E&P Offshore Acreage in Greece:

2019 Roadmap

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Vice President HHRM SA

Establishment of HHRM by Law 4001/2011

- The law introduced HHRM as :

"A Competent Independent Authority, exercising exclusively the Hellenic Republic's rights on Hydrocarbon resources (managing upstream activities and licensing)"

- **HHRM is a 100% State owned Company but not a NOC !**

HHRM SA

1. exercises the management for State account of Hydrocarbon rights (including prospecting, exploration & exploitation) for the public benefit.

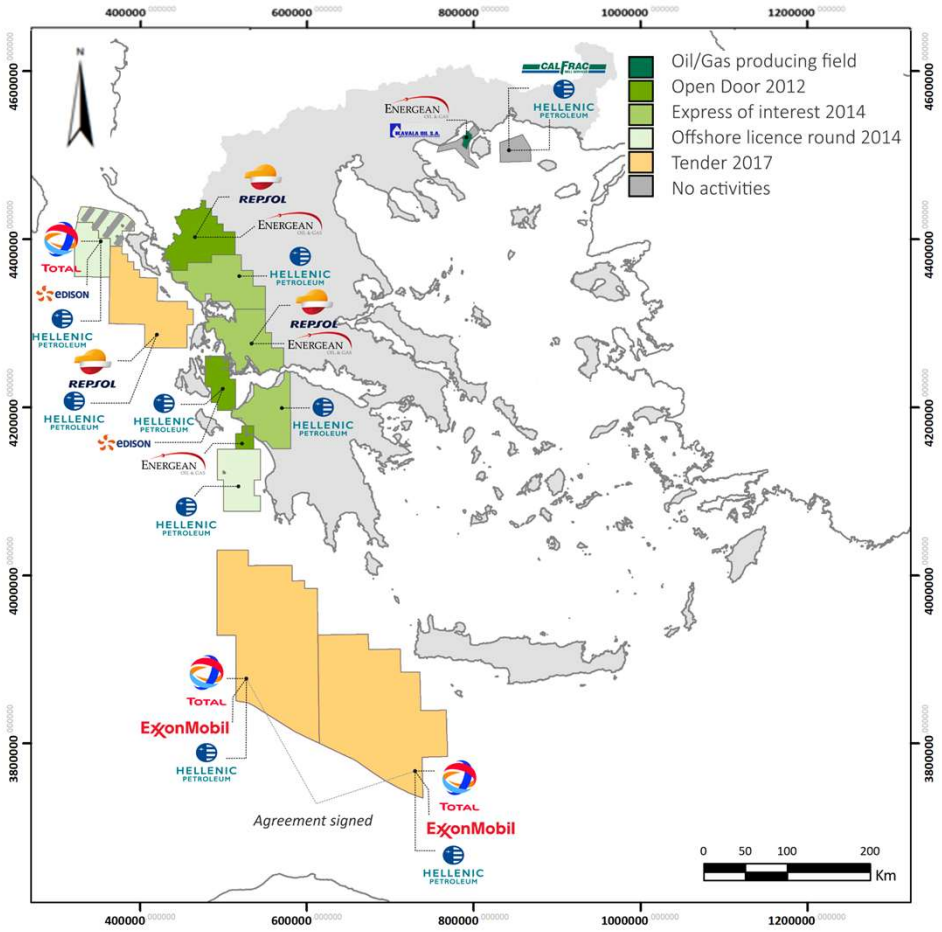
- The HHRM, as lessor, proceeds to tenders, receives bids, evaluates, negotiates and concludes Lease Agreements with third parties.

- The Agreements are signed by HHRM SA and the Contractor and are submitted to the Minister of Environment and Energy for approval.

- The right of hydrocarbon prospection is granted by decision of HHRM SA.

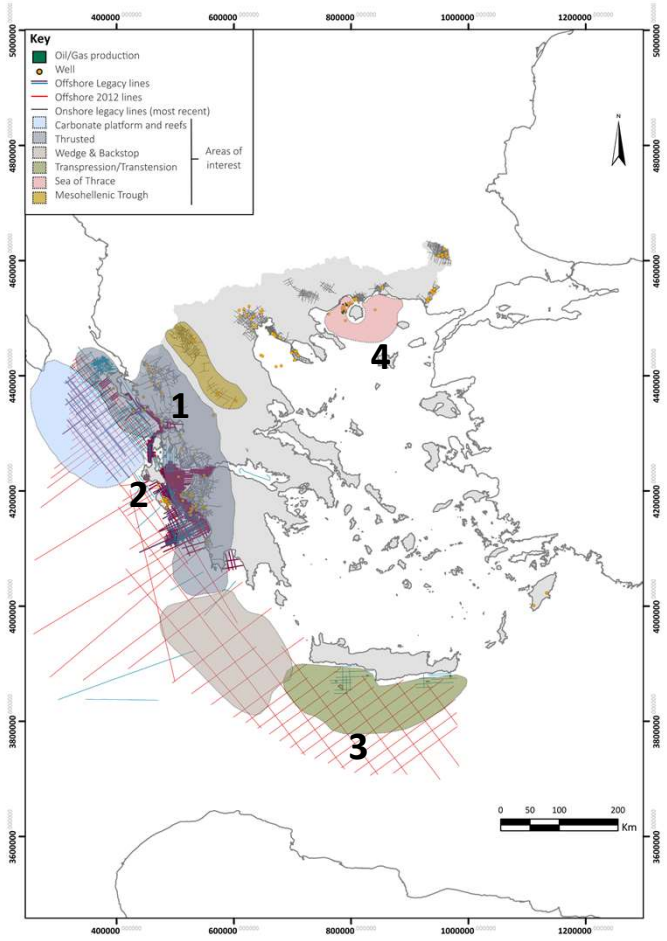
2. HHRM has been also appointed as the Competent Authority for Offshore Safety in Oil and Gas Operations in Greece since July, 2016, through Law 4409/2016 (transposition of Directive 2013/30/EU).

Awarded areas in focus: Current blocks situation in Greece



Greece and hydrocarbons: Principle Tectonic settings

1. The active Fold & Thrust Belt (Hellenides)
2. Kefalonia Fault (KFT)
3. Africa slab subduction (Aegean Island Arc)
4. NAF



Future E&P Opportunities

1. Offshore (Western Greece)

- Central Ionian Sea (N & S part)
- South of Peloponnesus

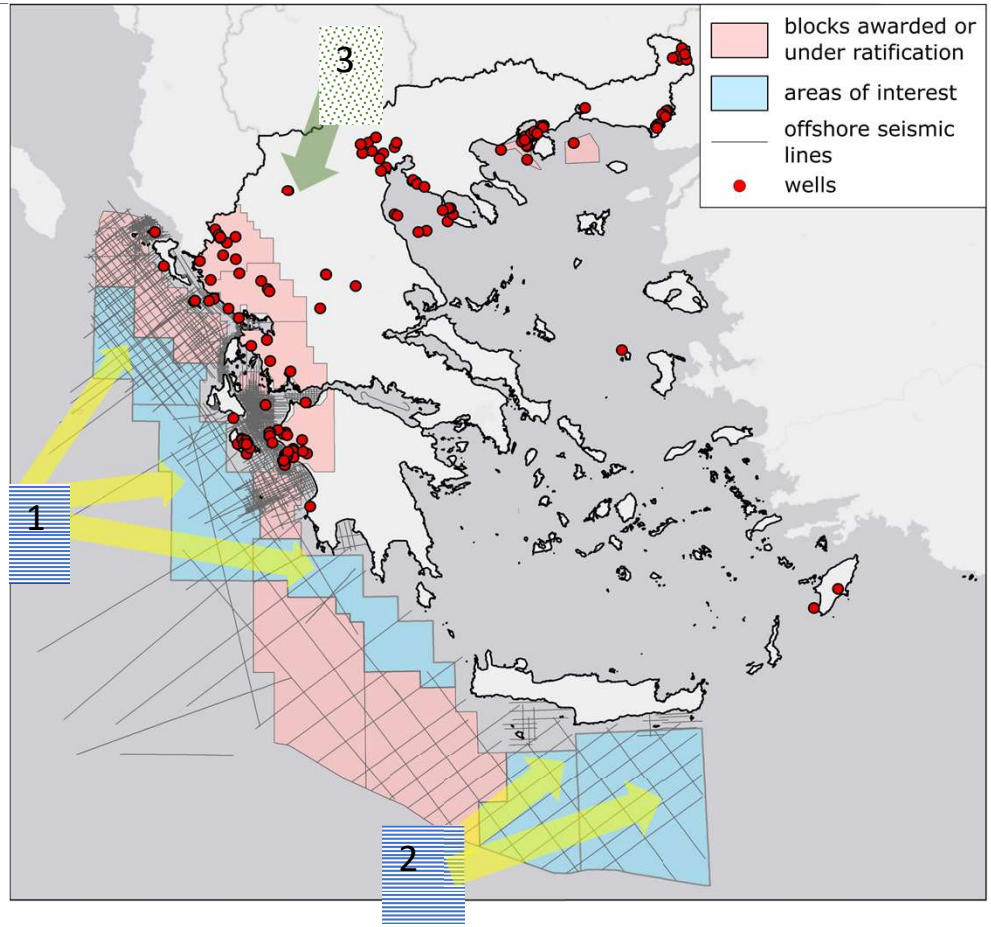
2. Offshore

- South of Crete (central & eastern part)

3. Onshore (Central Greece)

- Mesohellenic Basin

– Under technical evaluation



Main Challenges vs Advantages (Offshore)

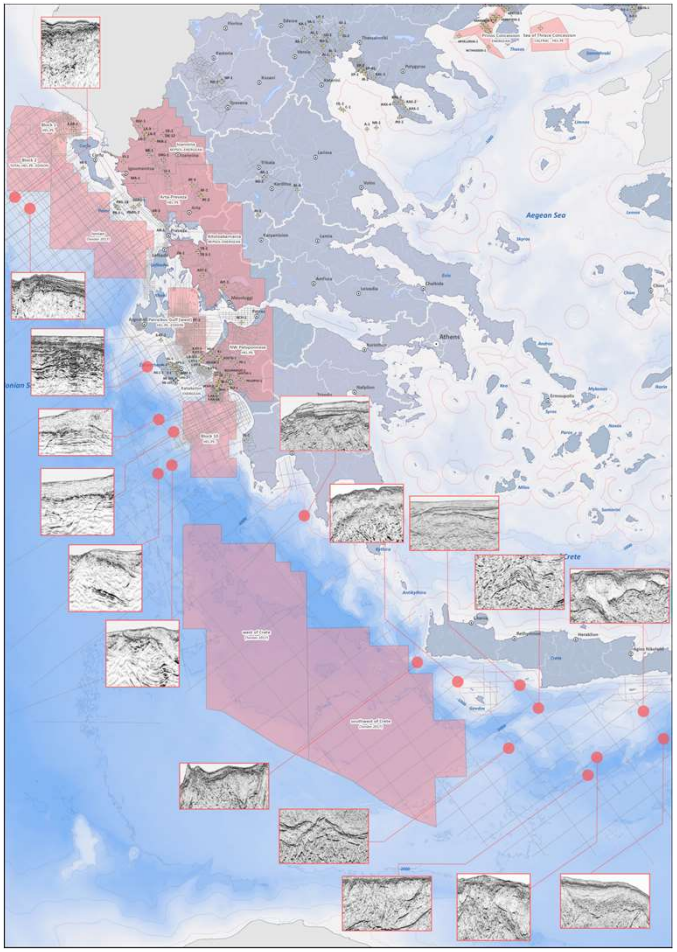
Main challenges

- Frontier areas (sparse seismic 2D grid, to the south)
- Sea-water depths
- Structural elements such as the Kefalonia transform fault and its consequences, South of Crete complexity
- Source Rocks
- Environmentally protected sectors & tourism

Main advantages

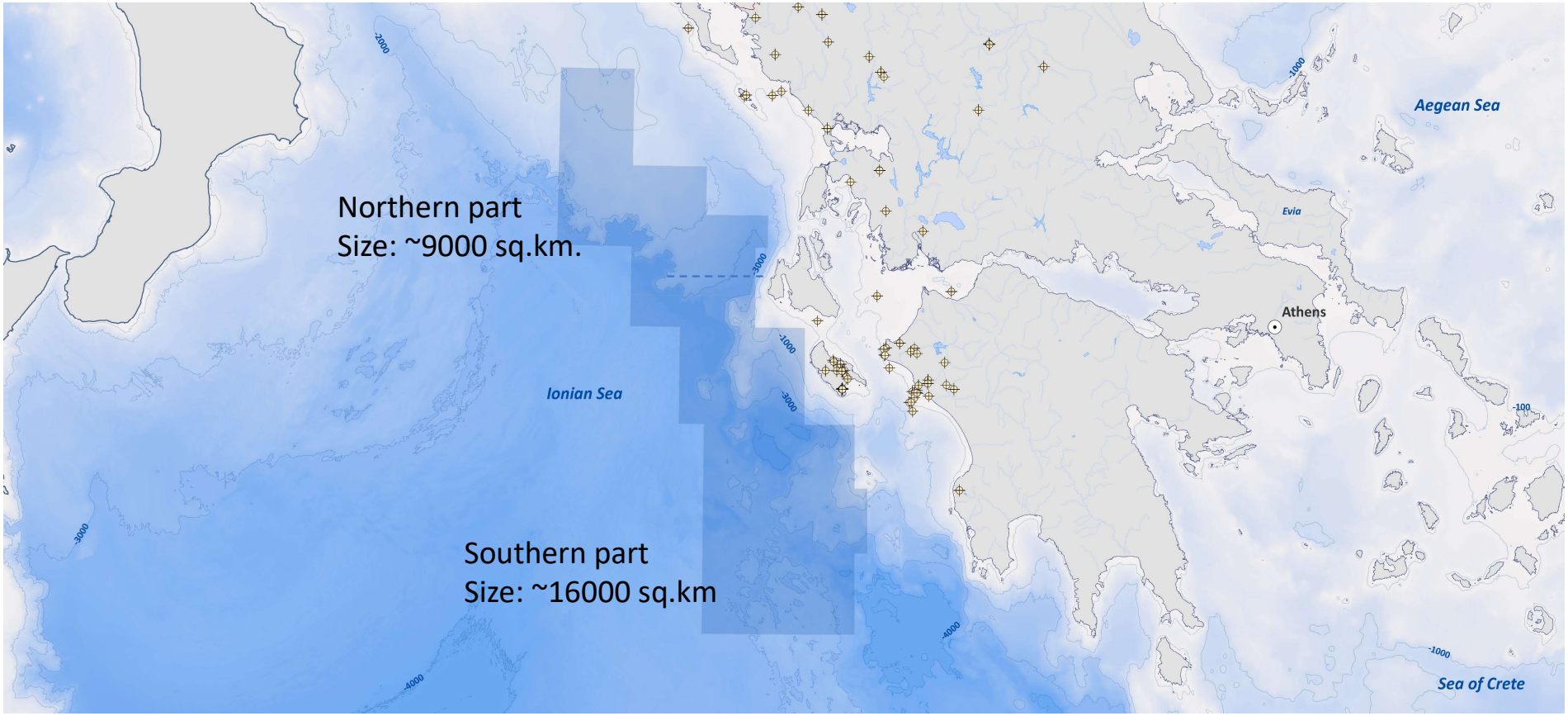
- Discoveries in W Greece, Oil & gas shows and seeps, Albanian [basin] and Italian analogues [platform]
- Wells to correlate (Ionian Sea, absent in Crete)
- Large acreage-potential blocks to explore
- EastMed Pipeline Project in progress (S. of Crete), TAP underwater (N Ionian)
- Fiscal regime

Plays in the available Offshore Acreage

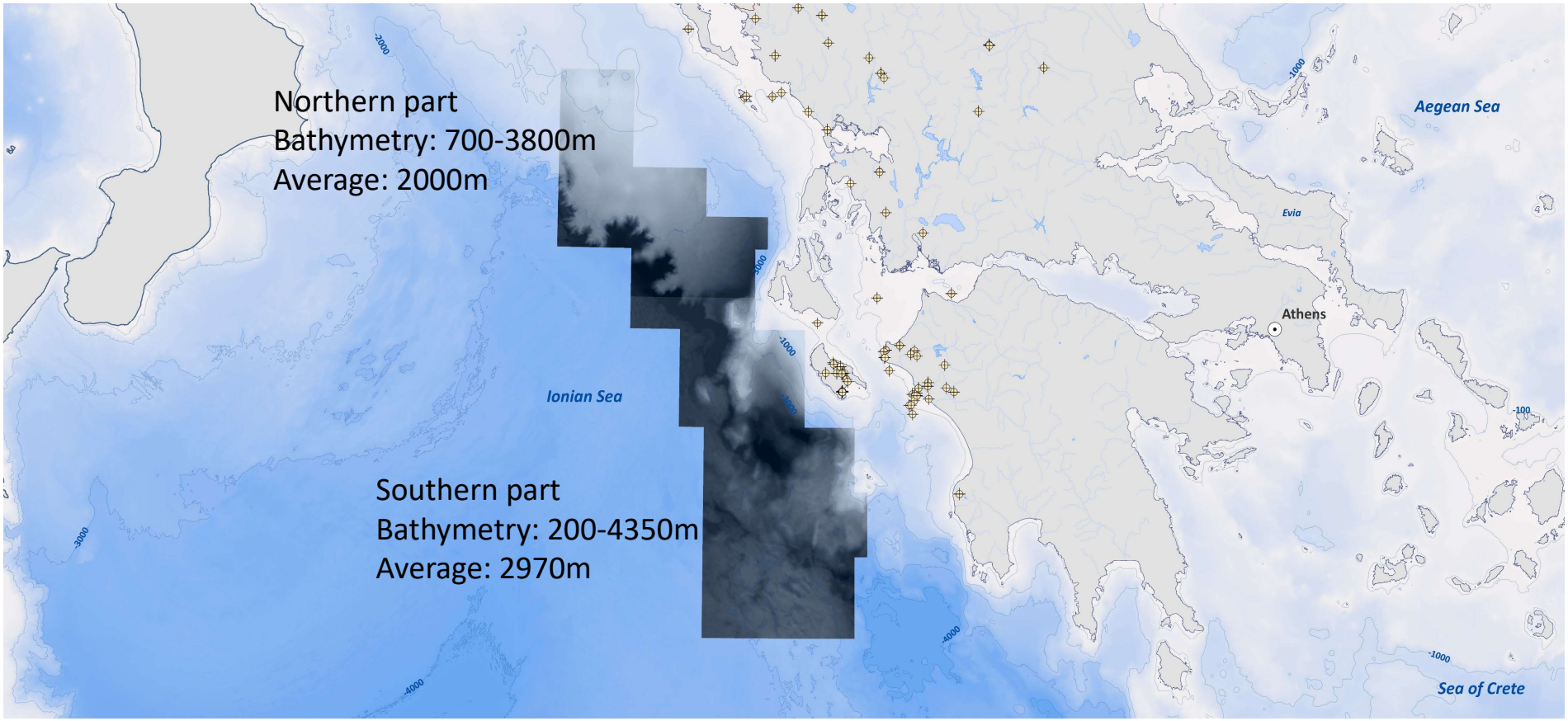


Plays identified using PGS's newly reprocessed PSDM data

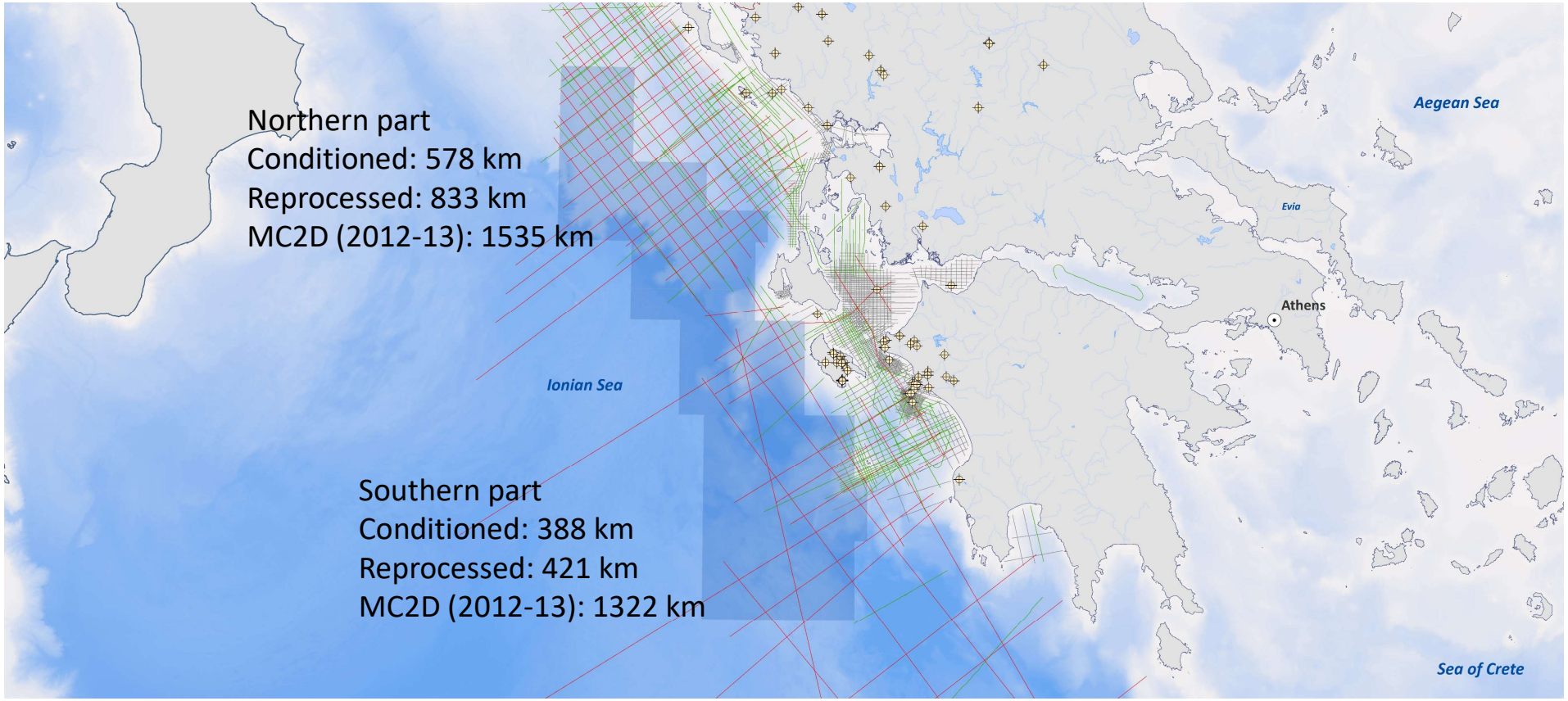
Offshore Central Ionian Acreage



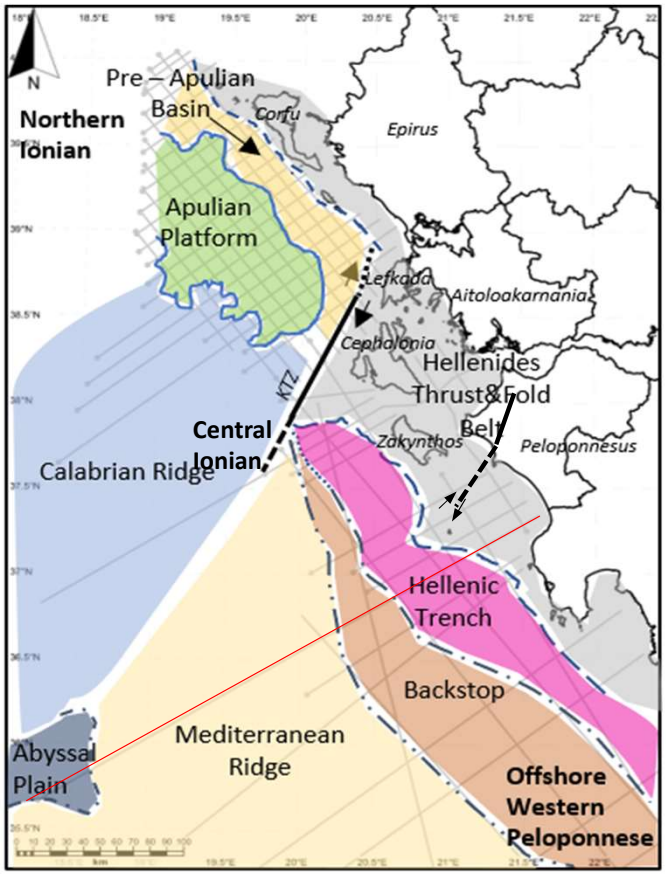
Offshore Central Ionian Acreage: Bathymetry



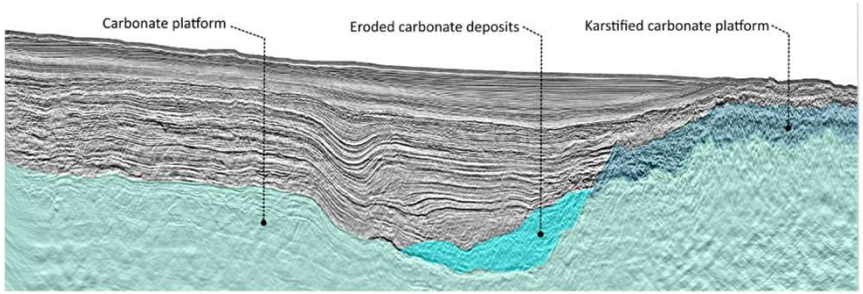
Offshore Central Ionian Acreage: Seismic coverage

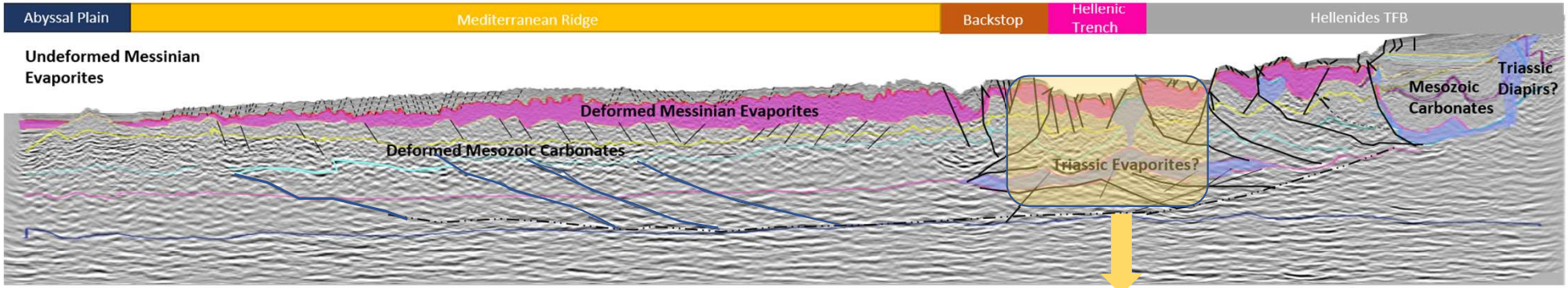


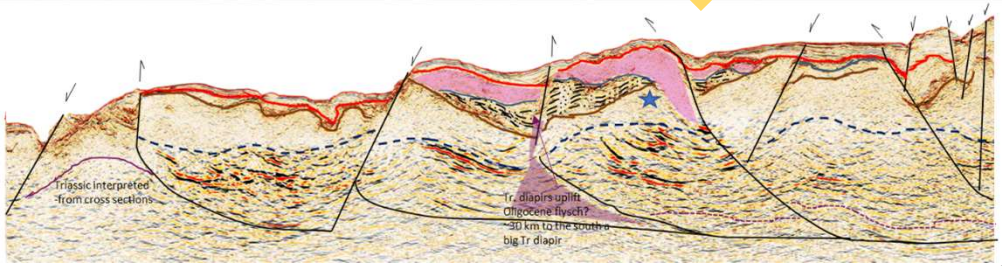
Tectonic setting : Central Ionian Sea



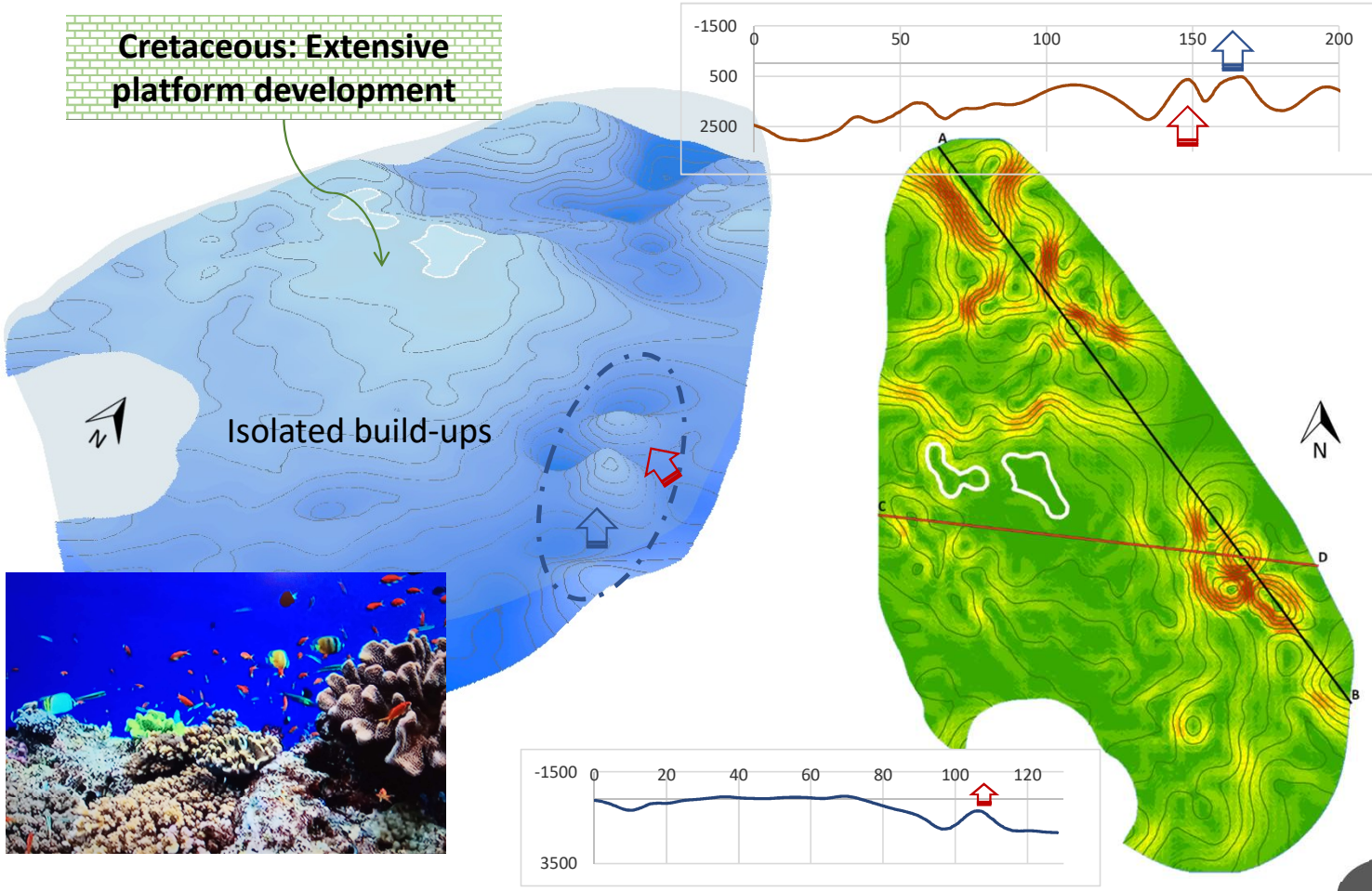
What we are currently studying in Offshore Western Greece



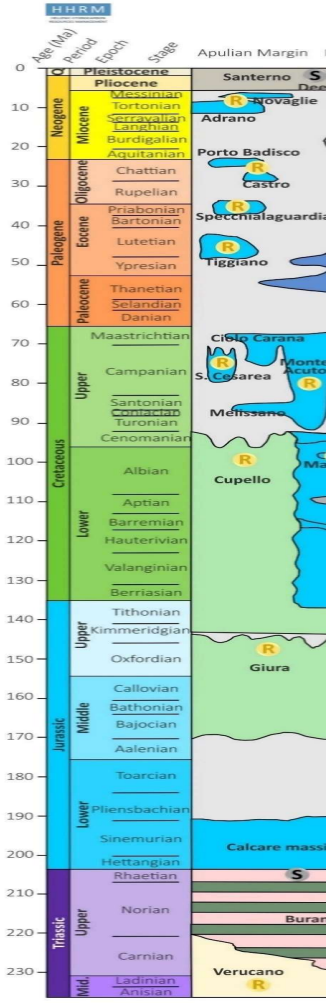


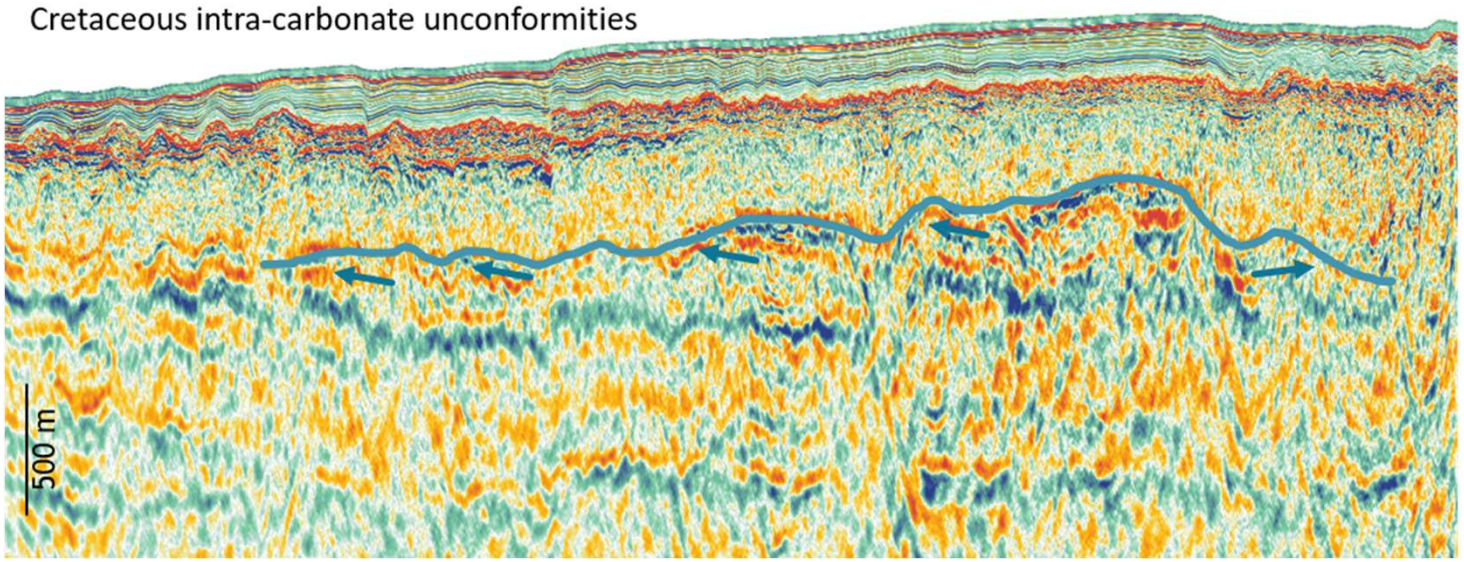


Cretaceous


Cretaceous: Extensive platform development
Isolated build-ups
-1500
500
2500
0
50
100
150
200
A
B
C
D
N
-1500
3500
0
20
40
60
80
100
120

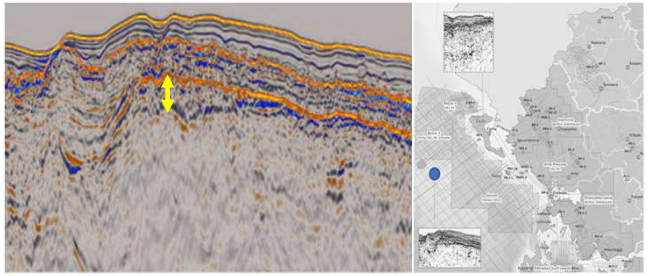
Apulian Platform: Seismic character



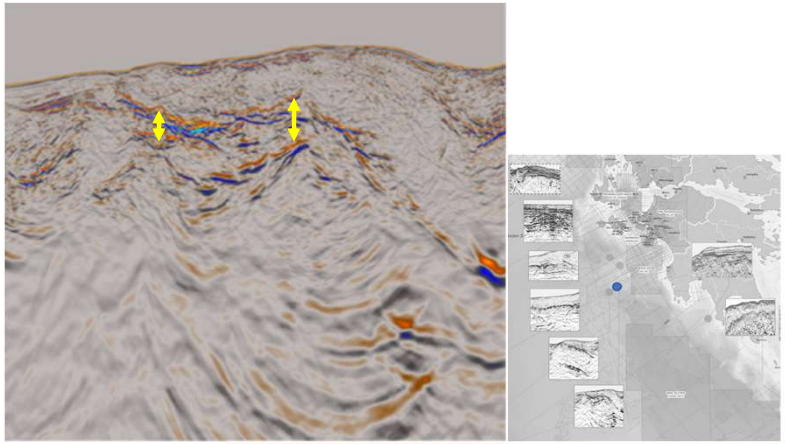


- Intra Platform Unconformities and
- Truncations on intra-cretaceous unconformity

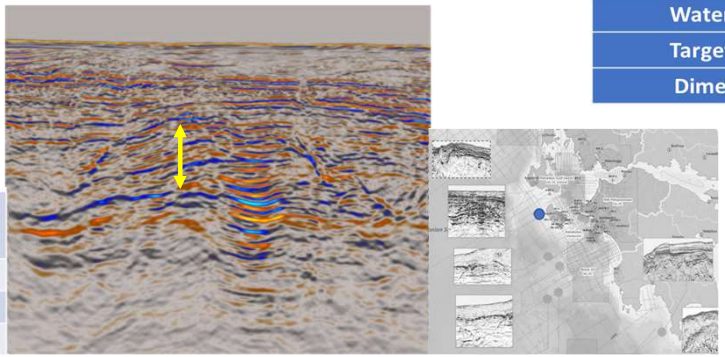
Plays in offshore Central Ionian available acreage



Type	Karstified Carbonate Platform
Water depth	840 m
Target depth	1,100 m
Dimensions	6685*160 (m)

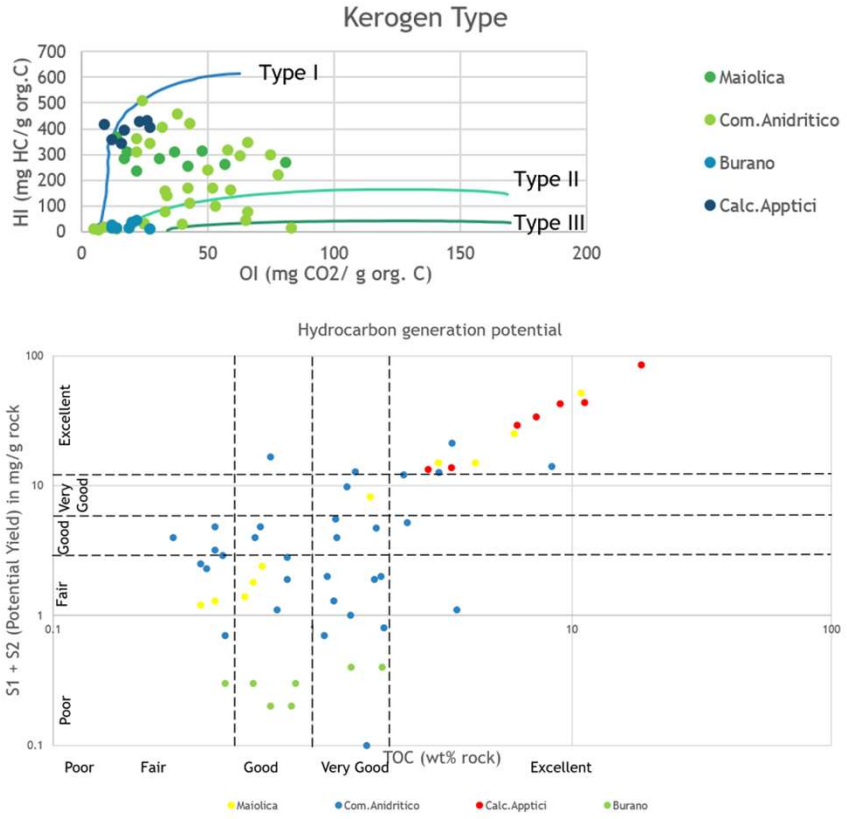


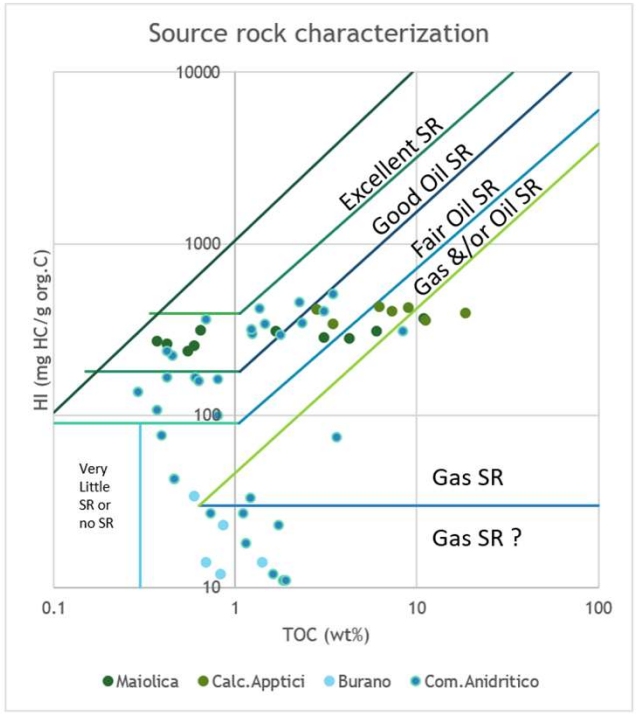
Type	Isolated Carbonate Build-up
Water depth	2,160 m
Target depth	3,060 m
Dimensions	4,260*720 (m)

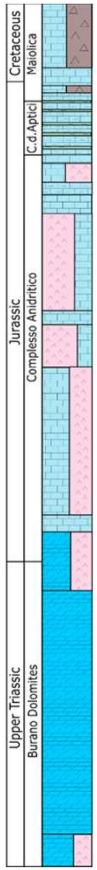


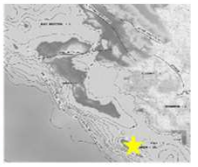
Type	Carbonate mounded feature (mound build up)
Water depth	1400 m
Target depth	2,160 m
Dimensions	3,800*630 (m)

Source rocks North Ionian

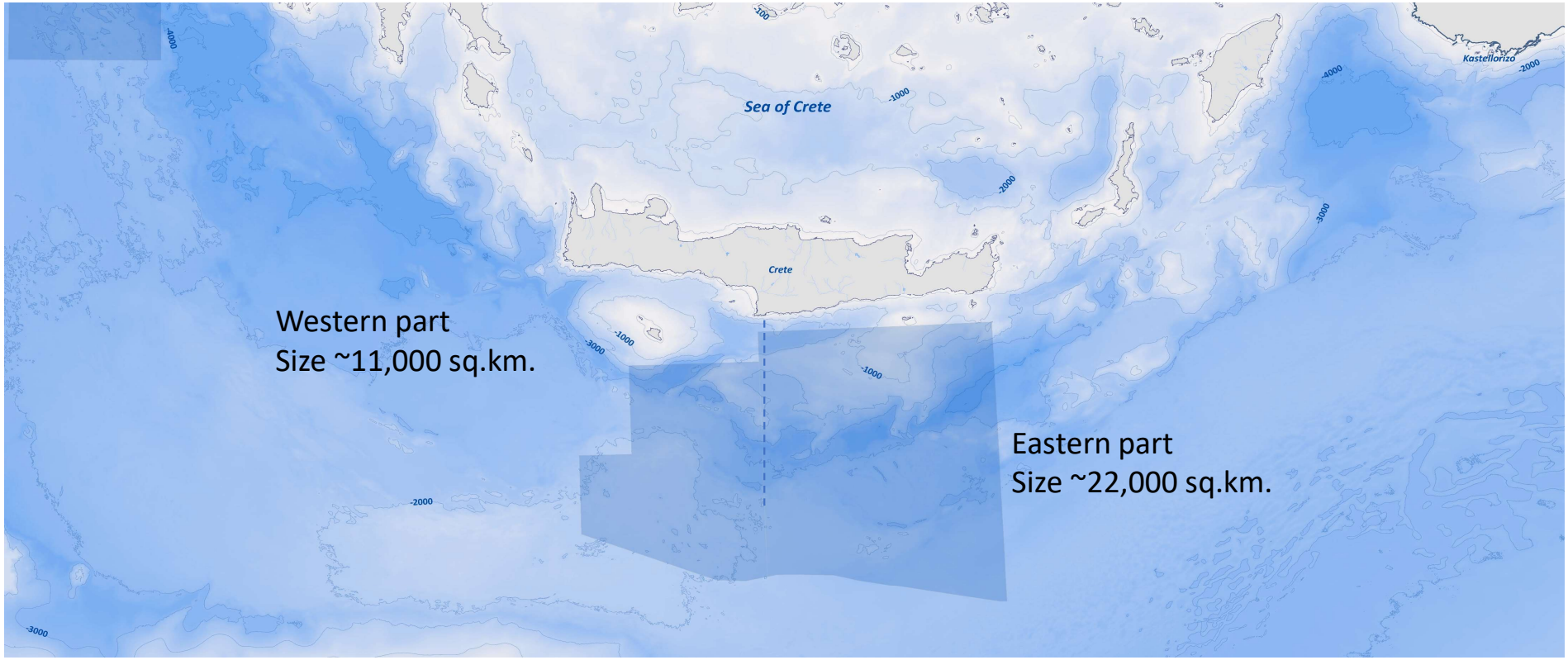




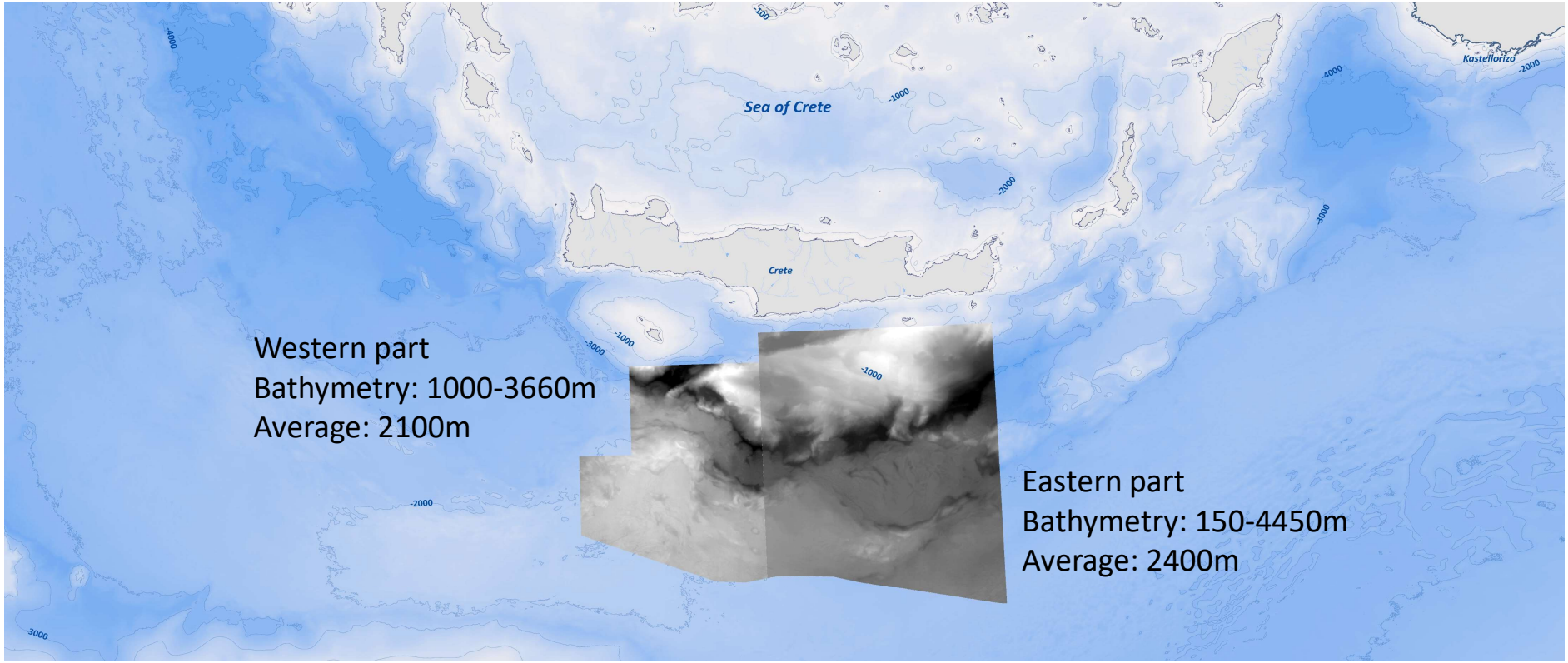




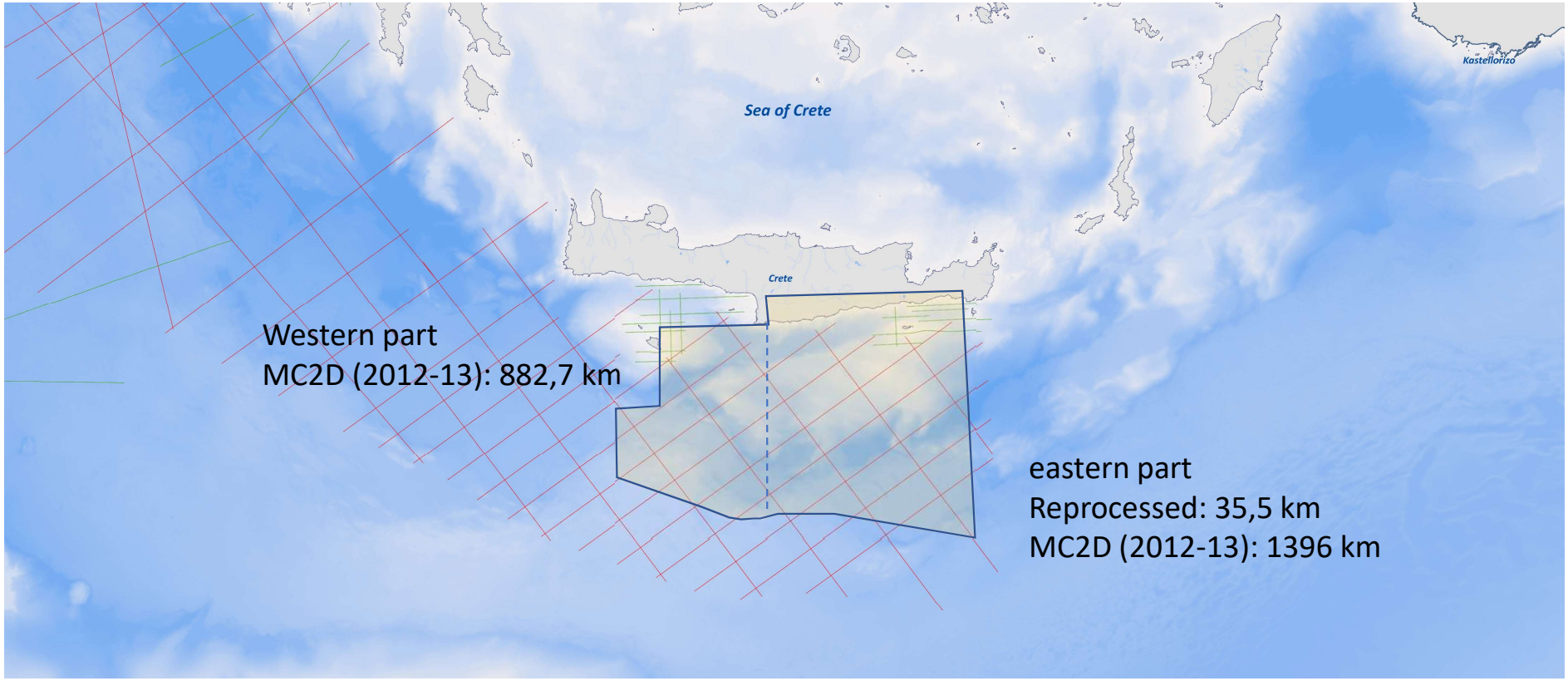
Offshore South of Crete Available Acreage



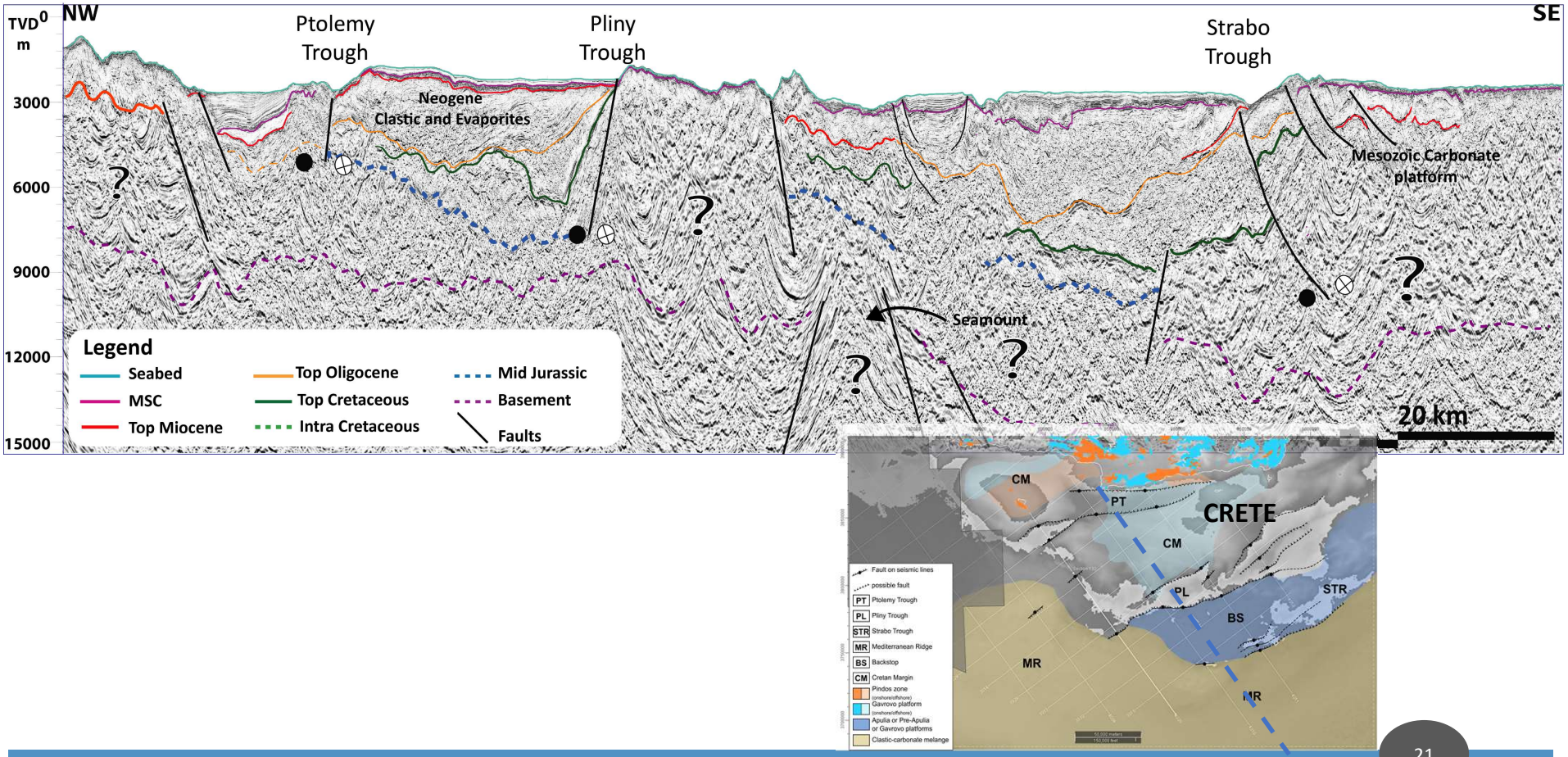
Offshore South of Crete Available Acreage: Bathymetry



Offshore South of Crete Available Acreage: Seismic coverage



Offshore South Crete

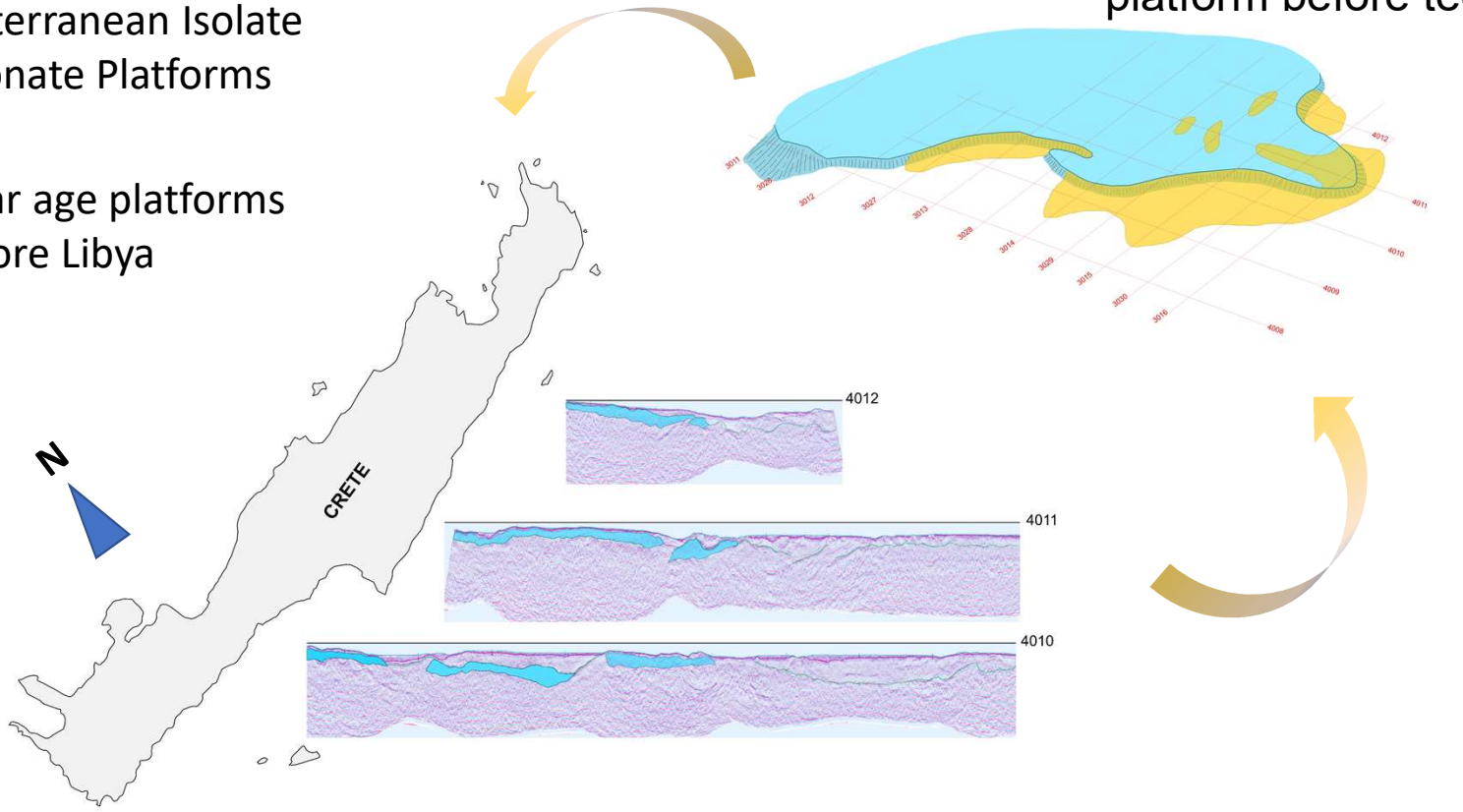


South of Crete in seismic

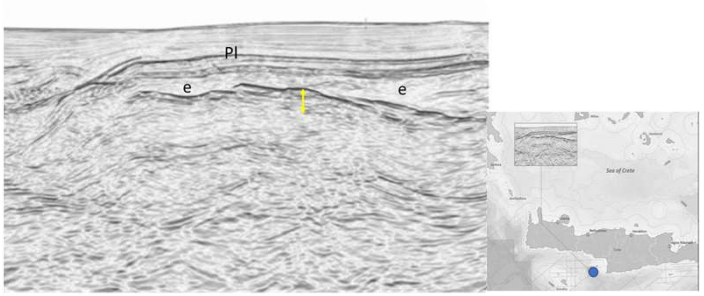
Similarities with other Mediterranean Isolate Carbonate Platforms

Similar age platforms offshore Libya

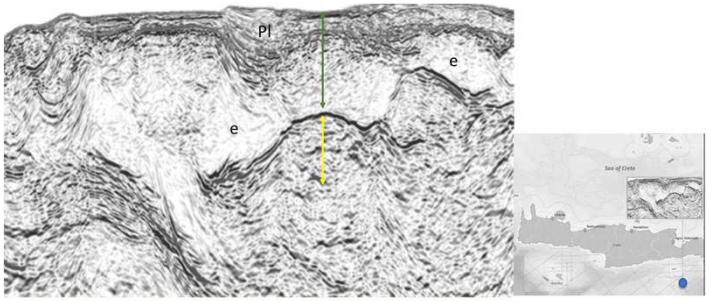
Eocene-Cretaceous carbonate platform before tectonism



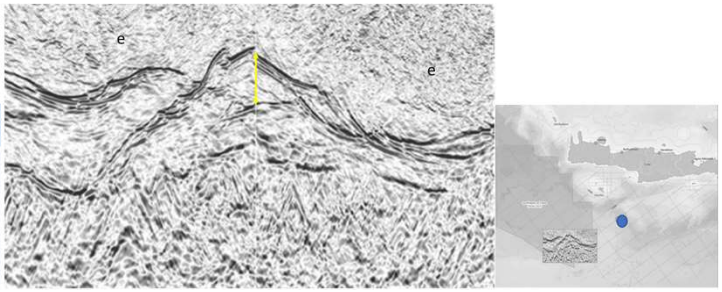
Plays in Offshore South of Crete Available Acreage



Type	Carbonate Build up
Water Depth	2,500 m
Target Depth	3500 m
Dimensions	H: 400 m , W: 1,500 m



Type	Anticline/Build up
Water Depth	2,890 m
Target Depth	3,700
Dimensions	H: 1,500 m, W: 4,000 m



Type	Carbonate Build up
Water Depth	2,650 m
Target Depth	4,630 m
Dimensions	H: 1,000 m, W: 3,000 m

Summarizing: Hydrocarbons prospectivity

- There is Open Space for new opportunities in offshore of both western Greece and South of Crete Isl.
- Huge acreage is offered for E&P, waiting for Your **Expression of Interest** !
- **Central Ionian Sea** and **South of Crete** areas provide interesting & promising structures and potential for future offshore exploration.

	Ionian	**Offshore Crete**
Source	Mesozoic/Miocene shales (e.g. Paxi)	Mesozoic/Miocene shales
Plays ➢ **Stratigraphic**	1. Cretaceous to Paleogene karstified platform carbonates (intraplatform to slope plays) 2. Carbonate build ups	1. Carbonate build ups (Zohr analogues) 2. Siliciclastics/ (turbidite deposits) pinch-outs
➢ **Structural**	Faulted blocks	Antiform structures (anticlines)
Seal	1. Neogene shales 2. Messinian Evaporites and overlying Pliocene shales (in the southern part)	1. Messinian Evaporites 2. Miocene and Pliocene shales

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HELLENIC HYDROCARBON RESOURCES MANAGEMENT

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Thank you

Summarizing: Hydrocarbons prospectivity (1/2)

- There is Open Space for new opportunities in offshore of both western Greece and South of Crete Isl.
- Huge acreage is offered for E&P
- **Central Ionian Sea** and **South of Crete** areas provide interesting & promising structures and potential for future offshore exploration

- **Central Ionian Sea**
- Source**:** Mesozoic/Miocene shales (Paxi example)
- Plays are
  - mostly stratigraphic and include
    - Cretaceous to Paleogene karstified platform carbonates (intraplatform to slope plays) and
    - carbonate build ups
  - and secondary structural including faulted blocks

  - sealed by Neogene shales in the Ionian offshore available acreage, and locally (southern part) by a combination of Messinian Evaporites and overlying Pliocene shales.

Summarizing: Hydrocarbons prospectivity (2/2)

South of Crete Offshore Acreage

- It is a frontier offshore area
- Source: Mesozoic/Miocene shales
- Plays are both stratigraphic and structural, including
  - carbonate build ups (Zohr analogues),
  - antiform structures (anticlines) and
  - siliciclastics (turbidite deposits)/pin-chouts,
- Sealed by Messinian Evaporites and overlying Pliocene shales, or Miocene and Pliocene shales