INTRODUCTION
Large volumes of oil and gas have been generated and trapped within Paleozoic sections in western Libya, Tunisia and Algeria. The Ghadamis and Murzuq Basins, located in the western half of Libya, are the most attractive oil and gas exploration areas for the last decades due to the increasing number of new oil discoveries. The lower part of Silurian Tanezzuft Formation, so called “Hot Shale”, is the major source rock of northwestern African oil and gas fields due to high organic matter content. The Late Ordovician glacial events played a major role in the development of paleo-highs and lows that controlled source rock and reservoir rock distribution. Two major migration systems can be observed in the Murzuq Basin: a fault related vertical oil migration to Devonian reservoirs and combined lateral and vertical oil migration into older, i.e., Cambro-Ordovician, reservoirs and traps. Turkish Petroleum Overseas Company (TPOC), a subsidiary of Türkiye Petrolleri Anonim Ortaklığı (TPAO), tested 11 prospects and discovered 7 oil fields in Area-147/3-4 in the Murzuq Basin. Proven hydrocarbon distribution in the Murzuq Basin reflects the interaction of several factors such as regional structural evolution, source rock quality, distribution and maturity, trap geometry and age, and reservoir quality both in terms of facies variations and diagenetic changes. Migration pathways are controlled by adjacent reservoir facies variations, the fault system distribution, trap type configurations, and the Tanezzuft Shale seal efficiency. The Early Devonian erosion mostly eroded Silurian top seal towards the Gargaf uplift in the northwestern edge of the Murzuq Basin.

PETROLEUM GEOLOGY
The Murzuq Basin is an intracratonic sag basin on Northern Gondwana passive margin and covering an area of approximately 350,000 km² in Southwest Libya. It is surrounded with Al Qarqaf Arch to the North, Tihemboka Arch to the west and Tibesti Ridge to the east (Clifford, 1986; Sutcliffe et al., 2000, Hallet, 2000; Echikh et al., 2000). Early Paleozoic time was characterized by the presence of NW-SE trending lows and highs, clearly indicated by thickness variations in the Cambro-Ordovician and Silurian sedimentary successions. Present-day structures are related mostly to Hercynian compressional movements. The most important source rock is the Silurian Tanezzuft Formation deposited in northern Gondwana during Early Silurian flooding after the Late Ordovician glaciation. It generated large volumes of oil and gas charging Cambro-Ordovician, Silurian and Devonian reservoirs (Davidson et al., 2000; Echikh et al., 2000; Hallet, 2000). The Late Ordovician glaciation was dominant in most of North Africa (Clifford, 1986; Sutcliffe et al., 2000) and complex glacial, glacio-marine, and peri-glacial fluviodeltaic coarse clastics were deposited in paleohighs and paleolows. The Late Ordovician glacial and peri-glacial fluviodeltaic clastics, which form currently reservoirs, are overlain by marine Silurian shales that also serve as top seal for older Cambro-Ordovician reservoirs in the Murzuq Basin. More than 90 exploratory wells have been drilled in the Murzuq Basin, resulting in the discovery of around 25 oil pools with around total of 5000 MMbbl of oil in place.
550 km of 2D and 350 km² of 3D seismic data acquisition and seismic processing supported with 3500 km of reprocessed old 2D seismic data, well and well-log data studies. The TPAO/TPOC exploration and research team delineated 22 prospects for testing the hydrocarbon potential of the Area-147/3-4. Soil gas surface geochemistry techniques were used to determine any surface occurrences distribution related to prospects and leads. 11 exploration wells were drilled between 2009-2011 and 7 new oil fields were discovered prior to the Libya conflict during a period of “Arab spring” revolutionary uprising. The API gravity of oils recovered from Ordovician and Devonian reservoir intervals range from 31° to 37°. The main trapping mechanisms are structural fault-bounded simple anticlines and buried hills often reflecting glacially related paleo-topographical highs resulted from a combination of complex glacial related depositional and erosional phases during the Late Ordovician (Sayılı et al., 2007). The porosities of reservoir sandstones range from almost tight sand to 20% with low (0.20 mD) to moderate (up to 200 mD) liquid permeabilities. Reservoir rock porosities are mostly inter-granular and dissolution voids partially filled with silica cement and authigenic clays (Yılmaz, 2010; Yılmaz et al., 2010). The reservoir facies distribution is basically controlled by the depositional environmental characteristics enhanced by vertical fracturing.

RESULTS AND CONCLUSION
The Ordovician reservoir sands were deposited in a glacial and periglacial complex including fluvo-marine to fluviodeltaic sandstones. The Late Ordovician glaciation has been the major agent for the Paleozoic petroleum system; it formed paleohighs during ice movement which served as anticlinal and buried hill traps and deep paleodepressions for Silurian hot shale accumulation. Early Silurian marine transgressive shale served as both source rock and cap rock for underlying traps such as those proven by recent TPOC discoveries in the Murzuq Basin.

REFERENCES


