Geophysical Research Abstracts,
Vol. 11, EGU2009-6997-1, 2009
EGU General Assembly 2009

Glacio-eustatic control on the morphology of an Oligocene surface in the Eastern North Sea

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The North Sea area constituted during the Cenozoic an epicontinental sea surrounded by landmasses delivering sediments for the basin. At the Eocene-Oligocene transition a dramatic change in source and type of sediments took place in the eastern North Sea. At this time the mainly hemipelagic clays of the Eocene were replaced by muddy to locally sandy sediments sourced from Fennoscandia. The Oligocene clinoforms exceed in the Norwegian-Danish Basin 1 kilometer in thickness. In the present study we have integrated micropaleontological (dinoflagellate cyst) and 3D seismic studies of Oligocene surfaces in order to investigate the influence of the climate for the evolution of depositional geometries and surface morphologies in the study area. Age-indicating dinoflagellates allow us to correlate surfaces within the succession with the global time scale and thereby with published oxygen isotope curves. Temperature-indicating dinoflagellate taxa furthermore allow us to infer paleoclimatic changes during the Oligocene.
One of the surfaces studied on 3D seismic datasets shows features such as low-angle landward directed onlaps, incised valleys and pockmarks, in toto indicating a prominent, relative sea-level fall. The cold-water dinoflagellate genus Svalbardella was recorded immediately above this surface. The coincidence of a cold-water indicator with this 3rd order sequence shows that this sequence is controlled by climatically induced sea-level changes, and that 3D seismic analysis combined with high-resolution dinocyst-analysis substantially improves the understanding of the depositional history and processes within the North Sea Basin.