Geophysical Research Abstracts
Vol. 18, EGU2016-970, 2016
EGU General Assembly 2016

Palynology of the northeastern Fram Strait since the Last Glacial Maximum : evidence for large amplitude changes in sea-surface conditions

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Palynological analyses were performed in core PS2863 (80°33.47'N, 10°17.93'E) and MSM5/5-712-2 (78°54.94'N, 6°46.04'E) in order to document changes of sea-surface conditions of the northeastern Fram Strait since the Last Glacial Maximum (LGM). The study area is ideally located to record the northernmost influence of the North Atlantic waters prior they enter into the Arctic Ocean, at the surface or through subduction. Core PS2863 contains a 183 cm long sequence characterized by sedimentation rates of 8.6 cm/kyrs and abundant dinocysts (up to 22 000/g) except during the LGM. Core MSM5/5-712-2 shows a much higher time resolution with a mean sedimentation rate of 27.7 cm/kyrs. It also contains generally abundant dinocysts (up to 48 000/g). The preliminary results from these cores permit some inference in terms of regional paleoceanography. The assemblages of the LGM (23-19 ka) are characterized by the lowest dinocyst concentrations (< 200/g), which suggests low productivity. However, the assemblages dominated by Bitectatodinium tepikiense (up to 40%) suggest cold condition in winter with sea ice cover development but relatively high sea-surface temperature (SST) in summer, possibly due to low salinity (< 32.5 psu) and low thermal inertia at the surface thus owing to summer warming. The high abundance of Bitectatodinium tepikiense (up to 40%) is a feature observed at the scale of the Nordic Seas (see de Vernal et al., 2005) during the LGM, reflect a situation with modern analogues in cool estuarine environments marked by strong seasonality. The assemblages from 19 to 16 ka BP are marked by an almost monospecific assemblage of Brigantedinium spp., which reflect very cold conditions and extensive sea ice cover for up to 8 months/yr. It is synchronous with a peak of reworked palynomorphs that indicates erosion of surrounding lands and outwash deposition, likely related to important meltwater discharges. From 16 ka BP to 12.5 ka BP, the dominance of the Spiniferites species leads us to reconstruct relatively high summer temperatures (up to 11°C) in a context of high seasonality due to low surface salinity and to strong stratification. After 12.5 ka BP, important changes in species relative abundance reflect the development of modern-like dinocyst assemblages. A lowering of summer SST and increased salinity are recorded from 12.5 to 10.5 ka, after which the data indicates an early Holocene thermal optimum followed by a cooling trend accompanied by increase in sea ice cover. The palynological results from the Fram Strait area are generally consistent with biomarker data suggesting late glacial variations in sea ice cover and Holocene cooling trend (Müller et al, 2012, 2014).

References:
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