Geophysical Research Abstracts
Vol. 13, EGU2011-2954, 2011
EGU General Assembly 2011

Sedimentary provenances over glacial/interglacial stages in central Arctic constrained by mineralogy and radiogenic tracers

Nathalie Fagel (1), Jonathan Gueibe (2), Nadine Mattielli (2), Christelle Not (3), and Claude Hillaire-Marcel (3)

(1) University of Liege, AGEs Geology, Liege, Belgium (nathalie.fagel@ulg.ac.be, +32.4.3662029), (2) Université de Bruxelles, DSTE, Belgium, (3) Université du Québec à Montréal UQAM, GEOTOP, Montréal, Canada.

In this study we determine the mineralogy and the radiogenic Nd and Pb isotope signatures of sediments from Central Arctic. By coupling mineralogy and radiogenic isotopes our aim is to identify the detrital particle provenance and to interpret the changes in the relative contribution of the different source-areas in term of paleoceanographical changes over the last 400 kyr in the Arctic. Cores HLY0503-12TC and HLY0503-12MC were collected at 1585m on the Mendeleev Ridge during the HOTRAX cruise. The stratigraphy and core correlation were constrained by the profile of ^{230}Th and ^{210}Pb, respectively. The upper 70 cm of core HLY0503-12TC covers the Marine Isotope Stages MIS 1 to MIS 11. The upper 50cm of core HLY0503-12MC represent the MIS 1 to MIS 7. In core HLY0503-12TC the mineralogy of the coarse silty (20-63 μm) and sandy ($>$ 63 μm) fractions is characterised by similar depth profile. The mineralogy depicts pronounced changes in the relative contribution of carbonate (calcite and dolomite) minerals in regard with silicates (mainly quartz plus feldspars). The carbonate-rich layers match deglacial to interglacial interval. The mineralogy of the carbonate-free clayey ($<$ 2 μm) fraction is dominated by 60-70% of illite and at least 20% of kaolinite. In both cores a significant enrichment in kaolinite (reaching up to 35-40%) is observed in the two intervals corresponding to glacial MIS 4 and 6. The radiogenic composition of the sediment has been measured on the carbonate-free $<$ 20 μm fraction of the sediments. Like mineralogy, the Nd and Pb signatures systematically change over glacial/interglacial stages. The observed temporal changes in the Nd and Pb isotopic composition of the Central Arctic sediments confirm that the sediment supplies changes over glacial/interglacial changes. Interglacials are characterised by lower ^{143}Nd/^{144}Nd ratios and higher ^{206}Pb/^{204}Pb, ^{207}Pb/^{204}Pb, ^{208}Pb/^{204}Pb ratios. In a biplot ^{206}Pb/^{204}Pb vs. ^{208}Pb/^{204}Pb diagram the data define a linear trend. The higher Pb isotopic ratios point towards the signature of the Mackenzie River whereas the lower Pb ratios fit with the Lena composition. All intergacial-deglacial samples are shifted towards the Mackenzie end-member. Such source is consistent with their carbonate-rich lithology, detrital carbonates and especially dolomite being originated mainly from this area and from Canadian channels. Moreover the low ^{143}Nd/^{144}Nd ratios are close to the signature of the suspended particles collected in the Mackenzie and the Lena rivers. During glacial stages, both mineralogy and radiogenic signatures evidence less contribution from the Mackenzie area. Moreover the sedimentary mixings report contribution from another source characterised by higher ^{143}Nd/^{144}Nd ratios and enriched in kaolinite. Taking into account the surface distribution of clays in Arctic kaolinite was only observed in northern Alaska and along Canadian channels. No isotopic data from those areas (e.g., the Innutian orogenic belt) are available to confirm our hypothesis. To conclude our mineralogical and geochemical data confirm that the sediment provenances in central Arctic remain close to the Present conditions during the earlier interglacials. In contrast the limit between the Beaufort Gyre and the Transpolar Drift may be different during glacials, in relation with restricted entrance of waters from the Bering strait.