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Meltwater history inferred from authigenic carbonates and fine grained glaciomarine sediments from the Mendeleev Ridge in the Arctic Ocean

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Authigenic carbonates and mud fractions of the glaciomarine sediments were investigated texturally and geochemically. The sediment core (PS72/410-1) was retrieved using a giant box corer from the central Mendeleev Ridge of the western Arctic Ocean (Station location= Lat. 80°30.37"N, Long. 175°44.38"W) during the Polarstern Arctic expedition (PS72) in 2008. The core is 39 cm long with age of ca. 76 ka BP and was collected from the water depth of 1,802 meters. The sediments show various colours from grey to brown as previously reported in other Arctic deep sea sediments, reflecting glacial-interglacial and/or stadial-interstadial cycles. Authigenic carbonate minerals are present through the whole sequence except for a few centimetres. These authigenic carbonates are composed of high Mg-calcite, low Mg-calcite and aragonite. Various crystal shapes of aragonite and calcite together with clear growth shapes of the crystals suggest that they are inorganic in origin. Highly enriched carbon isotope compositions (δ13C = 0 $\sim$ +5‰ vs. PDB) strongly indicate that they formed in methanogenic zone below sediment/water interface by the reaction between anoxic pore fluids and host sediments induced by methanogenic bacteria. However, a wide range of oxygen isotope values (δ18O = -5 $\sim$ +5‰ vs. PDB) may indicate that porewater has been changed due to reaction between residual seawater and volcanic sediments. Relatively higher contents of K, Al, Fe and Be values from muddy sediments as well as low δ18O compositions of authigenic carbonates may imply strong input of meltwater from volcanic region (Eastern Arctic region) whereas higher oxygen isotope compositions of authigenic carbonates and higher Sr and K contents of mud sediments may reflect stronger influence from carbonate-rich region (Canadian Arctic region). Mineralogical changes form low to high Mg-calcite together with decrease in Mg, Sr and Fe contents strongly support less freshwater input from glacial mode to interglacial mode. Based on the stable isotope data of authigenic carbonates and trace element contents of mud sediments, formation history of the Upper Deep Polar Water can be reconstructed.