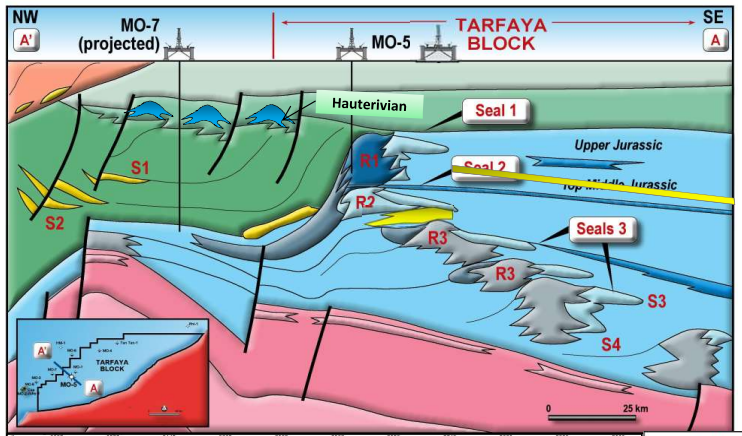
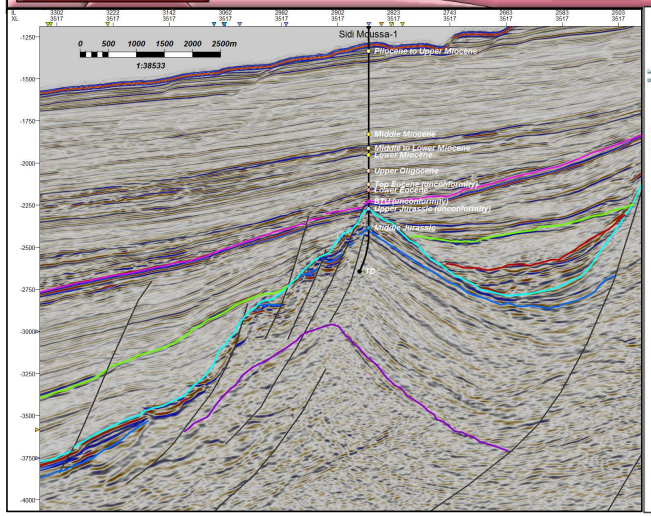


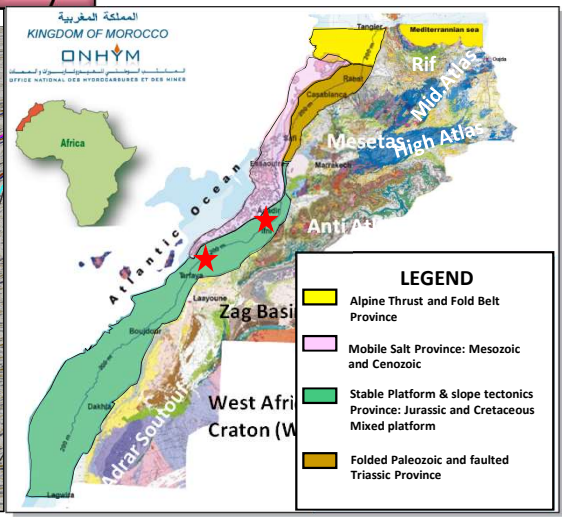

- Plays Previously Explored in Morocco and Results
- Do the successfully tested plays in MSGBC basin extend to Offshore Morocco?
- Offshore Morocco-MSGBC basins analogies
  - Geological settings
  - Petroleum Systems
  - Exploration Plays
- Conclusions

Previously Explored Plays and Results

Carbonate Platform Play







Jurassic Carbonate Platform Play

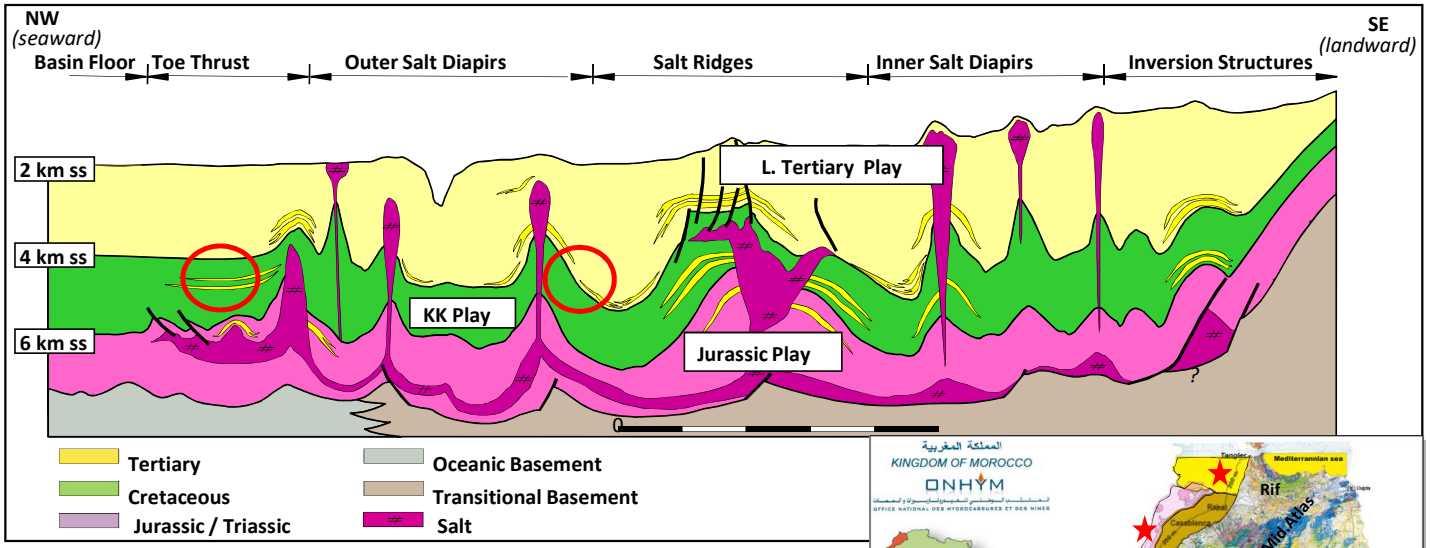
- **Targets:**
  - Reef buildups on the shelf edge
  - Carbonates in down faulted tilted blocs

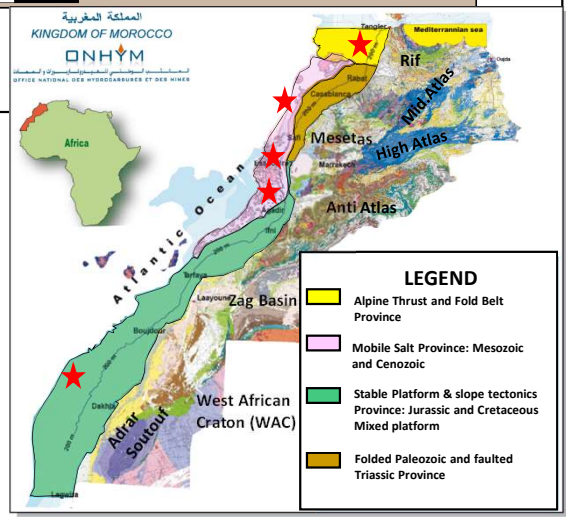
- **Results:**
  - Bio-degraded heavy oil and light oil accumulations in Cap Juby and Sidi Moussa
  - Wet gas shows in wells
  - Evidence of working petroleum systems associated with 2 different source rocks: Toarcian-Pliensbachian and Callovian.

N.B. same petroleum systems proven in the onshore

Previously Explored Plays and Results

Salt related and turbidites Plays



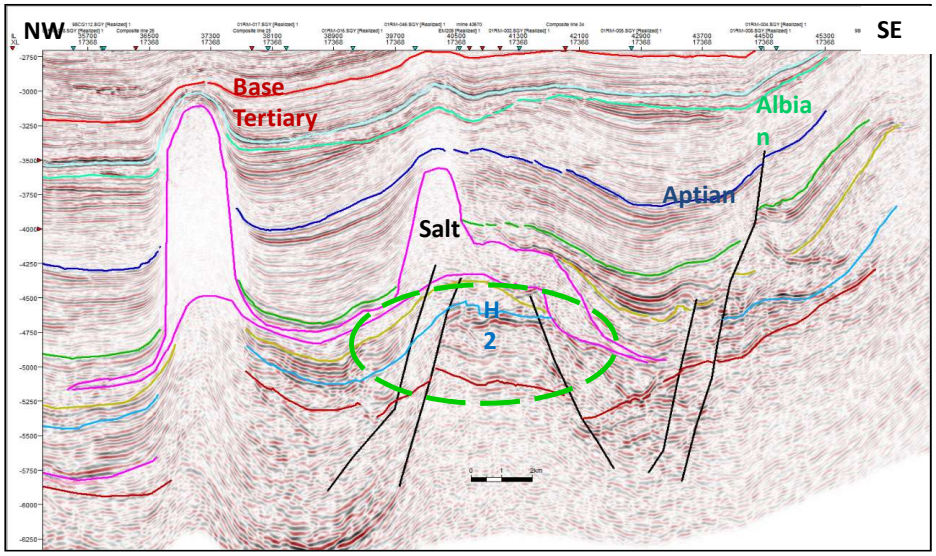


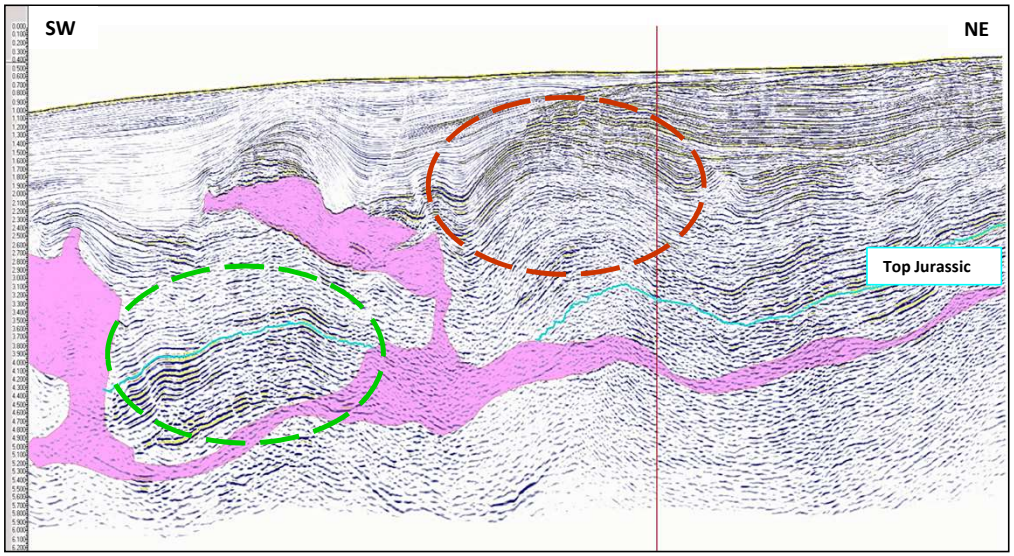
Tertiary and Cretaceous turbidites

- **Targets:**
  - Miocene sandstones
  - Lower Cretaceous sandstones
- **Results:**
  - Non commercial and Wet gas shows
  - Evidence of working petroleum systems associated with 2 different source rocks: Jurassic and Lower Cretaceous (Aptian-Albian?).

Salt related Untested Plays

Lessons learned:
Sandy turbidite would have been accumulated in intra growing salt diapirs minibasins, and only thin bedded sands were penetrated by wells drilled at the flanks of the diapirs.

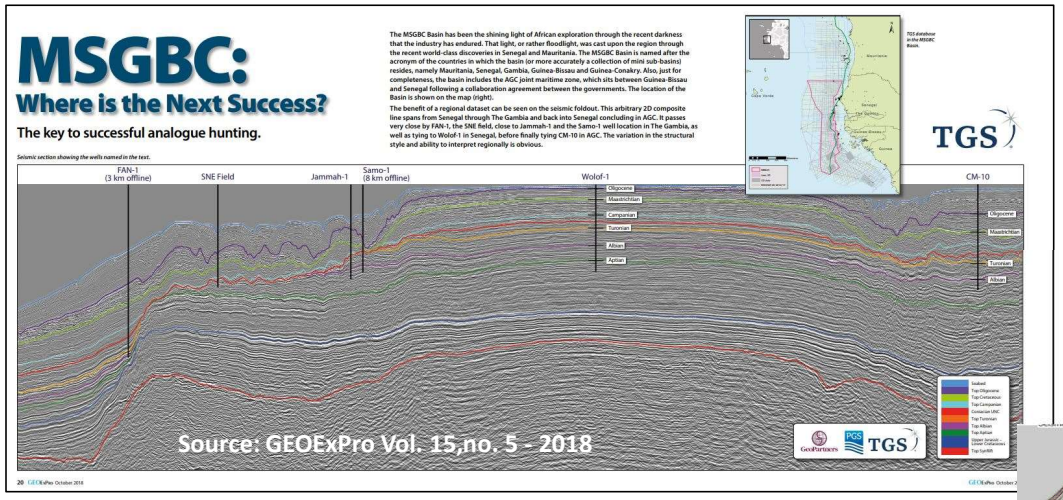




Next plays to be tested Jurassic sub-salt structures and Lower Cretaceous inverted sand bearing mini basins

Q: Do the successfully tested plays in MSGBC basin extend to Offshore Morocco basin?

SEISMIC & WELLS DATABASE



Moroccan Atlantic Margin

Area

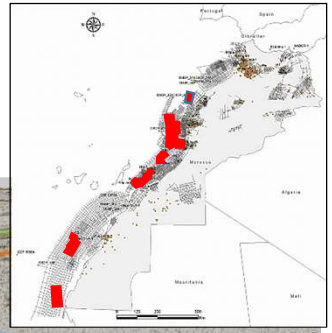
- 300 000 Km² (to 4 000 m bathymetry)

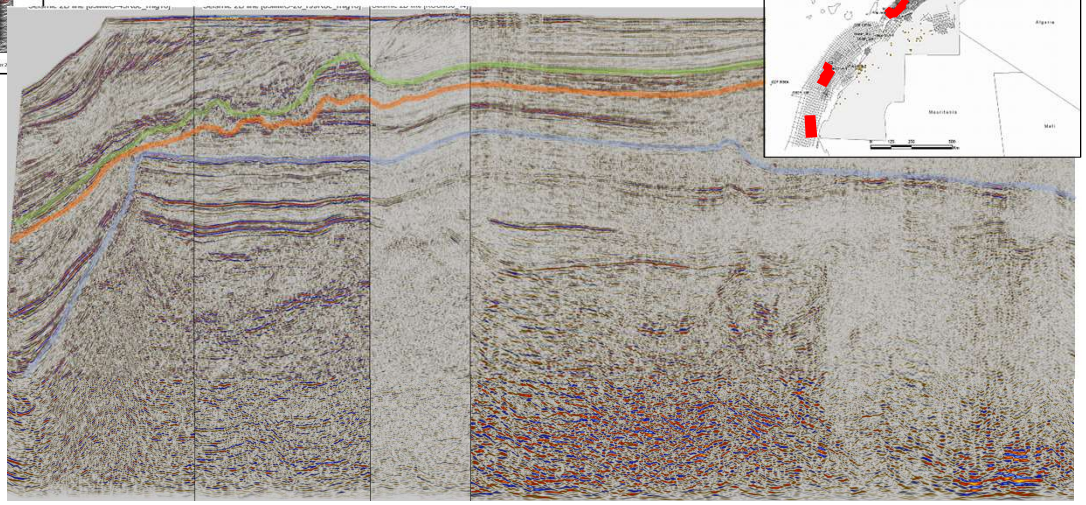
Seismic

- 2D Seismic: 163 366 Km + 13 300 km (MC)
- 3D Seismic: 70 242 Km²

Wells

- 42 Exploration wells





MSGBC Atlantic Margin (Mauritania & Senegal)

Area

- 196 722 km²

Seismic

- 2D Seismic: 137 900 Km
- 3D Seismic: 48 200 Km²

Wells

- 270 Exploration & appraisal wells

Offshore Morocco-MSGBC basins analogies

Geological Settings: Basins underwent similar but slightly diachronous events

- **Triassic-Lower Lias Rift**
  - Continental sediments and evaporites
- **Mesozoic-Cenozoic Passive Margin**
  - Jurassic Carbonate dominated platform with organic intervals: Toarcian-Pliensbachian & Callovian
  - Lower Cretaceous deltaic systems with Barremian and Aptian-Albian source rocks
  - Upper Cretaceous successive transgressive-regressive sequences: Cenomanian-Turonian Source rocks and slope tectonic
  - Tertiary uplift of the continent: Strong Incisions
- **Main differences:** Salt and Alpine tectonics.

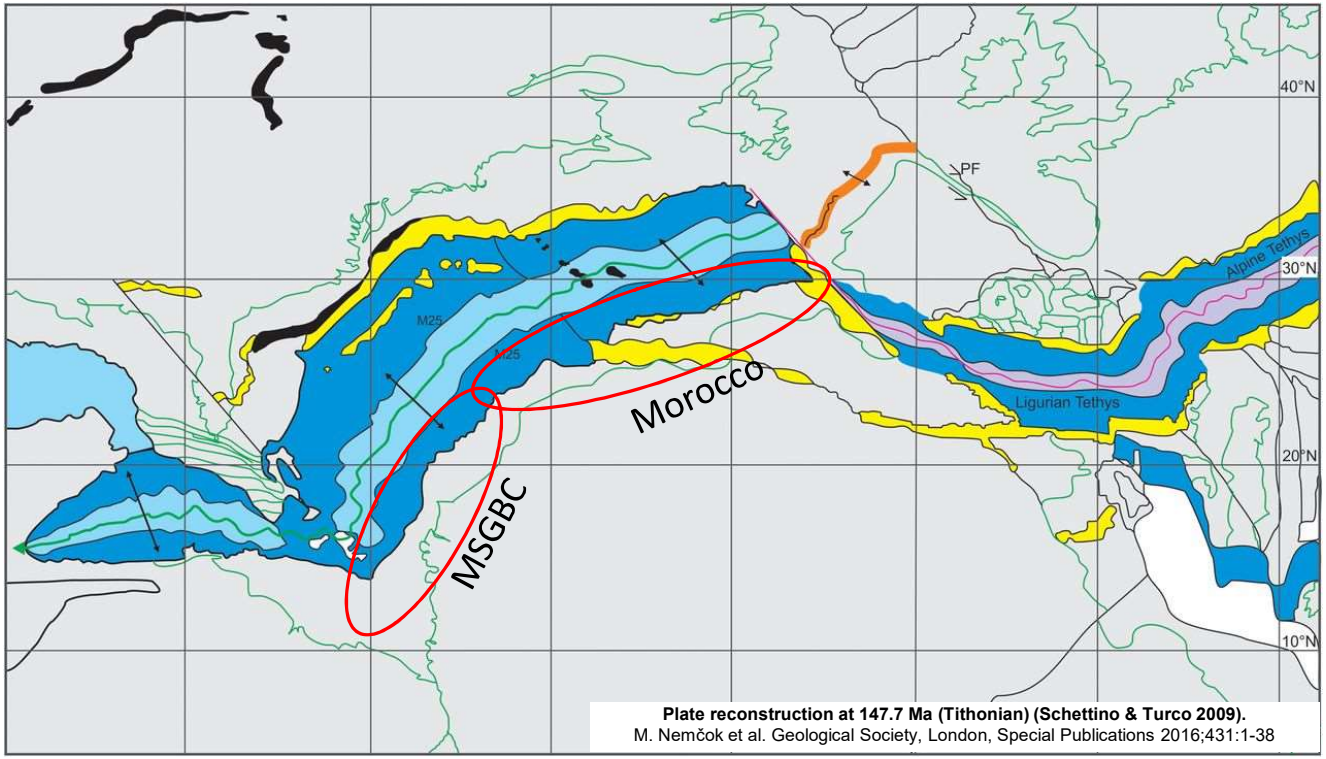
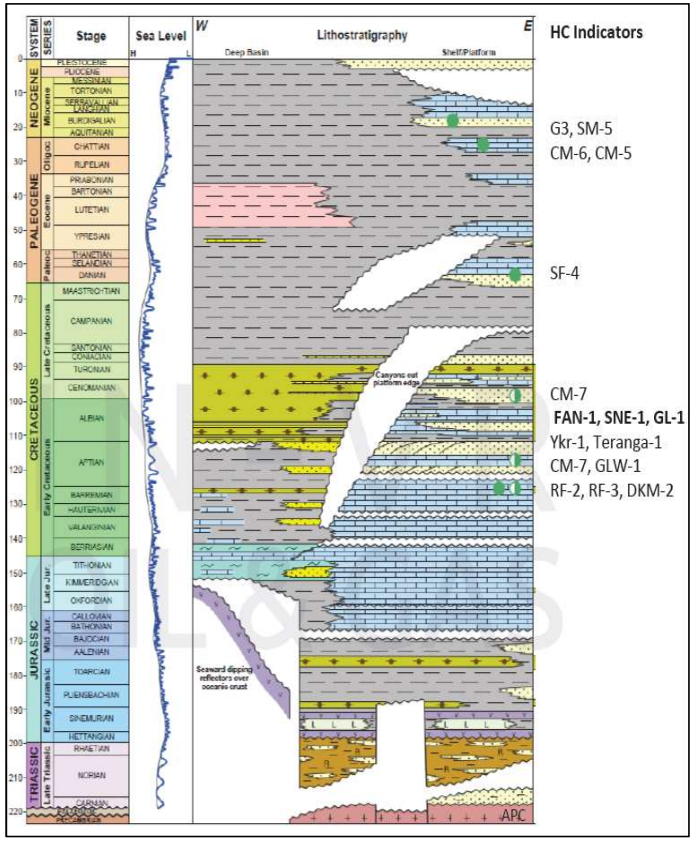


Plate reconstruction at 147.7 Ma (Tithonian) (Schettino & Turco 2009).
M. Nemčok et al. Geological Society, London, Special Publications 2016;431:1-38

Offshore Morocco-MSGBC basins analogies

Petroleum Systems: Basins underwent similar but slightly diachronous events

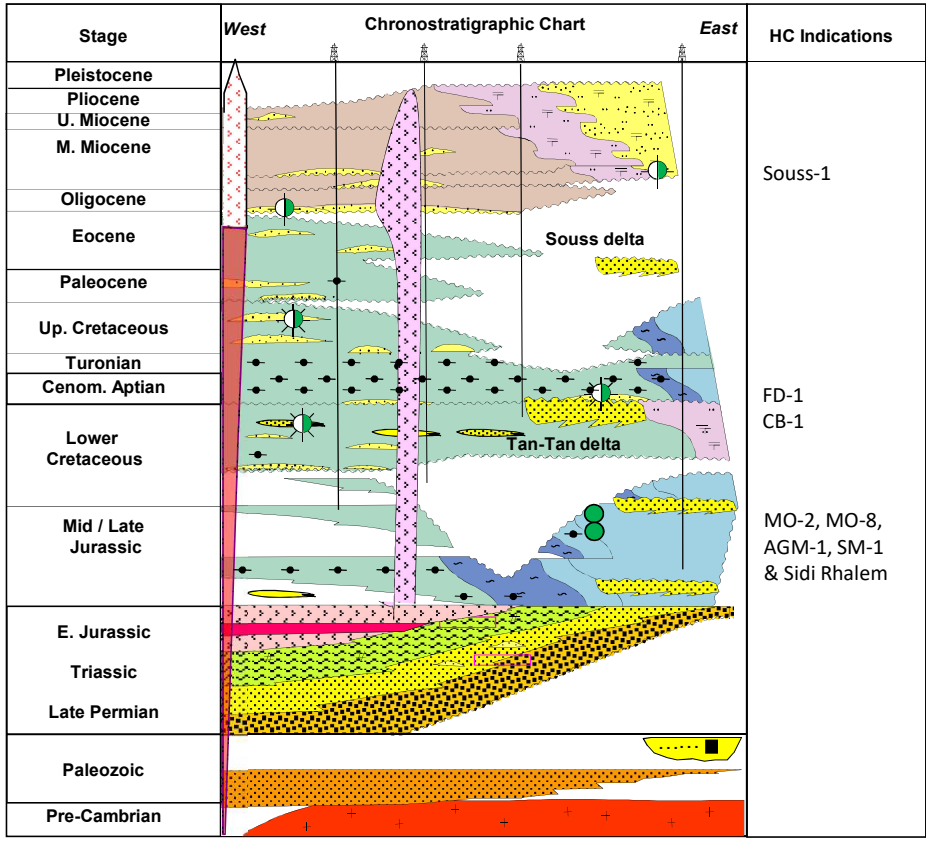


Upper Cretaceous Reservoirs

Aptian-Turonian Source Rocks

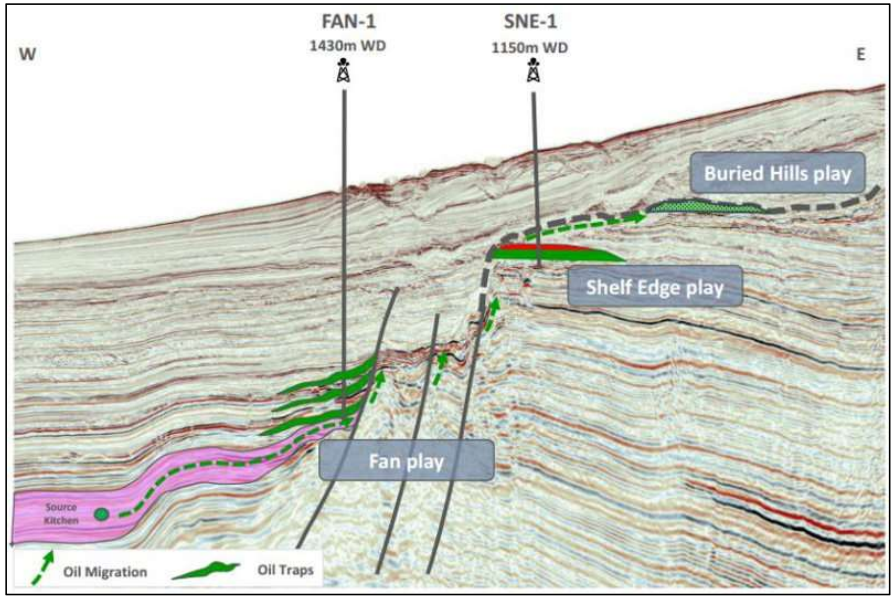
Lower Cretaceous Reservoir Rocks

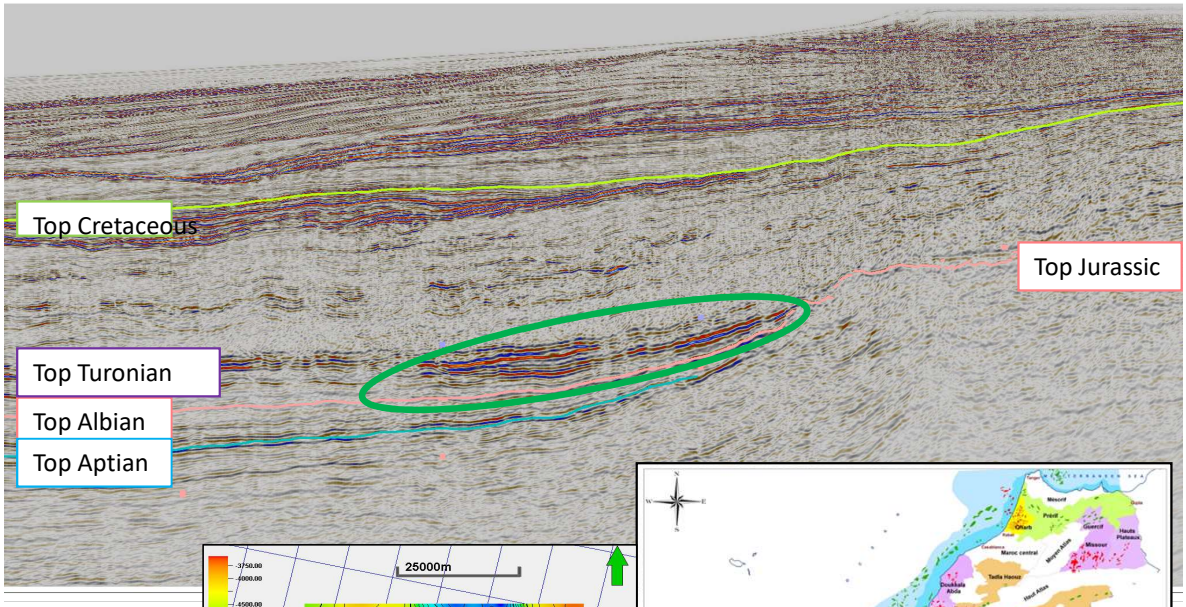
Jurassic source beds

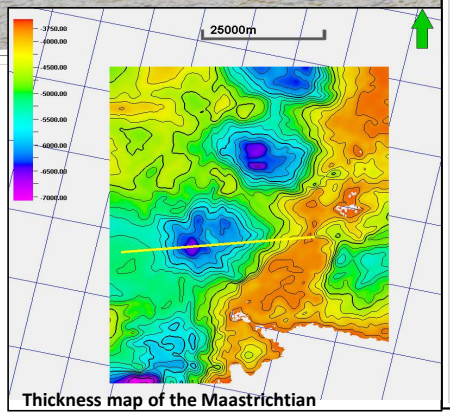


Offshore Morocco-MSGBC basins analogies

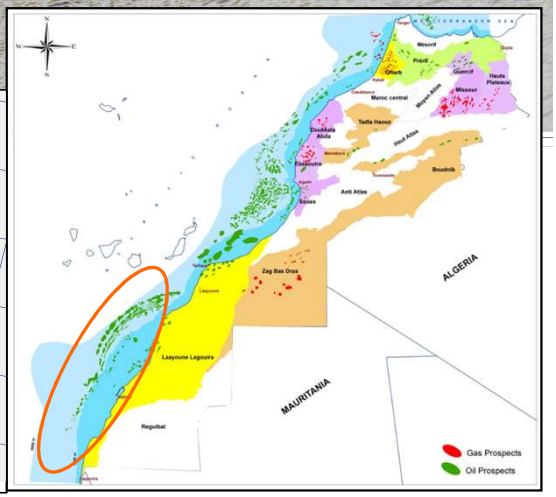
Exploration Plays: Coniacian & Albian Fans







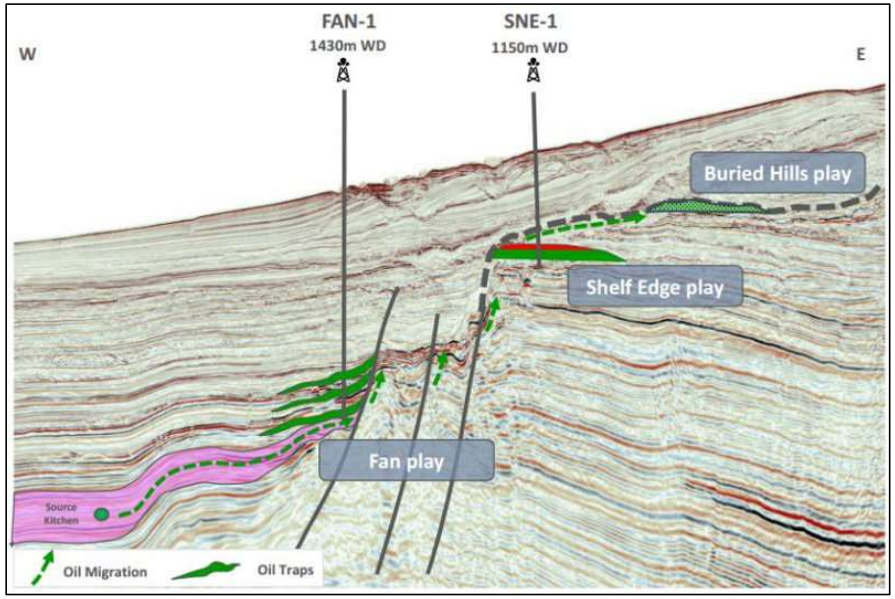
Thickness map of the Maastrichtian

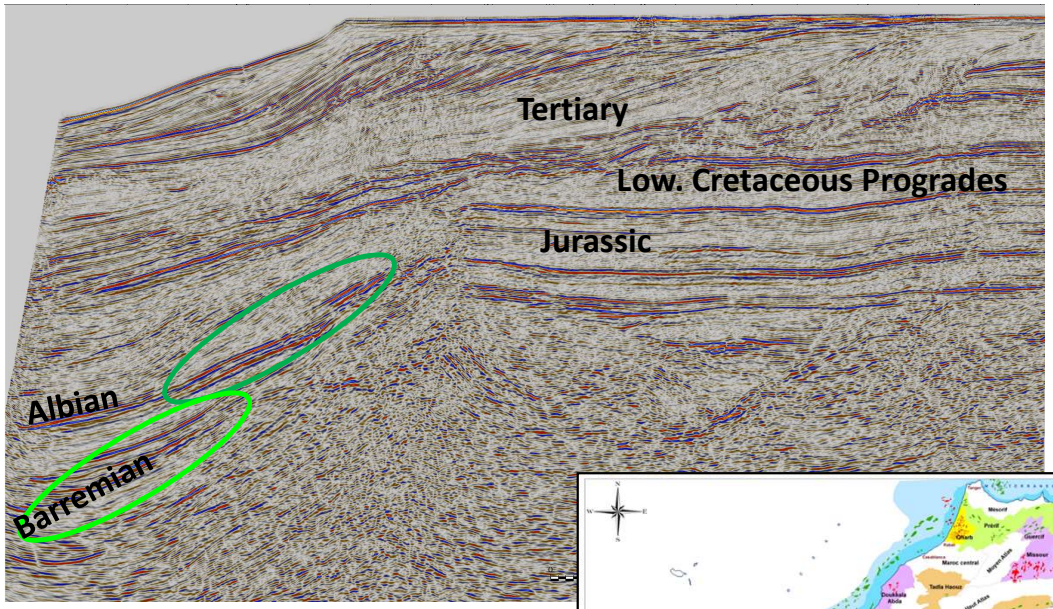


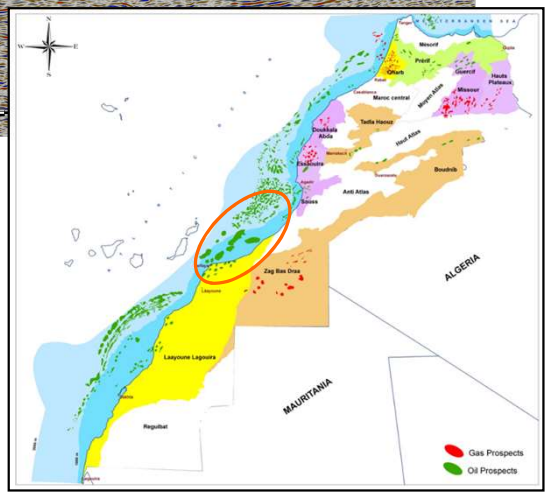
- *Gas and condensate non commercial accumulation in the area Jurassic SR?*
- Main Objective: Coniancian turbidite sandstone
- Source Rock: Cenomanian-Turonian
- Secondary Objective: Mid Albian turbidite sandstone
- Reservoir Rock : Aptian-Low. Albian

Offshore Morocco-MSGBC basins analogies

Exploration Plays: Albian Fan



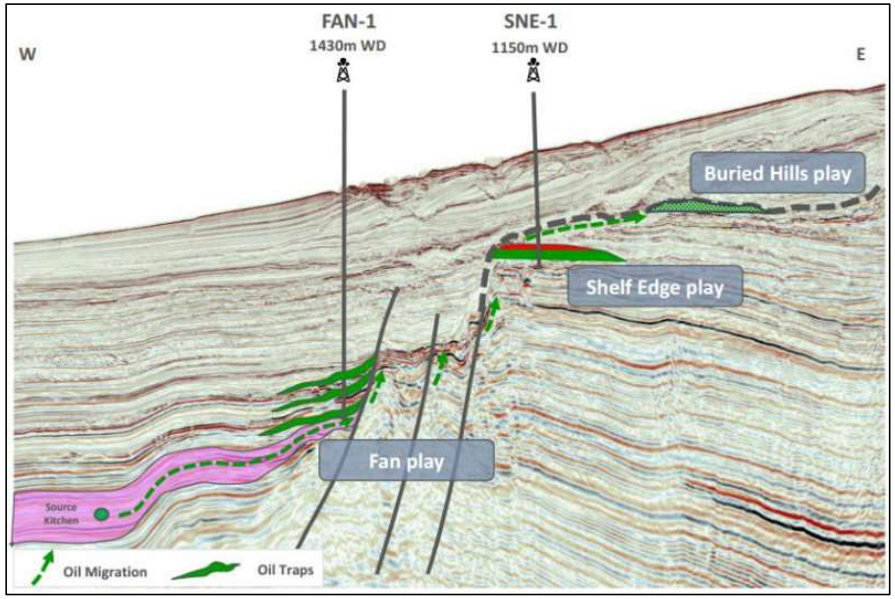


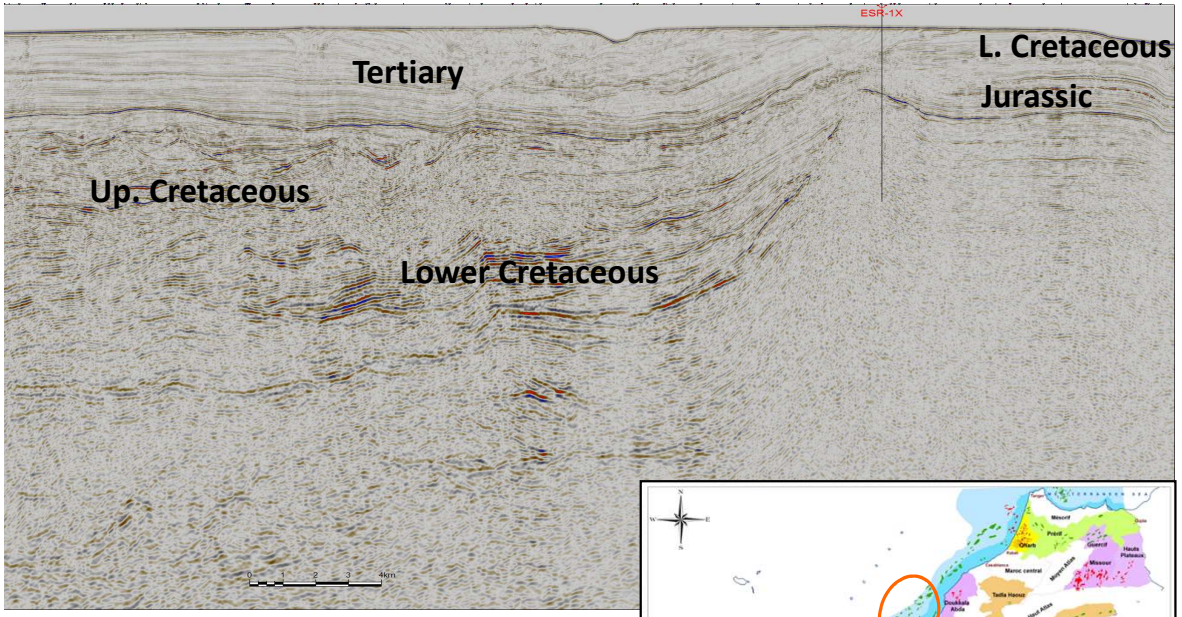


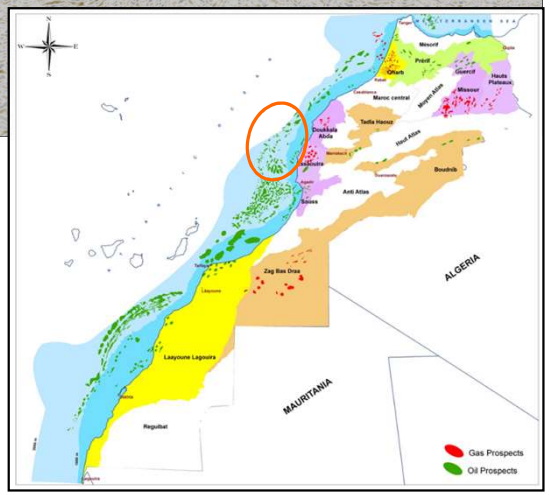
- *Light and Heavy oils accumulations in the Jurassic in the area (SR: Lower and Middle Jurassic)*
- Main Objective: Mid Albian turbidite sandstone
- Source Rock: Aptian-Low. Albian
- Secondary Objective: Barremian turbidite sandstone (Tantan delta)
- Reservoir Rock : Lower/Middle Jurassic

Offshore Morocco-MSGBC basins analogies

Exploration Plays: Albian Fan



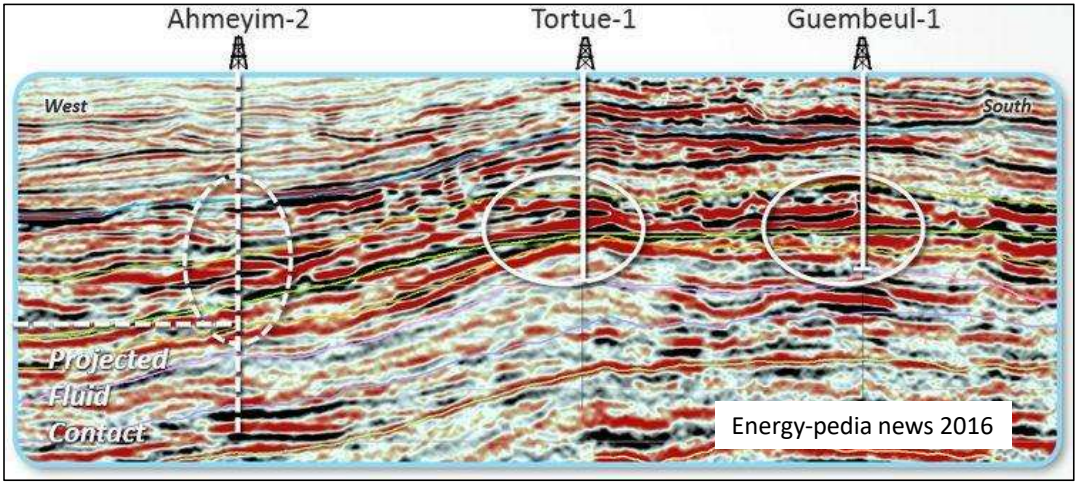


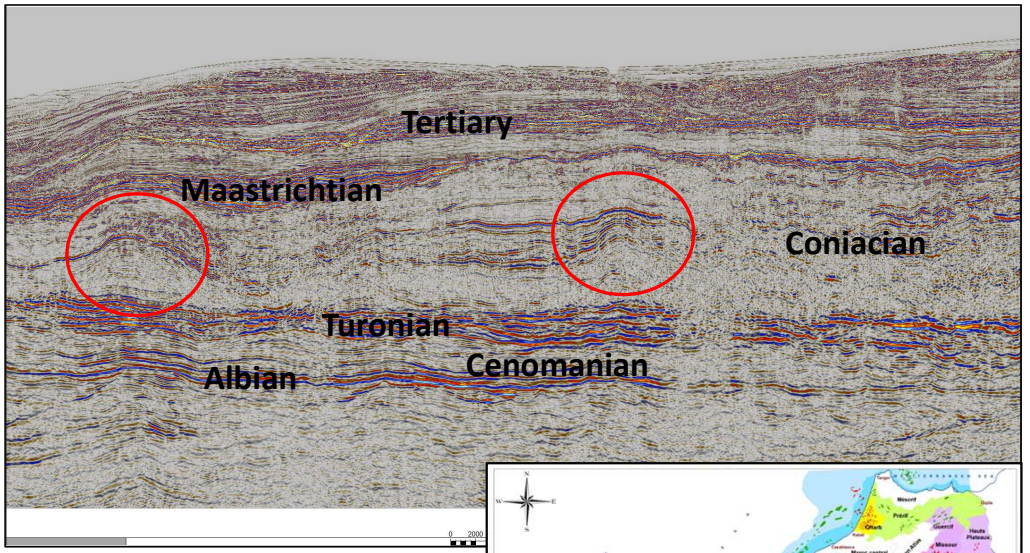


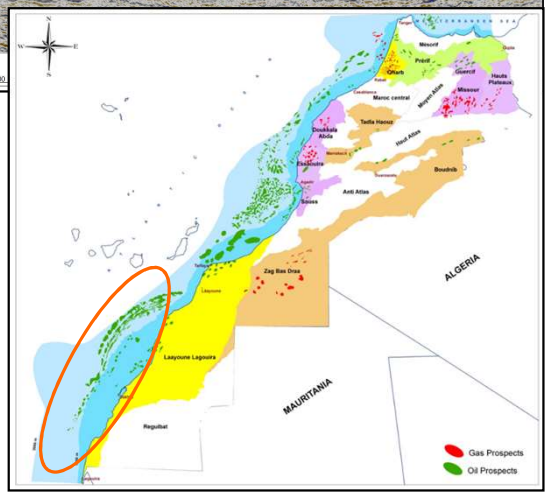
- *Light oils accumulation produced from Up. Jurassic Onshore (SR: Lower and Middle Jurassic)*
- Main Objective: Mid Albian turbidite sandstone (Base Mid. Incisions on the shelf)
- Source Rock: Lower and/or Middle Jurassic

Offshore Morocco-MSGBC basins analogies

Exploration Plays: Tortue analogue







- *Gas and condensate non commercial accumulation close by (Jurassic SR?)*
- Main Objective: Coniancian turbidite sandstone
- Source Rock: Cenomanian-Turonian

Conclusions:

- Previous exploration efforts, even though not economically successful, demonstrate presence of workable Petroleum Systems related to active Source Rocks;
- Further salt related plays such as sub-salt and inverted mini basins remain untested;
- Preliminary analysis of the seismic data, well results and identified petroleum systems indicate that analogues of Fan and Tortue discoveries in offshore Senegal and Mauritania do extend north in the Moroccan Atlantic offshore;
- These analogues, presently qualified as leads, are covered with suitable 2D and 3D seismic and deserve to be adequately assessed to be upgraded to drillable prospects.


THANK YOU
For further discussions, please visit ONHYM's booth
126