



المكتب الوطني للهيدروكاربورات و المعادن
ΕΘΣΟ. Α.Ε.Ε.Ο. | ΗΦΣΛΟ:Κ.ΟΘ:Ο. + Λ ΣΧ:Υ.Χ
OFFICE NATIONAL DES HYDROCARBURES ET DES MINES



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Houston, Texas

MOROCCAN OIL AND GAS EXPLORATION OPPORTUNITIES IN THE SPOTLIGHT

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Petroleum Exploration Manager



Country Key Aspects

Hydrocarbon Exploration Overview

Petroleum Systems & Hydrocarbon Plays

Examples of untested Plays, Leads & Prospects

Morocco Incentives

Summary

MOROCCO: A FAST GROWING ECONOMY



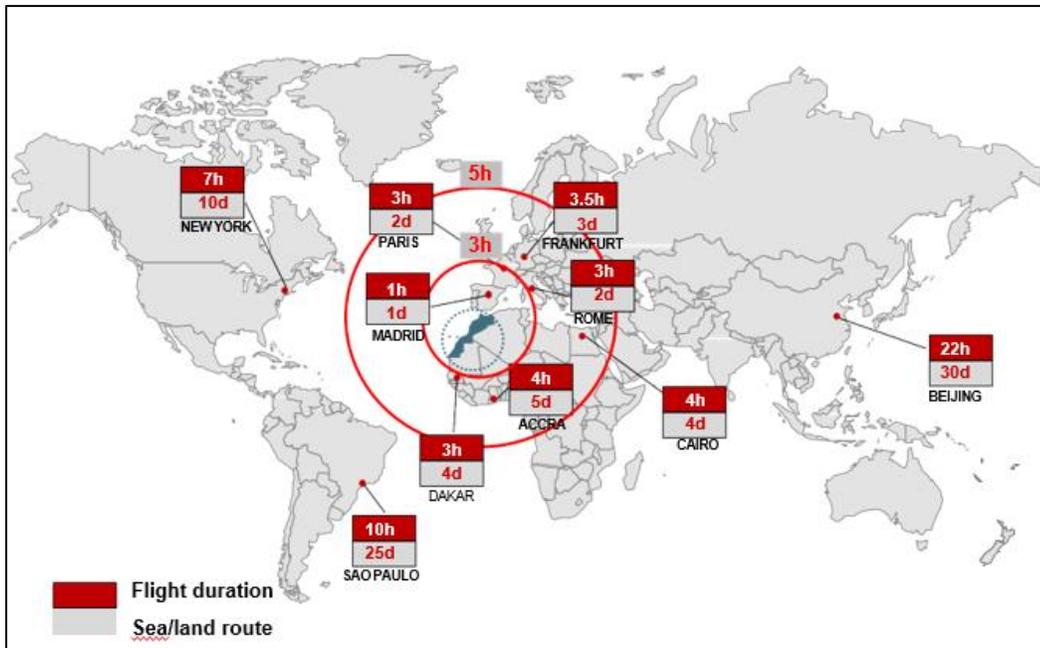
- **Population:** 36.45 million (very welcoming people)
- **Language:** Arabic, Amazigh, French, Spanish and English
- **Primary Energy Consumption :** 20 million TOE
- **Dependency on energy imports :** 95 %
- **Net energy bill :** 14 billion \$ (2022)
- **2030 energy consumption forecast :** 43 million TOE
- **GDP:** 330 billion \$ (2022)
- **GDP Growth:** +2.5 % (2022)
- **Inflation rate:** 6.6 %
- **Foreign Direct Investment:** 1.9 billion \$
- **Currency:** Moroccan Dirham (MAD)

General Information	
Capital	Rabat
Institutional System	Democratic and social Constitutional Monarchy
Area	710 850 km ²
Time Zone	GMT+1

MOROCCO: A CROSSROAD FROM AFRICA TO EUROPE

- Morocco is a **politically stable** country
- A unique **geographic location** with **3 500 Km coastline** on the **Atlantic Ocean** and the **Mediterranean sea**
- **15 Km distance** from **Europe**

- **1st in North Africa** in terms of **infrastructure quality**
- **14 foreign trade ports** and **24 airports**
- **Tangier Med Port: A growing global connectivity** with **174 ports** and **74 countries**





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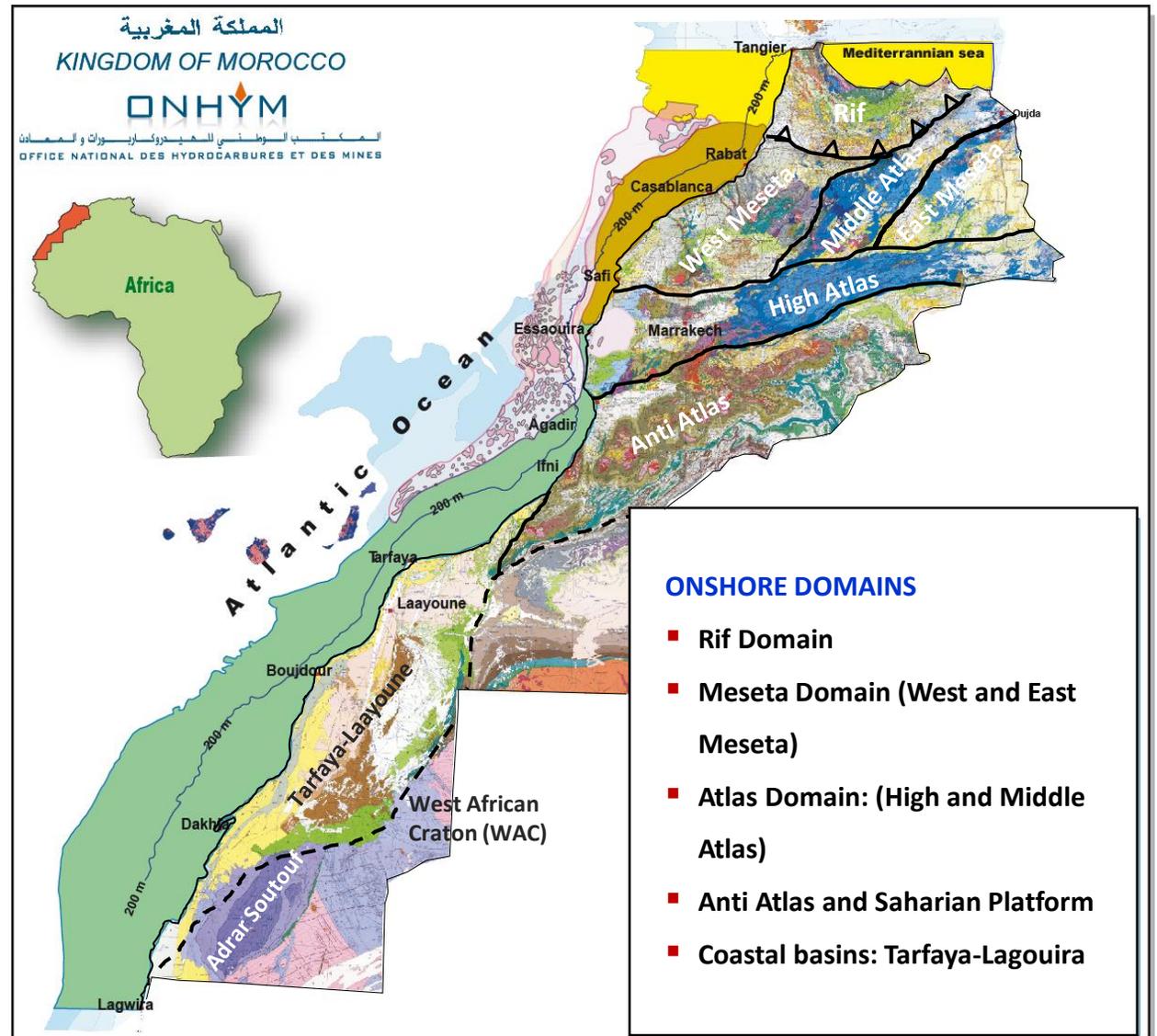
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OFFSHORE & ONSHORE MOROCCO: GEOLOGICAL SNAPSHOT

MAIN ONSHORE STRUCTURAL DOMAINS AND ASSOCIATED PETROLEUM OBJECTIVES

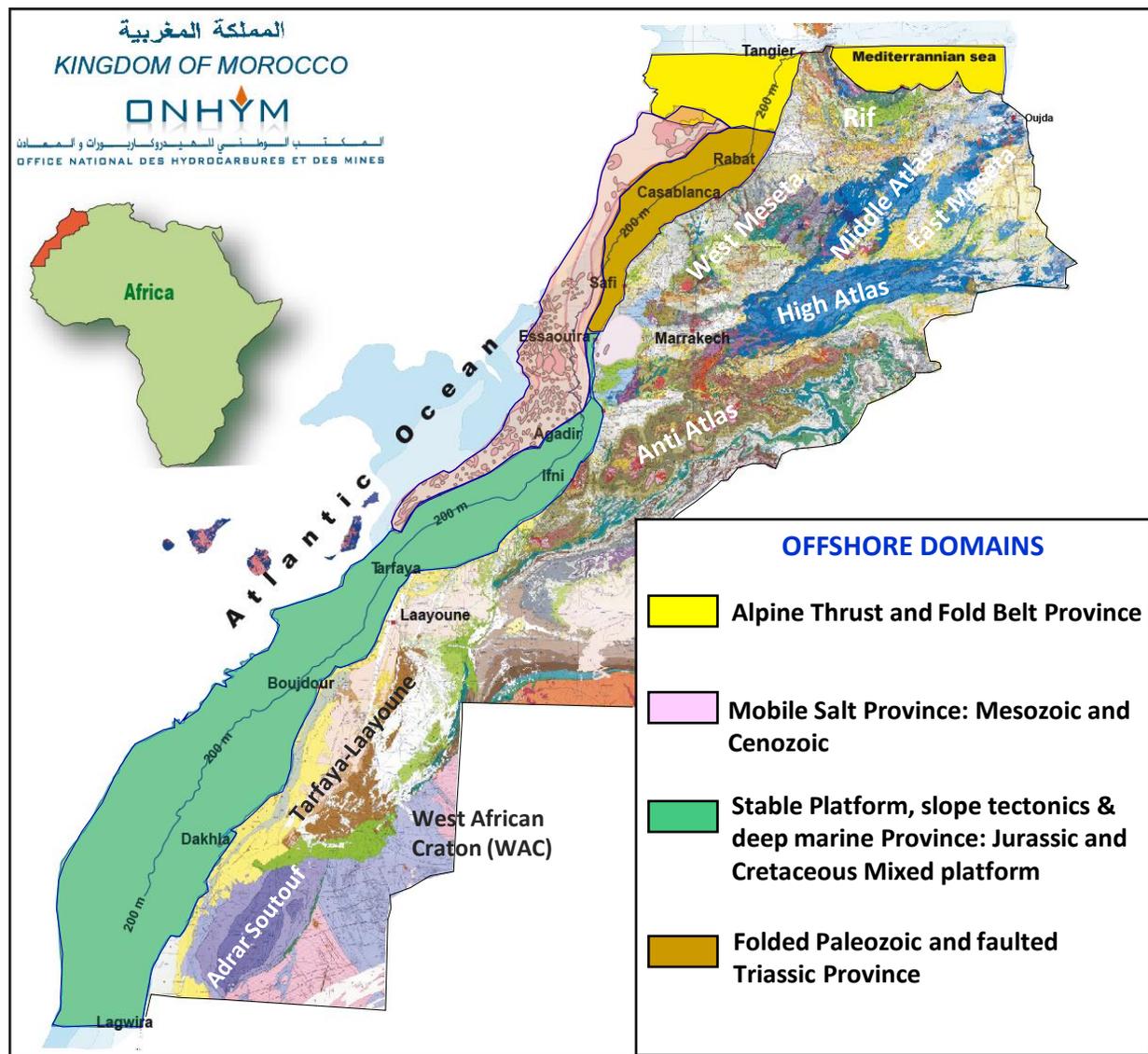
- **The Rif Domain:** Alpine folded and thrust belt (Mesozoic and Tertiary Objectives)
- **The Meseta Domain:** Hercynian Folded & thrust belt and Meso-Cenozoic rift & Passive margin (Paleozoic, Triassic and Jurassic objectives)
- **The Atlas Domain:** Early Mesozoic Tethysian Rift and Alpine Inverted and Folded belt (Triassic and Jurassic Objectives)
- **The Anti Atlas and Saharian Platform:** Hercynian domain (Paleozoic Objectives)
- **The Coastal basins:** Atlantic Mesozoic-Cenozoic Passive Margin (Triassic, Jurassic, Cretaceous and Tertiary Objectives)



OFFSHORE & ONSHORE MOROCCO: GEOLOGICAL SNAPSHOT

MAIN OFFSHORE STRUCTURAL DOMAINS AND ASSOCIATED PETROLEUM OBJECTIVES

- **Alpine thrust and folded belt province:**
 Extension of the Rif domain (Jurassic, Cretaceous and Tertiary Objectives)
- **Folded Paleozoic and faulted Triassic Province:**
 Extension of the Meseta (Paleozoic and Triassic Objectives)
- **Mobile salt province:** Mesozoic Atlantic Rift & Passive Margin (Triassic, Jurassic, Cretaceous and Tertiary Objectives)
- **Platform and Deep Marine Province:** Mesozoic Atlantic Rift & Passive Margin (Jurassic, Cretaceous and Tertiary Objectives)



HYDROCARBON EXPLORATION STATUS

SEISMIC & WELLS DATABASE

ONSHORE

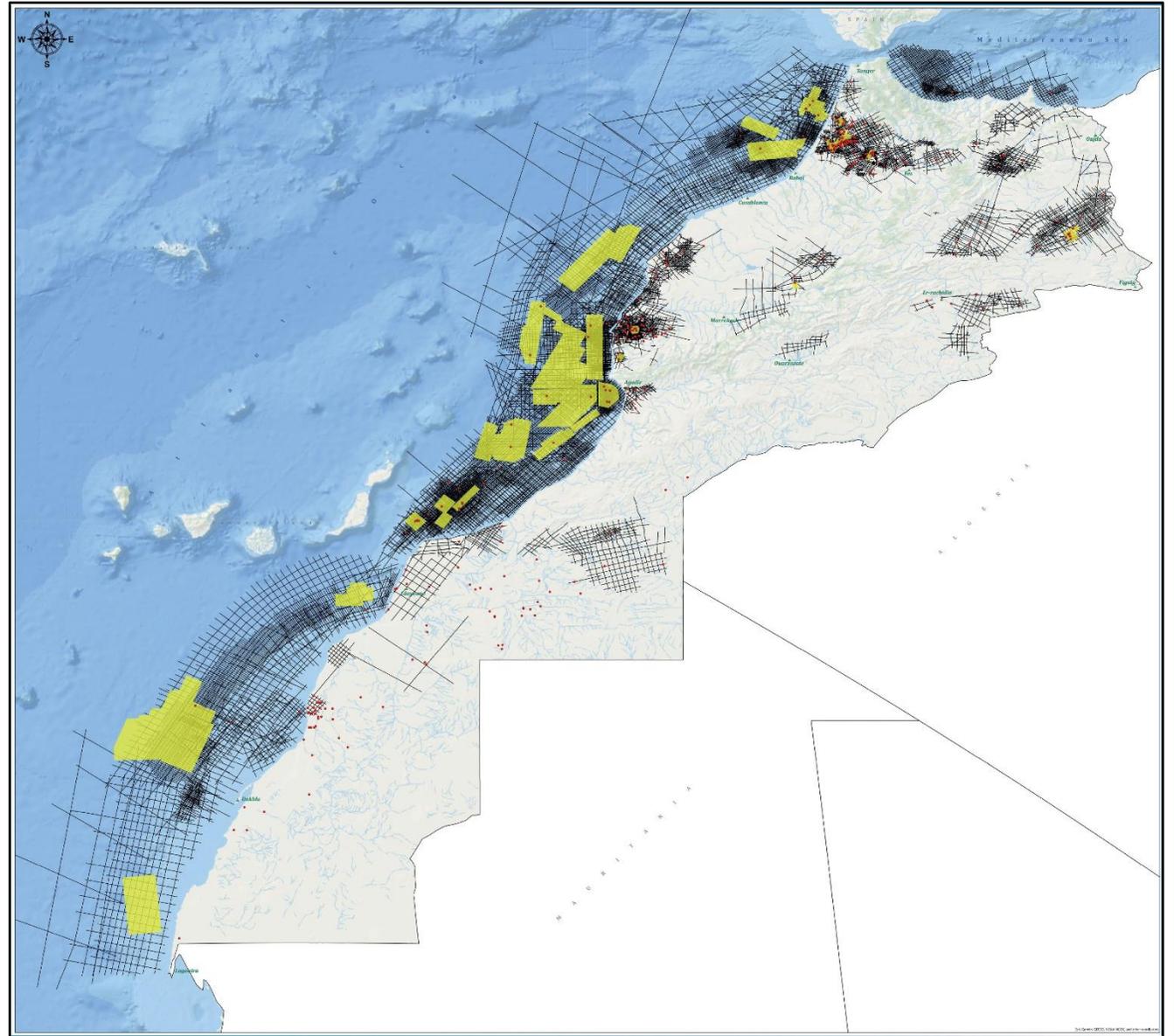
58 722 KM OF 2D SEISMIC
2 218 KM² OF 3D SEISMIC
327 EXPLORATION WELLS

OFFSHORE ATLANTIC

176 623 KM OF 2D SEISMIC
67 888 KM² OF 3D SEISMIC
43 EXPLORATION WELLS

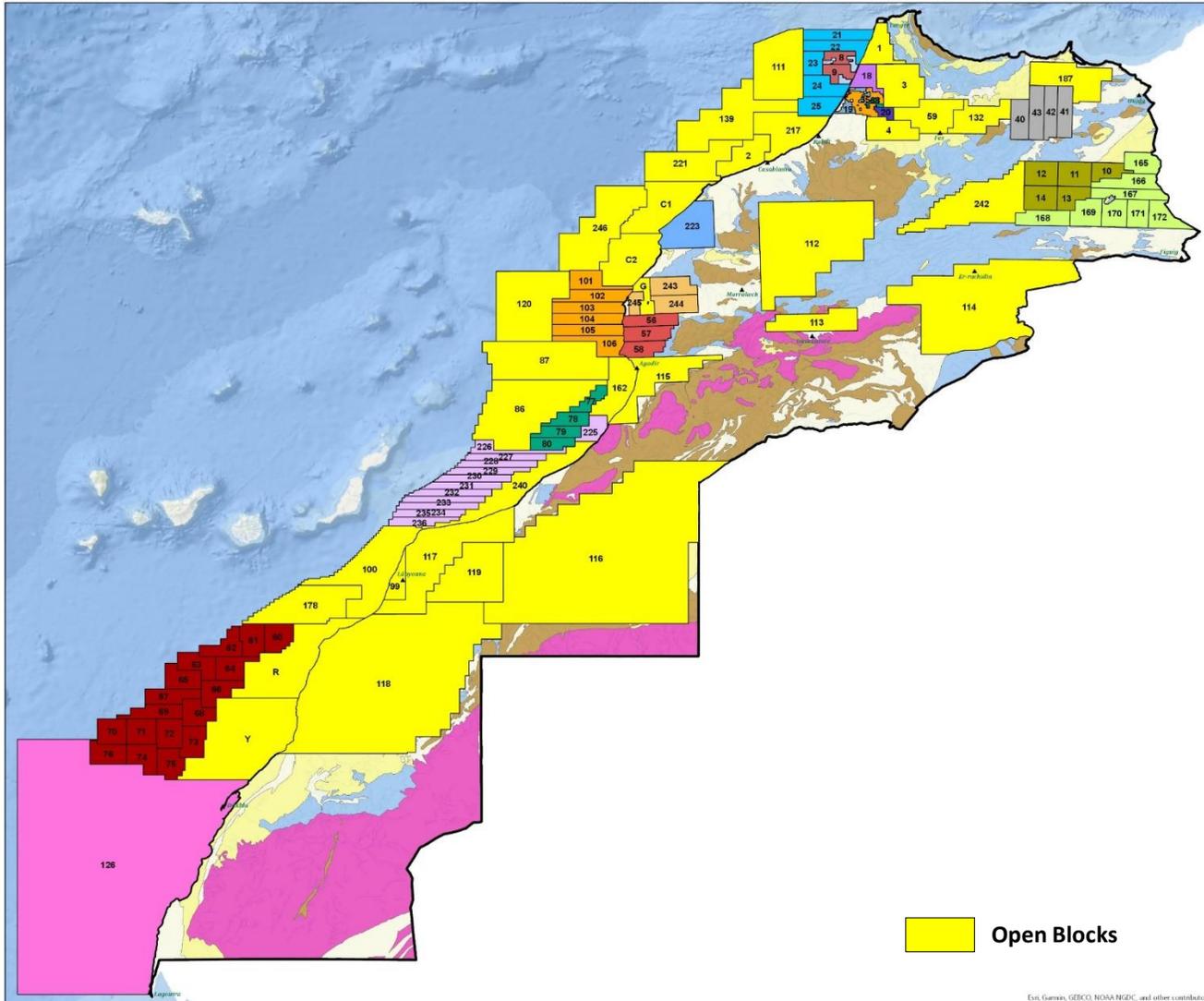
OFFSHORE MEDITERRANEAN

10 775 KM OF 2D SEISMIC
2 EXPLORATION WELLS



HYDROCARBON EXPLORATION STATUS

LICENSING STATUS



74 Exploration Permits : **46** Offshore & **28** Onshore

1 Offshore Reconnaissance License

12 Exploitation concessions (including **3** ONHYM)

34 Open Blocks: **17** Offshore & **17** Onshore





Country Key Aspects

Hydrocarbon Exploration Overview

Petroleum Systems & Hydrocarbon Plays

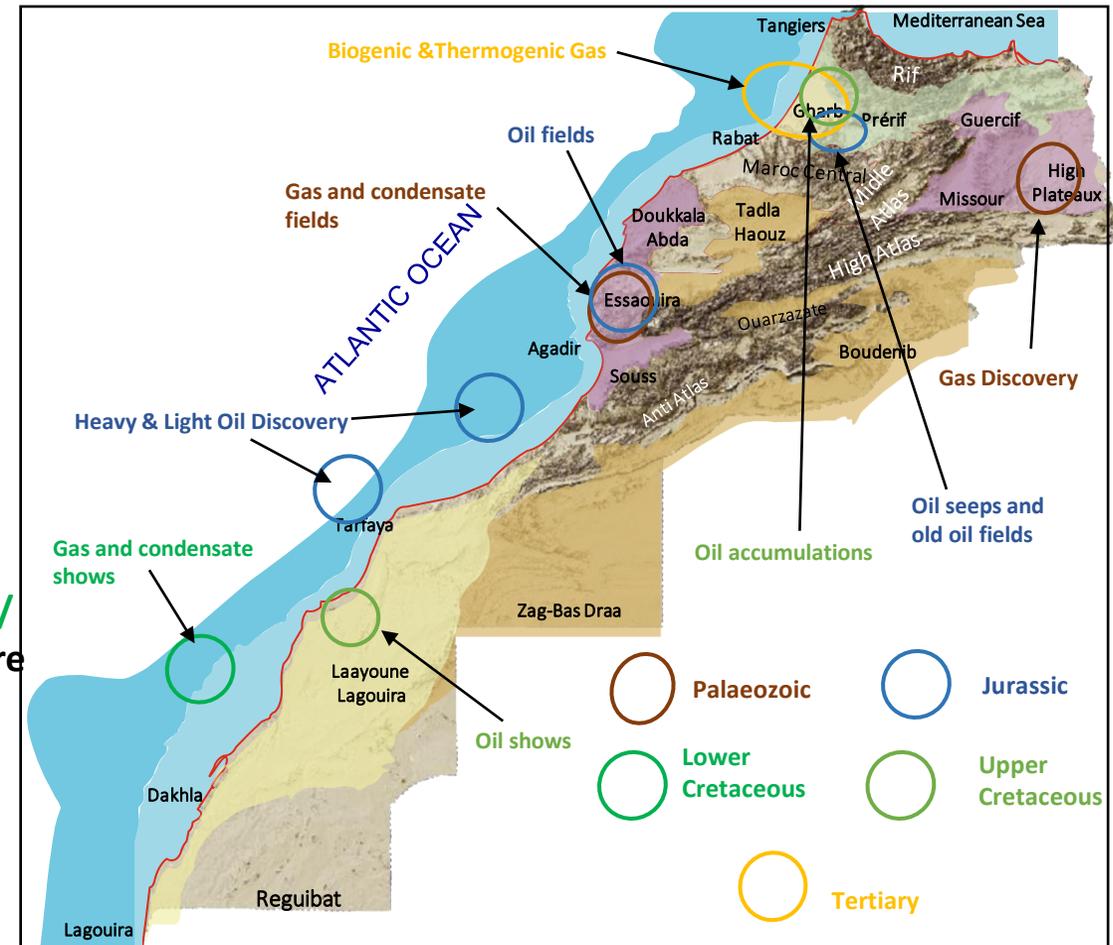
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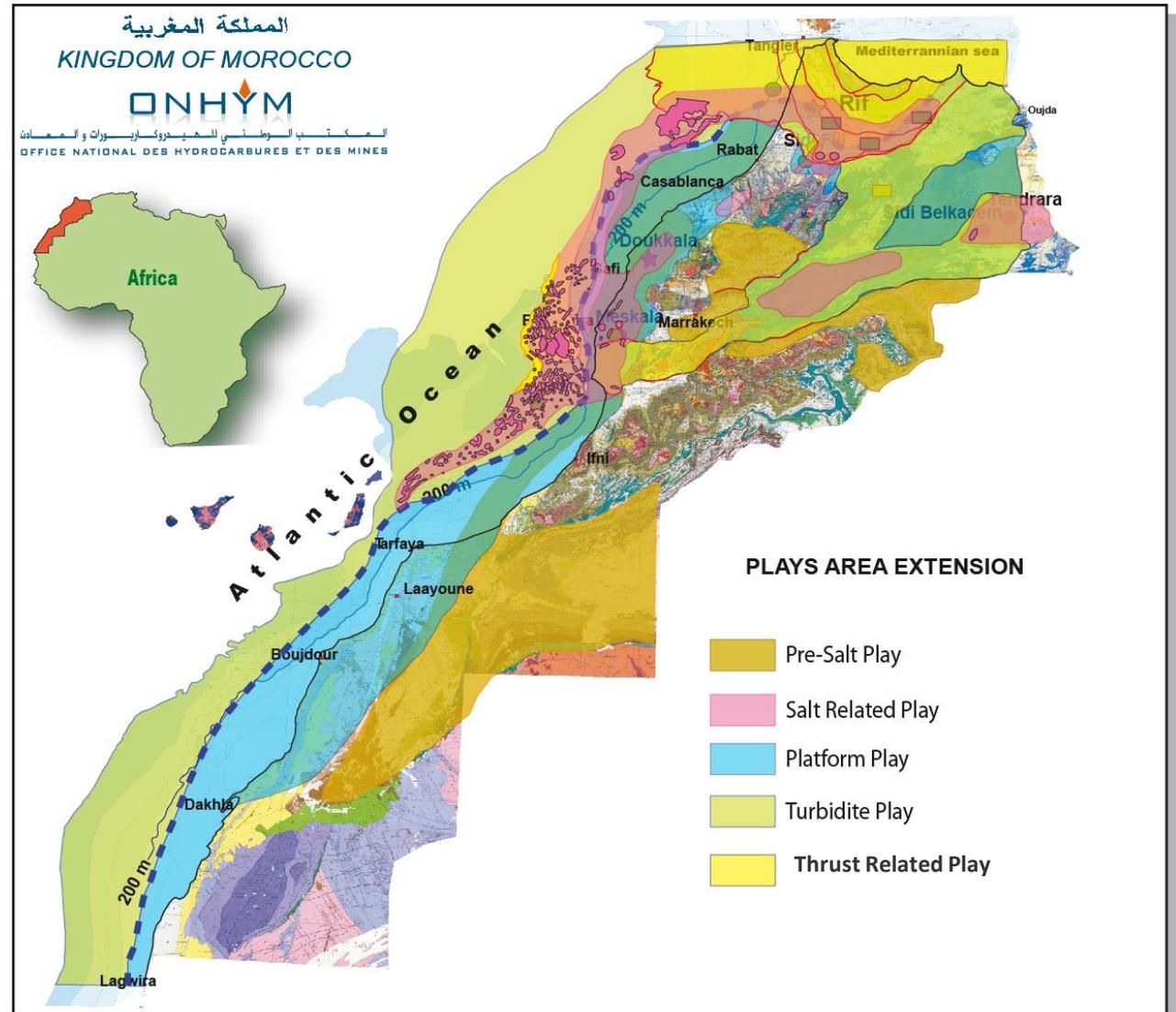
OFFSHORE & ONSHORE MOROCCO : PETROLEUM SYSTEMS SUMMARY

- The petroleum systems are widely extended in stratigraphic time from Paleozoic into Tertiary. These are proven in the Onshore and Offshore Moroccan sedimentary basins through hydrocarbon occurrences (discoveries, shows, surface oil seeps). The main peers are:
 - **Palaeozoic petroleum systems (Silurian/Triassic & Silurian/Ordovician-Devonian):** e.g. Meskala gas & condensate field and High Plateaux gas discovery
 - **Jurassic petroleum systems (Toarcian-Callovian/Jurassic):** e.g. oil fields in the rides prerifaines & Essaouira and oil discovery in the Offshore
 - **Lower cretaceous petroleum systems (Jurassic-Lw. Cretaceous/ Lw. Cretaceous):** e.g. oil and gas shows encountered in Offshore Atlantic
 - **Upper cretaceous petroleum systems (Cenomanian-Turonian/Upper Cretaceous-Tertiary):** e.g. Ain Hamra oil accumulation and oil shows in the Onshore
 - **Tertiary petroleum systems (Tertiary/Tertiary):** e.g. biogenic gas fields and Anchois discovery in Gharb basin



OFFSHORE & ONSHORE MOROCCO : HYDROCARBON PLAYS

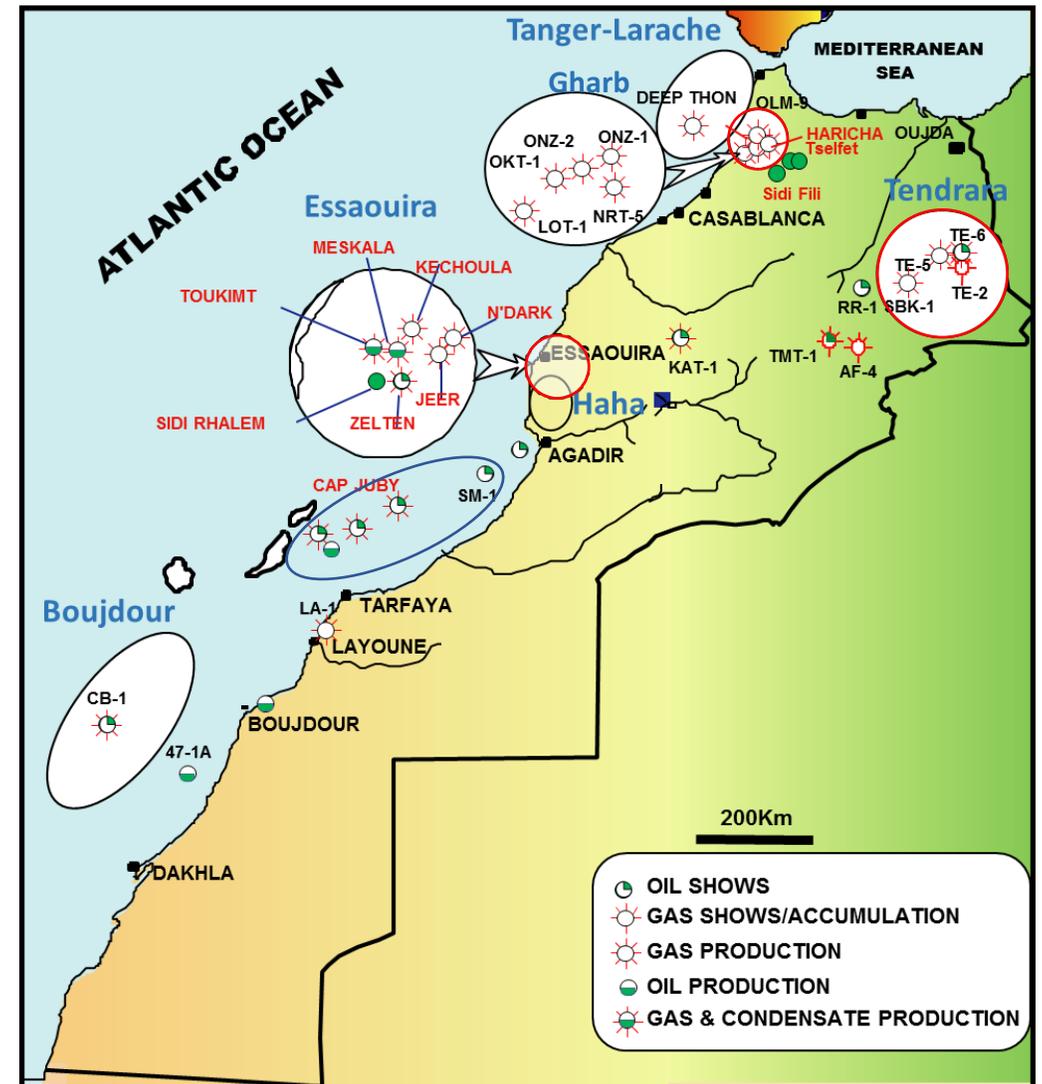
- Development of different plays widely extending in space and geological time:
 - Salt Related Play
 - Platform Play
 - Turbidite Play
 - Thrust Related Play
 - Pre-Salt Play
- These plays have been developed thanks to intensive 2D and 3D seismic acquisitions, processing and reprocessing during the last 2 decades
- Only few structures related to some of these play types were tested leading to limited hydrocarbon discoveries.



MULTIPLE PROVEN PETROLEUM SYSTEMS OFFSHORE AND ONSHORE

PRODUCING FIELDS AND DISCOVERIES

- ❑ 3 main producing or under development fields:
 - **Essaouira Basin onshore** : Meskala Gas and condensate.
 - **Gharb Basin onshore** : Biogenic and thermogenic gas.
 - **Tendrara** : Natural gas in High Plateaus onshore.
- ❑ Anchois Discovery in Lixus Offshore (extension of the Gharb basin).
- ❑ Multiple heavy oil and gas shows offshore identified as a result of drilling.





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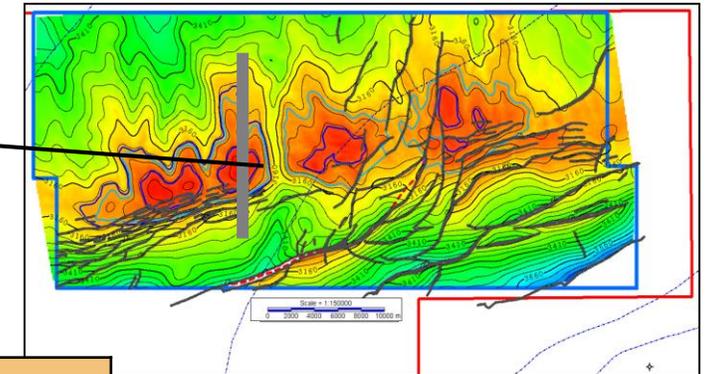
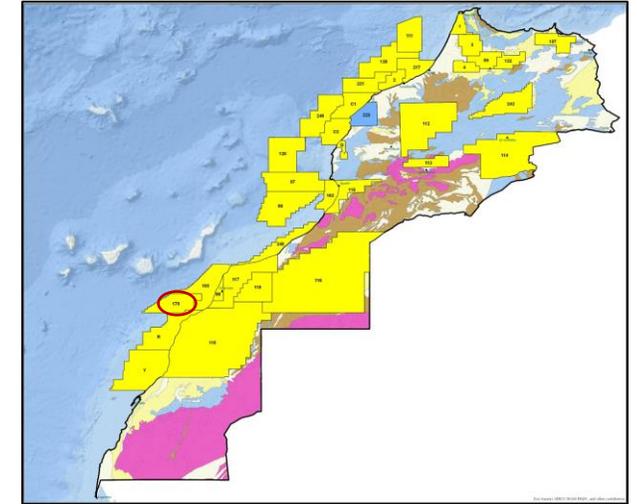
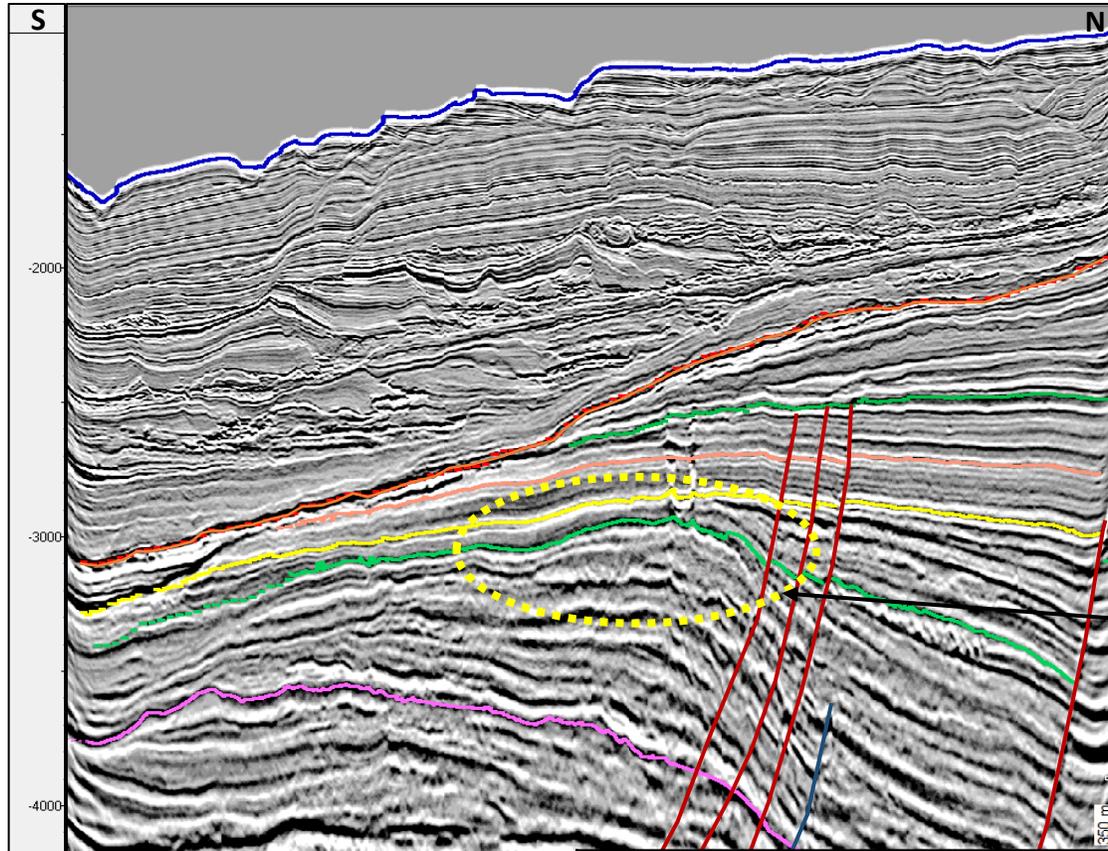
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OFFSHORE ATLANTIC MOROCCO : SLOPE ROLLOVER/TURBIDITE PLAY

LARGE VALANGINIAN 4-WAY CLOSURE WITH GAS PIPES

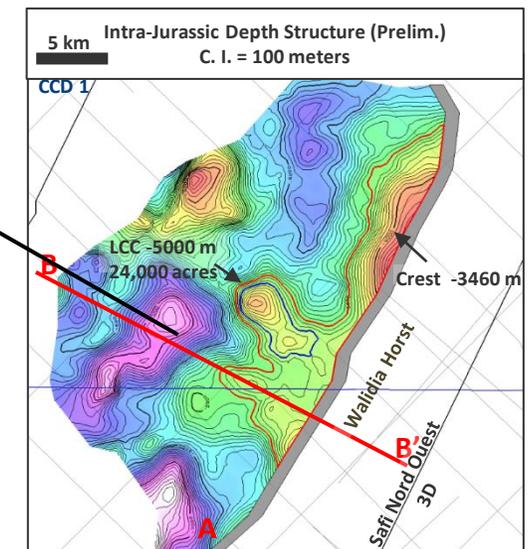
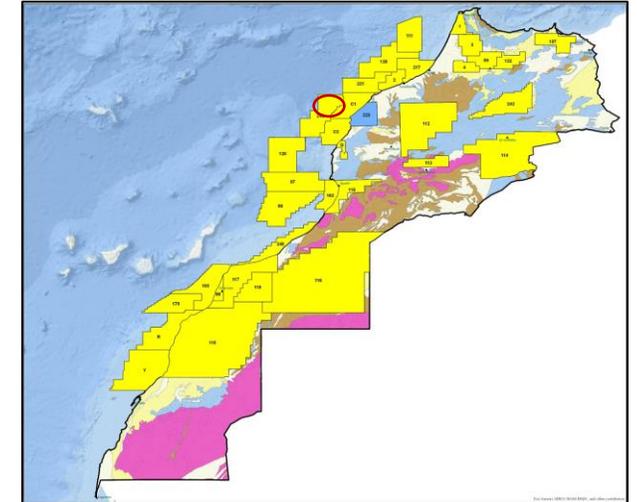
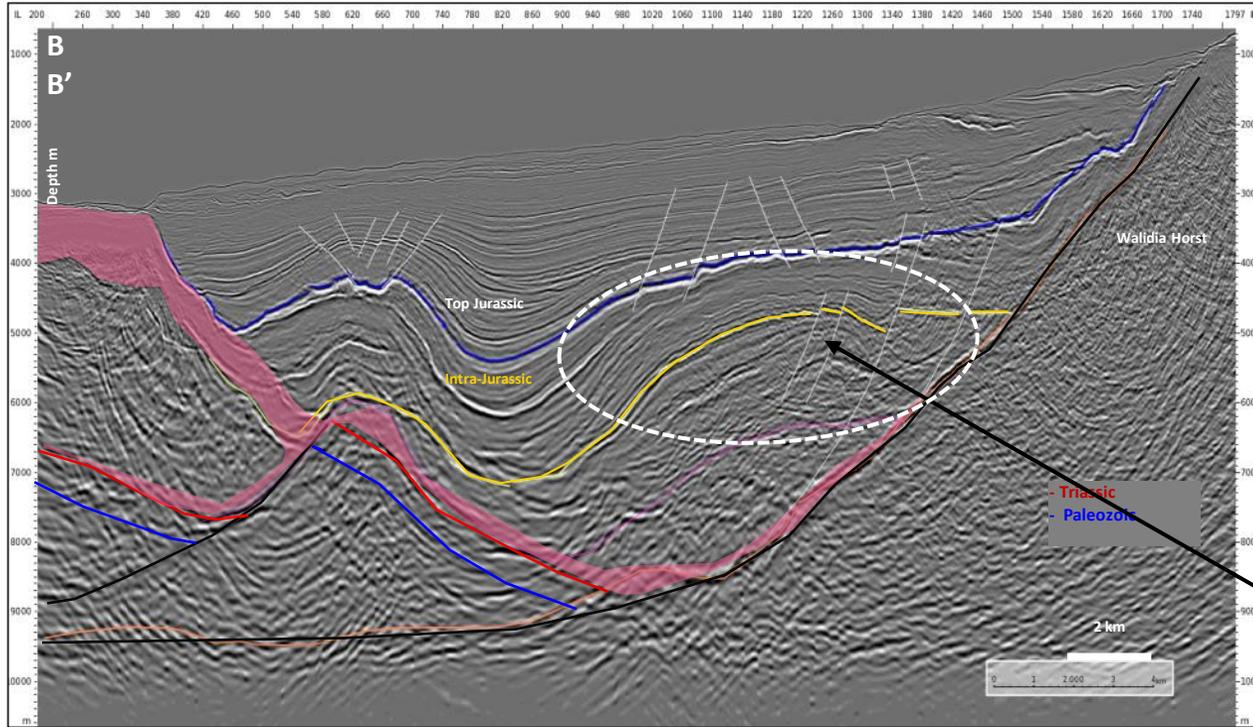


1. Source Rock: Callovian and Toarcian marls & shales
2. Migration: Vertical pathway through faults
3. Reservoir: Valanginian sands
4. Seal: U. Cretaceous & Tertiary Marls & shales
5. Trap: Structural (3 to 4-way closures)

PROSPECT	
Water Depth (m)	1250
Closure (Km ²) (mean)	43
STOIIP (mean) (MMbbls)	1556
Recoverable resources (mean) (MMbbls)	470

SAFI DEEP OFFSHORE: SALT RELATED PLAY

DOWNTHROWN SUPRA-SALT ROLLOVER WITH 3-WAY CLOSURE

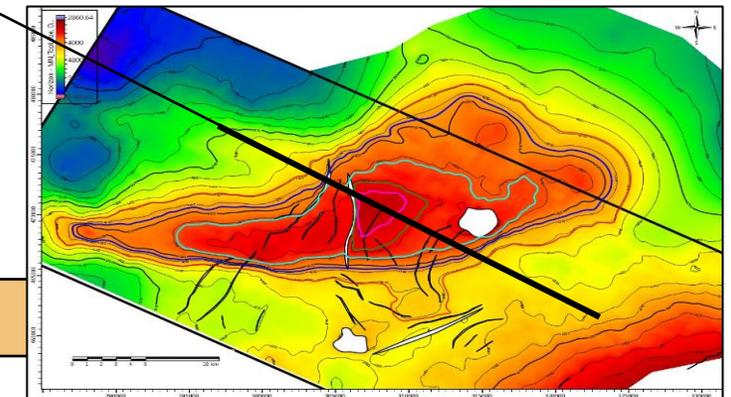
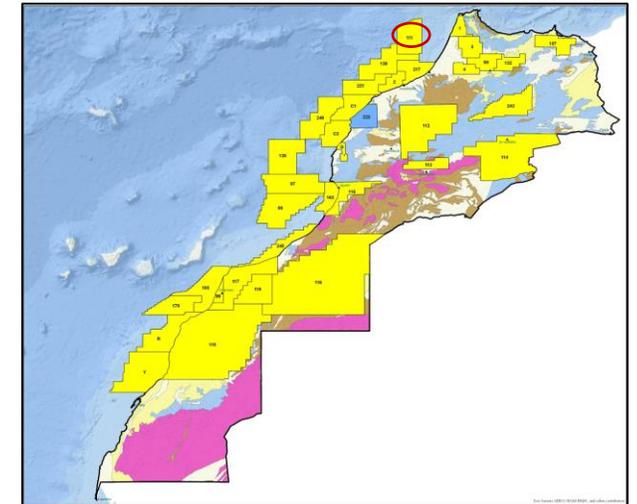
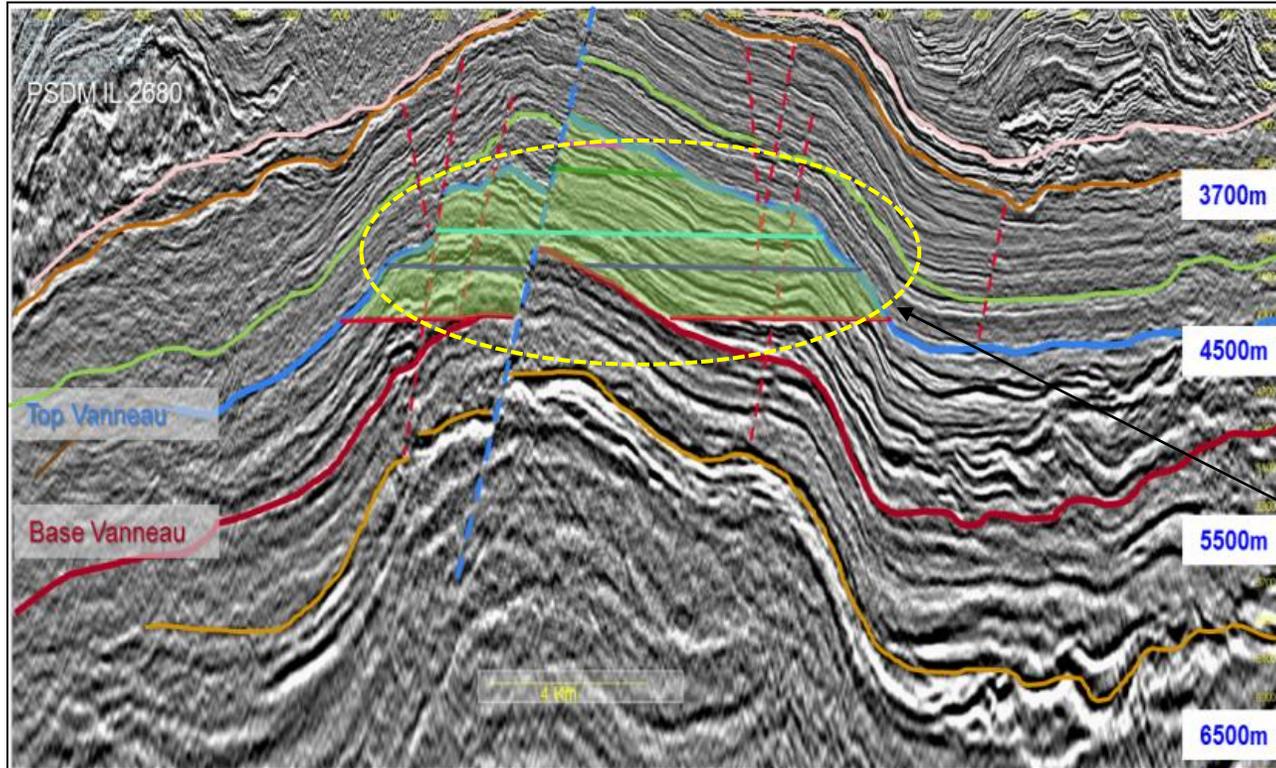


1. Charge: Type II Jurassic source rocks
2. Reservoir: Deep-water clastic turbidites (Jurassic)
3. Geometry: A mix of 3-way and 4-way salt influenced structures
4. Seal: Salt and shales

PROSPECT	
Water Depth (m)	1800
Closure (Km ²) (max)	97
Recoverable resources (mean) (MMbbls)	305

OFFSHORE ATLANTIC MOROCCO : TURBIDITE PLAY

4-WAY FAULTED ANTICLINE STRUCTURE



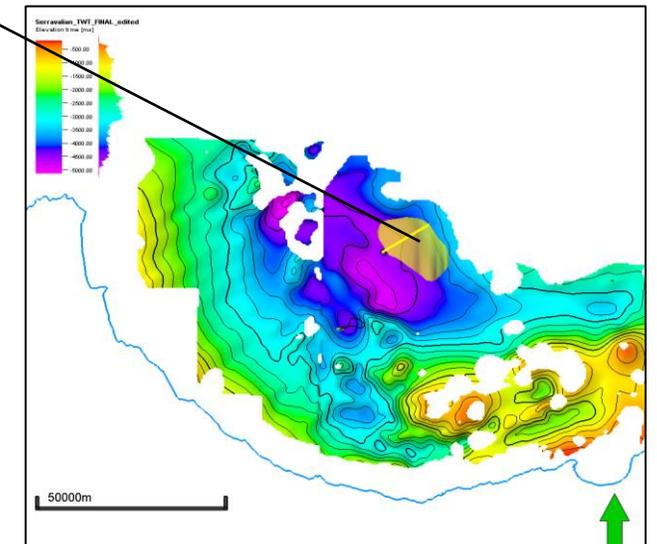
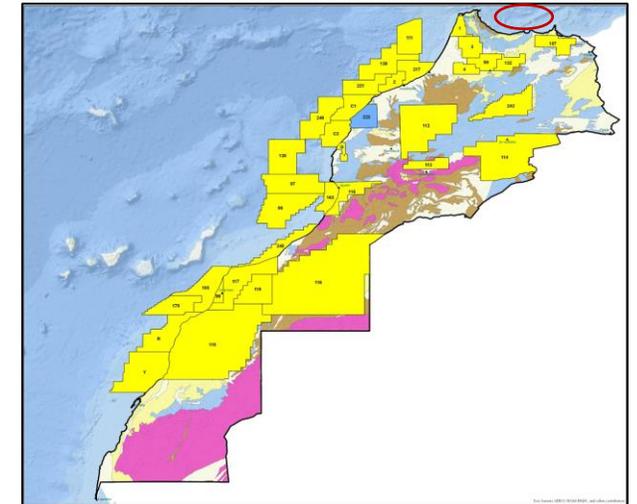
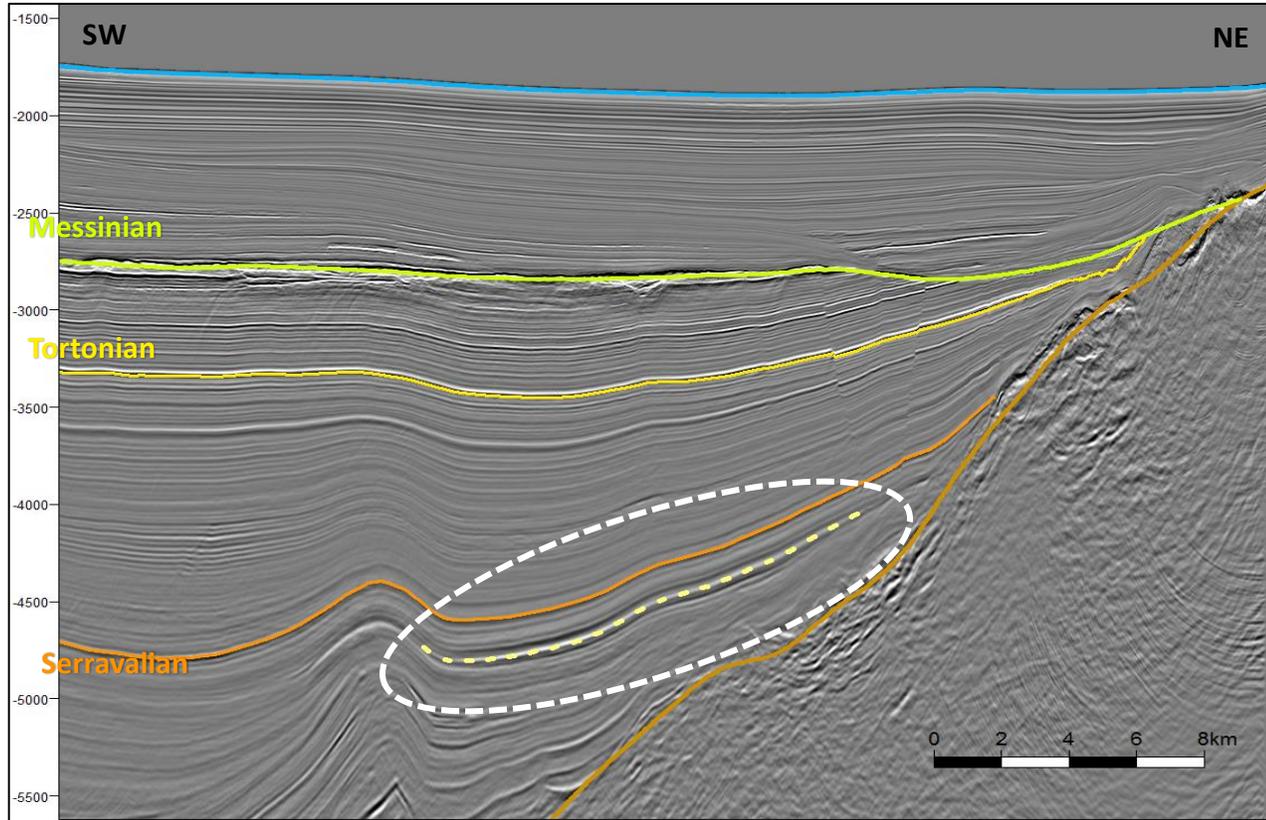
1. Source Rock: Mid & Lower Cretaceous/ Toarcian
2. Migration: Vertical
3. Reservoir: Deep marine sand-rich stacked turbidite channels of Barremian age
4. Seal: Deep marine Aptian-Albian Marls & shales
5. Trap: Structural (4-way faulted closure)

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PROSPECT	
Water Depth (m)	2100
Closure (Km ²) (mean)	21.58
Recoverable Resources (mean)	Oil case : 360 MMBO Gas case : 172 BCF

OFFSHORE MEDITERRANEAN MOROCCO : TURBIDITE PLAY

SERRAVALIAN TURBIDITE LOBE

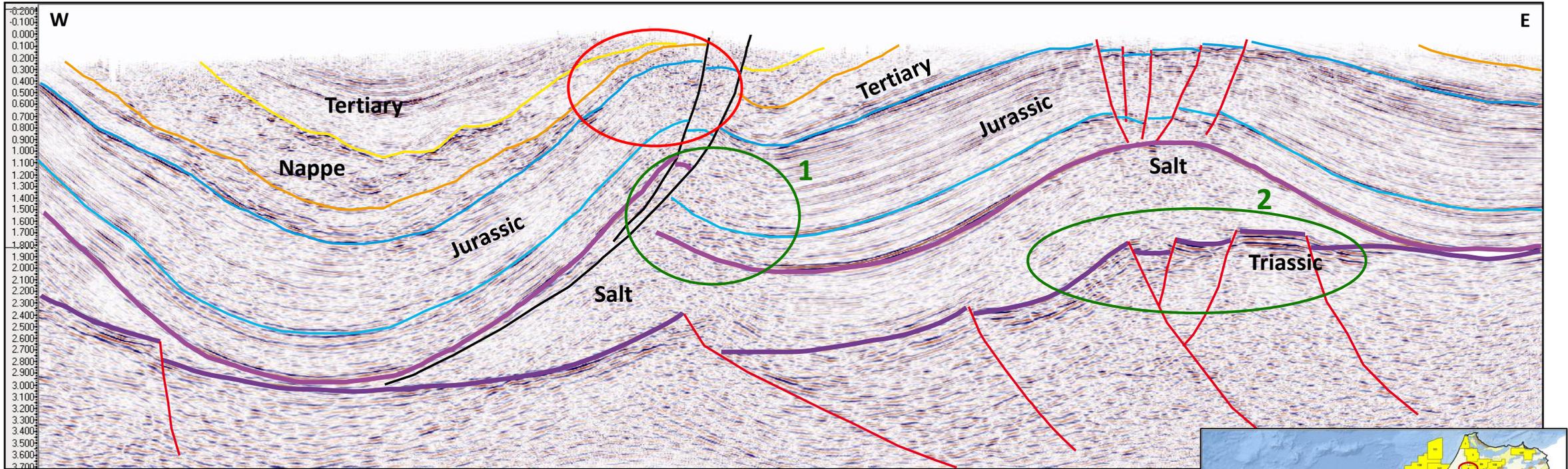


1. Source Rock: Paleogene/ Early to Middle Miocene age
2. Migration: Vertical
3. Reservoir: Serravalian turbidite sandstones
4. Seal: Tertiary interbedded Marls & shale
5. Trap: Stratigraphic

PROSPECT	
Water Depth (m)	1300-1600
Closure (Km ²) (P10)	200-220

ONSHORE MOROCCO : THRUST AND PRE-SALT PLAYS

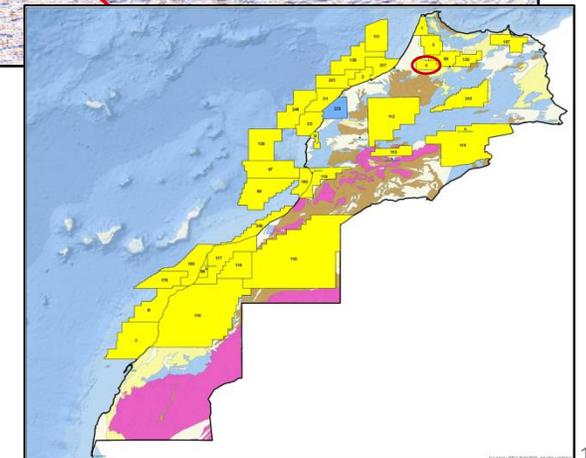
SUB-THRUST AND PRE-SALT STRUCTURES



○ Tselfat oil field Hanging wall (produced oil from Mid-Jurassic and Domerian limestones)

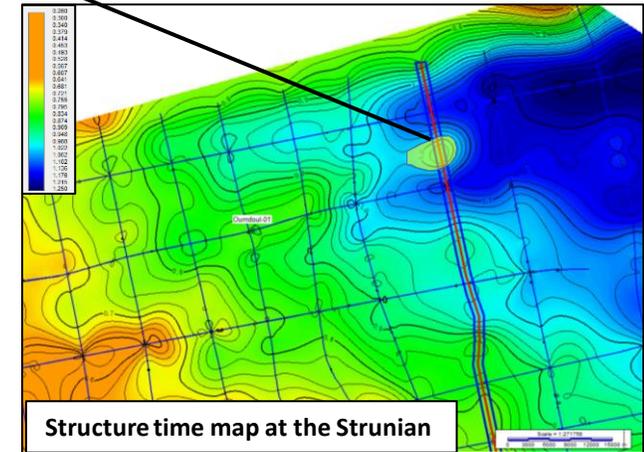
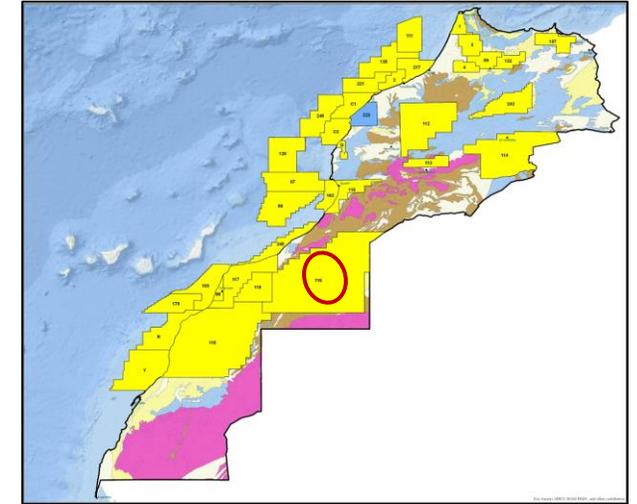
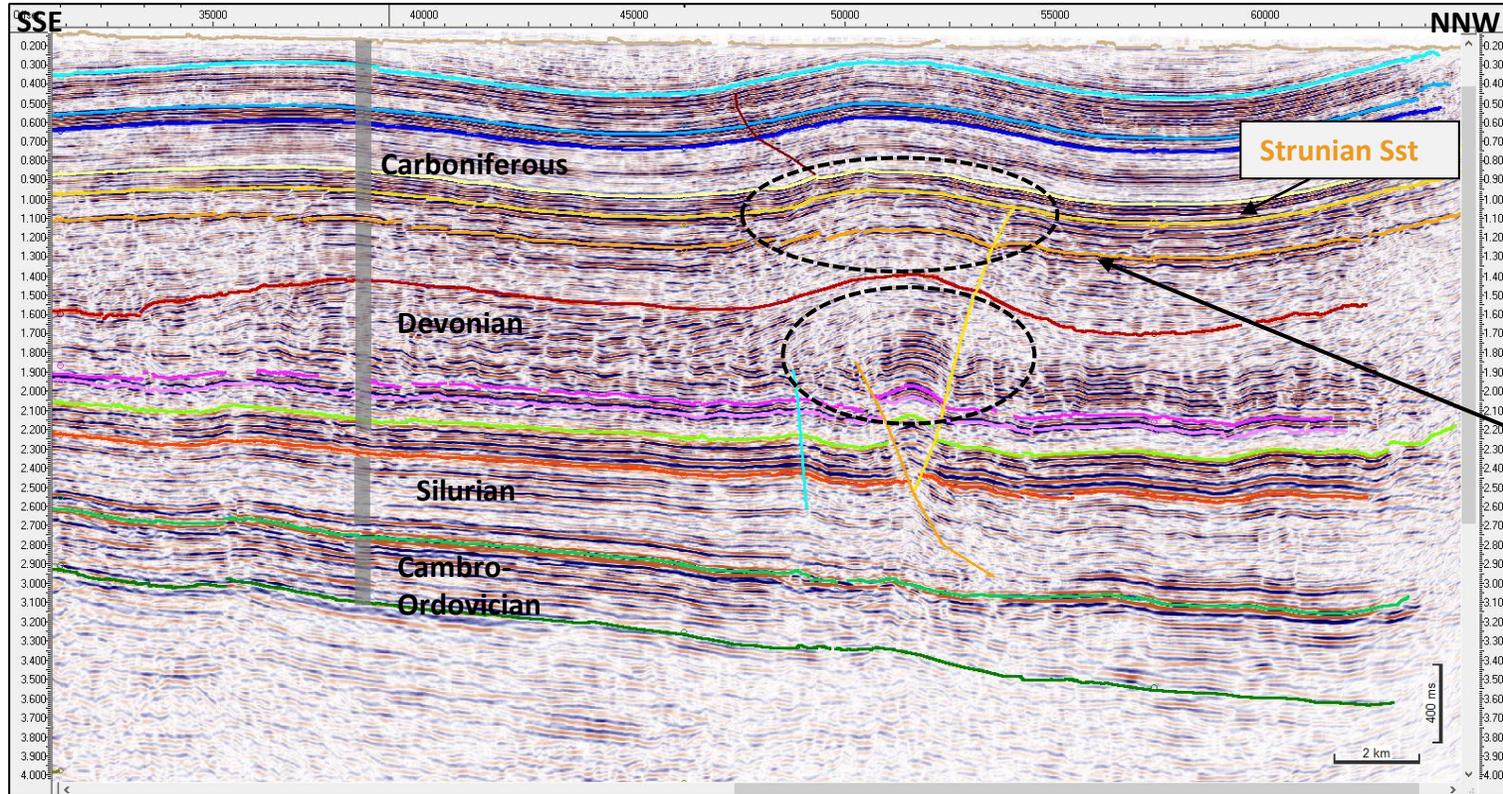
Untested targets:

- Sub-thrust: 1
 - Domerian platform limestone
 - Mid. Jurassic sandstones (Haricha formation)
- Pre-salt: 2
 - Triassic fluvial sandstones



ONSHORE MOROCCO : PALEOZOIC PLAY

PALEOZOIC MULTI TARGET STRUCTURES

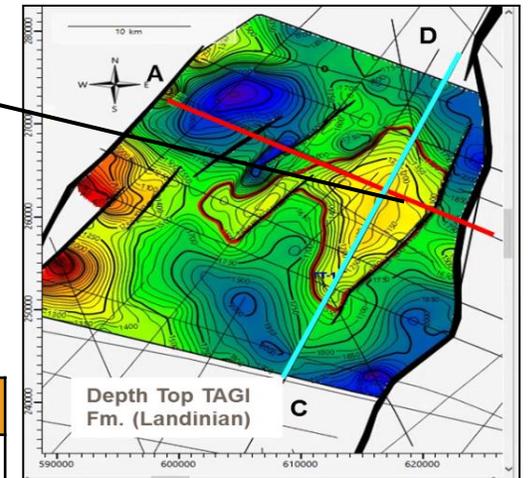
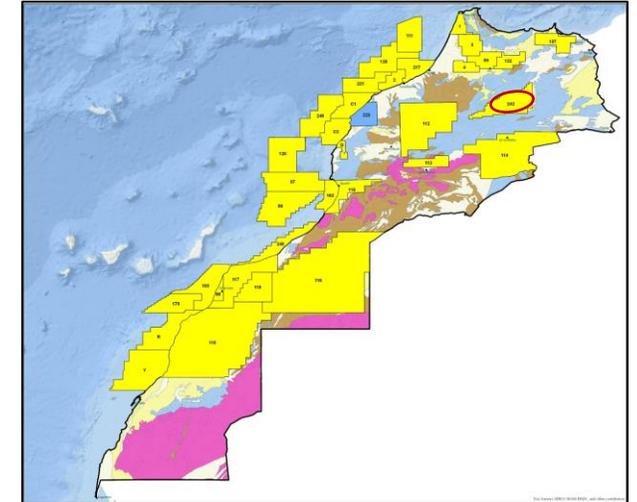
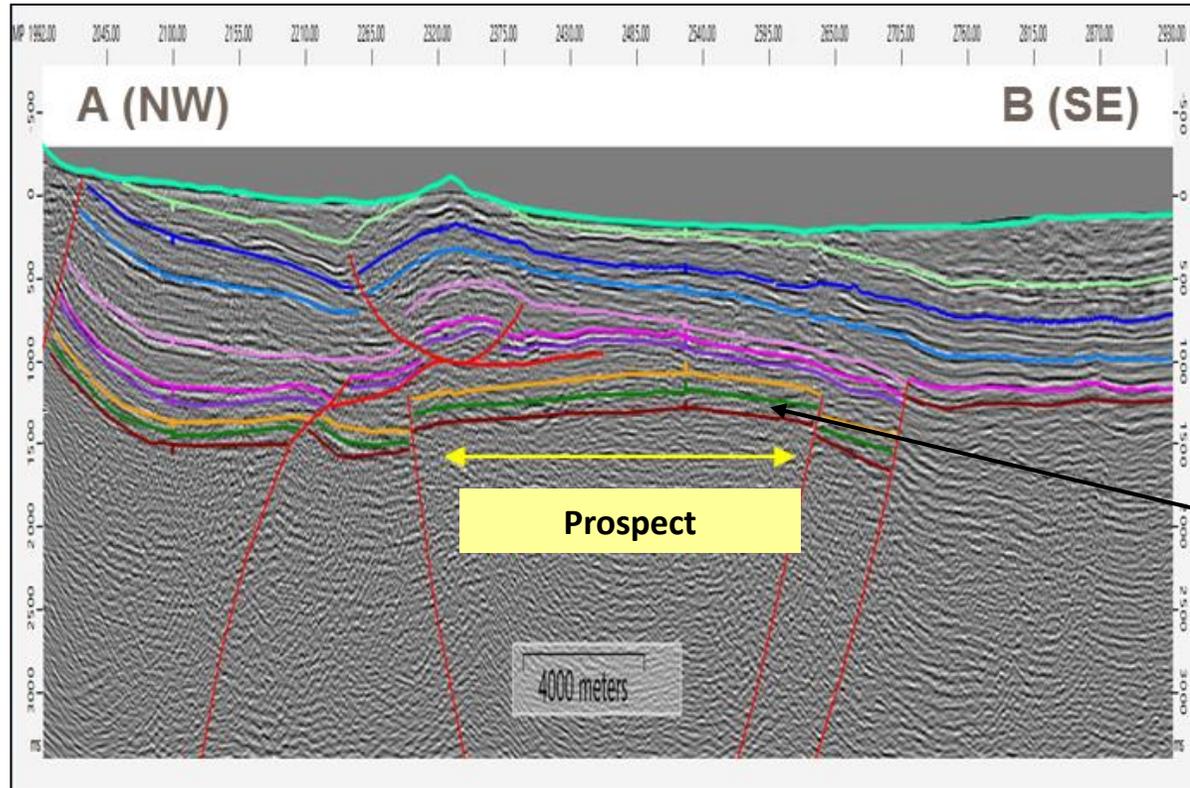


1. Source Rock: Silurian hot shales & Devonian shales
2. Migration: Vertical pathway through faults
3. Reservoir: Carboniferous & Lower Devonian sandstones
4. Seal: Paleozoic interbedded shale & marls
5. Trap: Hercynian structures (3 to 4-way closures)

DOUBLE TARGET PROSPECT	
Primary target (Devonian) gas resources	276 Bcf
Secondary target (Lwr Carb.) gas resources	294 Bcf
Total	570 Bcf

ONSHORE MOROCCO : PRE-SALT PLAY

3-WAY FAULTED ANTICLINE STRUCTURE : TAGI OBJECTIVE



1. Source Rock: Silurian shales
2. Migration: Vertical pathway through faults
3. Reservoir: Upper Triassic and Carboniferous fluvial sandstones
4. Seal: Lower Jurassic & Carboniferous shales
5. Trap: Structural (3-way closure)

PROSPECT	
Depth at target (m)	2300-270
Closure (Km ²) (mean)	60
Recoverable resources (mean) (BCF)	381



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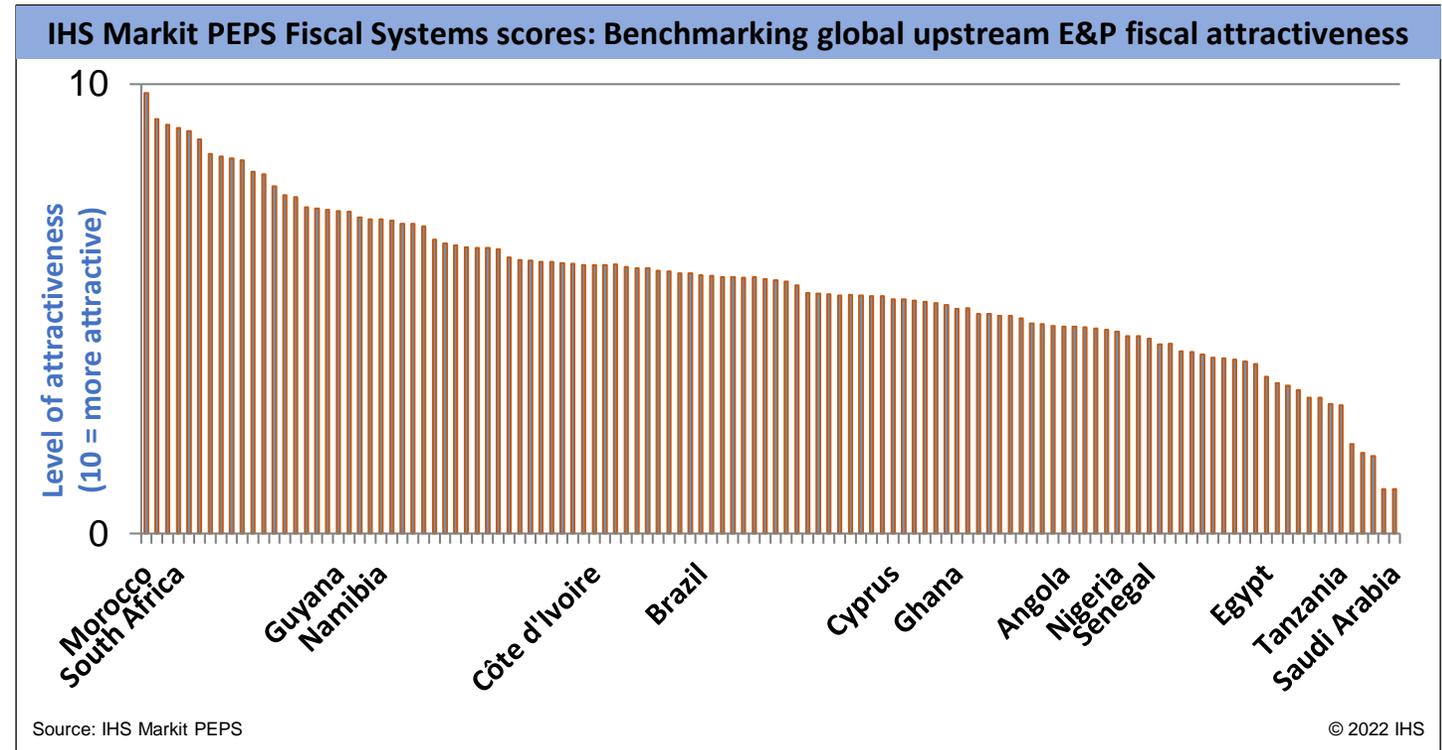
Morocco Incentives

Summary

MOROCCO INCENTIVES

THE MOROCCAN HYDROCARBON LAW : ONE OF THE MOST ATTRACTIVE IN THE WORLD

- ❑ Government interest share : 25% maximum
- ❑ Corporate tax : Total exemption for ten-year period
- ❑ Surtax : None
- ❑ Tax exemption
 - With-holding tax on profits
 - Value added tax
 - Business activity tax
 - Urban tax
 - Tax on non-improved urban land





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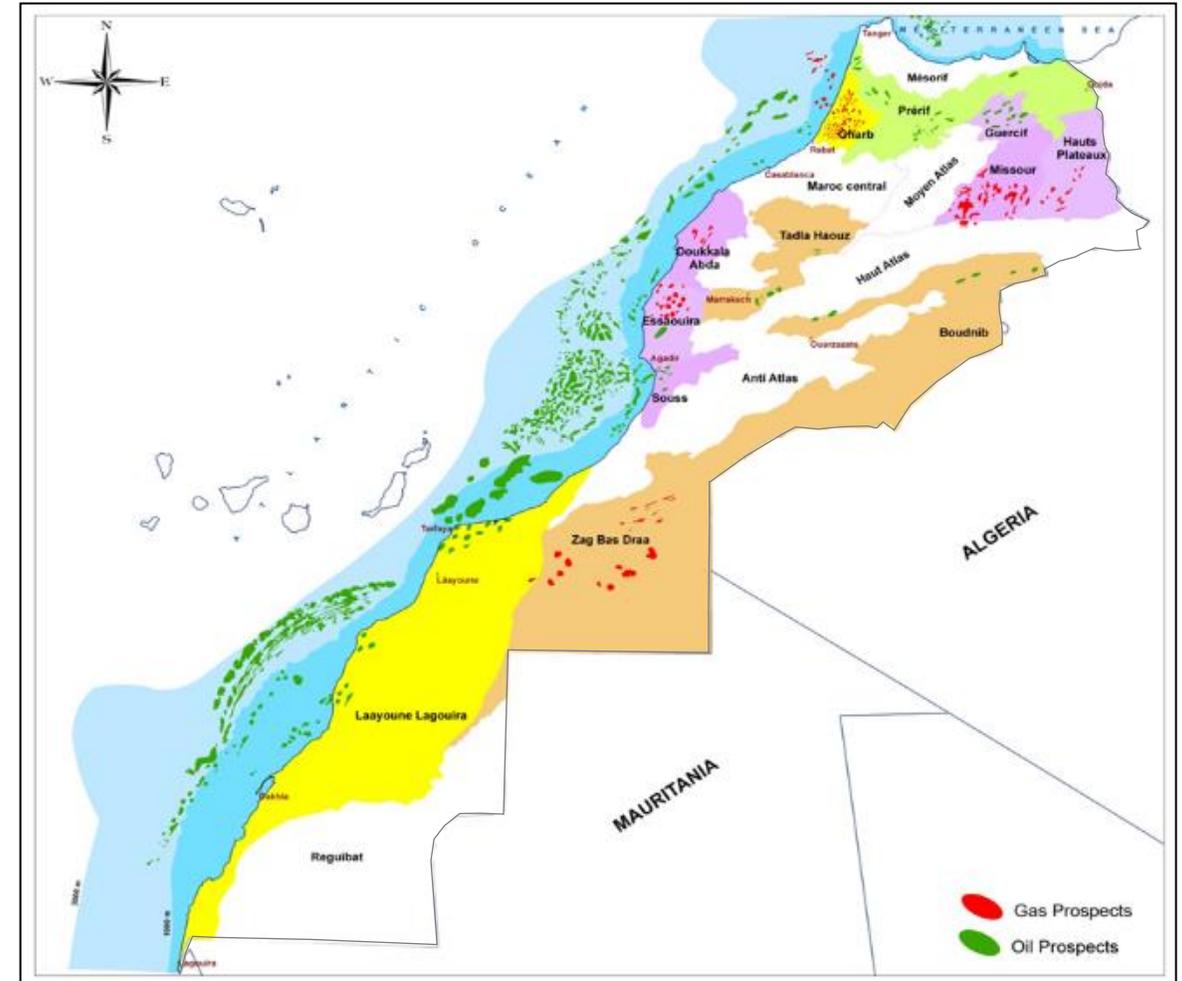
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SUMMARY

- ❑ Favourable Geology for oil and gas exploration and production.
- ❑ Still largely underexplored onshore and offshore basins with only 372 exploration wells (45 offshore & 327 onshore).
- ❑ More than 850 prospects and leads were identified. The so far drilled wells have discovered modest local hydrocarbon to prove existence of working petroleum systems.
- ❑ Favourable and attractive terms.
- ❑ Secure and attractive business environment with outstanding opportunities.



THANK YOU

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