

# Evidence for active petroleum systems on the deepwater Scotian Slope, Canada

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This presentation reviews recent evidence for the presence of working petroleum systems on the deepwater Scotian Slope, offshore Nova Scotia. It uses data from recent piston-coring cruises and from wells drilled offshore Morocco to speculate on what the age and type of source rock(s) could be present. The Scotian Slope extends from the shelf break at 200 m to almost 4000 m water depth. It is 850 km long with an area of about 80 000 km<sup>2</sup>. Only eleven wells were drilled on the slope between 1983-2004 with little success to date other than minor gas discoveries in Annapolis G-24 (2002) and Newburn H-23 (2002). Geochemical analyses of selected cuttings samples from intervals in all wells where oil-staining was suggested failed to confirm the presence of migrated hydrocarbons because of the very high concentration of synthetic oil-based drilling mud.

Several direct hydrocarbon indications based on satellite observations and seismic analysis have been observed on the Scotian Slope. A regional geochemical survey with piston coring was undertaken by TDI-Brooks in 2000 that suggested thermogenic hydrocarbons may be present at some locations, although there are doubts whether they represented evidence of petrogenic hydrocarbons. In 2015 and 2016, the Nova Scotia Department of Energy, in partnership with the Geological Survey of Canada, organized piston-coring cruises on the Scotian Slope to confirm the presence of seeps suggested by satellite and seismic evidence. The 2016 cruise encountered gas hydrates for the first time at three separate sites. At two of these locations, the methane in the hydrate had a biogenic origin but the third site had a thermogenic oil-associated gas based both on its composition and isotopes. Sediment samples from this site also show strong evidence for petrogenic hydrocarbons. This site provides good evidence for a working petroleum system and oil-prone source rock in this area. Indications of thermogenic gas and/or sediments with possible petrogenic hydrocarbons were also observed at other sites along the Scotian Slope, implying one or more source rocks with wide areal extent. Nova Scotia's conjugate margin is offshore Morocco. Here, oil has been found in Upper and Middle Jurassic reservoirs that might be equivalent to those that could occur on the Scotian Slope. Oils from these reservoirs have different geochemical characteristics suggesting at least two different Jurassic carbonate source rocks.