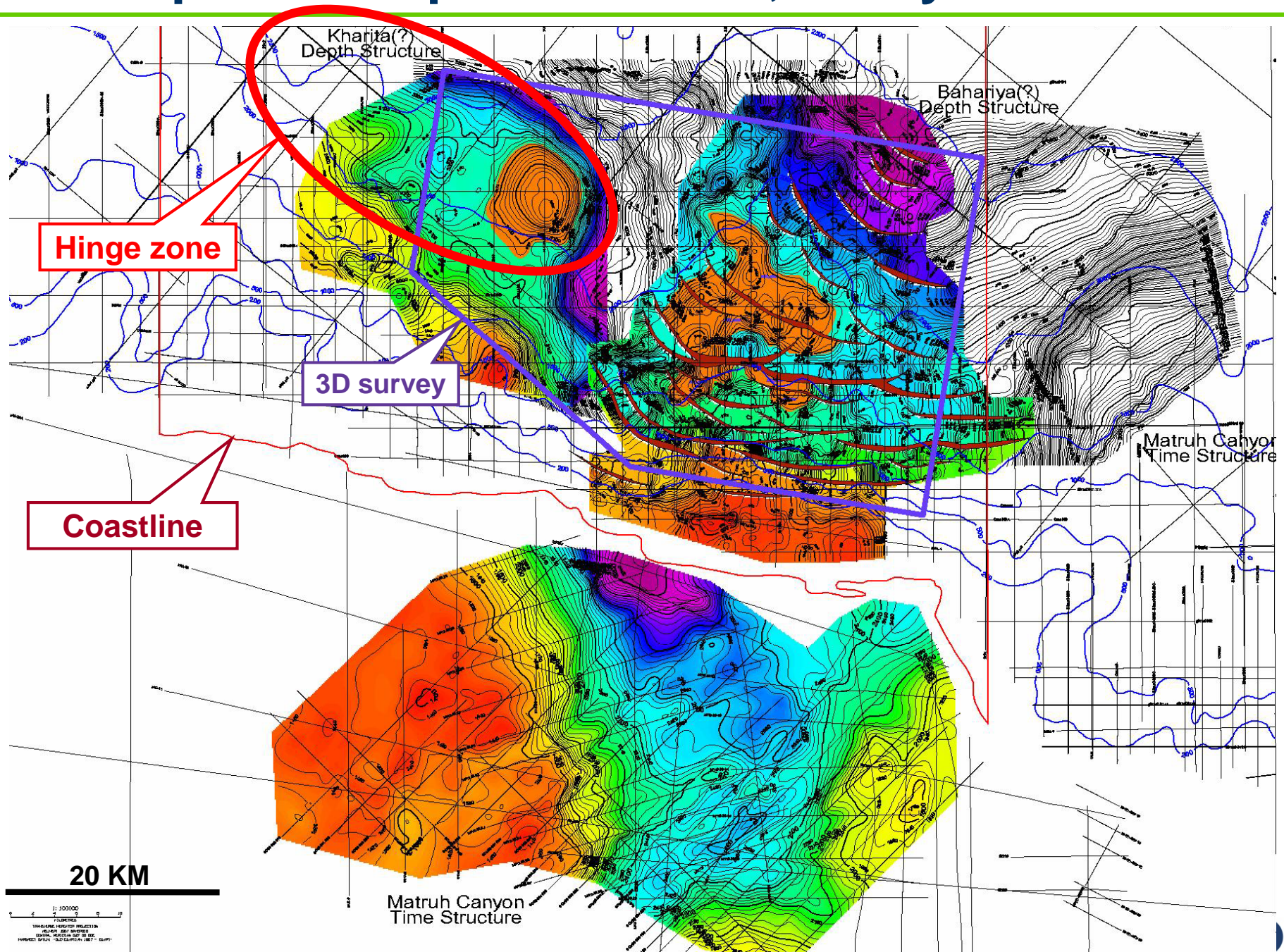


5 KM

Move & More. OMV



# Composite map of 2D leads, Obaiyed Offshore

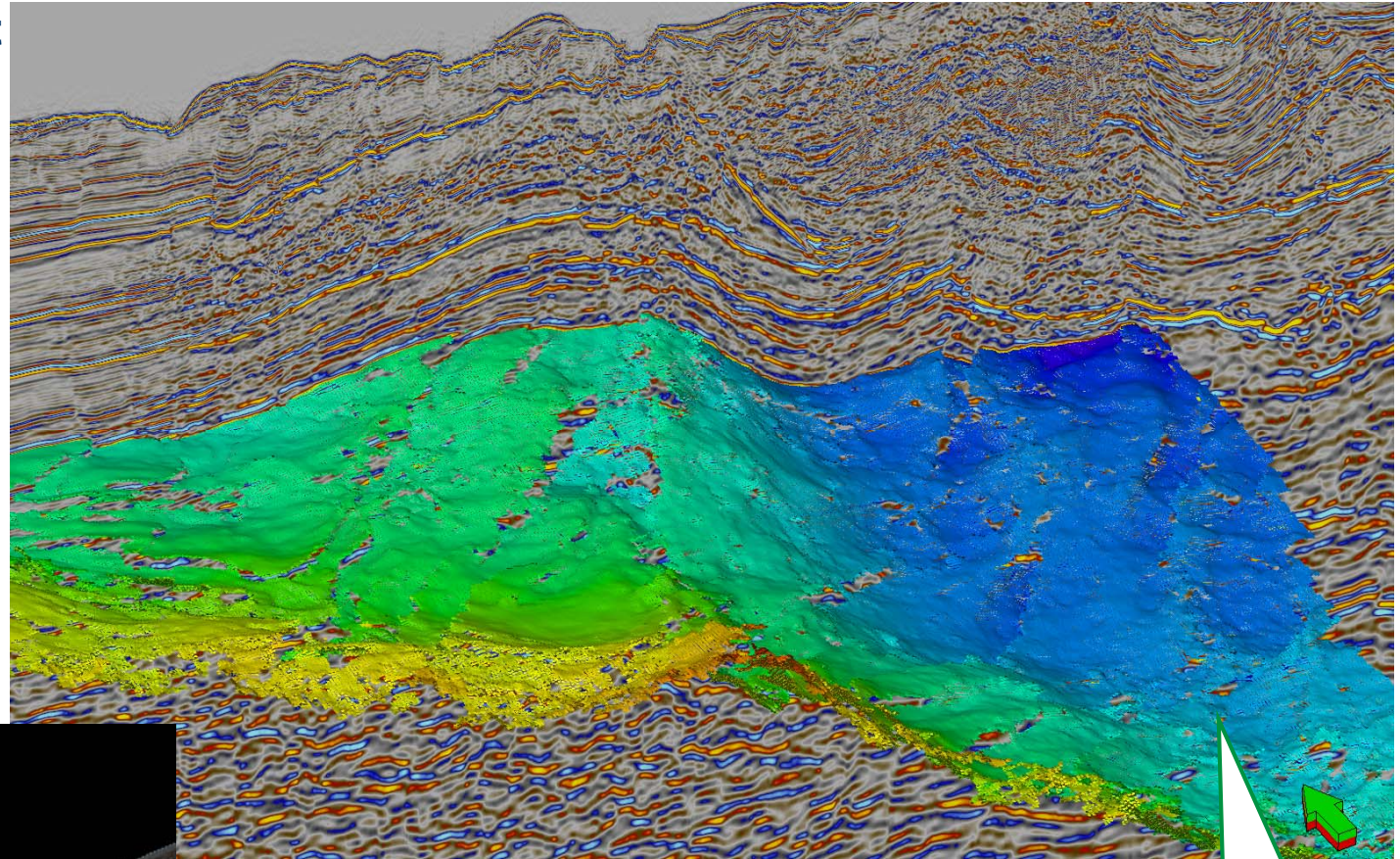




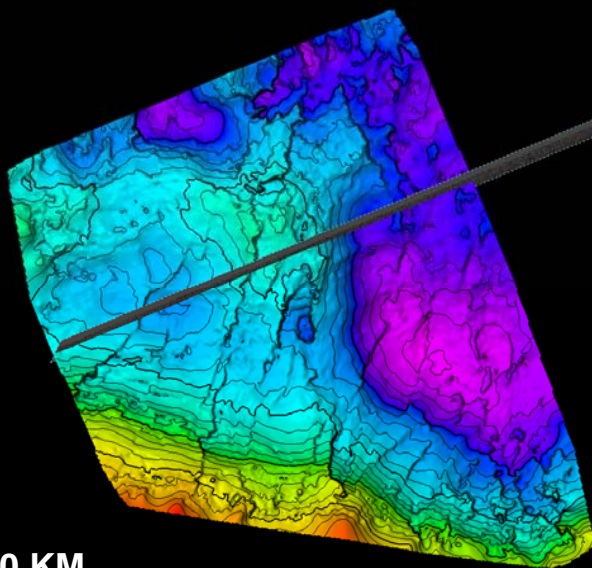
# Seismic expression of the Omega Lead on 3D seismic

West

East



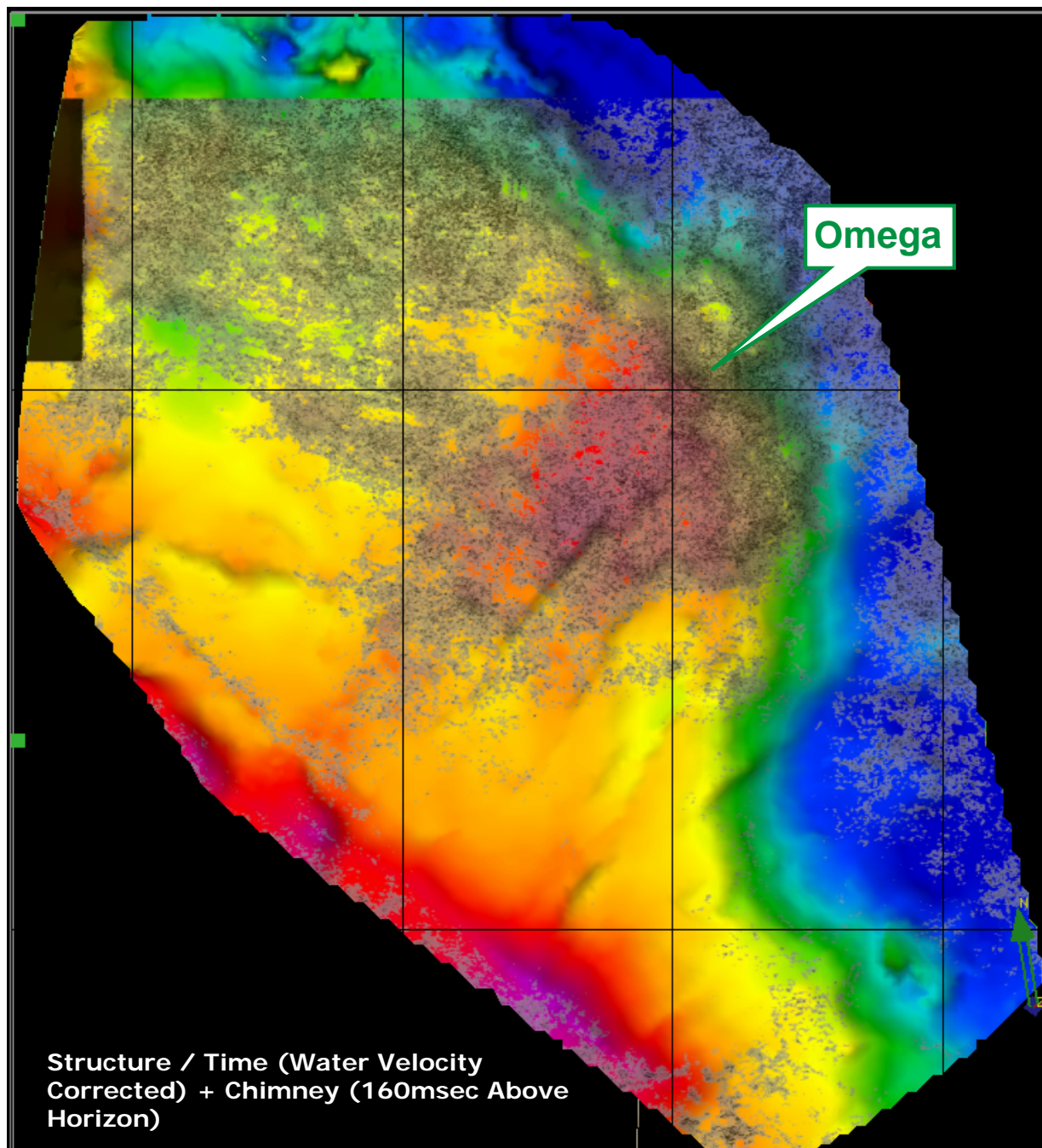
Matruh Canyon



10 KM

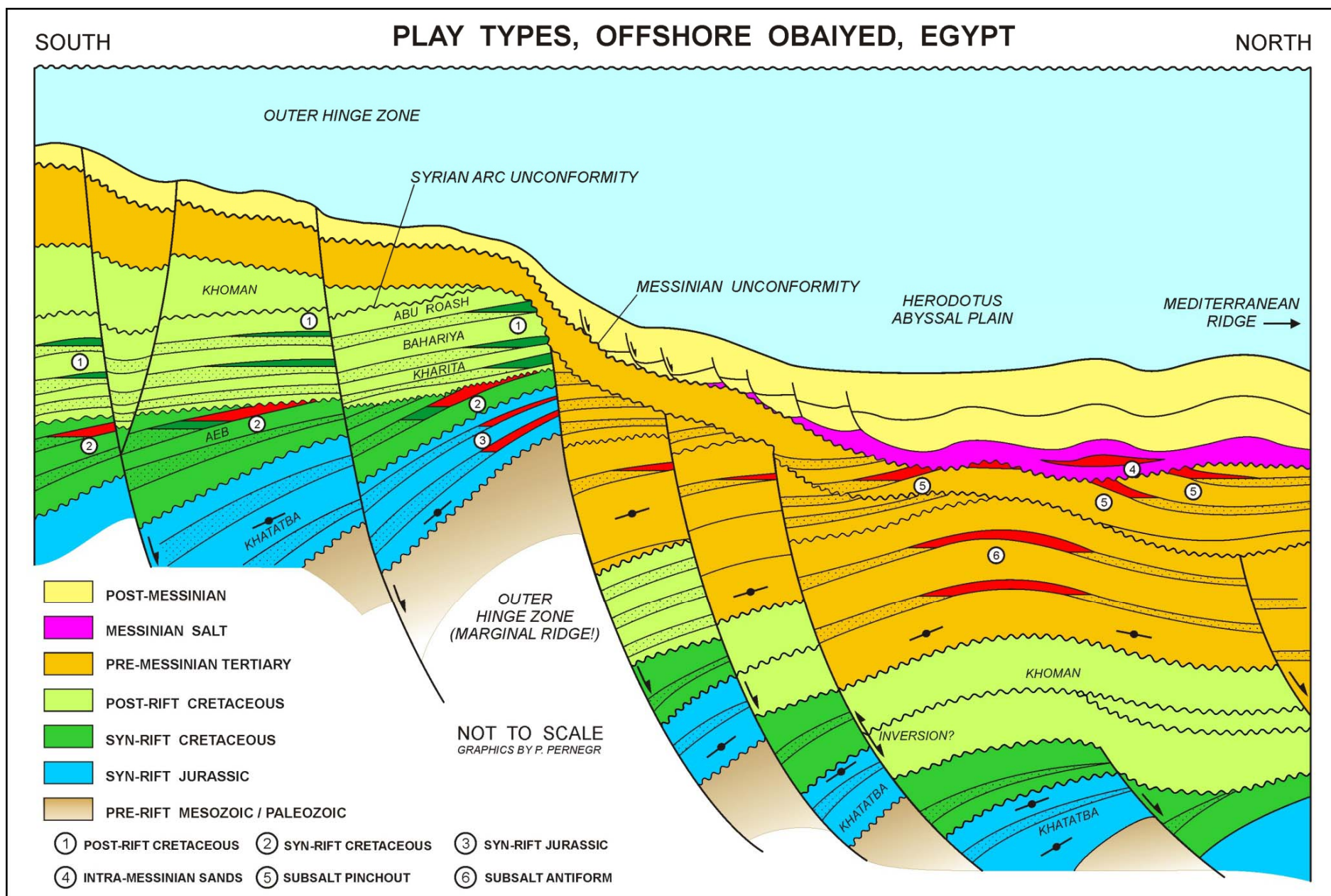


# Evidence for gas charge based on a chimney cube



Chimney probability results 160 msec above the Kharita horizon show a large gas cloud over the crest of Omega and along the hinge zone trend to the NW

## Play types, lower slope and abyssal plain



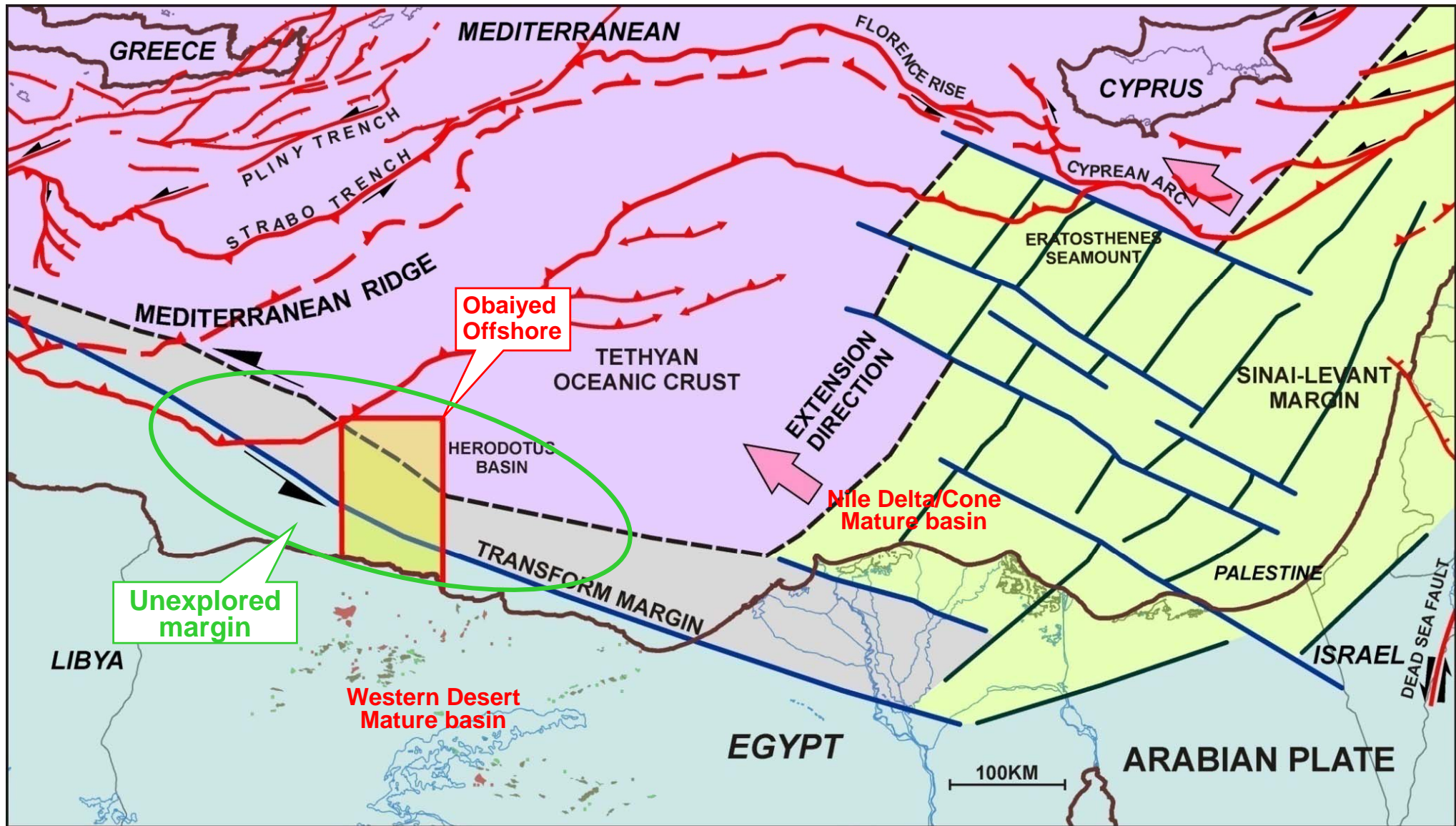
**The Omega Trend is associated with the “hinge zone” (or marginal ridge if it is indeed a transform margin)  
The Messinian salt related play types remain unevaluated due to insufficient seismic data coverage**

**Move & More. OMV**





# Hinge zone or marginal ridge in the deepwater?



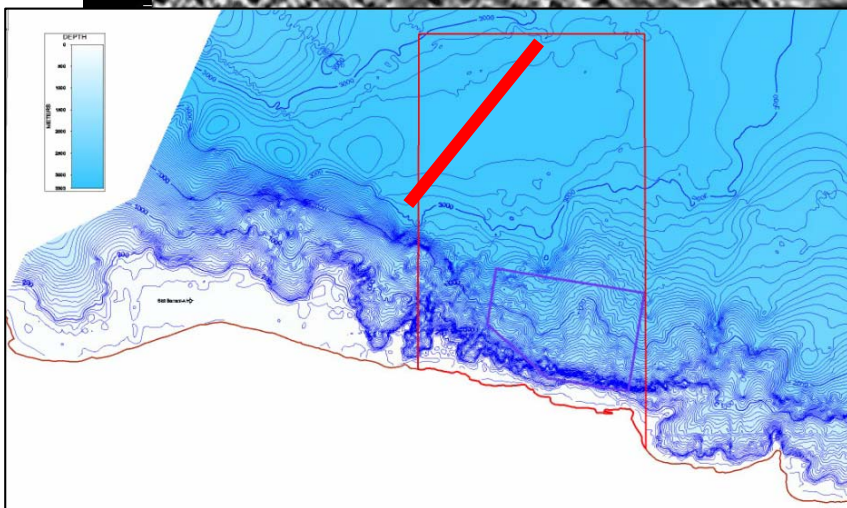
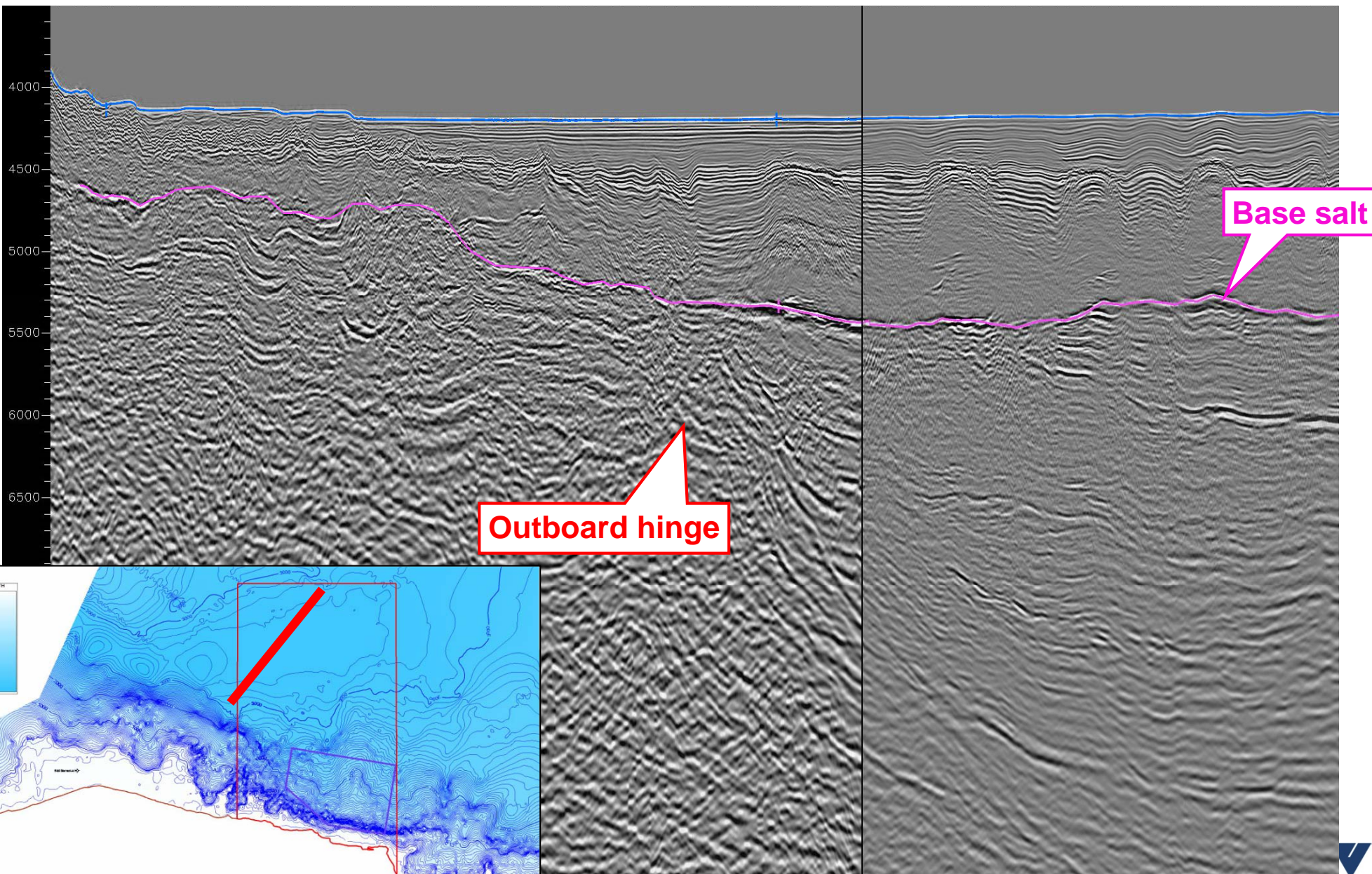
modified after DOTMED (2001); Longacre and others (2007)



# Sub-Messinian potential, offshore Obaiyed

SW

NE



10 KM

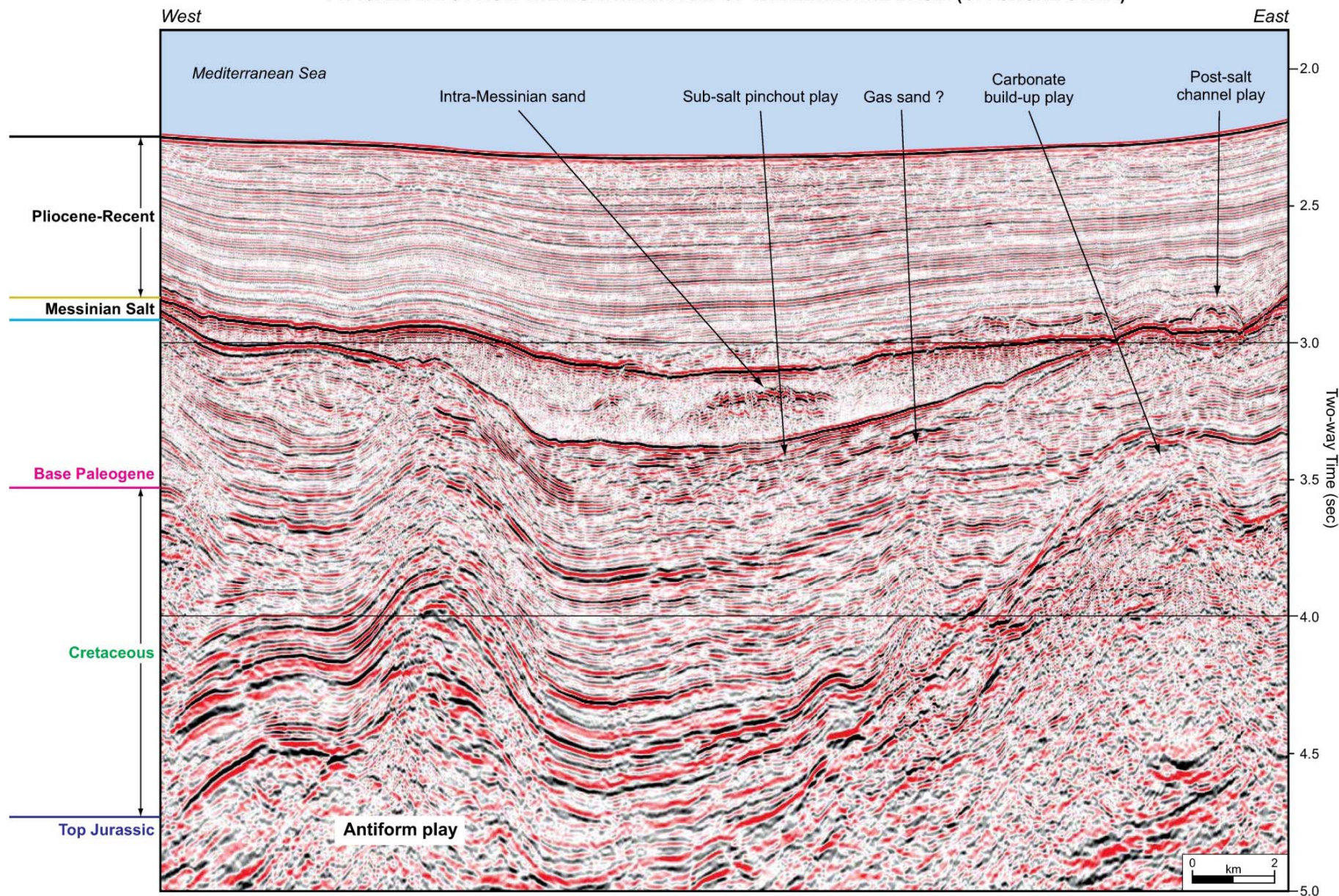
Move & More.

OMV



# Analogue plays from offshore Syria

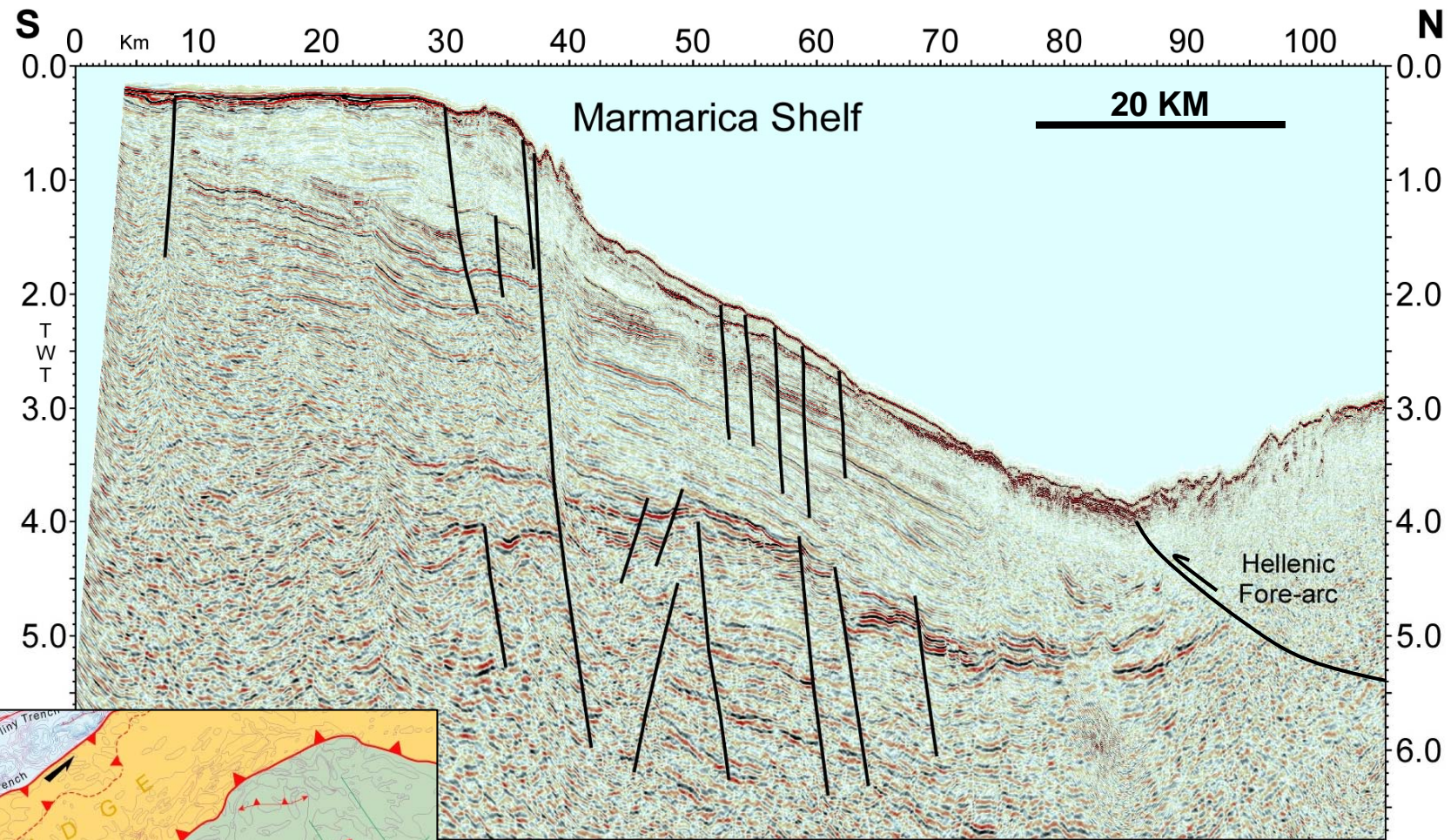
TYPICAL PLAYS FROM THE NORTHERN PART OF THE LEVANTINE BASIN (OFFSHORE SYRIA)



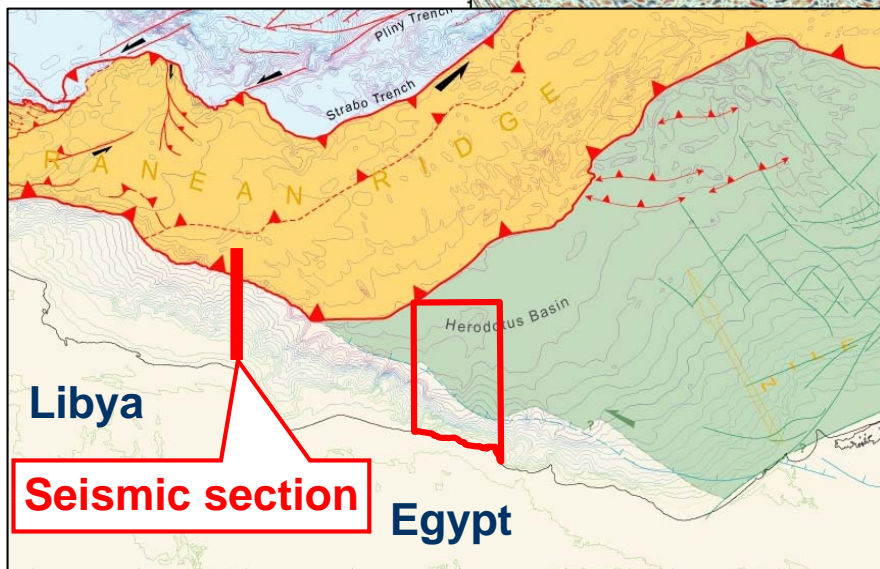
Roberts and Peace (2007)



# Deepwater tectonics in easternmost Libya



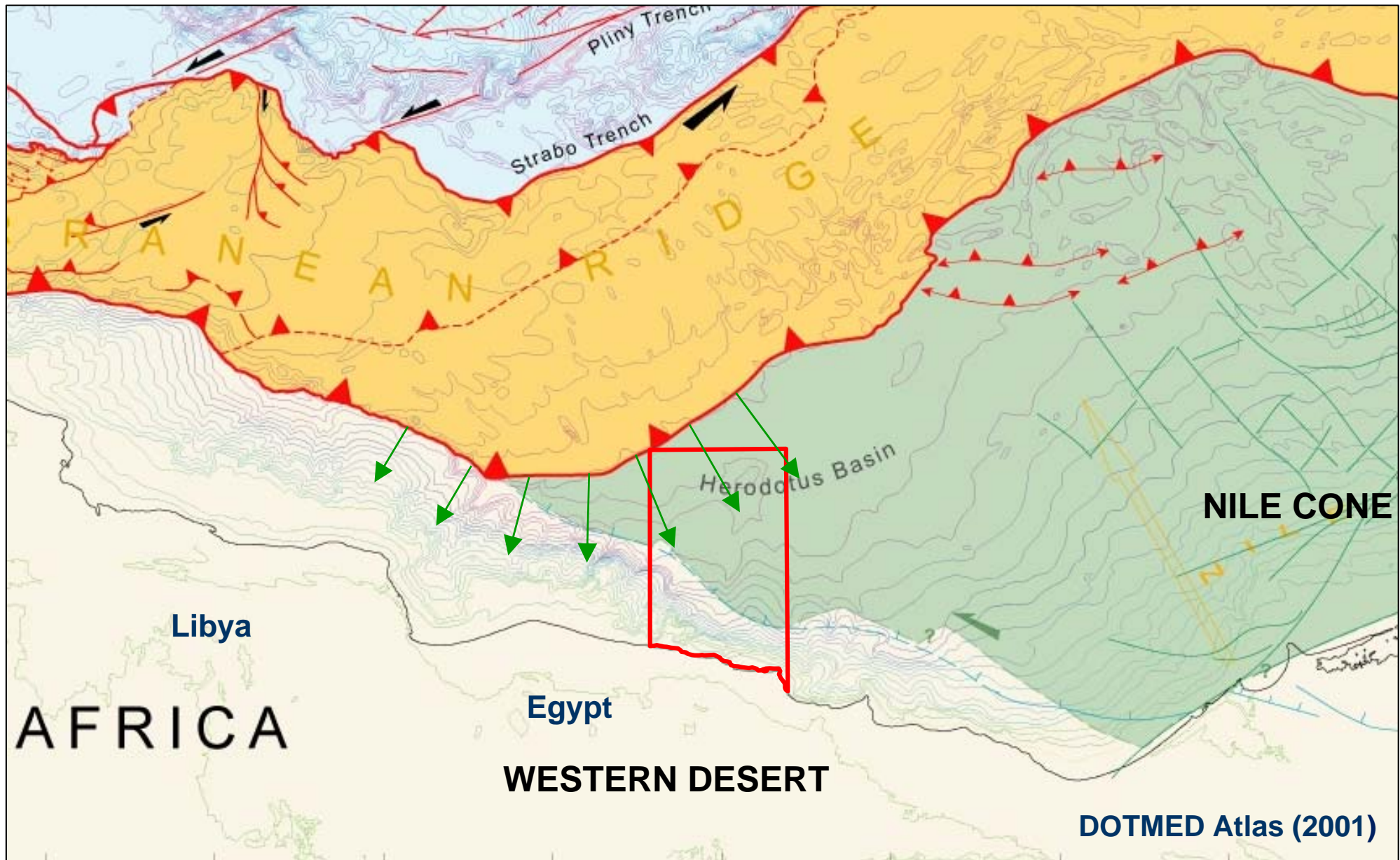
Fiduk (2009)



Seismic section



# Deepwater tectonics of the Eastern Mediterranean



Late Tertiary to Recent loading, expulsion and migration from the North, from beneath the incoming Mediterranean Ridge (accretionary wedge)?



# Conclusions

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- Offshore NW Egypt was practically unexplored until recently
- A variety of untested deepwater play types exist which are proven and "traditional" in West Africa (e.g., rafts in Angola and hinge zones in Côte d'Ivoire) or in North Africa (Messinian subsalt in the Levant)
- Charge appears to be the critical risk at present
- Numerous large prospects were defined offering repeatability for the successful play types