

Kimmeridgian Source Rock Super-Highway in the North Atlantic

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In the past decade, offshore Atlantic Canada has become an important petroleum producing province. The largest hydrocarbon discoveries were made during the 1979-1984 period, when drilling in the high-risk, high-cost North Atlantic waters were stimulated by a Canadian Federal Government's Petroleum Incentive Program (PIP). Currently 350,000 bopd are produced from three oil fields of the Jeanne d'Arc Basin offshore Newfoundland, while 450 MMcft/d flow daily from the five gas fields of the Sable sub-basin offshore Nova Scotia. These basins had a complex geodynamic evolution including Mesozoic extension, salt tectonism, subsidence and localized exhumation that have created numerous hydrocarbon trapping styles.

The main ingredient of the Atlantic Canada's petroleum system however, is the presence of rich Kimmeridgian-aged source rock that is predominantly restricted marine in the Grand Banks basins and predominantly terrestrial derived on the Scotian Shelf and slope basins, due to source rock deposition in different paleogeographic conditions. Initially indicated by seismic mapping and basin-to-basin correlations, the presence of Late Jurassic in other Newfoundland offshore basin was recently confirmed by drilling. The 2003 Mizzen L-11 well in the Flemish Pass Basin has intersected a Late Jurassic source rock and discovered reservoir oil, while the Great Barasway F-66 well in the East Orphan Basin intersected a Late Jurassic sequence that may contain source rocks.

This proves that these two basins were part of the Kimmeridgian-aged source rock super-highway partially following the Atlantic rift trend connecting the Scotian Shelf to offshore Newfoundland basins and extending into the Porcupine, Rockall Trough and Slyne basins, West of Ireland and from here into the North Sea and Norwegian Sea basins and sub-basins. While not directly proven by drilling, it is hypothesized that arms of this Kimmeridgian Sea extended into Labrador Sea basins situated now on the slope and deep waters of both Greenland and Labrador margins. Identifying and mapping with regional seismic grids the Late Jurassic source rock super-highway is the key to further oil and gas discoveries in this region of the North Atlantic.