

# **Hydrocarbon Exploration and Production in the East Mediterranean and the Adriatic Sea**

**An IENE International Workshop**

**Background Paper Presentation**

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# Presentation Overview

- Production/Consumption in SE Europe
- Geography
- Geology
  - Adriatic Sea
  - Eastern Mediterranean
  - Mediterranean Ridge
- Hydrocarbon E&P activities in:
  - Albania, Croatia, Cyprus, Egypt, Greece, Italy, Israel, Lebanon, Montenegro, Syria, Turkey

Country	Oil Production (bbl/d) <i>[2011]</i>	Oil Consumption (bbl/d) <i>[2011]</i>	Gas Production (bcf/y) <i>[2010]</i>	Gas Consumption (bcf/y) <i>[2010]</i>	Oil Refining Capacity (bbl/d) <i>[2009]</i>
Albania	15,500	44,000	2	1	26,000
Bosnia & Herzegovina	0	35,000	0	7	0
Bulgaria	1,000	134,000	0	77	115,000
Croatia	13,500	113,000	67	100	250,000
Cyprus	0	65,000	0	0	0
Egypt	564,500	697,000	2,369	1,630	726,000
F.Y.R.O.M.	0	19,000	0	3	50,000
Greece	1,800	336,800	0	135	423,000
Italy	99,200	1,455,500	293	2,930	2,337,000
Israel	100	237,000	114	129	220,000
Lebanon	0	88,000	0	0	0
Montenegro	0	4,000	0	0	0
Romania	86,900	217,000	374	455	517,000
Serbia & Kosovo	2,200	81,000	15	80	215,000
Syria	300,200	258,000	356	340	240,000
Turkey	45,700	679,900	24	1,346	714,000
<b>TOTAL</b>	<b>1,130,600</b>	<b>4,464,200</b>	<b>3,614</b>	<b>7,233</b>	<b>5,833,000</b>

**Source: U.S. Energy Information Administration**



# Geography

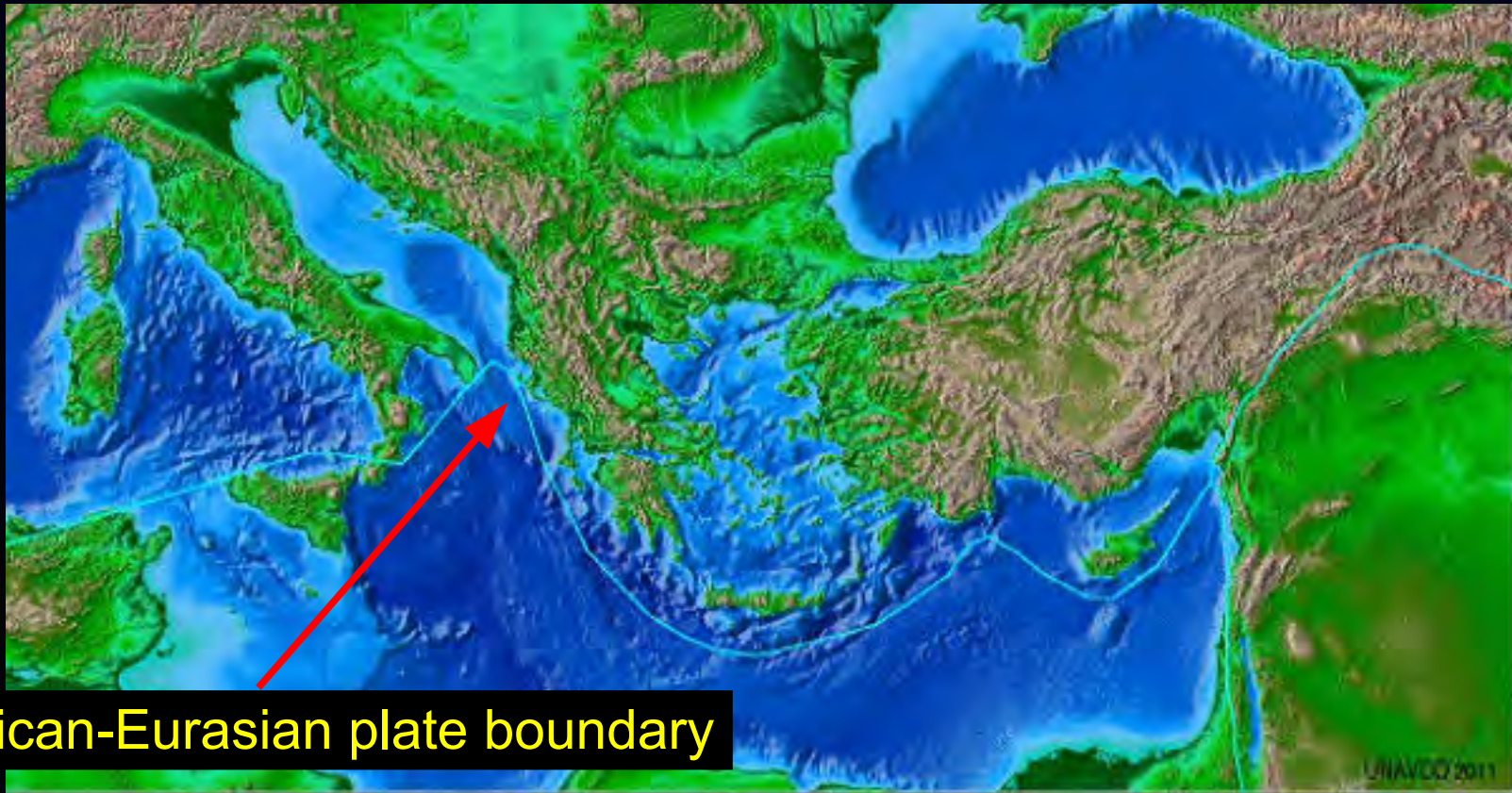


two main basins

deepest point



# Geology



African-Eurasian plate boundary

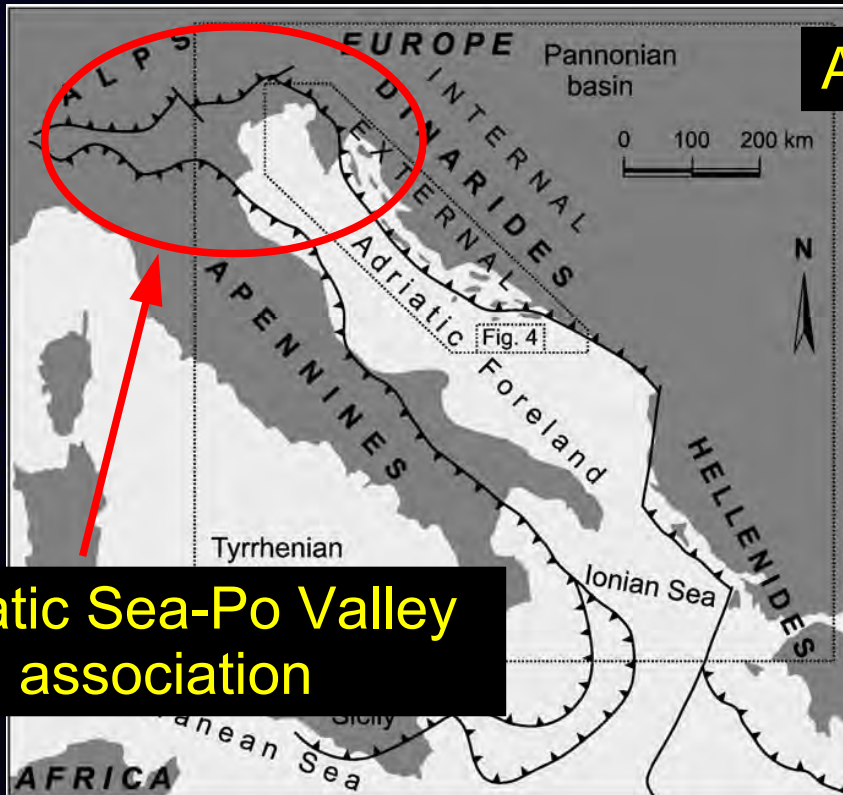
Complex geological history:

- Plate Convergence
- Messinian Salinity Crisis

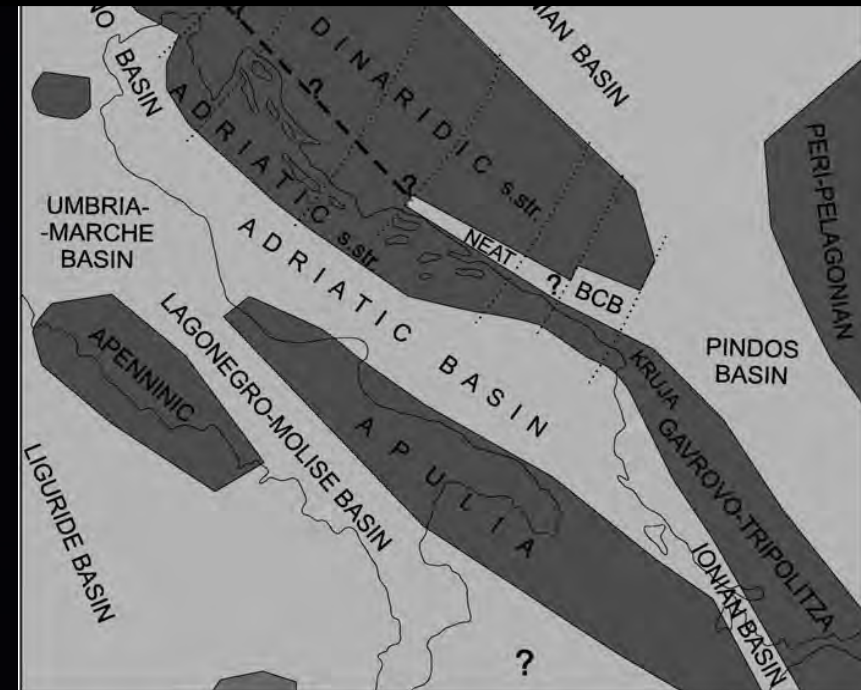


# Adriatic Sea

Separation: M.-L. Triassic  
Adriatic & Apulian Carbonate Platforms



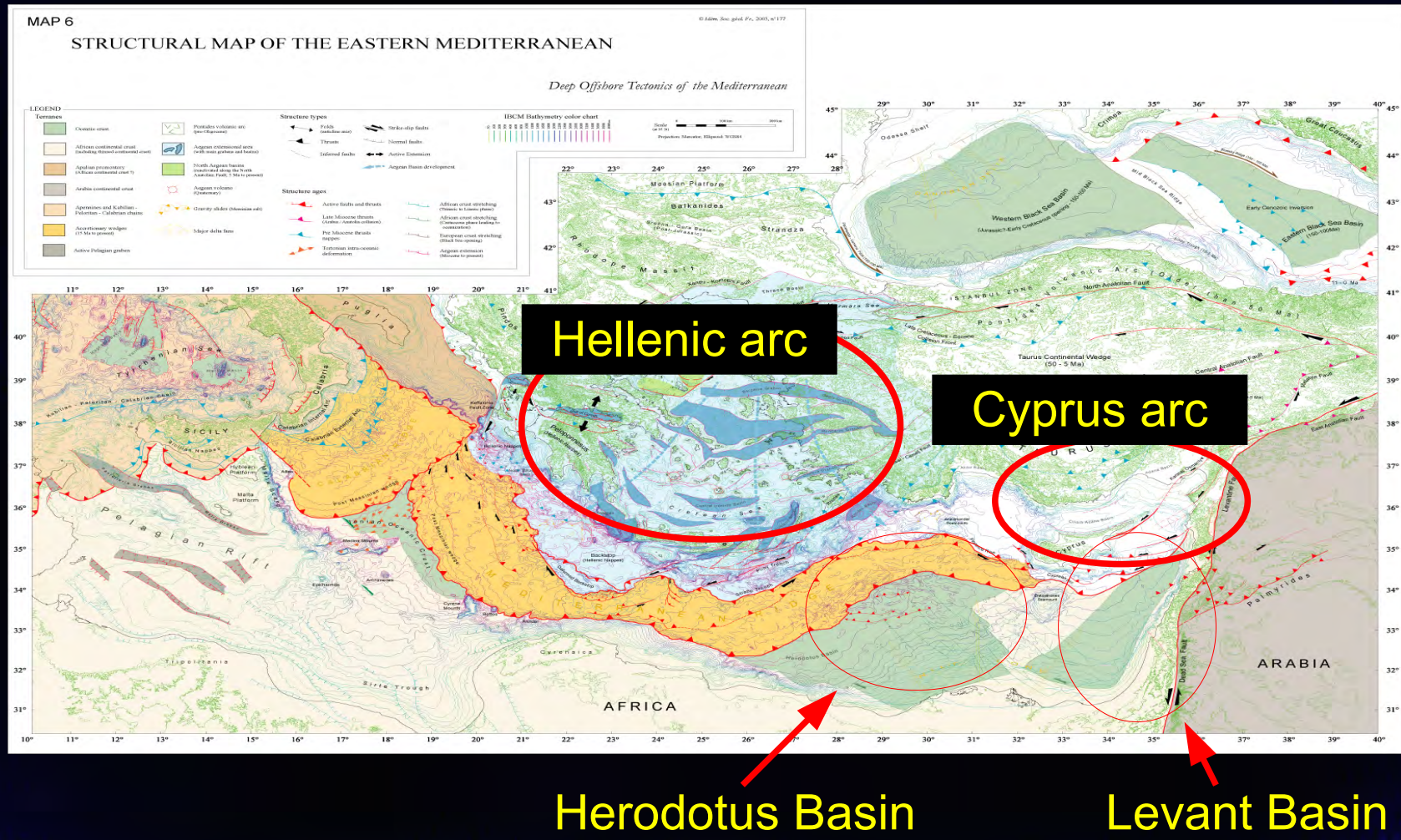
Adriatic Sea-Po Valley  
association



- 3 morphological domains:
- northern: shallow, low gradient continental shelf
  - central: 250 m, steeper & narrower shelf
  - southern: deep basin (approx. 1,200 m)



# Eastern Mediterranean





# Eastern Mediterranean (Hellenic Arc)

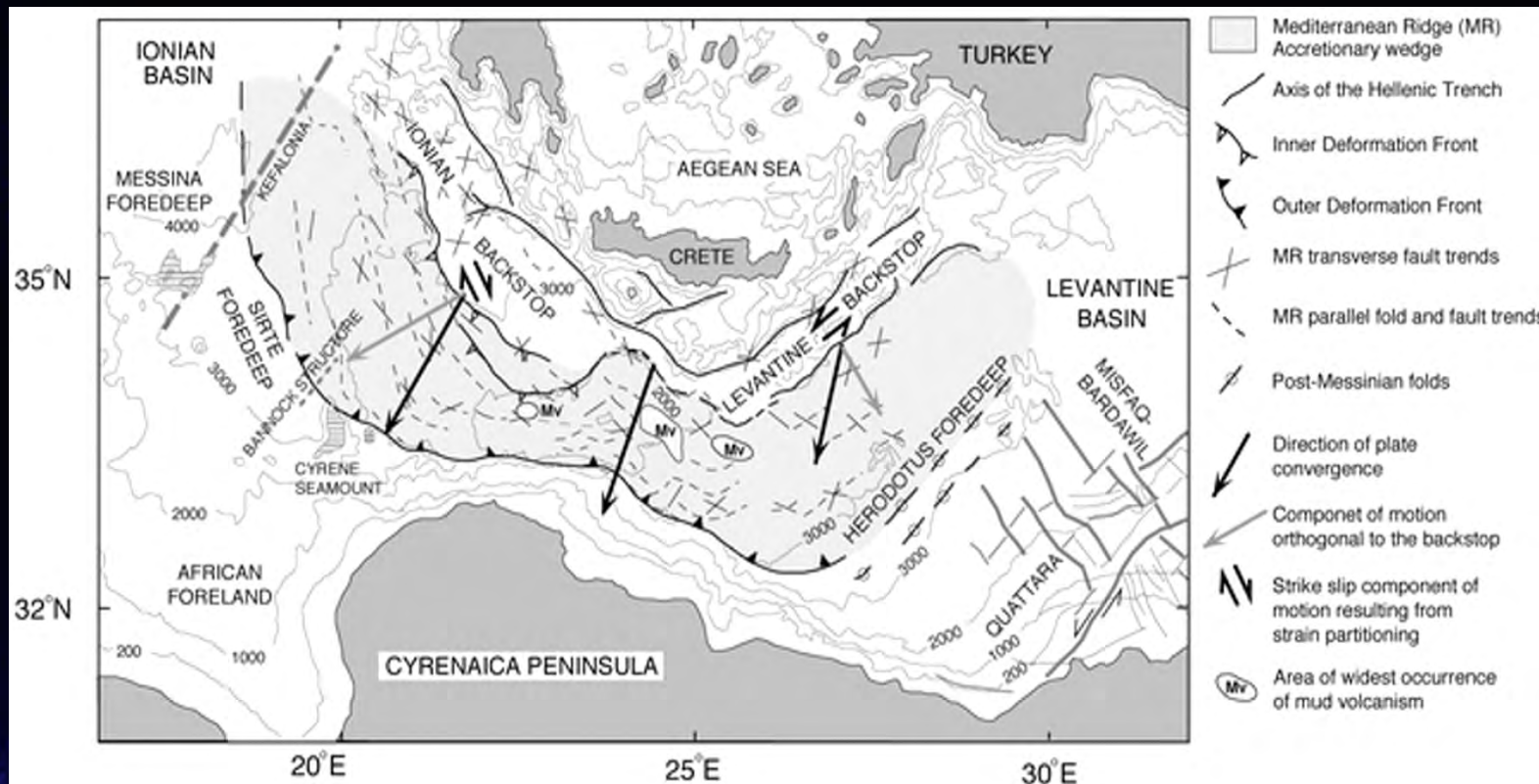


- multiple, parallel and en echelon deeps
- Separated blocks
- not one long subduction trench
- trenches not equal in depth



# Mediterranean Ridge

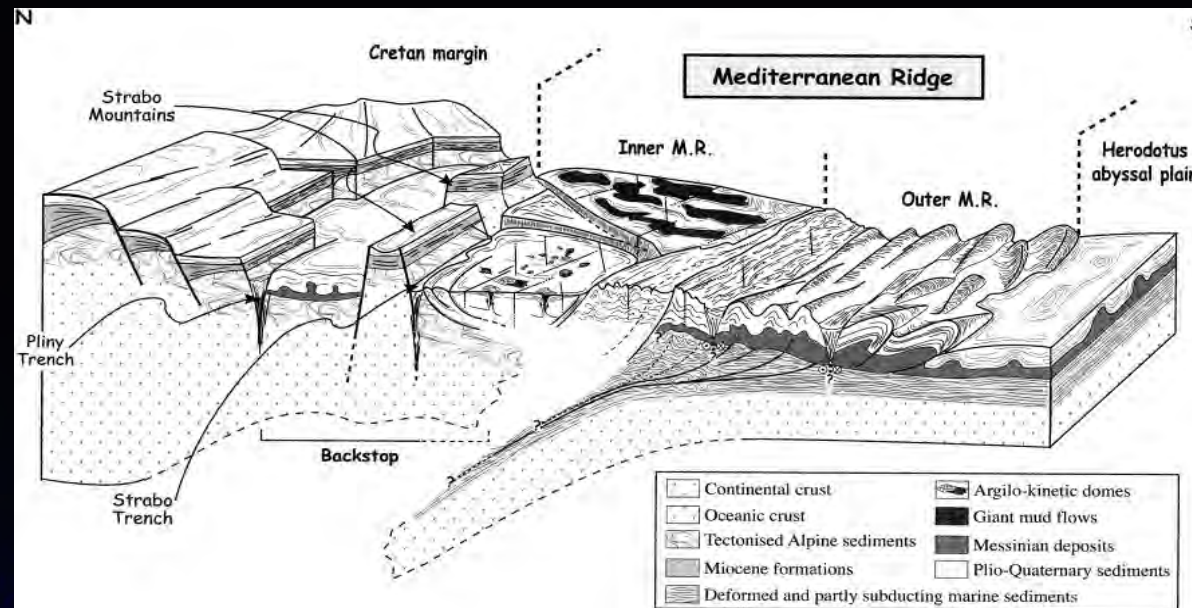
- prevailing feature
- different to Levant basin due to plate collision





# Mediterranean Ridge (cont'd)

- mud volcanoes
- not thoroughly surveyed
- very deep water





# Hydrocarbon E&P activities

- under-explored area (except Egypt & Syria)
- significant discoveries have opened new plays
- further exploration efforts will redefine the future



# Albania

- producer since early 20<sup>th</sup> century
- Patos-Marinza discovered in 1928, production commenced in 1939
- production peaked in 1974 (2.25 million tons/year)
- oil production in 2010: 11,000 bbl/d
- current gas production: 500 Mcf/d



# Croatia

- production peaked in 1980s
- production has faced major decline 1994
- oil production in 2009: 15,000 bbl/d
- gas production in 2010: 67 Bcf/d



# Cyprus

- first activity before World War II
- first seismic, in 1970-1974 (shallow, 200 m)
- mid-1980s, geological/geophysical by the Soviet Academy of Scientists, offshore
- in 2011 Noble Energy Inc. discovers in “Block 12” (estimated resources 5-8 Tcf)
- 2<sup>nd</sup> Licensing round is under way



# Egypt

- first production in 1885
- in 1938 first commercial discovery
- in 1973 the Ministry of Petroleum was formed
- proven reserves: 4.4 billion bbl
- declining oil production: 540,000 bbl/d
- gas reserves: 78 Tcf (3<sup>rd</sup> highest in Africa)
- gas production in 2009: 2.3 Tcf

# Greece

- first attempts in 1903 (some evidence show efforts in 1860)
- systematic exploration in the 1960s-1970s
- 1971 discovery of Prinos, offshore Thassos
- Prinos' production peaked in 1985 (28,000 bbl/d)
- 1<sup>st</sup> Licensing round in 1996
- today, "open door" procedure and international invitation for non-exclusive seismic

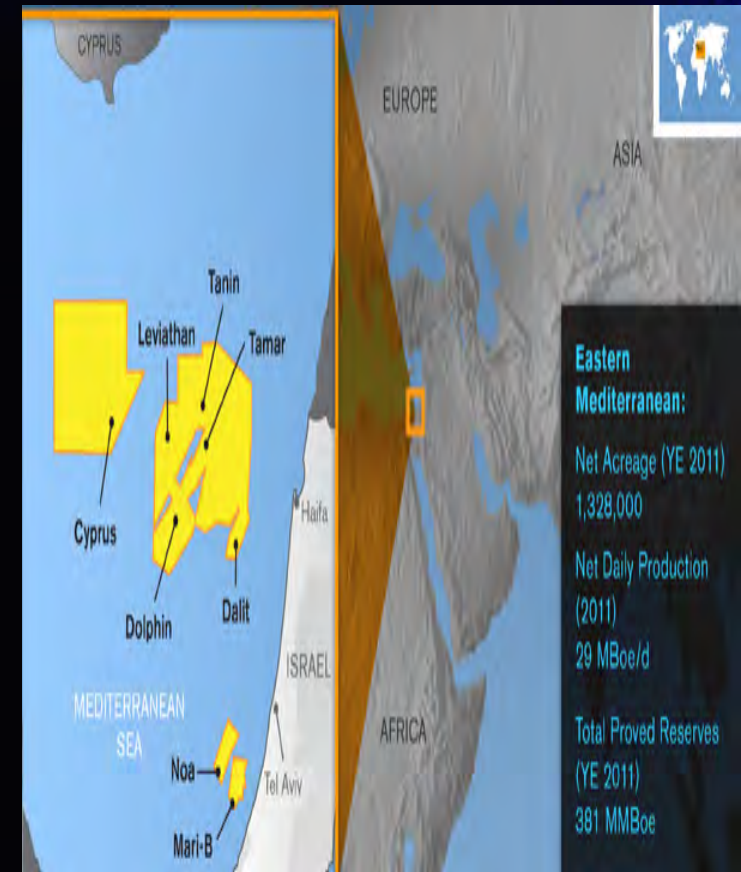


# Italy

- first exploration in 19<sup>th</sup> century, poor results
- 1<sup>st</sup> sizeable gas field discovered in 1944 (Po Plain)
- discoveries where made ever since, but exploration has not reached a mature level
- proven oil reserves: 1 billion bbl
- proven gas reserves: 3 Tcf
- oil production in 2010: 106,000 bbl/d

# Israel

- drilling began in 1947
- in January 2009, Noble Energy Inc. discovered Tamar (gross mean resources 5 Tcf)
- in March 2009, Noble Energy Inc. discovered Dalit (gross mean resources 500 Bcf)
- in June 2010, Noble Energy Inc. discovered Leviathan (gross mean resources 17 Tcf)





# Lebanon

- no wells offshore Lebanon
- 7 wells onshore 1947-1967 (traces of gas and/or bitumen)
- no hydrocarbon production

# Montenegro

- activity started after World War II
- 1949-1966, 16 wells onshore (900-4,600 m)
- 5 offshore wells, 1970s-mid 1990s
- total length of 6,500 km 2D seismic
- 311 km<sup>2</sup> of 3D seismic
- Data Room currently opened
- 1<sup>st</sup> Licensing round expected in 2012



# Syria

- exploration started in the mid 1930s
- in 1968 first commercial discovery
- most significant producer in the Mediterranean Middle East
- oil reserves: 2.5 billion bbl
- in 2011, oil production: 400,000 bbl/d
- in 2010 gas production: 316 Bsf
- proven gas reserves: 8.5 Tcf

# Turkey

- more than 3,000 wells since 1935 (mainly onshore)
- most of the reserves and major production is in Hakkari basin (SE Turkey)
- oil reserves: 270 million bbl
- in 2009, oil production: 46,000 bbl/d
- in 2010, gas production: 23.9 Bcf



Thank you for your attention