Preliminary results of investigations of seabed cold seeps along the outer continental margin south of Nova Scotia, Canada

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Cold seeps occur where fluids, such as hydrocarbons, migrate from depth and escape at the seabed. They are relatively common features in petroleum basins around the world. The detection of seeps at the seabed is often a strong indicator that an active petroleum system is present and provides critical information about the hydrocarbon source, migration pathways, and maturity. In addition, seabed seeps often host unique biological communities and are indicators of excess pore fluid pressures in shallow sediments. Seabed seeps are notoriously difficult to sample because of their ephemeral nature and environmental complexities. In 2015, a joint research project was undertaken by the Geological Survey of Canada and the Nova Scotia Department of Energy to investigate and sample potential seabed seep features along the continental slope south of Nova Scotia. Since that time, two research expeditions have occurred; the first in June–July 2015 and the second in June-July 2016.

In order to determine the most appropriate areas for sampling, a multidisciplinary approach was applied which utilized all available seismic reflection data, interpretations of sea-surface satellite imagery, and near real-time assessment of seabed and water column anomalies using multibeam bathymetric echosounder and high resolution seismic reflection systems. During the expeditions, core samples were processed on board and subsampled for conventional organic geochemical analysis and geomicrobiology. Besides understanding the petroleum system, the core samples collected during this research project serve other important research needs including improved understanding of the microbiology of bacteria living in the sediment and geological hazard assessment. Results are preliminary, but to date the project has identified a number of active seafloor seeps in water depths from 2700 to 3800 m, and for the first time offshore Nova Scotia, gas hydrates have been recovered from the seabed confirming the interpretation of their occurrence on the margin from geophysical methods and numerical modelling.

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