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Provenance discrimination in late Quaternary sediments from the Amerasian Basin (Arctic Ocean) constrained by mineralogical record

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This study focuses on the determination of potential source areas for the terrigenous material derived from Eurasia and North America to reconstruct the circum- Arctic ice-sheet history and sedimentary processes in the Amerasian Basin of the Arctic Ocean during Quaternary times. Investigations are carried out on marine sediment cores recovered during the ARK-XXIII/3 (2008) Expedition of RV "Polarstern". Coring sites are located along a transect at 77°33,6' N from the East Siberian Sea continental margin across the Mendeleev Ridge to the Chukchi Abyssal Plain (Stein et al., 2009).
To determine the provenance of terrigenous material, we investigate the mineralogical composition of sediments and the petrography of rock clasts (IRD). In order to distinguish between different agents of particle transportation such as icebergs, sea ice and currents, we study the grain-size distribution of the sediments. Currently we report the results of the quantitative mineralogical analysis performed on bulk sediments using the X-ray diffraction (XRD) method as well as the distribution of coarse-grained material in different fractions separated via dry sieving.
Our results provide an evidence for two different source areas for the terrigenous material deposited close to the East Siberian Sea continental margin. Sites located at the Mendeleev Ridge and to the east are characterized by significant amount of dolomite probably supplied from the Canadian Arctic Archipelago (e.g., Phillips and Grantz, 2001). The dolomite-rich layers (also referred to as pink-white layers; Clark et al., 1980) are consistent with MIS 6/5, 4/3 and 3/2 transitions. The gravel and pebble size of dolomite suggests transport by icebergs due to the collapse of the Laurentide Ice Sheet. These layers enriched in detrital dolomite cannot be traced to the west of the Mendeleev Ridge where the coarse fraction is dominated by quartz. Only the transition MIS 3/2 is marked by higher input of dolomite. Such sedimentation patterns can be explained by the influence of the two major systems of surface ocean currents and ice motion in the Arctic Ocean, the Beaufort Gyre and the Transpolar Drift. In this case, Mendeleev Ridge represents a boundary zone for the sediment pathways which probably have shifted with time due to the relocation of the front between the Atlantic and the Pacific water domains in the Arctic Ocean (Macdonald et al., 2000, and references therein).
Future detailed microscopy studies of the coarse fraction will comprise detailed identification and quantification of IRD in order to provide important background provenance information for reconstructions of the extension of the ice masses which grounded on the Mendeleev Ridge and adjacent shelf areas in the late Quaternary as recorded by acoustic profiling (Stein et al., 2009).

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