

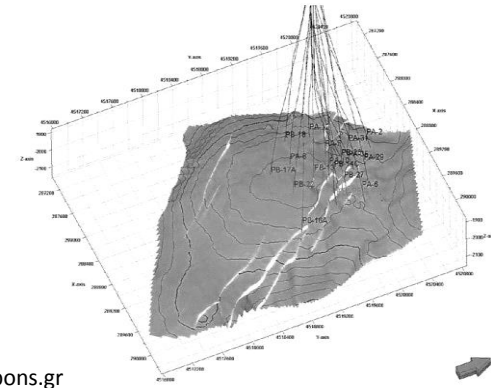
HHRM

HELLENIC HYDROCARBON
RESOURCES MANAGEMENT

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Athens, 3rd SEE Upstream Workshop, October 2018

Seismic tools & structural setting offshore south Crete



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Frontier area

What is a frontier area?

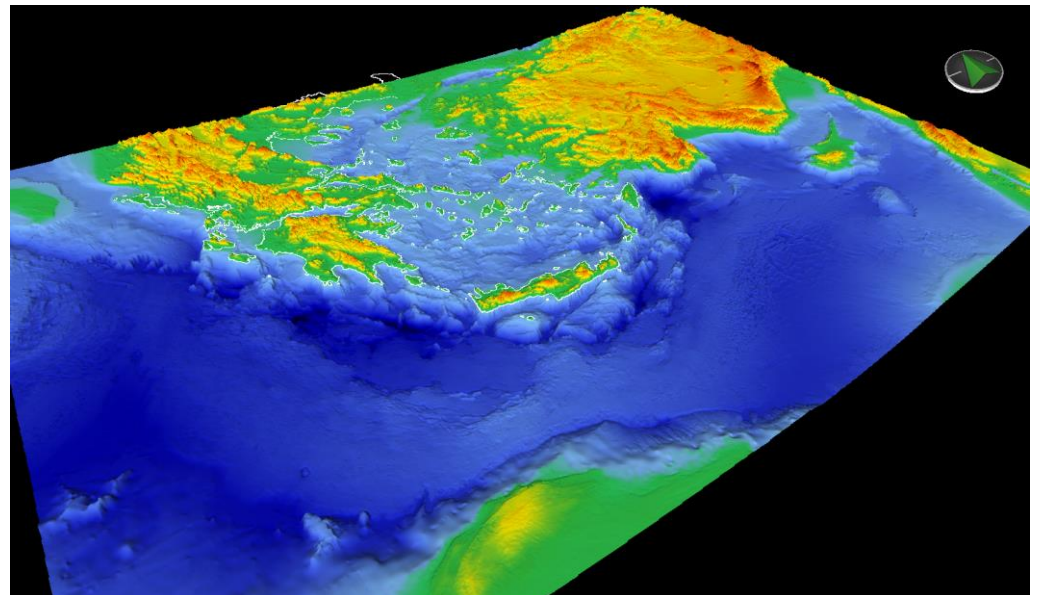
- It is an area where the exploration activities have not been carried out or an area with short-term exploration.

Why offshore south of Crete IS a frontier area?

- Debatable and controversial complex geological processes
- Only limited geological knowledge from onshore can be applied to offshore Crete
- Very underexplored area
- Lack of wells
- Sparse seismic grid
- Deep water

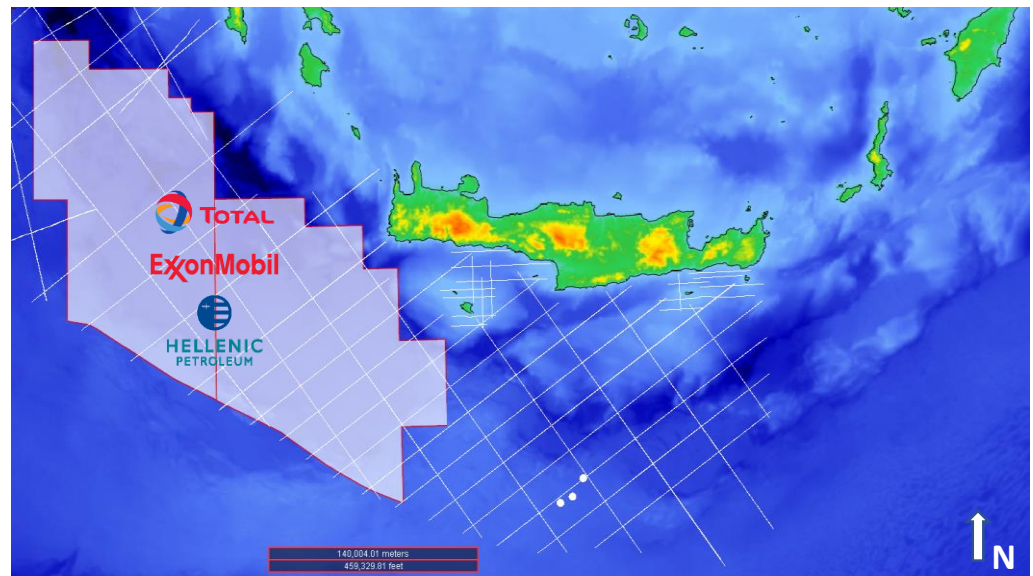
But it all comes down to...

The most critical question:
Is there is an active petroleum system?

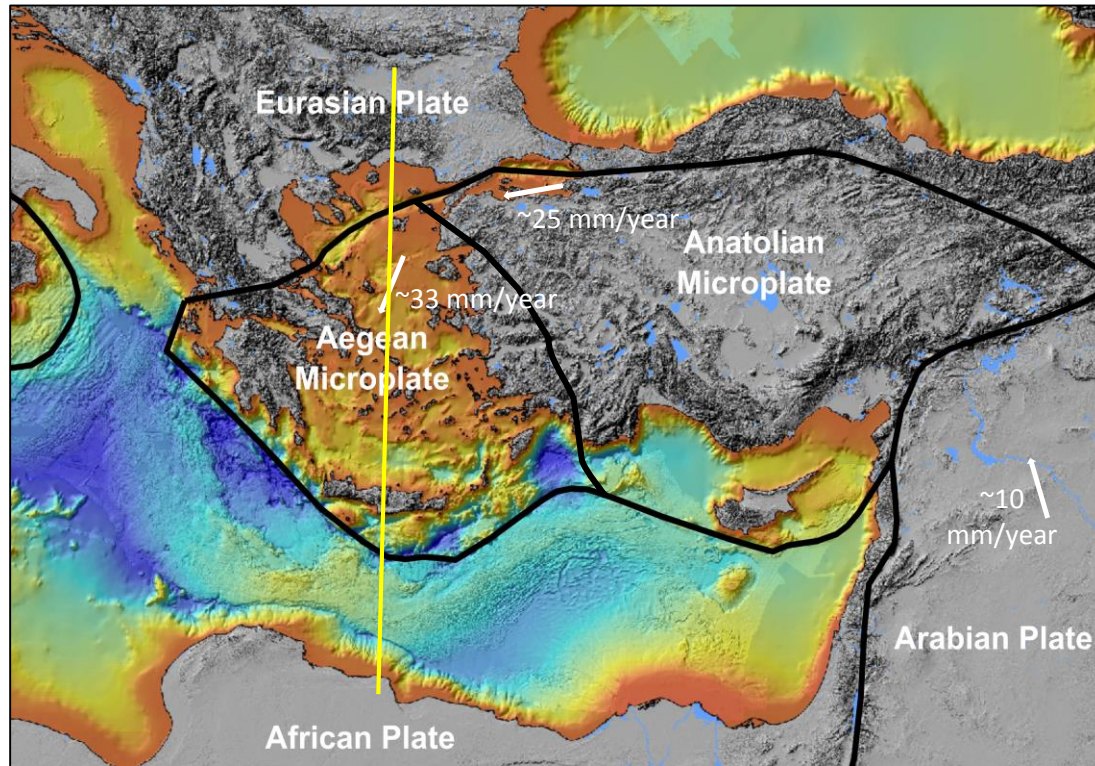


Available data

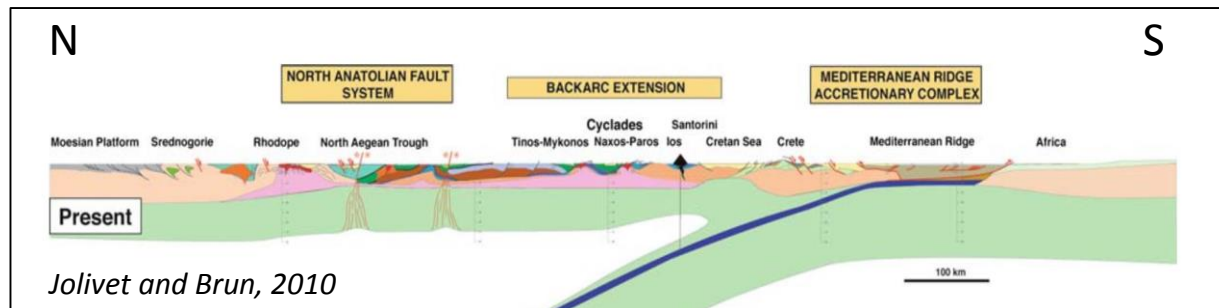
- Legacy seismic data (approx. 650 km, 1980s)
- PGS-2012 seismic data (PSTM, PSDM)
- 3 Ocean Drilling Project wells (ODP 969, 970, 971)
- Published literature



Regional tectonics

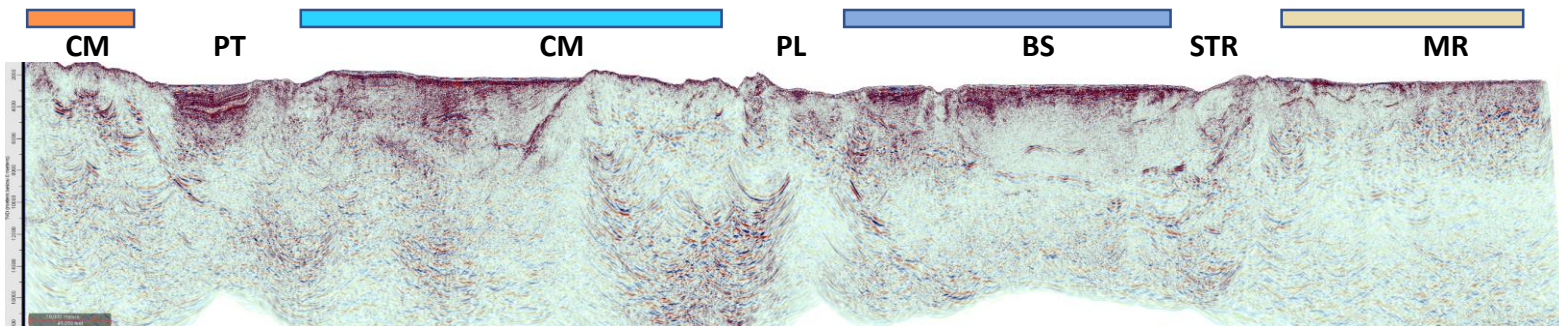
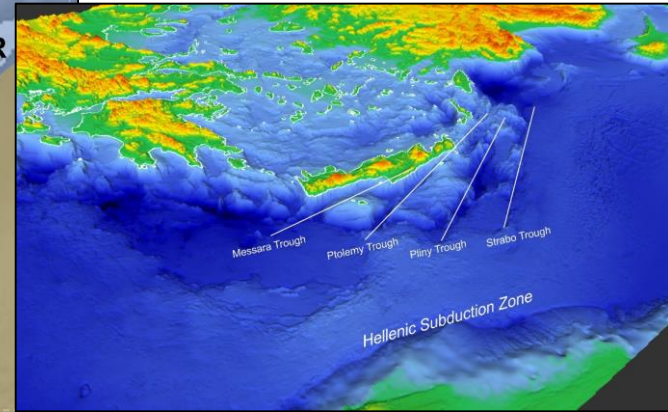
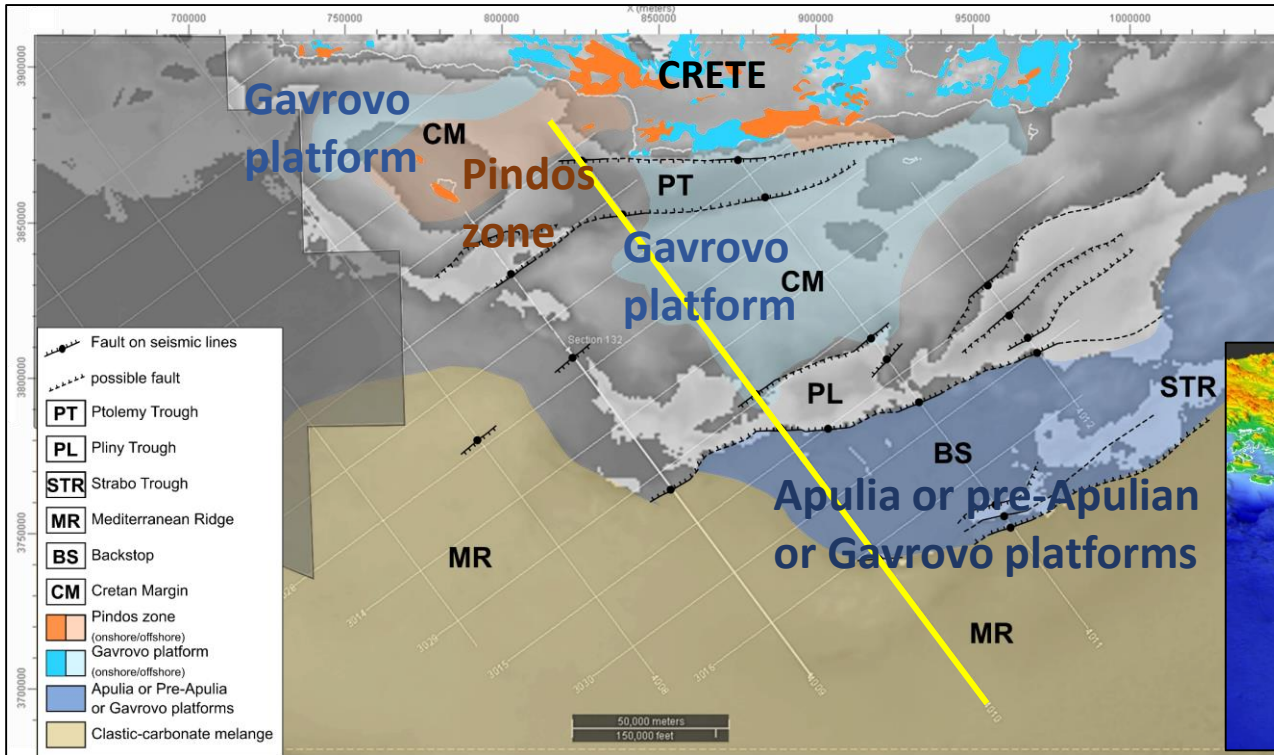


Map source: Commission for the Geological Map of the World (CGMW)
Modified after McClusky et al., 2000)

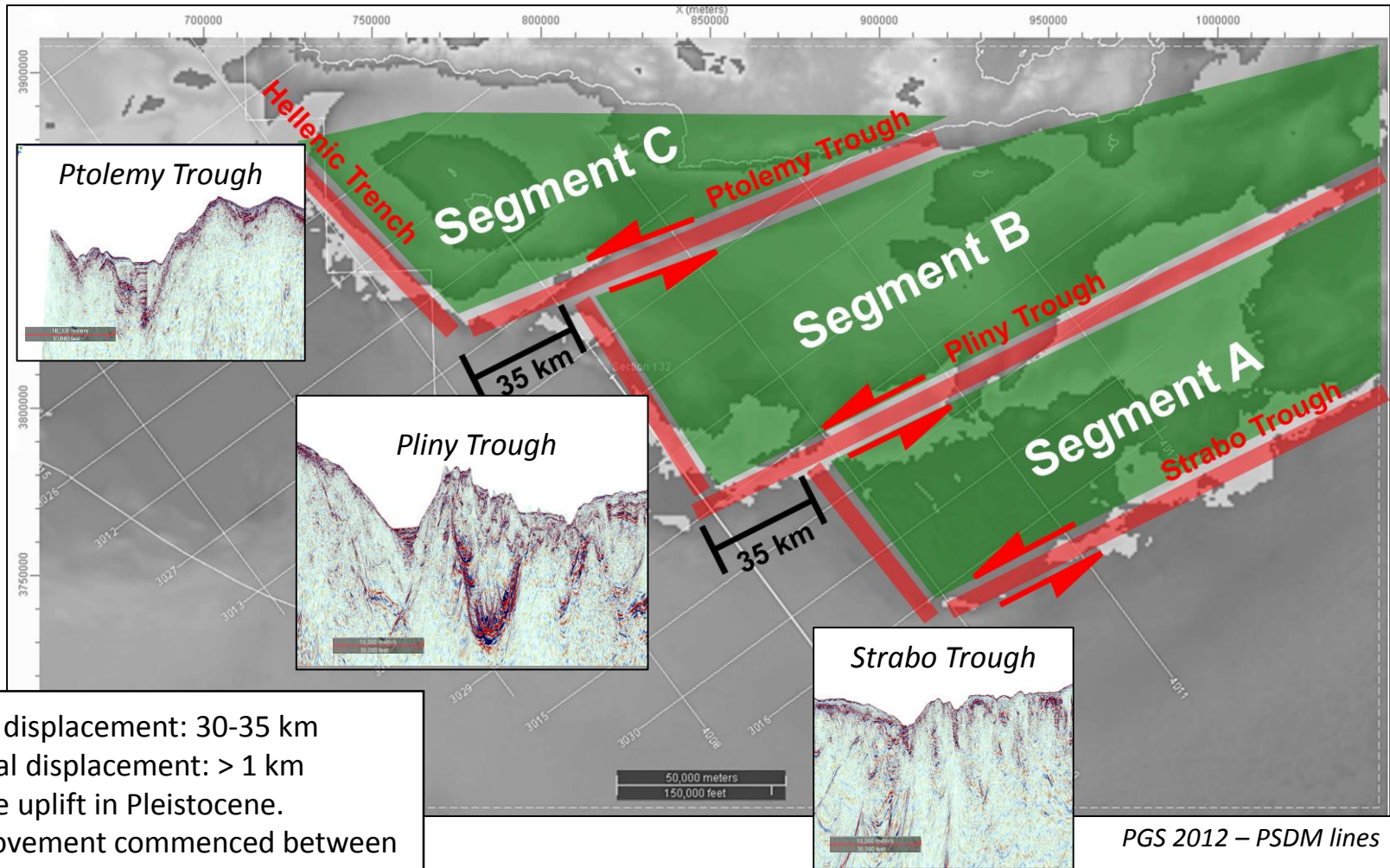


Jolivet and Brun, 2010

Structural setting as a key



Trough displacement rates



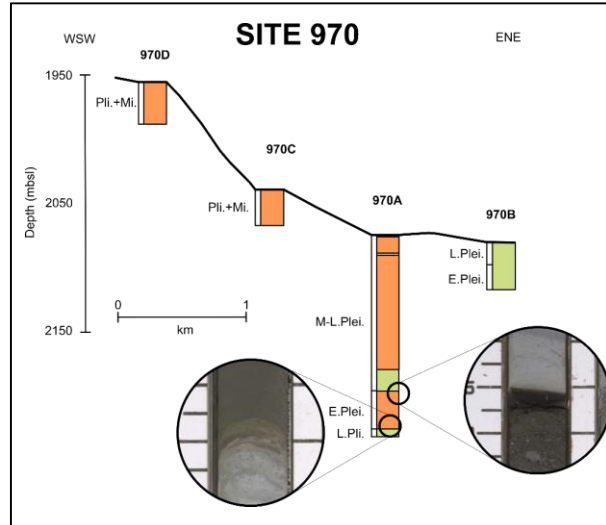
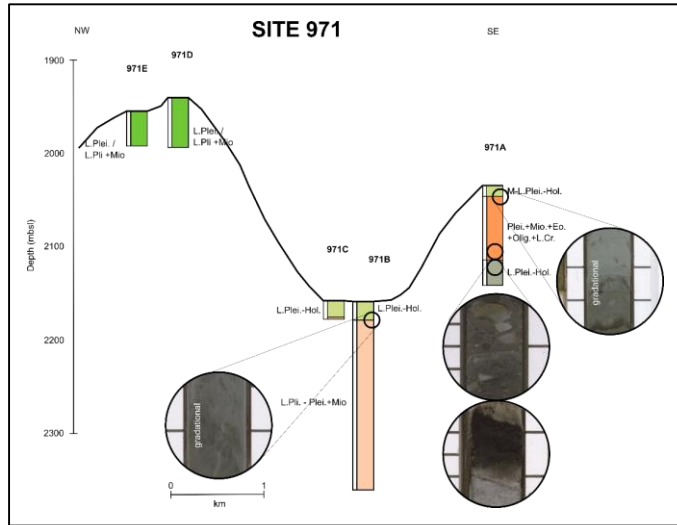
PGS 2012 – PSDM lines

Trough displacement: 30-35 km
Vertical displacement: > 1 km
Crete uplift in Pleistocene.

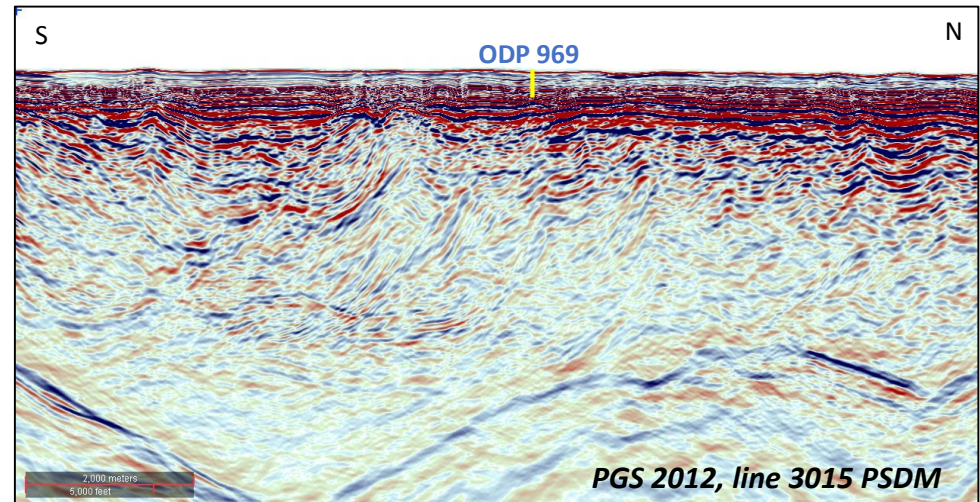
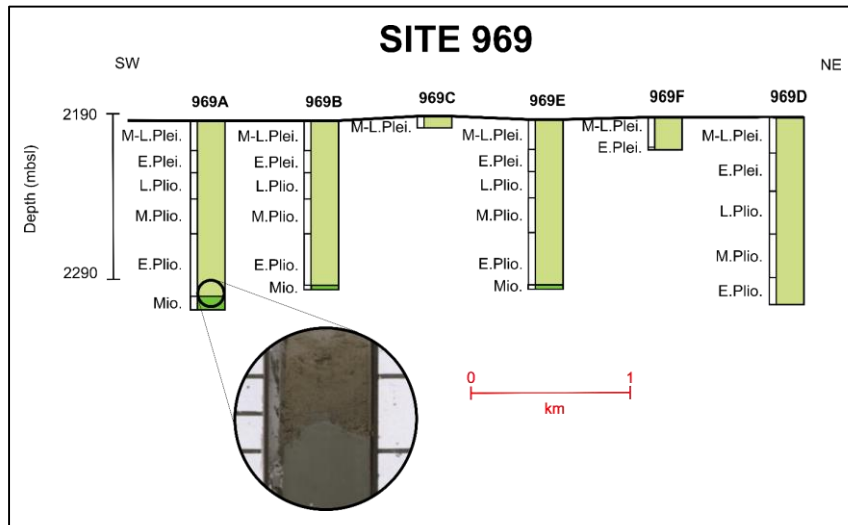
If tectonic movement commenced between 11-1.8 Ma (Zachariasse et al., 2008):

- 11 Ma (L. Miocene) → 1.4-1.6 mm/year
- 1.8 Ma (L. Pliocene) → 8-10 mm/year

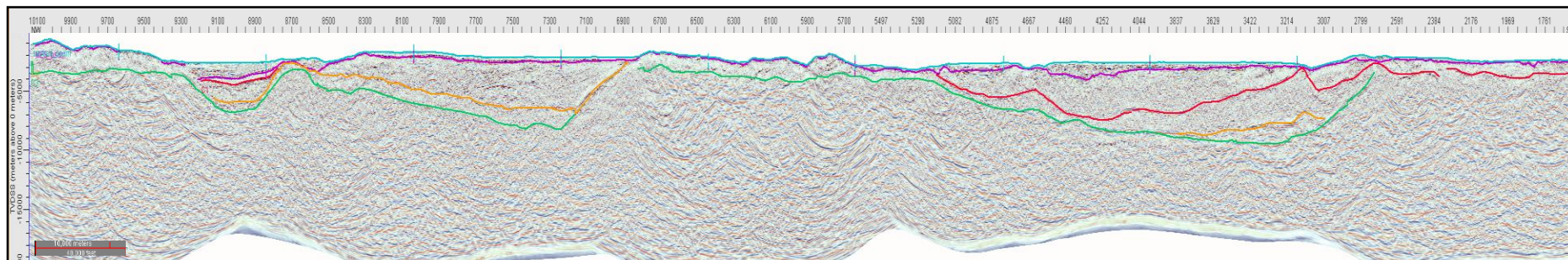
Correlation ODP wells/seismic



- Mud debris-flow deposits
- Matrix-supported clast-rich debris-flow deposits/breccia/conglomerate
- Nannofossil ooze and/or sapropels
- Mousseliike or calcareous silty clays
- Hemipelagic sediments



Petroleum systems (?)



Cretan Margin

Source Rocks: Viannos and Skinias formation (Messara basin) and Metochia formation (Gavdos isl.)

Reservoirs: shallow-marine carbonate deposits (Gavrovo platform), Neogene clastic sediments (offshore Messara basin)

Seal: Neogene shales/mudstones, Messinian evaporites

Trap: build-ups, stratigraphic

Backstop

Source Rocks: Triassic-Jurassic deposits (Pre-Apulian Zone) or Foustapidima black limestones (Ionian Zone)

Reservoirs: Cretaceous shallow-marine carbonate deposits (Apulia or Pre-Apulia Zone) or hemipelagic carbonates (Ionian zone)

Seal: Clastic deposits, Messinian evaporites

Trap: structural

Mediterranean Ridge

Source Rocks: ?

Reservoirs: Carbonate deposits (very speculative origin)

Seal: clastic deposits, Messinian evaporites

Trap: structural

Conclusions

- Crete is a frontier area
- PSDM interpretation – 1st attempt
 - Key tectonic elements (thrust faults, normal faults, strike-slips)
 - Distinct geological provinces (CM, BS, MR)
 - Attempt to distinguish geotectonic zones (external Hellenides)
 - Key surfaces (MES, Neogene Flysch, Top Carbonates, intra-Carbonate reflectors)
 - Messinian event is locally expressed (as evaporites or as MES)
 - Messinian evaporites significantly less compared to west and southwest of Crete blocks
 - Potential trapping structures
- Trough age can be inferred from seismic (basins filled with Neogene flysch)
- Each geological province has different petroleum system potential
 - Speculative analysis only
 - A lot of missing information on petroleum system elements
- Better geological understanding → better negotiation tools
- HHRM's work promotes geological knowledge in unexplored areas

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