

Are there Petroleum Systems Offshore Labrador?

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The sparsely explored Hopedale and Saglek basins on the northern Labrador Shelf have significant petroleum systems. Oil and gas have been found in seven wells in the 1970s and early 1980s, with an overall success ratio nearing 30%, but because it was mainly gas, interest soon waned. Radarsat data show persistent oil slicks over several locations, which has prompted new seismic, organic geochemical, biostratigraphic and basin modelling studies at the GSC. We have found source rocks in four wells and there is now evidence for two types of kerogen. One has dispersed organic matter like resinite, as found in the Mackenzie Delta, that produces gas and condensate; the other is the Type II-I that is more oil prone. Another encouraging discovery is the presence of the fresh-water fern *Azolla* in Type II-I kerogen bearing rocks, indicating that conditions could have been ideal for algal blooms, thus making for an excellent oil-prone source rock.

The Hopedale and Saglek basins cover an area of about 1100 x 200 km, and formed by rifting between Labrador and Greenland at about 65 Ma. The latest biostratigraphy indicates six regional unconformities that do not correlate with the lithologic units that were defined over 25 years ago. This difference reflects the clastic nature of Late Cretaceous-Palaeogene section, the latter deposited from the huge outflow of the Bell River which would be comparable to today's Mississippi Delta. Aggravating the correlation is the absence of good carbonate markers and the poor quality seismic data. Nevertheless, our data allowed us to build for the northern Saglek Basin an interpretive 4D model of the crust and overlaying sediments to assess the potential petroleum systems over time, which will be shown. The model shows that there are many other prospects that could be larger than the 2.3 Tcf discovered at Hekja. From the geological setting we know that there are major clastic reservoirs and good seals and that the high present-day heat flows would promote hydrocarbon generation. In the northern Saglek Basin, the rocks containing the oil-forming source rocks appear to be absent, but the gas and condensate in the Hekja well show that the dispersed kerogen source rock must be present.