The Petroleum Potential of the Medjez El Bab region, Tunisia

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Key words

Medjez El Bab, M'Cherga, Lower Fahden, Bahloul, biomarkers, oil potential, oil system.

Abstract

This study focused on a geochemical characterization of oil seeps and source rocks outcropping in several areas of the North of Tunisia, especially at Medjez El Bab and Mateur. Our interest mainly concerns lower M'Cherga (Valanginian-Barremian) deposits in Oued Bazina (Mateur region), lower Fahden (lower Albian) series in Oued Siliana (Beja area) and upper Cenomanian-Lower Turonian Bahloul deposits in Oued Faouar (Medjez El Bab area). Our approach used specific analyses based on Rock Eval pyrolysis and the GC-MS techniques. In addition, three oil indices of Cenomanian and Turonian collected from Medjez El Bab area were also analyzed by Gas Chromatography coupled to Mass Spectrometry.

Introduction

Organic geochemistry plays a very important role in oil exploration. The study of the conventional domain has not been fully completed. This map shows the location of oil seep samples in North Tunisia. Despite the abundance of oil indices in the north-west and central Tunisian North, the oil prospecting work in our study area shows a lack of the identified oil seep samples. For that reason, we have used the collection of surface indices in the Medjez El Bab region in order to determine the origin of these hydrocarbons. (Fig.1)

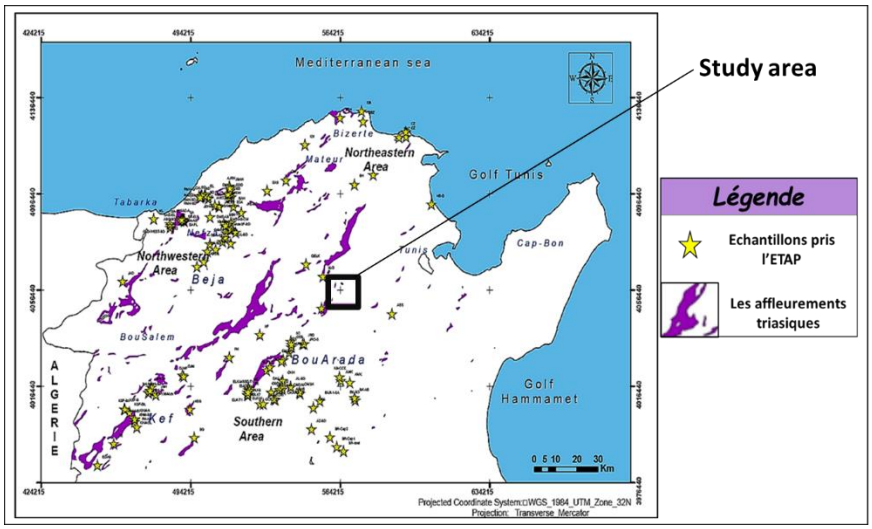


Fig. 1: Map showing the position of the main identified oil seeps (until 2015) in the northern part of Tunisia (Belhaj et al., 2015)

Analytical Methods

Laboratory analysis were carried out using two methods (1) Rock Eval pyrolysis techniques to evaluate the organic matter to measure the source rock richness and maturity. (2) Gas Chromatography coupled to mass spectrometry (GC/MS) enabling the study of biomarkers and allowing oil-oil and oil-source rock correlations.

Results and comments

The source rock M'Cherga is rich in organic materials, essentially marine (type II), with a terrestrial contribution (type III) and it is mature (Oil window). The lower Fahden source rock is of marine origin with a terrestrial contribution. The organic material of lower Fahdene is equally mature at T max (452°C). The Source rock Bahloul is rich in organic material originated from Marine plankton (type II). The organic material of Bahloul is marginally immature to mature (Fig.2).

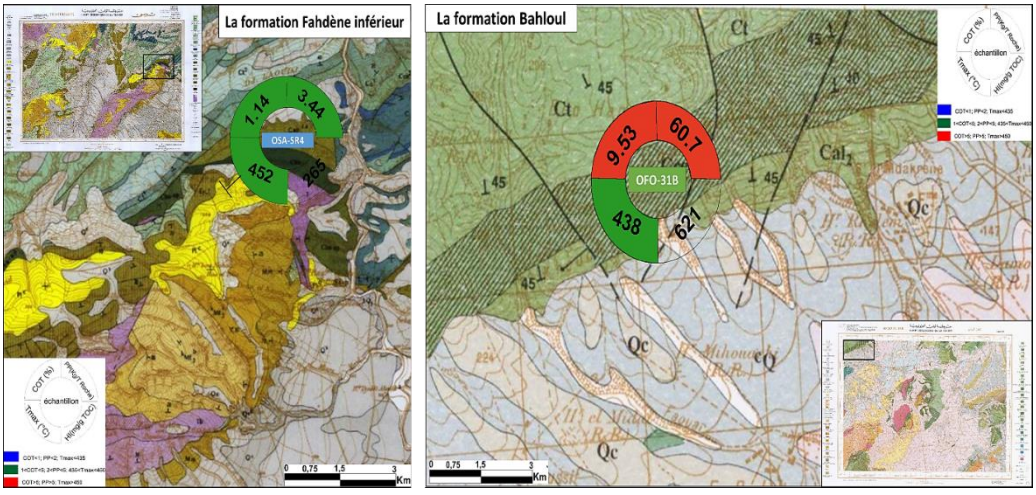


Fig. 2: Location and geochemical characterization of source rocks in the study area (Extracted from the geological map of Medjez El Beb and Beja 1 / 50.000)

The oil seeps-oil seeps correlation has led to subdivide the analyzed oil seeps into two main types. The first type includes the Turonian age sample taken at the Jedidi village and the Cenomanian age sample taken from the Medjez El Bab outcrop. The second type consists of the Cenomanian age sample taken from the Jedidi Village (Fig.3).

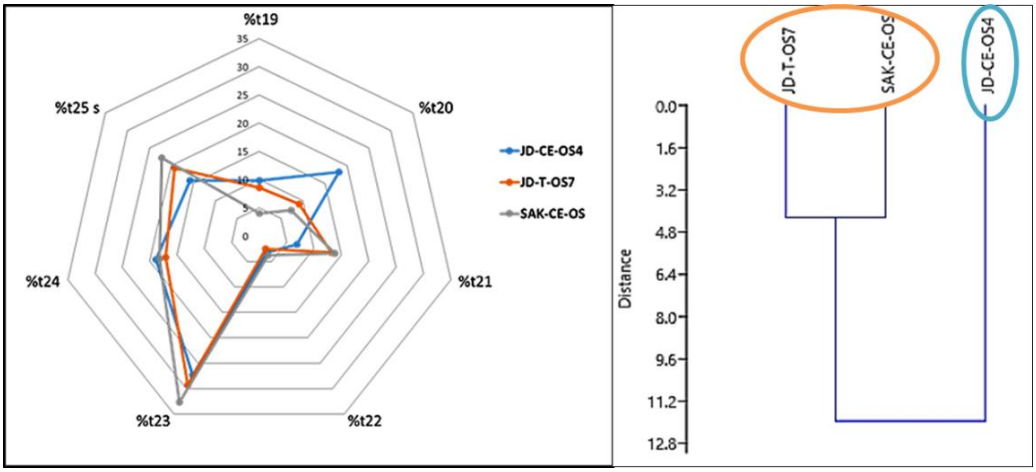


Fig. 3: Correlation of oil seeps studied.

The oil seeps-source rock correlations indicate that the two Turonian age indexes taken from the Jedidi village and from the Cenomanian age, taken from the Medjez El Bab outcrop are generated by the Bahloul formation while the Lower Fahden Formation generated the Cenomanian age index collected in the Jedidi Village. However, the source rock M'Cherga has no positive correlation with the three examined seeps. Consequently, it has not contributed to their generations (Fig.4).

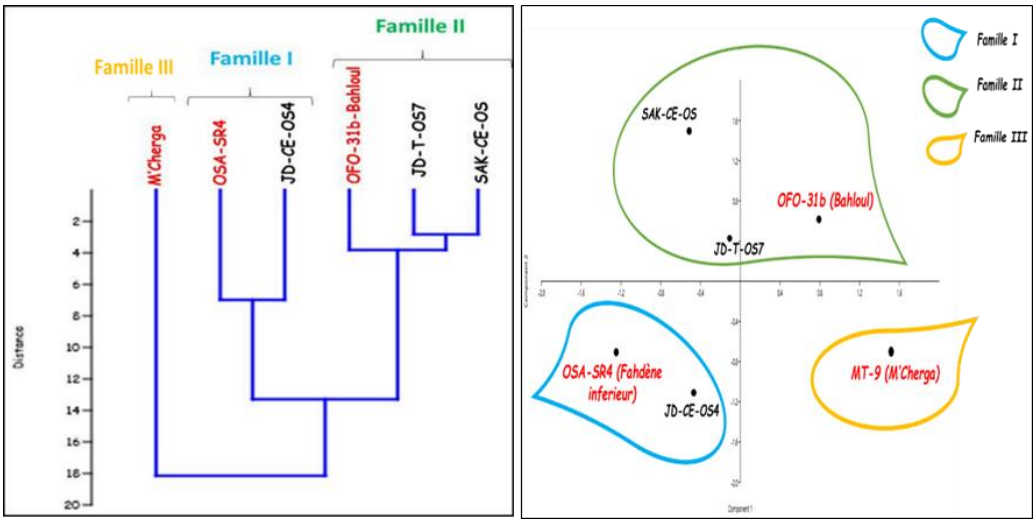


Fig. 4: Oil-rock correlation illustrating the three families.

Conclusions

This study underlines the existence of, at least, two active petroleum systems related to the Lower Fahden and Bahloul deposits (Fig.5). Within the two systems, the reservoir series could pose serious problems, especially in terms of frequency and quality. Reservoir levels may correspond to fractured carbonate units included in the same interval or above, such as the Campanian Abiod limestones. On the other hand, fracturing is common in the studied area. Further studies have to identify the main tectonic phases and establish a relative chronology considering other significant processes, such as hydrocarbon genesis, migration, faulting-folding, traps genesis, etc.

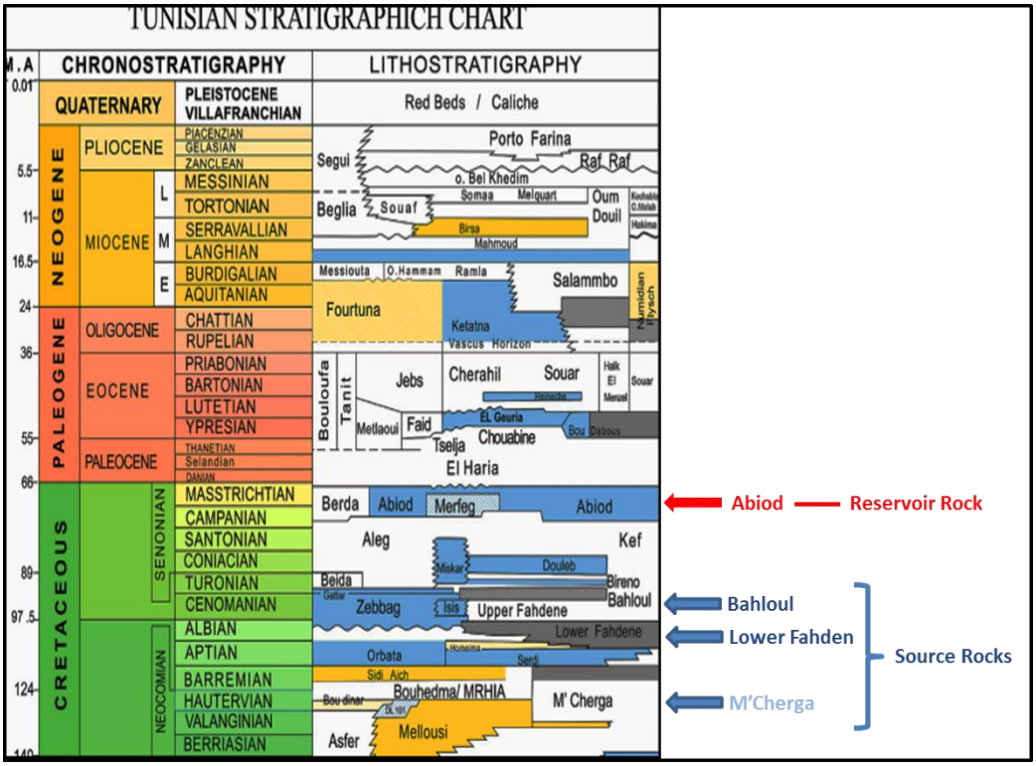


Fig. 5: Stratigraphic Charter of Tunisia illustrating the formations studied (ETAP, 1998).

Bibliography

Belhaj Mohamed, A., Saidi, M., Ben Jrad, M., Riahi, S., Soussi, M., Bouazizi, I., &Saadani B. (2015) - The Organic Geochemistry of Source Rocks, Bitumens, Asphalts and Oil Stains From Northern Tunisia : New Approach on Petroleum Exploration 77th EAGE Conference & Exhibition 2015 Madrid IFEMA, Spain.

Saidi M., Inoubli H., Ghenima R., Ben Nasr D. (1998) – Caractéristiques géochimiques des roches mères en Tunisie. Rapport interne ETAP.