

### **Marine Geohazard Investigations in Extreme Arctic Offshore Environments**

Blasco, Steve M.<sup>1</sup>; Bennett, Robbie<sup>1</sup>; Blasco, Katie A.<sup>1</sup> (1) Geological Survey of Canada, Bedford Institute of Oceanography, Dartmouth, NS, Canada.

Hydrocarbon exploration activity in the Canadian Beaufort Sea now extends to 1500 m water depths. The Arctic offshore environment is dominated by extreme cold and ever-present drifting sea-ice. Seabed geohazard investigations are not only hampered by extreme operational conditions but by a very limited knowledge of seabed conditions and the distribution of geohazards. This is compounded by the existence of geohazards not encountered in southern hydrocarbon exploration regions. The Beaufort Sea is subject to 'known' geohazards such as shallow gas, subsurface faulting, unstable foundation conditions, slope stability, gas hydrates, mud volcanism and clay diapirism. Unique geohazards associated with the Arctic seabed environment include seabed scouring by ice keels and subsea permafrost coupled with the need for bottom-founded and anchored structures to resist extreme ice loads. Recent advances in seabed survey technologies are essential to Arctic geohazard assessment. Multibeam mapping is required for investigating extreme ice scour depths that may exceed 5 m below seabed. Advanced high resolution multichannel seismic data processing techniques are required to cope with rapid spatial variations in velocity (from 1800 to 3500 to 2000 m/sec) in ice-bearing sediments to 700 m below sea level. In addition, the new need to identify biologically significant benthic ecosystems requires the use of multibeam backscatter, sidescan, subbottom profile and seabed sample data to define the geological constraints to the distribution of unique benthic environments. Seabed survey operations to acquire geophysical, geological and geotechnical data are restricted by a short operating season, limited open water conditions and the lack of ice strengthened survey platforms. Sediment sampling to depths greater than 10 m below seabed is currently not possible.