

# **ACOUSTICAL MAPPING OF METHANE DISTRIBUTION IN THE HOLOCENE SEDIMENTS OF THE ÅRHUS BAY, DENMARK**

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Within the EU project METROL, the overall purpose of the fieldwork in the Århus Bay is to track possible seasonal and inter-annual variations of the geochemical zonation in areas represented by variation in depth to the methane free gas zone. A M/S Line cruise was devoted to shallow seismic work in the Århus Bay, with the purpose to make detailed acoustic mapping of the acoustic blanking, representing the distribution of methane in the sediments and to attempt to establish the general stratigraphy of the Århus Bay, in order to be able to relate the gas formation to specific units. On basis of mapping of the areas that show acoustic blanking, a preliminary map of the distribution and depth to free methane in the muddy sediments has been produced. The combined information from the different seismic equipment's allowed a mapping of the distribution and depth to free gas in the intervals 0-0,5m, 0,5-2m, 2-4m and >4m. The map shows that acoustic blanking is found in the central part of Århus Bay about 4m below the seabed. A rather dense seismic grid and a key sampling station M1 document this. In areas where the sedimentation rate is assumed to be high, the acoustic blanking is found with gradually more methane towards the sediment surface. From the selected key station M2 with no free methane in the top 4m of the sediment to M5 with free methane within the surface 1-meter. The mapping results show that the oldest seismic unit is glacial till, probably related to the latest glacial advance in the region. The glacial till is covered by lateglacial icelake clay-silt reaching a thickness of up to 10m. The existence of the clay-silt is documented by descriptions of old vibrocores from the region. The glacial till and the lateglacial clay-silt contain insignificant amounts of organic matter and can not be regarded as the source of the methane gas. In the deeper part of the Bay, early Holocene organic material and peat has been described in few cores. A thin seismic unit is observed probably representing

an early Holocene lowstand period, when most of the Århus Bay was dry land. The 3 uppermost seismic units are related to the Holocene transgression of the region representing different hydrographical conditions. The lowermost unit partly drapes the basin area with clay sediments and partly shows prograding sandy coastal deposits around glacial ridges. Some shells are reported in old cores but it is unclear if it is brackish or marine deposits. The next unit consists in general of marine mud to sandy mud covering most of the central part of the Århus Bay and some places reaching the present seabed in areas of erosion or non-deposition. The distribution of the youngest seismic unit illustrates the sub-recent to recent sedimentation basin areas in the central part of the basin. The acoustical mapping shows that the methane production takes place in all the Holocene seismic units.