



Seismo-stratigraphic framework of the Late Quaternary to Holocene succession in the Southern Danish Central Graben

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This study presents a seismo-stratigraphic framework for the late Quaternary to Holocene succession in the Southern Danish Central Graben based on unit mapping and characterization from a combination of geophysical, geological and geotechnical data. The mapped units are constrained by erosional surfaces associated with both glacial, marine and fluvial erosion and hence record major events in the central North Sea Basin.

Generally, the late Quaternary to early Holocene sediments in the Southern Danish Central Graben lack good age constraints, and the conventional seismic surveys acquired by the petroleum industry does not resolve the top layers very well. By including site surveys and regional high-resolution sparker lines, erosional channels and horizons can be identified and mapped locally and thus be used to create local seismic stratigraphies.

These local observations show comparable trends through the Southern Danish Central Graben, and we are able to correlate and extrapolate the local isolated observations using significant seismic surfaces or lithology changes in geotechnical boreholes or CPT logs. Furthermore, 3D seismic time slice analysis has proven very useful for identifying the lateral distribution and characteristics of buried Quaternary valleys over large areas.

All these observations, can in combination be used to define a seismo-stratigraphic framework and create a regional lithostratigraphy that extends over the Southern Danish Central Graben.

The mapped units within the study area show a great variability in depositional environment ranging from the Saalian glaciation to the present day marine environment; hence forming an excellent natural lab for studying ice-related geological processes at different scales. When moving upwards in the stratigraphy, the changes in depositional environments record the journey from the Scandinavian Ice Sheet cover through the proglacial rivers and lowland marshes, from the late glacial stages and into the marine realm in the Holocene.

The results from this study indicate that by performing high-resolution 3D seismic surveys in the area we could greatly improve our knowledge of both the geological evolution and the glacial dynamics that have formed the paleo-landscapes.

The study is part of the PhD project 'Seismic Acoustic Methods: a tool for refining the geotechnical models in a mature hydrocarbon producing area' that is funded by the Danish Hydrocarbon Research and Technology Center. The aim of the project is to use the stratigraphy to create a solid 3D geotechnical model in the Southern Danish Central Graben.