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# Pleistocene Bulk and Clay Mineralogy of (I)ODP Sites in the Arctic Ocean

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Mineralogical analyses are an essential part of any paleoenvironmental study on Arctic Ocean sediments. Biogenic components are only of subordinate importance, and inorganic components are the only continuously present but still widely unexplored tracers to understand past environmental conditions. In particular, the minerogenic content of sediments allow identifying source regions, to characterize transport pathways and transport mechanisms. Based on an extensive surface sediment data set from the Eurasian part of the Arctic Ocean distinct source areas can be identified with both clay mineralogy and bulk mineralogy in the hinterland of the Siberian shelf seas (Vogt, 1996, 1997; Wahsner et al., 1999).

The bulk and clay mineralogy of Pleistocene sediments of ODP Leg 151 Hole 910A is currently analysed by x-ray diffraction in the frame of a multiproxy study which aims at reconstructing the paleoenvironmental conditions at the Yermak Plateau in the past approximately 600,000 years (Knies et al., this volume). Although sediments are mainly derived from local source areas located on northern Svalbard, distinct events can be recognized in the XRD intensity ratios of the record that indicate variable supply of sediments, in particular of the fines. The mineralogy in the past 150000 years of Hole 910A is comparable to those of short sediment cores previously studied by Knies et., 1999; Knies & Vogt, 2003; Vogt et al. 2001). Our new studies confirm that some events are apparently of regional significance in the Yermak Plateau and eastern Fram Strait area:

- characteristic events during Svalbard Barents Sea Ice Sheet (SBIS) built up (the OLEM event I, Knies et al., 1999): low k-feldspar, high quartz content, single oc-

currence of ordered mixed-layer clay minerals, lowest smectite, high kaolinite and chlorite with a late Jurassic source rock ("hot shale") in the SE of Svalbard. This sediment layer is intercalated between sediment with increased calcite over dolomite and siderite content indicating an increased input and preservation of biogenic carbonate shells (a marker of warm Atlantic water influx).

- characteristic events during the Terminations: increased K-feldspar, kaolinite and smectite values point to Franz Josef Land, eastern Kara Sea and western Laptev Sea as origin. Carbonate content in particular calcite content is decreased due to intensive carbonate dissolution. Brine formation from the winter sea-ice built-up in the vicinity of the sampling site and the decomposition of the increased organic carbon from the very productive summer sea-ice edge cooperate in the production of carbonate aggressive deep-water. Therefore, low calcites vs. high terrigenous dolomite contents are combined with indicators of high surface water productivity (recorded by organic walled dinoflagellates (see Matthiessen et al., 2001) and agglutinating benthic foraminifera (Wollenburg et al., 2001).

Sediments of undoubtedly Middle Pleistocene age are studied for the first time in a relatively high resolution (every 10 cm down to every 5 cm in intervals with visible lithological changes) and allow identifying similarities and differences in sediment source areas. For the first time older terminations like MIS12/11 which clearly resample the MIS6/5 boundary are investigated in detail in the Arctic Ocean vicinity.

Several strong meltwater events have been recognized by means of $\delta^{18}$O and $\delta^{13}$C and coarse ice rafted debris records. They share a very similar mineralogy with comparatively high k-feldspar and low quartz contents combined with high smectite and kaolinite contents. This combination is very indicative of north-eastern Barents Sea (around Franz Josef Land) and north-eastern Laptev Sea sources. In this region several deep troughs (e.g. Franz Victoria and St. Anna Troughs) probably fostered the intensive decomposition of a large Barents/Kara Sea Ice Sheet (by downdraw effects).

A sedimentation model previously developed for interpreting the late Weichselian OLEM events during Termination (Vogt et al., 2001) might be applicable to several more core sequences best indicated by low smectite contents and an extremely low ratio of the k-feldspar/plagioclase vs. the quartz/feldspar ratio. When the SBIS ploughs the shallow Barents Sea during built-up large amounts of fine fraction is send through the Storfjorden trough (in the south of Svalbard) and the Franz Victoria Trough into the surface and intermediate waters of the Westspitsbergen Current and the Arctic Ocean realm which then transport the signal via currents and sea-ice to the ODP 910 site on the central Yermak Plateau.

Finally, our study provides reference data sets records which we compare to the new

boreholes that were drilled on the Lomonosov Ridge (Central Arctic Ocean) in the frame of the ”Arctic Coring Expedition” (ACEX, IODP) in summer 2004.

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