

**The Discovery of Zohr Gas Field in Egypt**  
**"... A Game Changer..."**  
**Impacts - Opportunities**

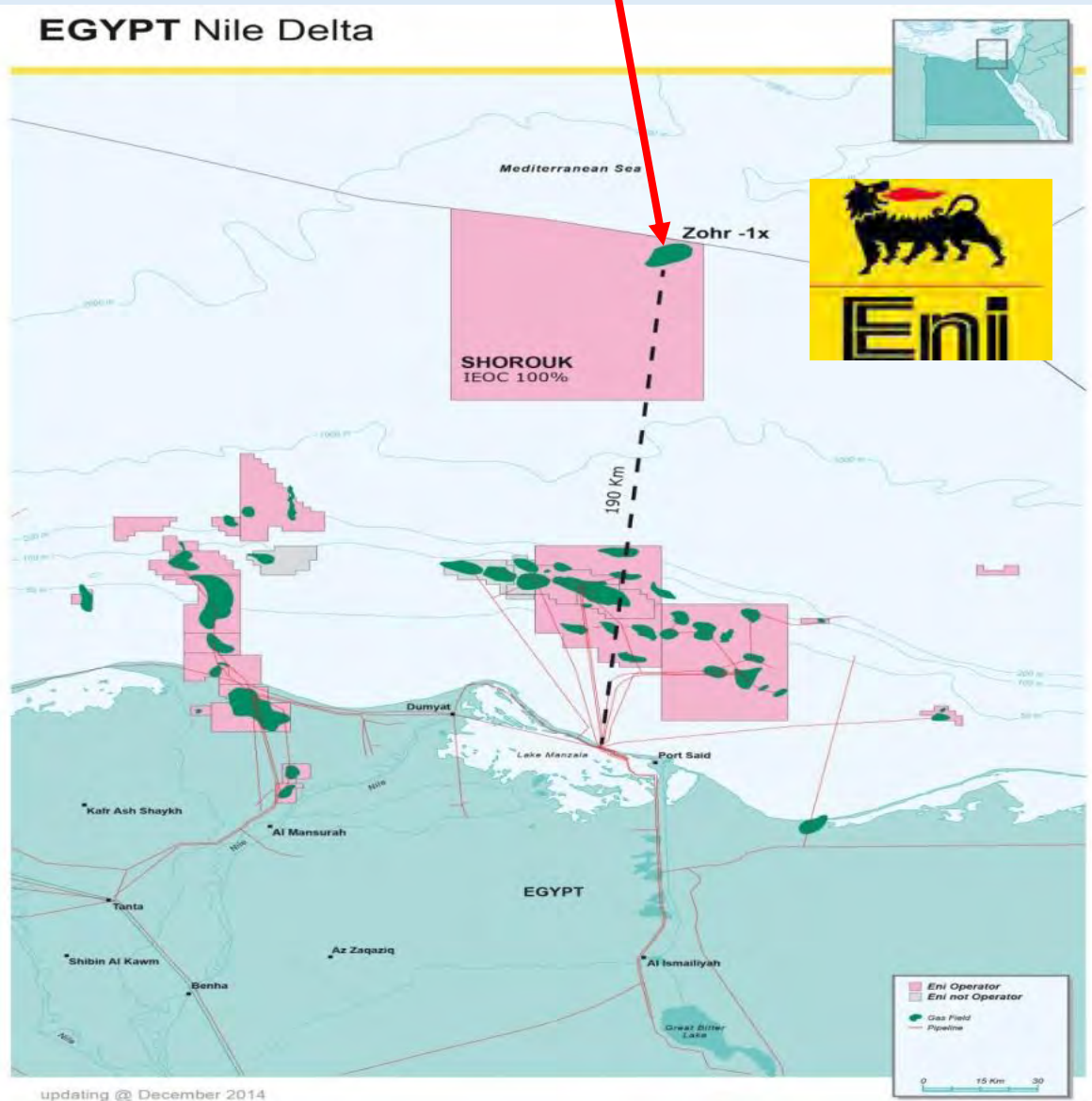
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# The discovery of Zohr gas field in Egypt ( August 2015)



“Saipem 10.000”

What do we know about the Zohr field?

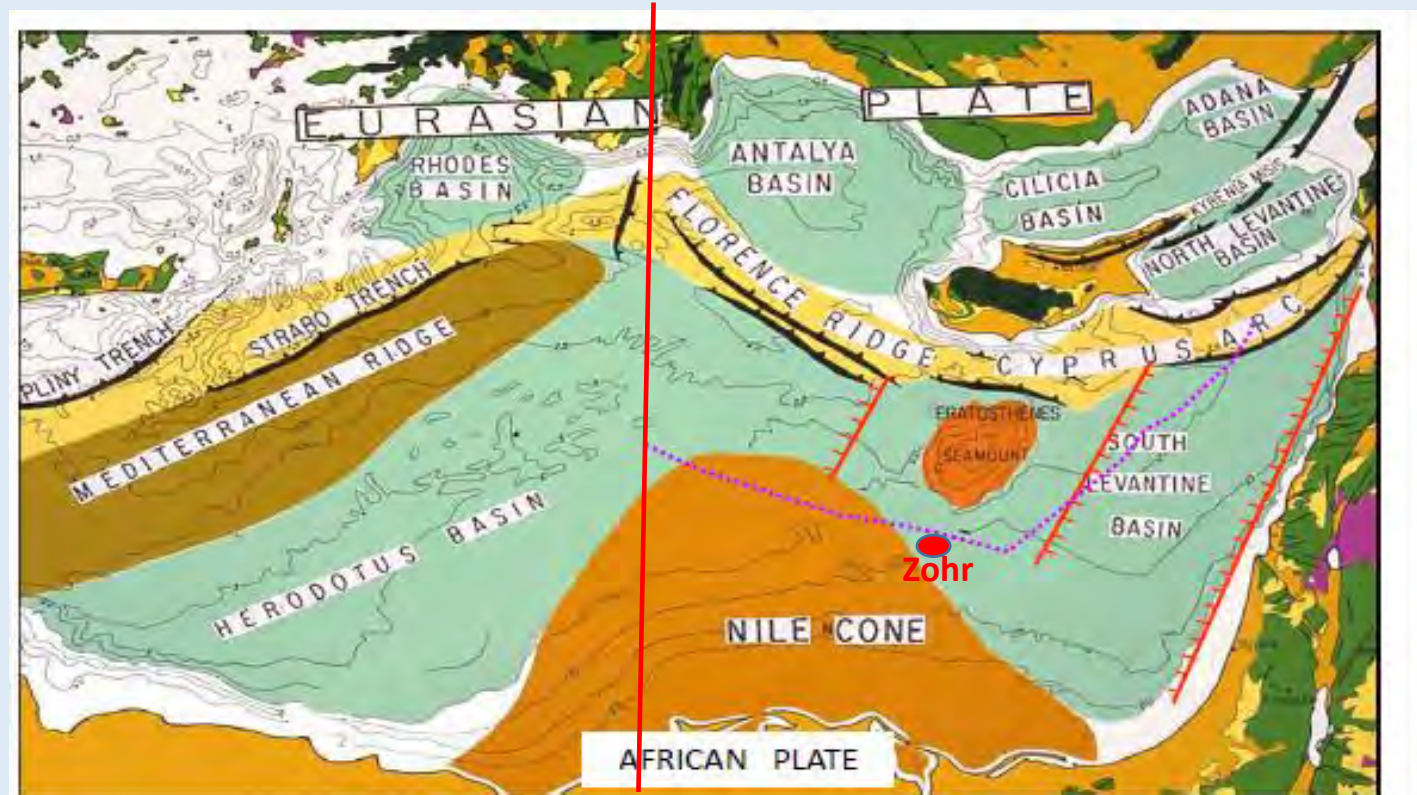
- Large accumulation (~30 TCF) of gas in a Miocene Carbonate reef reservoir

The presence of high quality reef reservoir was a surprise to the industry because :

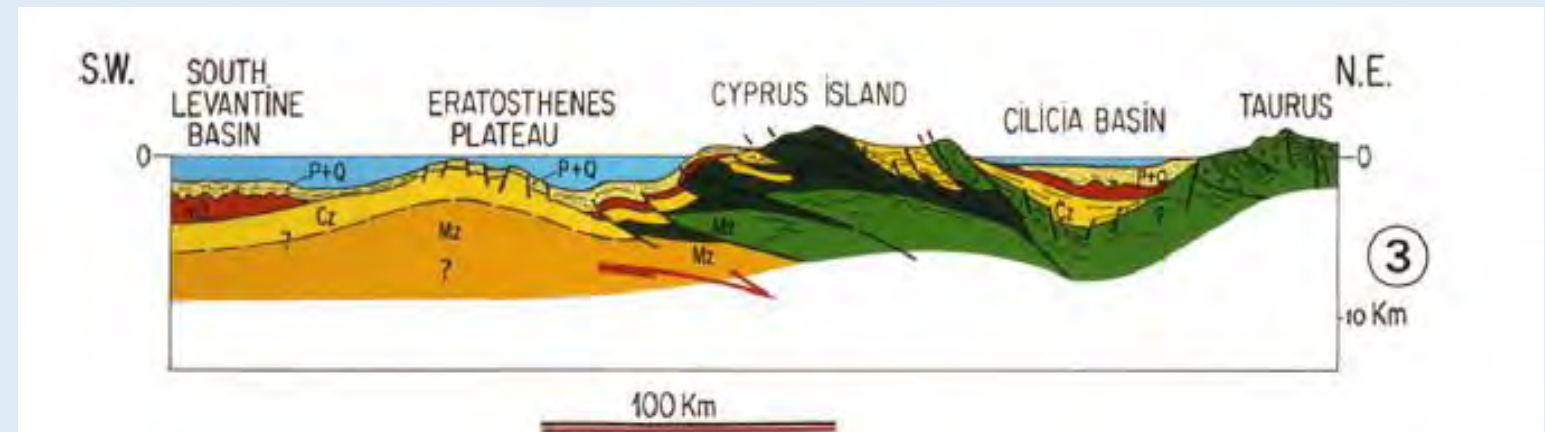
- Reef and siliciclastic systems don't “play well”
- Reefs grow in shallow, warm, clear water in the photic zone
- Unexpected to find Carbonate reefs next to a major delta (Nile)
- SHELL was exploring the area for more than 15 years without success
- But ENI thought and acted differently
- After the failure of Onasagoras and Amathousa wells in the EEZ of Cyprus, ENI moved to the block Shorouk in Egypt next to the borders line, and discovered the field of Zohr.

# East Mediterranean Sea: Geotectonic Units and Geological cross section

To understand the existence of Zohr gas field, somebody must study very well the geology and mostly the geological history and evolution of the Eastern Mediterranean and **understand the importance of the Eratosthenes Sea Mount.**



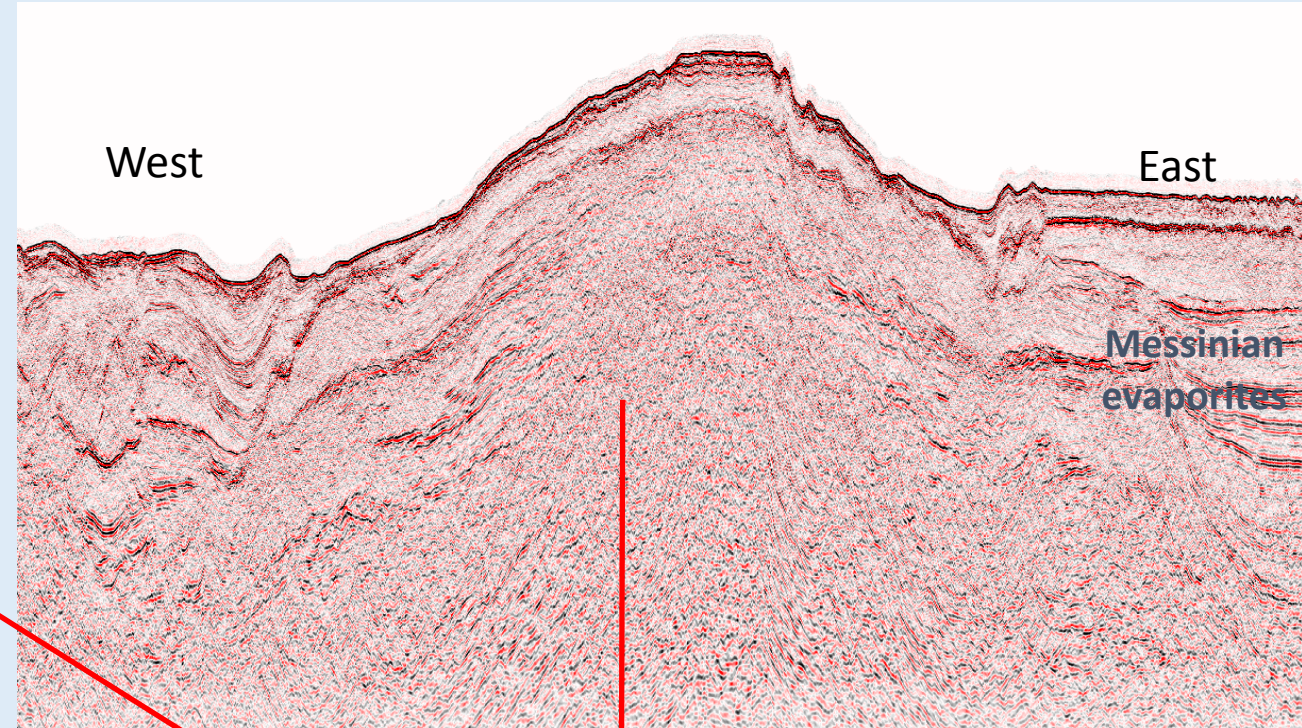
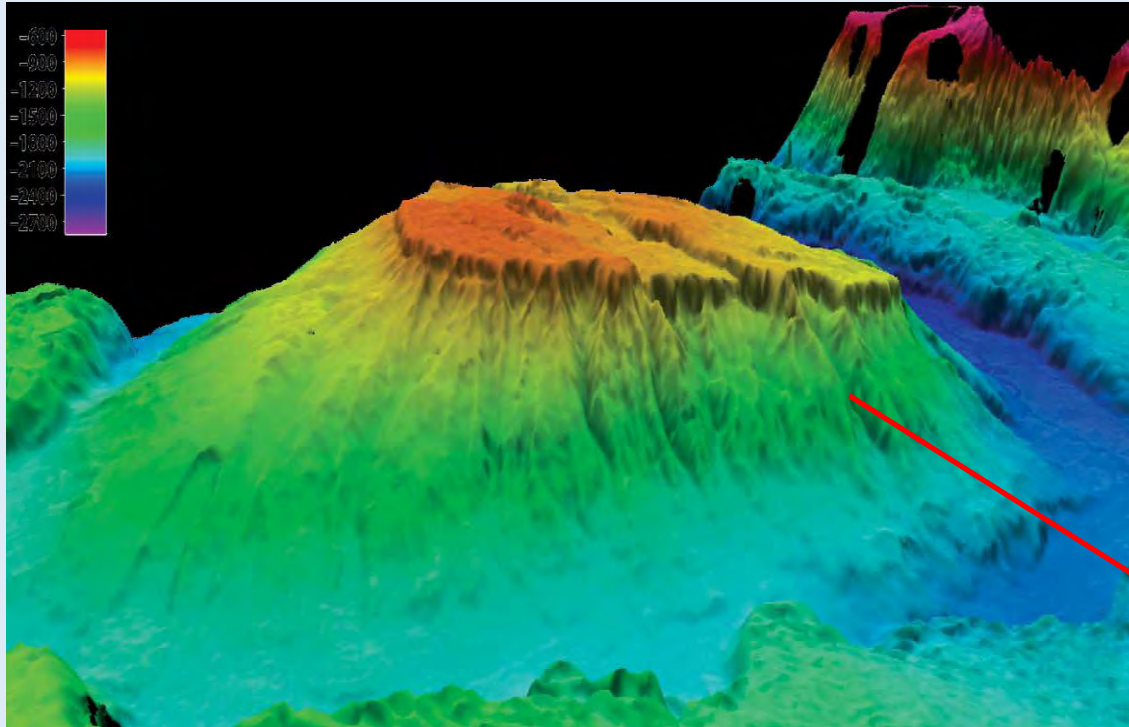
From Sage et Letouzey, 1990



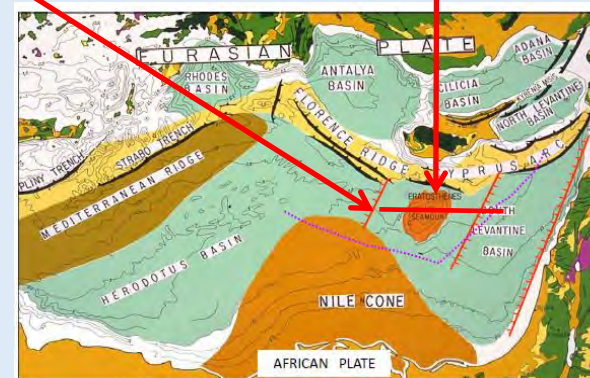
# The Sea Mount of Eratosthenes

## East - West seismic line and stereogram

The geological evolution and tectonic history of Eratosthenes carbonate platform, **is the main reason for the existence of Zohr field**



- 730 m below sea level,
- Surrounded by water depths of 2400 -2500 m
- 1670 m Sea bottom topography  
(Troodos Mountain is 1952 m above sea level)



# Zohr Discovery: Geology key points

- The Zohr discovery was a **game-changer** for the region → **Proof of a new play**
- The Eastern Mediterranean has a complex, long-lived tectonic history
- The Eastern Mediterranean has a favourable Petroleum Systems framework
  - About 12 km of sediments in Levantine with multiple source rocks, so with
  - Stacked petroleum systems and a first class Messinian evaporitic seal
- Now there are two proven lower risk plays in the Eastern Mediterranean
  - Cenozoic siliciclastic play: Proven biogenic gas play in Oligocene-Miocene Tamar sands
  - And the new Carbonate platform play: Proven biogenic gas play in Isolated Carbonate build-ups
  - Two other, not proven yet and higher risk plays are in the Mesozoic section
- All these elements make the Eastern Mediterranean an attractive exploration target with unlocked potential

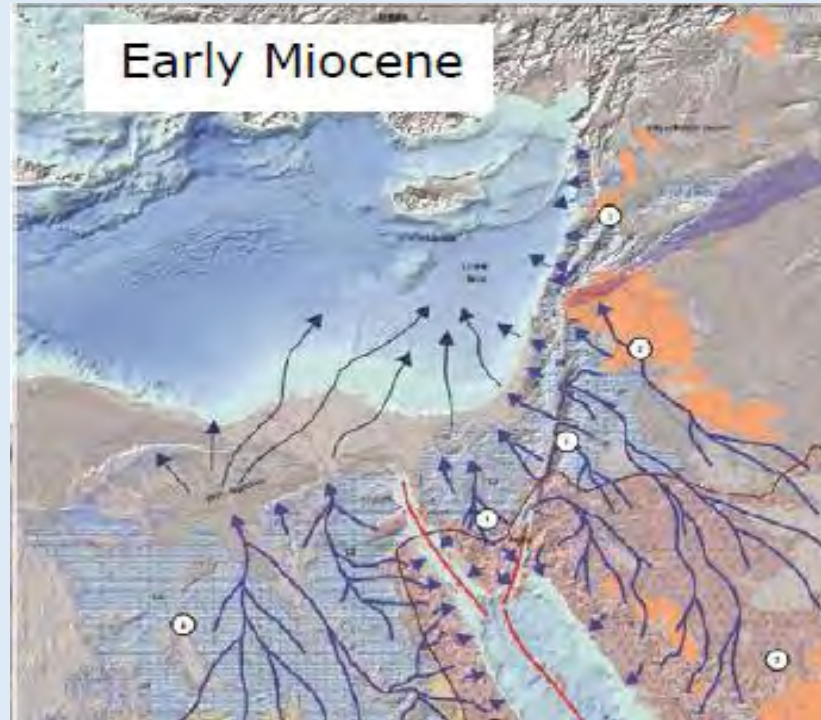
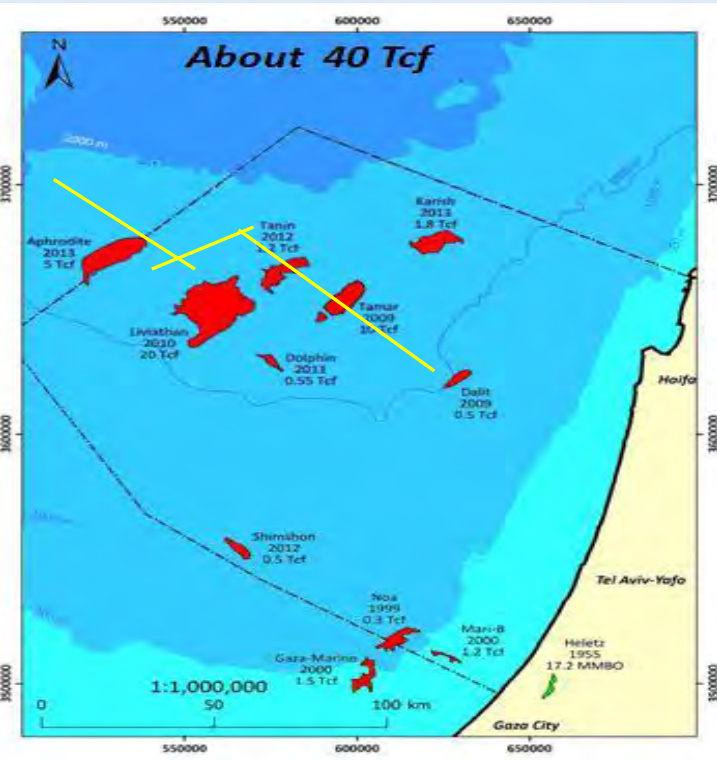
# Main Gas discoveries in the Levantine basin **before** the discovery of the Zohr field

## The Levantine Sand Play

Tamar,  
Leviathan,  
Aphrodite,  
karish,  
Tanin

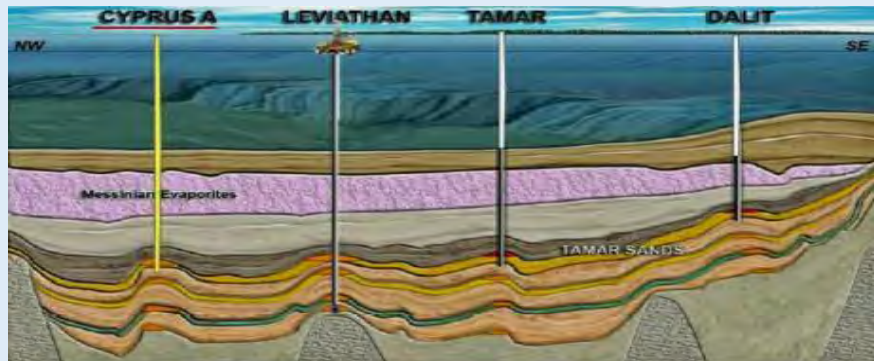
### Petroleum System

- Reservoir: Oligo-Miocene Sands (Tamar sands)
  - Seal: Middle Miocene Shales
  - Source : Shale interval of Oligo-Miocene for Biogenic gas. Thermogenic Gas/Condensate in Mesozoic.
  - Migration: After Messinian
  - Traps: Structural-Stratigraphic or Combination
- Main Analogue: Tamar gas field

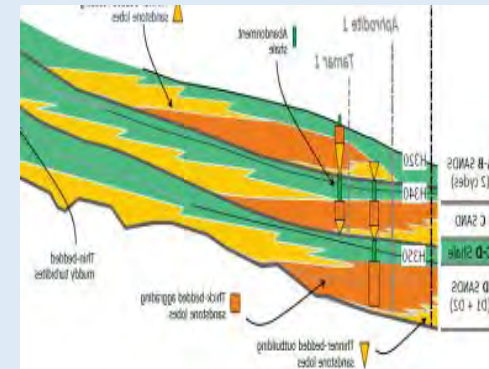


- The **Nile** is the dominant Sediment and sand delivery system in the Levantine and Herodotus basins
- The influence of other systems is localized

4-4,5 tcf      20-21 tcf      10-11 tcf      0,5 tcf

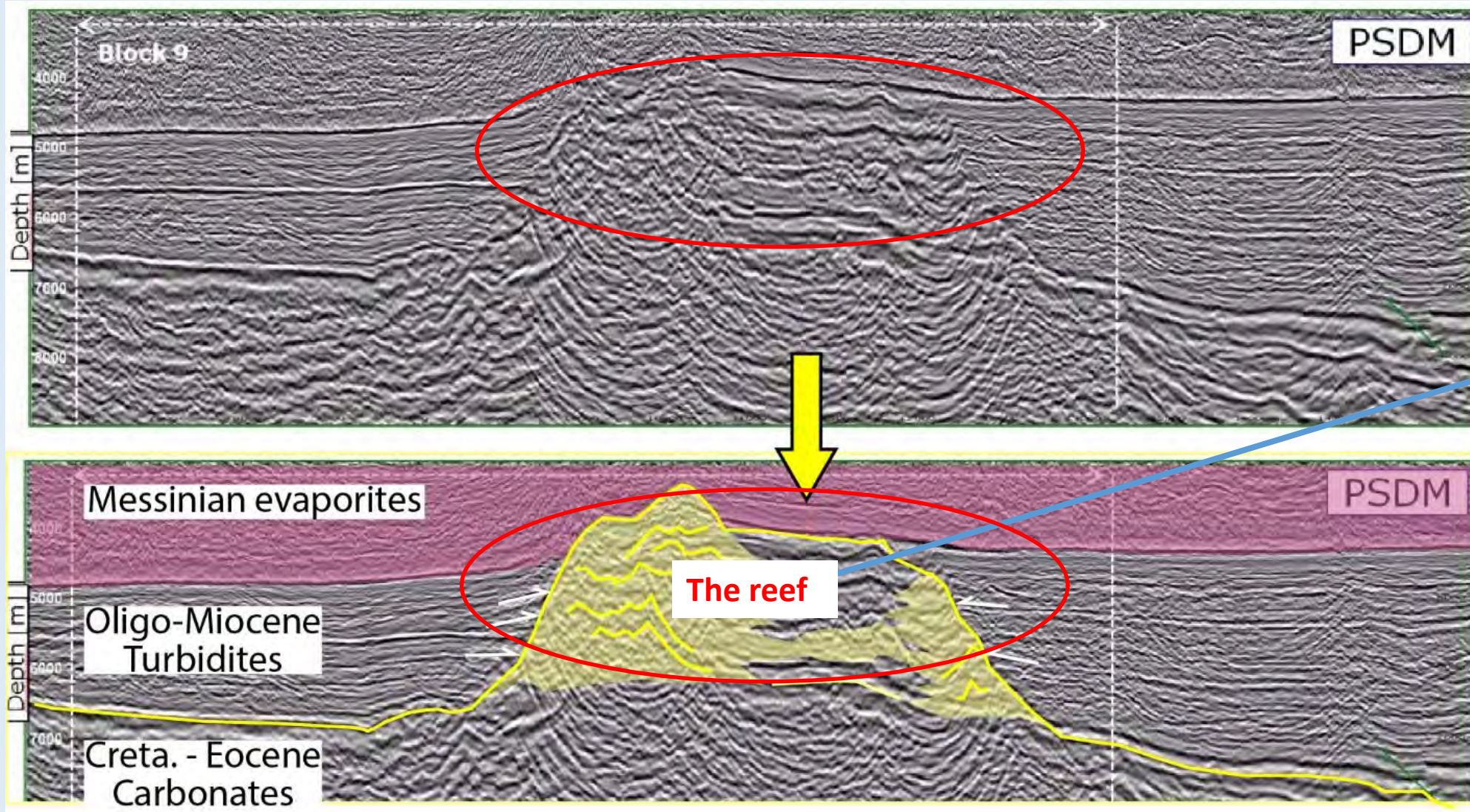


Type of reservoir:  
**Basin floor fans, Proximal or distant**



# The discovery of Zohr

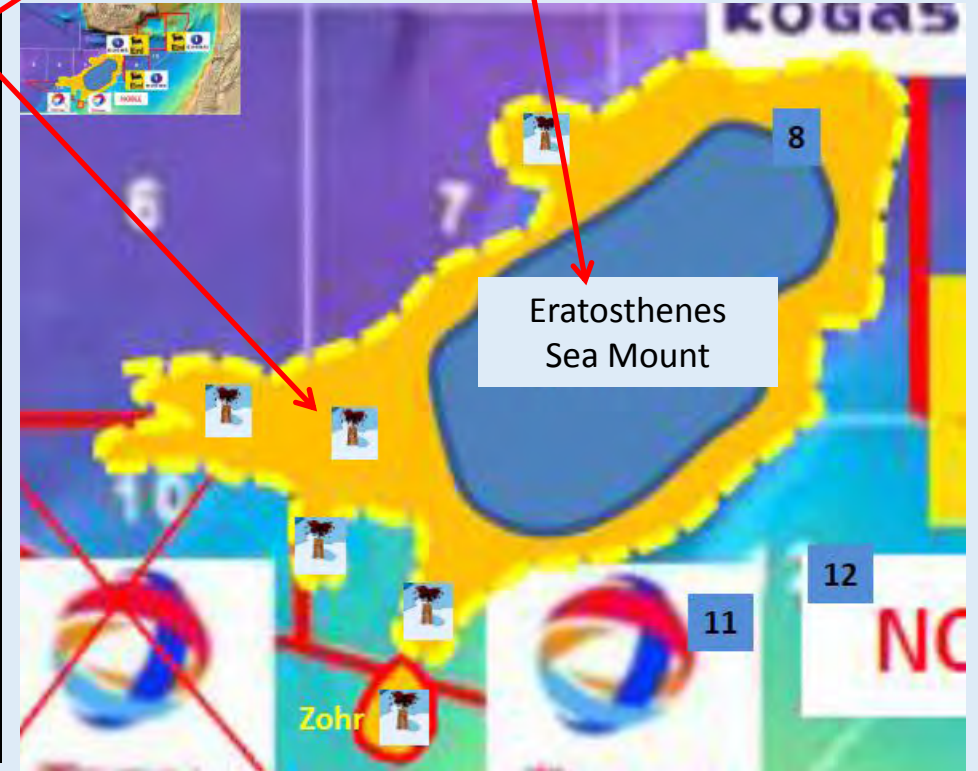
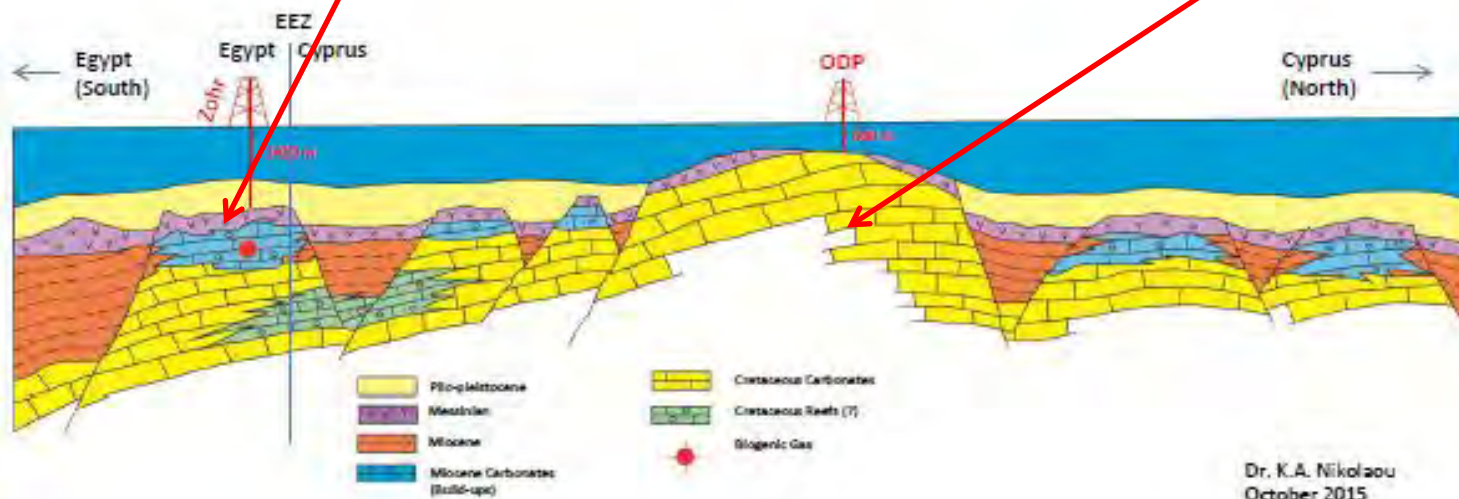
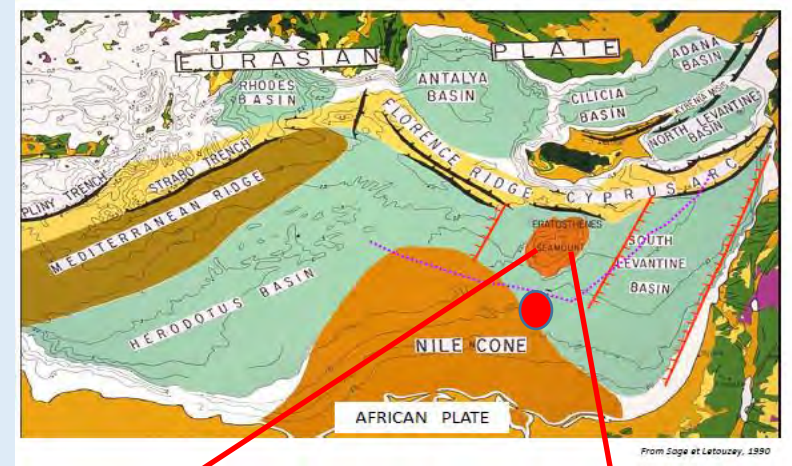
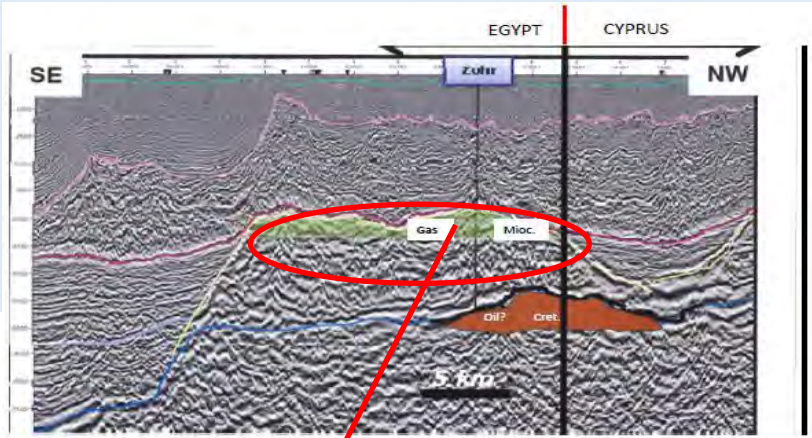
## Seismic character of the Zohr field



Zohr reef structure interpreted as Miocene shallow water reef by ENI

# Eratosthenes Sea Mount and Zohr Discovery. The carbonate play in the East Med.

*Zohr is a tree at the edge of a forest. And the forest is the area surrounding Eratosthenes Sea mount*





# Caicos modern carbonate platform as an analogue to Eratosthenes paleogeography



- The Caicos platform is a modern-day analogue to the Eratosthenes carbonate platform
  - Similar size
  - Similar physiography
  - Similar rock types and sedimentary structures



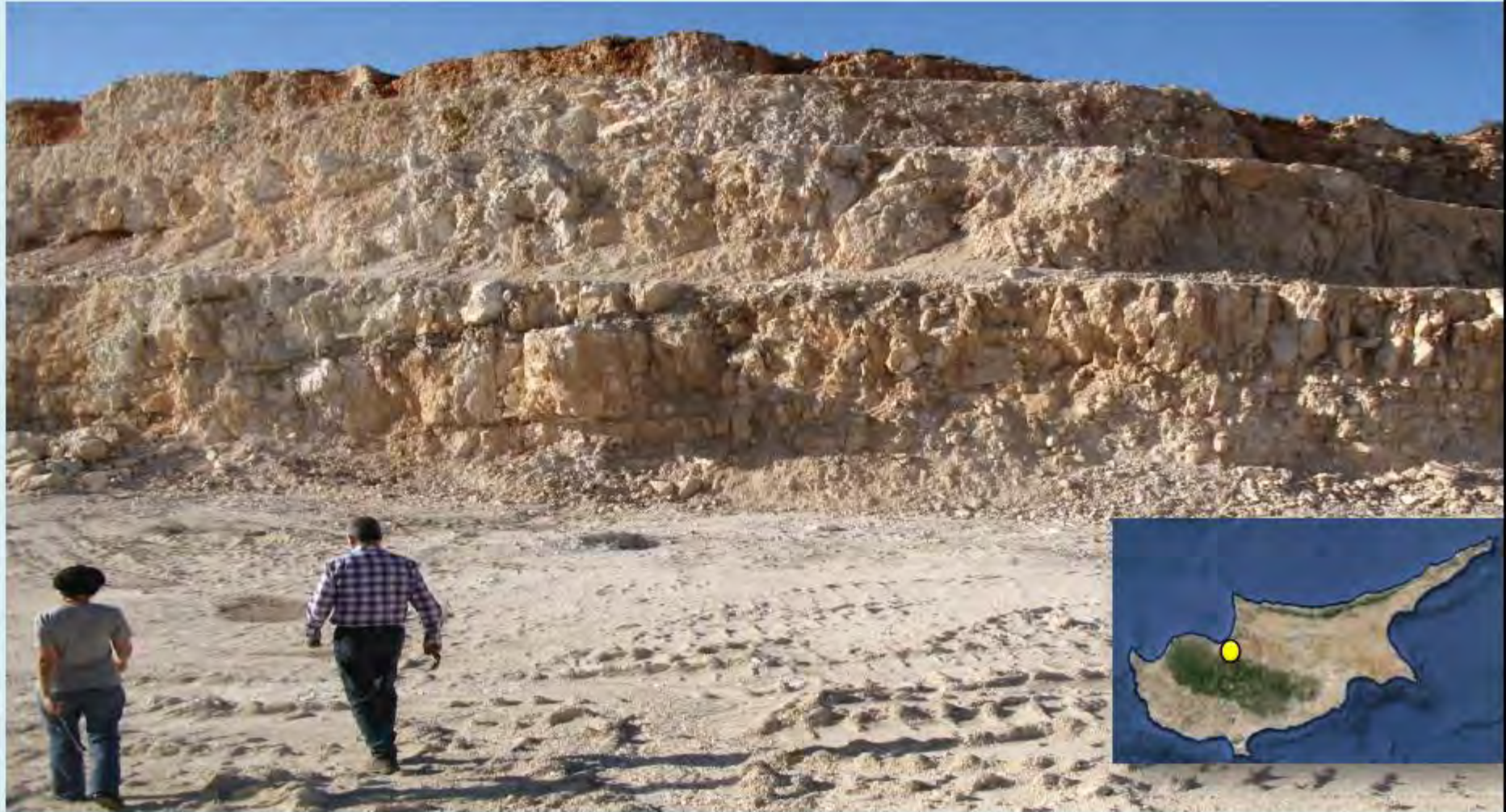
Eratosthenes Sea mount was an isolated island during Miocene, surrounded by shallow water platform with local reef built up.

# Studding the analogues of Zohr Reservoir in Cyprus

## Cape Greco: Miocene reef Carbonates



# Studding the analogues of Zohr Reservoir in Cyprus Paphos, Androlikou Quarries : Miocene reef Carbonates

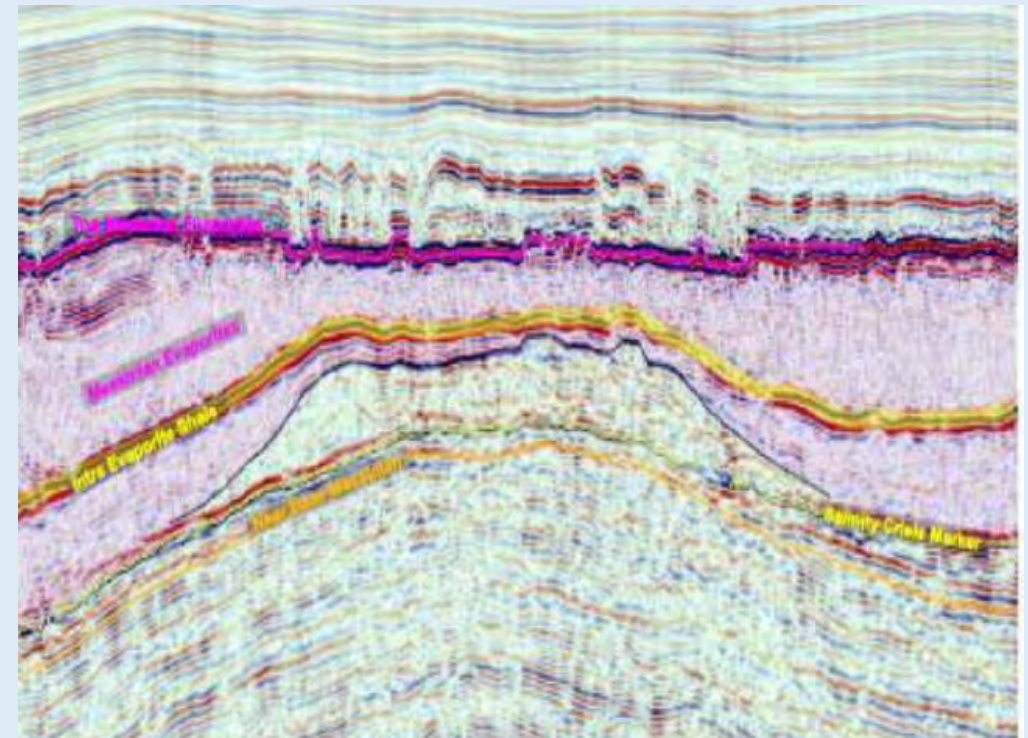
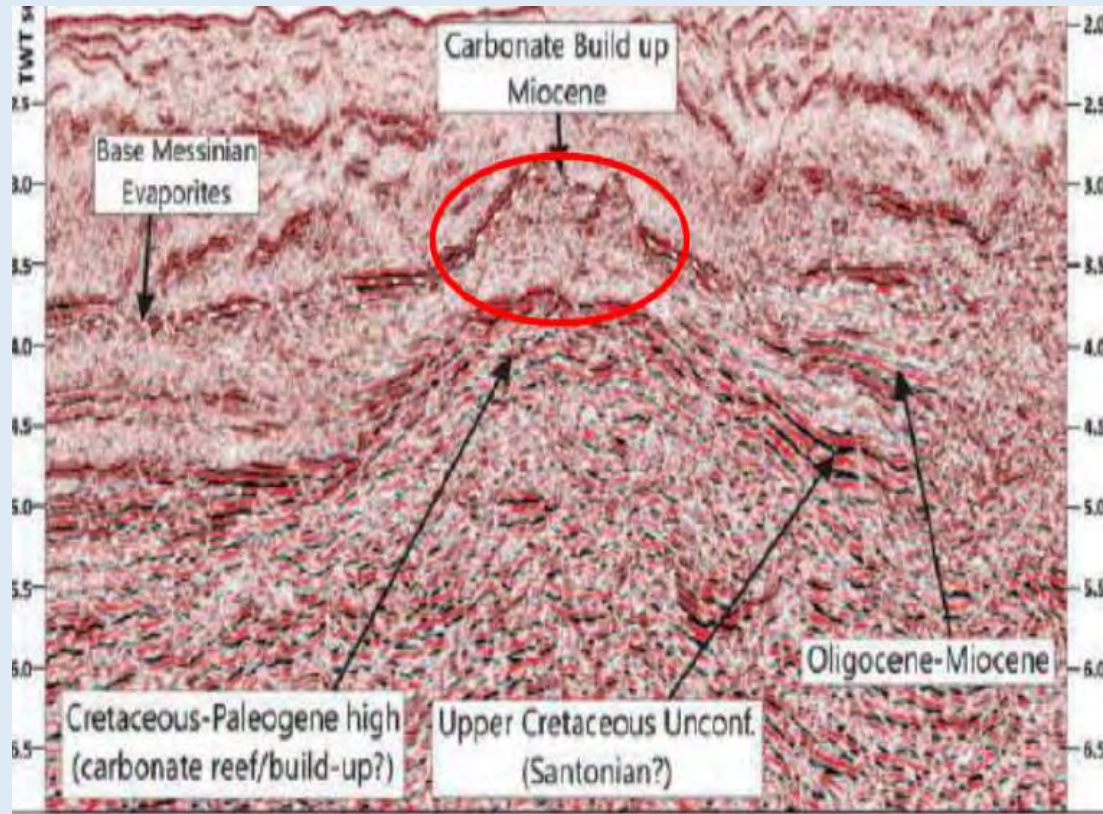


# Studding the analogues of Zohr Reservoir in Cyprus

## Paphos, Androlikou Quarries : Miocene reef Carbonates



# Other Zohr like Images somewhere in the Cyprus EEZ



# Summary and Conclusions

- The Eastern Mediterranean is considered as an attractive exploration area. At least another decade of active exploration is needed to fully evaluate the hydrocarbon potential within the Cyprus EEZ. Based on geological evidence it is considered an attractive exploration area with unlocked potential
- The huge Zohr gas discovery was the first test of a previously untested play. This new play mostly lies within the Cyprus EEZ. Similar Zohr like prospects have been identified within the Cyprus EEZ.
- Based on our evaluation, we believe that in the upcoming 3<sup>rd</sup> Licensing round, the 3 blocks in offer have substantial potential to discover Zohr like fields.

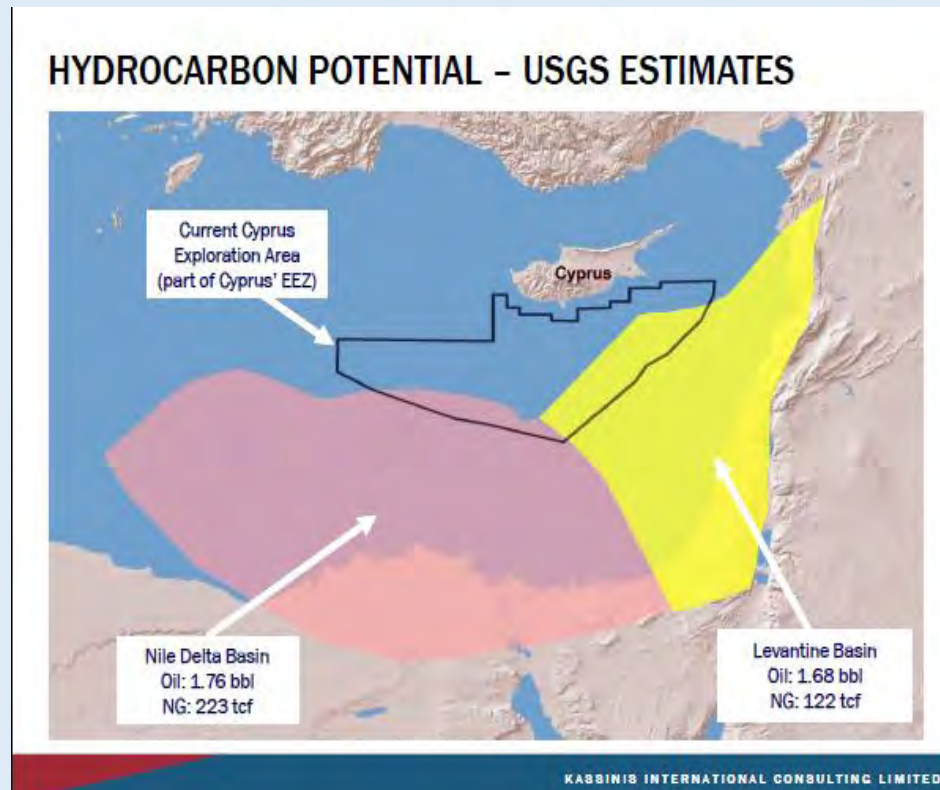
## USGS : East Med Hydrocarbon Potential

Total :

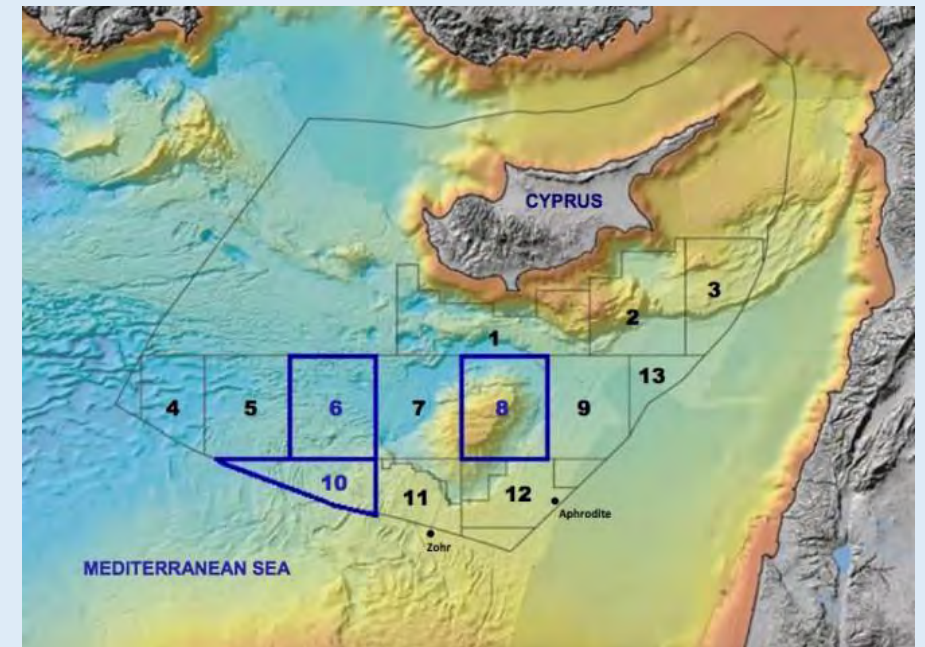
Around 350 Tcf of gas and 3,5 bil. barrels of oil.

•Already discovered: about 150 Tcf of gas.

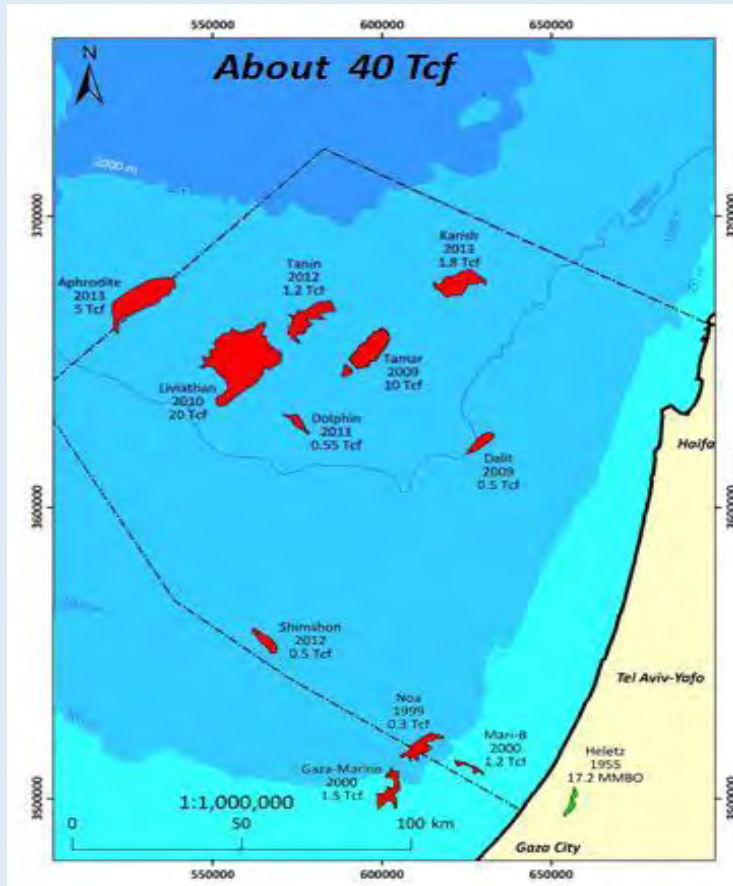
• To be discovered: about 200 Tcf of gas



The ongoing exploration round of Cyprus Offers to be submitted on July 22



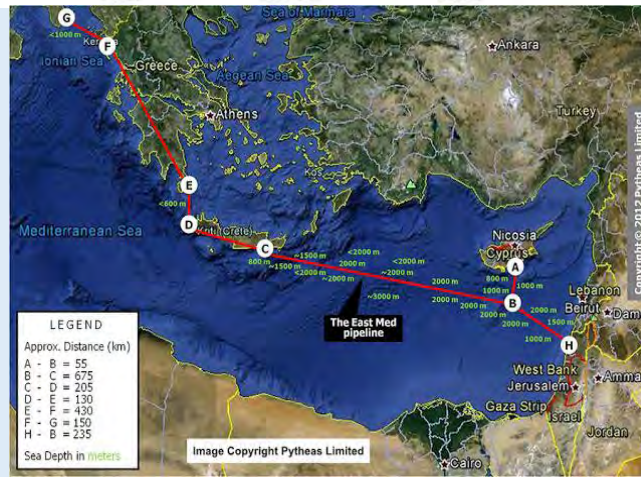
# East Mediterranean: Gas Discoveries and alternative transport routes



East Med Fields



The East Med route



# Zohr Discovery: Main Characteristics

- Country :Egypt, Area: east Mediterranean, Company: ENI
- Block : Shorouk , 3765 τ.χλμ ,
- Sea depths: 1400-1800 m. Total Depth of the first well 4131 m.
- ENI / Union Fenosa : Owners and operator of LNG liquefaction plant in Damietta , Port Said ( 1 train, 5,5 mil. T. /year
- Distance from Egypt: 180-190 km
- Structure: 100 sq km ,
- Gas Column: 630 m, Net pay: 410 m.
- **Reservoir: Miocene carbonates (reef- built up)**
- Gas in place: 30 tcf or 840 BCM ( or 5,5 bil. boe). (biggest in the Mediterranean Sea).
- Distance from block 11 of Cyprus : 4-6 km.
- Distance from Aphrodite gas field : 40 km