

Mineralogy and geochemistry of glaciomarine sediment cores from the Eastern Arctic Ocean during the last 200 ka

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The mineralogy and chemistry of two glaciomarine sediment cores recovered from the Eastern Arctic Ocean during the Arctic Expedition ARK-XX/3 of R/V 'Polarstern' in 2004 were analyzed in this study. Core PS66/321-4SL was recovered from the deep-sea floor east of Yermak Plateau (ca. -2,359 m), whereas core PS66/325-3SL from the northern continental margin of the Barents Sea (ca. -896 m). The core sites underlie the Svalbard branch of the West Spitsbergen Current which is transporting relatively warm Atlantic waters into the eastern Arctic Ocean. The main objectives of this study is to show whether mineralogical variations reflect the paleoenvironmental changes or not, and to find the significant elements for further analyses by XRF core scanner. The bulk mineralogical compositions by XRD were used to correlate with other proxies including chemical compositions. Organic-geochemical proxy data, sulfur, biogenic opal, and sand contents were also compared with the mineralogical and chemical compositions.

Hierarchical cluster analyses based on the correlation coefficient of the mineralogical compositions and some organic-geochemical proxy data were done for about 300 sub-samples. Carbonate, calcite, $\delta^{13}\text{C}_{\text{tot}}$, gypsum, and dolomite make Ca-rich group. Sand, K-feldspar, and plagioclase show strong positive correlations and make IRD group together with quartz, pyroxene, garnet, magnetite, and aragonite. Mixed layer clay, kaolinite, smectite, Fe-hydroxide, and opal make smectite-kaolinite group. Siderite, halite, TOC, C/N ratio, and sulfur make organic-group. Illite, chlorite, and barite make illite-chlorite group. Ca-rich group, IRD group, and illite-chlorite group might be derived from terrigenous source whereas smectite-kaolinite group and organic-group might be mostly originated from marine source.

Graphical presentation of mineralogical compositions versus core depth, together with organic-geochemical proxy data, sulfur, biogenic opal, and sand contents might indicate the paleoenvironments.

The PS66/321-4 core has big problems in terms of a precise stratigraphy due to the lack of foraminifera for measuring age dates and oxygen isotope records. But at the important depths we can get several isotope data and AMS ^{14}C dating. This is also compared to the other

published cores which located relatively close to our core site. The age of core seems to extend back to the MIS 6. The stratigraphic framework of the investigated sediment cores of PS66/325-3 is based on AMS ^{14}C dates and stable isotope records and other multi-proxies and then the stratigraphy is correlated to the other cores which are conducted by J. Knies. The age of core seems to extend back to the MIS 6.2 or 6.4. From SR calculated from two cores, SR of PS66/325-3 show very similar to the core PS2138 by J. Knies. And the SR of PS66/321-4 shows relatively linear Sr during the last 200 ka BP.

Mineralogical and chemical compositions from characteristic 50-54 samples selected from the two sediment cores were also analyzed and correlated each other to recognize the major chemical elements which reflect the characteristics of mineralogical compositions and organic-geochemical proxy data. Pd, Hf, and Ag show strong positive correlations and make rare-metal group together with Y, Au, W, and Pt. SrO, Rh, and CaO make Ca-rich group derived from calcite and gypsum and show positive correlation with $\delta^{13}\text{C}_{\text{tot}}$. Plagioclase, pyrite, K-feldspar, and amphibole constitute sand fractions and make one IRD group. Fe_2O_3 , As, Mo, and P_2O_5 make Fe-hydroxide group. MnO make another IRD group together with smectite, pyroxene, magnetite, and aragonite. Te might be derived from diagenetic opal. Nb and Ta might be derived from garnet. Co, Ni, MgO, and Pb have positive correlations. Rb, Cs, Be, and K_2O have also positive correlations. REE and Th have strong positive correlations each other. TiO_2 , Sc, Li_2O , Zn, Cr_2O_3 , V_2O_3 , Al_2O_3 , Ga, and ZrO_2 have positive correlations. All these elements might be derived from IRD of terrestrial source. Bi, U, and barite belong to one group. FeO might be derived from chlorite and/or siderite.

From those correlations, core analysis by XRF scanning for CaO, MnO, MgO, K_2O , TiO_2 , and Al_2O_3 seems to be meaningful in the recognition of the mineralogical variations. CaO designates carbonate sediments, whereas MnO designates the IRD sediments mostly of smectite, pyroxene, magnetite, and aragonite. MgO, K_2O , TiO_2 , and Al_2O_3 seem to imply the REE-enriched sediments probably of terrestrial source.