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**Old marine seismic and new satellite radar data:  
exploring for petroleum in the northern frontiers**

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This paper provides a review of hydrocarbon discoveries and presents some new concepts in the petroleum systems of the offshore northern Labrador Shelf and Baffin Bay region in eastern Canada. The focus of this work was the Hekja O-71 gas discovery of 1979, one of only five wells drilled between 1976 and 1980 from an area covering some 166,000 square kilometres, roughly one quarter the size area of Alberta.

This study emerged from the New Energy Options for Northerners (NEON) project, a broad scale re-examination of the petroleum potential of this area “from the crust up” using regional geophysical data sets to complement the usual seismic reflection interpretation and make an integrated compilation.

An opportunity to use SAR (synthetic aperture radar) data from RADARSAT-1 was taken as an exercise to incorporate alternative data sources to support this exploratory review and resource assessment.

Preliminary examination of the final map of interpreted slick-like features was underwhelming, but closer inspection revealed a close correlation of some of these occurrences to several previously overlooked bathymetric features which had underlying seismic signatures similar to previously identified gas hydrate “pipes” or chimney anomalies seen, for example, in data from offshore Nova Scotia and western Ireland. Worldwide many active marine hydrocarbon seeps appear on the sea floor as “pockmarks”; in this case no sea floor depressions were seen to be associated with active seepage. Instead, very distinct mound-like structures are seen associated with seeps at two locations.

The seismic evidence of these probable mud volcanoes as the sea floor structures in close proximity to the seepage features observed in the RADARSAT-1 SAR images makes a compelling argument for re-examining additional areas for petroleum prospects as well as the potential for considering new stratigraphic as opposed to purely structural plays in a new exploration fairway.