

## GEOCHEMICAL CHARACTERISTICS OF SOURCE ROCKS AND OIL SEEPS FROM CENTRAL AND NORTHERN TUNISIA

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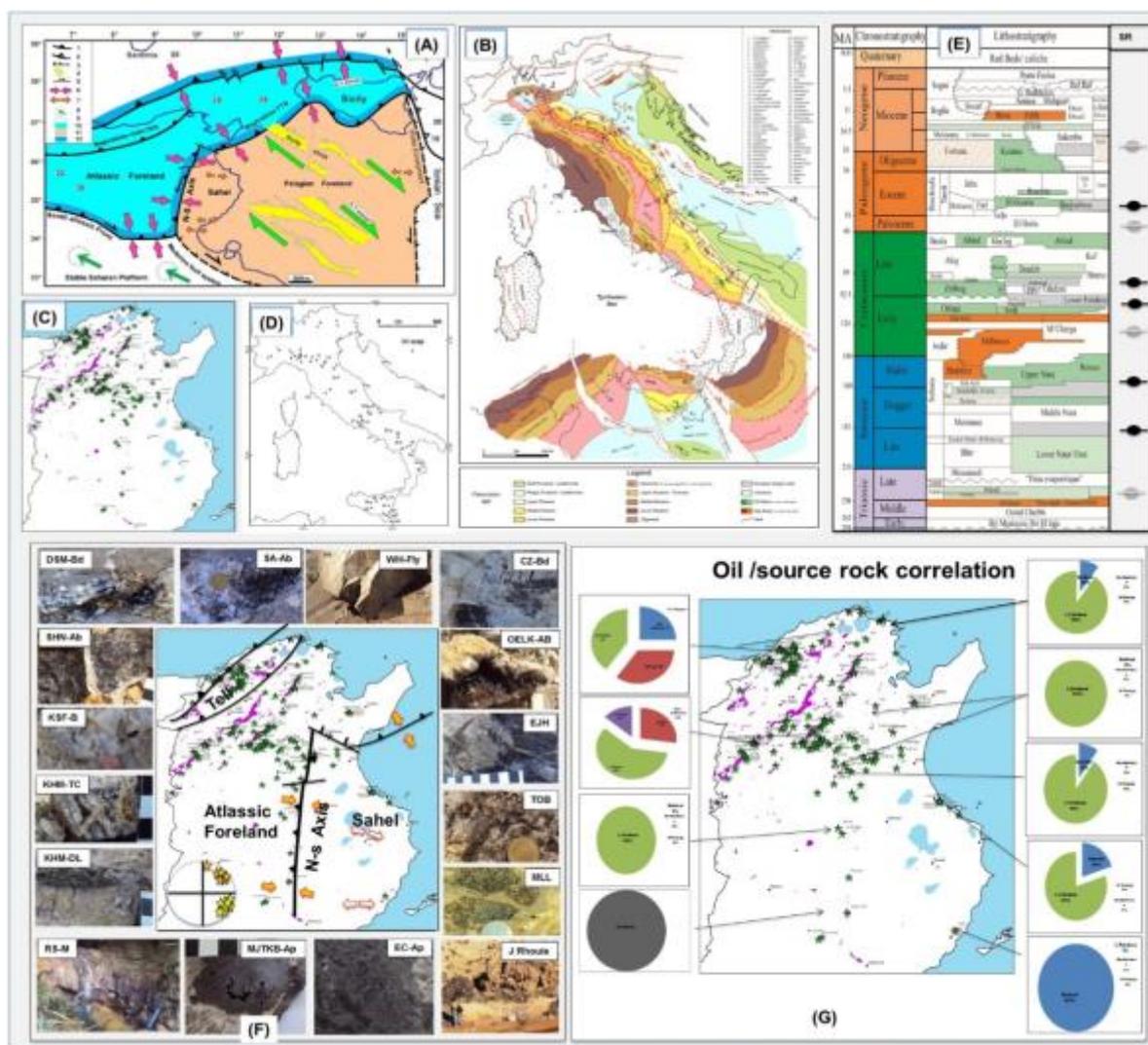
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### Abstract

Petroleum seeps have historically been important drivers of global petroleum exploration. Still today, they can serve as direct indicators of gas and/or oil subsurface accumulations. Seeps occur wherever a permeable pathway leads to the surface from mature source strata or leaking petroleum reservoirs. Seeps are effective indicators of tectonic discontinuities and rock formations with enhanced secondary permeability, providing information on the location and depth of gas-bearing faults (Etiopie et al., 2009, Abrams., 2005, Martinelli. G et al., 2012). Extensive field work studies have been conducted in recent years in central and northern Tunisia. Several bitumens, asphalts, oil stains (named oil seeps) and source rocks studies show that the Mesozoic and Cenozoic areas in northern and central Tunisia are highly related by the geodynamic history. Progressive uplift and basin inversion since the Mesozoic and Cenozoic provides favorable conditions for the migration phenomena. A geochemical study (Rock Eval pyrolysis, Gas Chromatography (GC), GC-Mass Spectrometer and isotope analysis) has been performed to investigate the origin of the oil seeps and was conducted to understand the types and distributions of effective source rocks. For this study, the geochemical survey is based on the analysis of more than 200 oil seeps and more than 2000 cuttings and outcrop samples representing several potential source rocks such as the Jurassic Nara Fm, Barremian M'Cherga Fm, the Albian Lower Fahdene Fm, the Cenomanian-Turonian Bahloul Fm, the Ypresian Bou Dabbous Fm, the Paleocene El Haria Fm and the Miocene Nymidian Flysch Fm.

The Albian Lower Fahdene, Late-Cenomanian-Early Turonain Bahloul and Ypresian Bou Dabbous source rocks have good to excellent oil/gas potential. The Jurassic Nara Fm, the Barremian M'Cherga Fm, the Paleocene ElHarria Fm and the Miocene Nymidian Flysch Fm show locally fair to good source rock characteristics.

The oil seep samples were associated with fracture, fault and strata in the Mesozoic and Cenozoic reservoirs and seals with the maximum number of oil seeps are found along the ~N120 trending fractures. Based on the geochemical data and the petroleum geological settings, the oil seeps from the Northeastern and Northwestern areas (Tellian, Numidian Flysh and Bizerte areas) were sourced from the three primary source rocks (Lower Fahdene, Bahloul and Bou Dabbous source rocks). While in the Elkef, Echeid and Bouarada areas (Atlas and Triassic diapirs zones), the oil seeps was initially charged by the Lower Fahdene and Bahloul Fms with the contribution of the Barremian source rock. In the pelegian basin (Sousse area), the good oil and gas seeps was sourced from the Lower Fahdene and Bahloul Fms. The Jurassic source rock is the major oil source in the southern part (Jbl Melloussi, Rhouis and Axe N-S). The occurrence of numerous oil seeps in some stratigraphic levels, faults and fractures is indicative of the presence of several active petroleum systems in these areas. The detailed geochemical study provides a new and detailed understanding of petroleum systems in the onshore Tunisia and in the Mediterranean Sea.



**Figure.** (A) Geological, structural and tectonic setting of Northern Tunisia (Bahrouni et al., 2014) (B) (Casero. P., 2004). (C) Map of natural oil seeps in Tunisian (Star form). (D) Map of natural oil seeps in Italy (Martinelli. G et al., 2012) (E) Stratigraphic chart showing the petroleum system from Tunisia.(F) Map and photos of Central and Northern Tunisia showing the locations of the identified oil seep samples (Star form). (G)Map of Central and Northern Tunisia showing the locations of the identified oil seeps and oil/source rock correlation.

## References

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