Unconventional Petroleum Plays in the Mediterranean Basins*

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Abstract

Exploration for unconventional petroleum in Europe has intensified over the last five years. The potential for unconventional oil and gas resources has been examined in order to determine the right types of rock, basin and maturity in basins around the Mediterranean Sea. Various target shale formations exist in the study area, ranging in age from the Lower Paleozoic to Tertiary. These shales are of very good geochemical quality, both in their Total Organic Carbon content, as well as in their hydrogen indices. The basins containing these rocks vary in their tectonic style, but they are often structurally "quiet" synclines or monoclines. The maturity of the shales has been found to be in the oil and gas window. Models for source rock deposition demonstrate the possibility of black shale deposition throughout the Paleozoic, Mesozoic and Cenozoic eras in various areas of the Mediterranean.

International oil companies explore for unconventional petroleum resources in several European Mediterranean countries. However, unconventional exploration has not started in earnest in North Africa, south Balkans, Near East or Middle East. Target shales for shale-gas, shale-oil and pyrolysed oil exist in Greece, Turkey, Israel and in the north African region. The purpose of the current study is to highlight areas of unconventional petroleum prospectivity in the Mediterranean region.

References Cited


Scopelliti, G., A. Bellanco, R. Neri, F. Baudin, and R. Coccioni, 2006, Comparative high-resolution chemostratigraphy of the Bonarelli Level from the reference Bottaccione section (Umbria-Marche Apennines) and from an equivalent section in NW Sicily; consistent and contrasting responses to the OAE2: Chemical Geology, v. 228, p. 266-285.


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The big shale fairways around the Mediterranean Sea

- Silurian Graptolites & Devonian shales
- Jurassic & Cretaceous marinites
- Jurassic & Cretaceous shales
- Early Permian shales
- Tertiary shales
- Oligo-Miocene shales
Prospective unconventional petroleum areas around the Mediterranean Sea
Spain
Lias (Pliensbachian) shales in the Asturian Basin

Silurian sections in the Iberian Peninsula

CCR: Catalonian Coastal Ranges
ClZ: Central Iberian Zone
CZ: Cantabrian Zone
IC: Iberian Cordillera
OMZ: Ossa Morena Zone
P: Pyrenees
WALZ: West Asturian-Leonese Zone

Silurian shale outcrops in Central Spain
France
Upper Carboniferous (Stephanian) black shales, Boson coal mine
Early Permian “Autunian” black lacustrine shales, Languedoc

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Terres Noires (Oxfordian),
Entreaunes
Terres Noires (Oxfordian),
Villeneuve d’Entreaunes
Albian-Aptian dark grey shales,
Sauzéries
Cenomanian dark grey-black shales, Vallée de Vesubie
Upper Triassic Kössen Formation, northern Italy


Triassic Noto Formation, Sicily

Liassic Posidonia Shale in northern Italy

Scopelliti G. et al., 2006: Chemical Geology v. 228, p. 266–285
Slovenia, Croatia, Serbia, Bosnia & Herzegovina
Miocene source rocks in the Pannonian Basin

Miocene source rocks in the Pannonian Basin

Greece
Possible structure with oil seeps in NW Greece

Turkey
The Silurian Dadaş shale in SE Turkey
Israel

Upper Cretaceous Ghareb oil shale


Marl chalk Bituminous (oil shale) Condensed carbonate Phosphorite Shell bed (mostly Inoceramus)
Ghareb

Mishash

Menuha


Egypt
Geochemical properties of the Middle Jurassic *Khatatba* and the Lower Jurassic *Ras Qatarra* shales
Libya
POSSIBLE SHALE TARGETS IN LIBYA

- Triassic lacustrine shales occurring locally in the Sirt Basin.
- Early Cretaceous lacustrine source rocks in the southeastern portion of the Sirt Basin, Libya), explaining the waxy nature of the oil in many of the fields in Libya
- the Late Cretaceous Cenomanian Turonian 'Sirt Shales' and 'Rakb Shales' of the Sirt Basin


Geochemistry of possible shale targets onshore Tunisia

Algeria
Morocco
Conclusions

• The onshore basins around the Mediterranean Sea contain several shale formations that could be exploited for unconventional oil & gas.
• Environmental and public opinion/political considerations will determine the future of unconventional petroleum explorations in these basins.