Geophysical Research Abstracts,
Vol. 11, EGU2009-10765, 2009
EGU General Assembly 2009

Gas hydrate quantification from ocean-bottom seismometer data along the continental margin of Western Svalbard.

A. Chabert (1,,), T. A. Minshull (1,,), G. K. Westbrook (2,,), C. Berndt (3,,)

(1) National Oceanography Centre Southampton, University of Southampton, Southampton SO14 3ZH, UK , (2) School of Geography, Earth & Environmental Sciences, University of Birmingham, Birmingham B15 2TT, UK, (3) IFM-Geomar, Kiel, Germany, ()

The stability of shallow gas hydrate in the Arctic region is expected to be affected by the warming of the bottom-water in the next decades. It is, therefore, important to evaluate how the gas hydrate systems will react to future increases in bottom-water temperature and the impact on climate of the spatial and temporal variability of the release of methane from these reservoirs.
As part of the International Polar Year initiative, a multidisciplinary marine expedition was carried out in September 2008 along the continental margin west of Svalbard in the Arctic. One of the objectives was to investigate the extent of the gas hydrate stability zone (GHSZ) along and across the continental slope and to estimate the quantity of methane present using the geophysical properties of methane hydrate- and gas-bearing sediments, which occur in and beneath the GHSZ.
Three seismic experiments employing ocean-bottom seismometers (OBS) were carried out across and along the continental margin as part of the project. Seismic data from 13 OBS in closely spaced arrays were acquired from 5 representative sites off west Svalbard, above and below the upper limit of the GHSZ. Two to four OBSs were deployed at each site, with a spacing of 200 m. The high frequency airguns were fired at 5-s intervals, concurrently with the acquisition of multi-channel seismic reflection profiles. The OBSs were equipped with a 3-component 4.5 Hz geophone package and a broadband hydrophone; the data-loggers were operated at 1 kHz sample rate. The OBS experiments were designed to recover P- and S-wave velocities to depths of a few hundreds metres below the seabed in order to estimate the amount of hydrate in the region, hydrate increasing both the P- and S-wave velocities of the sediments in which it is present. The data show clearly recorded P reflections at short offsets, as well as refracted arrivals at larger offsets, from depths of 1 to 2 kilometres below the seabed. S waves, generated by P-S conversion on reflection, are identified as strong low-frequency reflections on the geophone components from depths down to a few hundred metres below the seabed. Modelling of the P- and S-wave velocities will provide a better understanding of the sub-seabed distribution of the seismic properties from which the amount of hydrate present in sediment can be estimated and features indicative of its presence recognised.