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Holocene climatic and palaeoenvironmental changes in the South-Eastern Barents Sea – new insights from palaeomagnetic and geochemical stratigraphy

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Holocene climate variability and environmental changes have been studied using a sediment record from the Barents Sea with focus on the spatio-temporal evolution of bio-productivity and terrestrial sediment deposition in response to changes of climate and regional oceanography. From a 3 m long sediment core recovered in the South-Eastern Barents Sea at 72.5°N 32.5°E u-channels were extracted and stepwise demagnetized and measured for their natural remanent magnetization (NRM) and anhysteretic remanent magnetization (ARM) at the cryogenic magnetometer facility at the Geological Survey of Norway. The u-channel measurements at 3 mm resolution allow the reconstruction of palaeoinclination, relative declination and relative palaeointensity. Comparison of these parameters to FENNOSTACK (Snowball et al., 2007) and EGLACOM-SVAIS (Sagnotti et al., 2011) establishes a robust age model for the sediment sequence which otherwise contains little datable material. We applied statistical factor analysis as centred logratio (clr) transformation to reduce dimensionality of the XRF data and compare changes in high-resolution magnetic susceptibility, wet bulk density and XRF elemental composition with changes of climate proxies in other North Atlantic sedimentary records.

Based on the new chronostratigraphic framework changes of inorganic and organic proxies at long-term and sub-millennial scale resolve the temperature variability throughout the Holocene. Calcium content changes are related to regional bio-productivity changes in response to surface temperature changes with a pronounced deterioration at the beginning of the Neoglaciation and gradual enhancement during the late Holocene. Besides palaeoclimatic responses, the results offer the opportunity to study sediment transport and deposition during the regional deglaciation and mid-Holocene glacier growth in northwestern Fennoscandia. The temporal changes of the regional oceanography and the variability of marine palaeoproductivity in the South-Eastern Barents Sea indicate an active interplay between the North Atlantic Current (NAC) and the Norwegian Coastal Current (NCC) during the early Holocene, a predominance of the NCC during middle Holocene and a re-amplification of the NAC during the late Holocene. Comparison to other records from the Nordic Seas enables the reconstruction of responses and the vulnerability of this arctic marine ecosystem to past climate variations and may help to estimate upcoming responses to recent and future climate changes.

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