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Holocene paleoenvironmental development in Skagerrak, Eastern North Atlantic: Foraminifera and stable isotopes

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A 32 m long piston core (MD99-2286) was retrieved at 225 m water depth on the north-eastern edge of the Norwegian Channel in Skagerrak during the 1999-IMAGES V (International Marine Past Climate Study) cruise. It spans the latest part of the Younger Dryas and the entire Holocene period. The core site area is promising for high-resolution studies of changes in the oceanic circulation pattern and climate during the Holocene. Today, the circulation pattern in the area of MD99-2286 creates a sink for sediments because inflow of water from the North Atlantic Current and the Jutland Current mix with outflow-water from the Baltic Current, creating an anti-clockwise gyre. This causes a significant decrease in the current speed and allows sedimentation to occur.

The age model for the record is based on 27 radiocarbon dates. Foraminiferal contents have been analysed throughout the core, and stable oxygen and carbon isotopes have been measured for the time intervals 12000-8500 and 2100-(-50) cal. yr BP. The analyses show a cold ice-proximal environment during the latest Younger Dryas and earliest Holocene. This was subsequently replaced by a more glacial distal environment, initially affected by out-flowing melt water from the Baltic area. Around 10000 cal. yr BP, full interglacial conditions were established, and Skagerrak resembled a fjord with a strong inflow of Atlantic water until the eustatic sea level rose sufficiently to flood the entire North Sea, the English Channel and the Danish straits, and the modern circulation system was developed. A major faunal change occurred at ca. 8500 cal. yr BP, and subsequently relatively stable environmental conditions prevailed in the area, though with a slight change in oceanography after ca. 6400 cal. yr BP. Fluctuations in the carbon isotopes through the last 2000 years are considered to be related to water mass changes at the core site. Similar fluctuations are reflected by the foraminiferal fauna. The time-resolution of the foraminiferal data is currently being improved, and additional stable isotope analyses and Mg/Ca measurements are in progress.