Geophysical Research Abstracts, Vol. 5, 10194, 2003

SHEAR WAVE VELOCITY DEPTH PROFILES FROM DISPERSIVE WAVES RECORDED IN THE NATURAL LABORATORY (NATLAB) IN THE ARKONA BASIN, BALTIC SEA.

G. Klein, M. Mathys, O. Thießen, M. Schmidt, F. Theilen, T. Bohlen

Institute for Geosciences, University of Kiel, Olshausenstr. 40-60, 24098 Kiel
(gklein@geophysik.uni-kiel.de / Fax +49-0431-8804432)

The assessment of shear waves in the sea floor under in-situ conditions and the correlation of shear wave velocities with sediment properties can contribute significantly to the solution of geotechnical problems with respect to fluid content and cementation processes as encountered in gashydrate bearing sediments. Methodological investigations have been performed to determine the shear wave velocity depth profile using full wave field inversion of the slowness spectra of dispersive guided and interface waves. The dispersion characteristics and modal distribution of the wave field depends dominantly on the seismic properties of the sediments as well as the structure and layering of the sub surface. Seismic measurements conducted at two locations in the NATLAB area in the Arkona Basin with airgun sources, Ocean-Bottom-Seismometer (OBS)-stations and a solid-state-streamer showed distinct difference in respect to the observed wave types at each location. At the southeast rim of the study area, where a hard basement is found at shallow depth, interface waves were measured. In the central part of the Arkona Basin, where soft mud and till layers dominate, shear wave velocity information could be inverted from multi-modal acoustic guided waves for the first time, while interface waves were not observed. Interface waves, e.g. Scholte Waves, are highly sensitive to shear wave velocity variations with depth and propagate at distinct layer interfaces and are characterised by low velocity and frequency, while acoustic guided waves propagate in the water column of shallow depth with sensitivity to shear and compressional wave velocity variation with depth. The interface waves were depictable on Streamer and OBS data, yet the resolution of the Streamer

data is not sufficient for stand alone inversion. A-priory information is required for the inversion procedures to produce a start model. The acoustic modes of the central Arkona Basin are of exceptional good quality resolvable in the frequency range from 10 to 140 Hz with more than 6 higher modes. The shear wave velocity profile determined by the inversion exhibits low velocities of 40-50 m/s at the sea floor with two dominant steps. Comparison with the geological setting and core samples are in good agreement. Therefore we derived an appropriate shear wave velocity depth profile from guided waves in an area, where normal dispersion analysis methods focused on interface waves would fail.