Radiogenic isotope signature (Nd, Sr, Pb) in sea ice and marine sediments from the Arctic Ocean under the present boundary conditions

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In the Arctic Ocean, ice rafting is the most efficient mechanisms for the dispersal of detrital sedimentary material over ridges and between deep basins. However, it is difficult to link the radiogenic isotope signatures (Pb, Sr, Nd) of sediments to continental sources or to their dissolved fluxes from large rivers, thus to unequivocally use such tracers for reconstructing ice sources and routes during past interglacial intervals. Under full glacial conditions, notably during the last glacial cycle, isotopic sediment "sources" were mostly linked to streaming and melting along large ice-sheet margins (i.e., along the Canadian Arctic, the Barents-Kara Sea and likely from a shelf-based ice-sheet in the East Siberian Sea). Under the present geographical conditions, the large continental shelves of the Arctic Ocean control ~2/3 of the terrigenous sedimentary flux through coastal erosion, whereas the Mackenzie River provide the other ~1/3. Under such conditions, dissolved or particulate isotopic signatures of large river, but the Mackenzie, do not necessarily label sediment sources. Marine surface sediments from the circum-Arctic shelves are more likely to illustrate these sources. Here, we added ~30 sites to a database from literature, notably with new data from the East Siberian Sea area. A few major isotopic "shelf provinces" can be now identified based on their Sr, Nd and Pb isotope signatures: the Arctic Canadian shelf (εNd from -15.2 to -12.1, $^{87}Sr/^{86}Sr$ from 0.724 to 0.739 and $^{206}Pb/^{204}Pb$ ~18.9); the Mackenzie-Beaufort Sea shelf area (εNd ~ -14.7, $^{87}Sr/^{86}Sr$ ~ 0.730 and $^{206}Pb/^{204}Pb$ from 19.0 to 19.5) ; the Bering Strait/Chukchi Sea areas (εNd from -9.5 to -7/0, $^{87}Sr/^{86}Sr$ from 0.712 to 0.713 and $^{206}Pb/^{204}Pb$ from 19.0 to 19.3); the East Siberian Sea (εNd from -8.9 to -7.4, $^{87}Sr/^{86}Sr$ ~ 0.711 and $^{206}Pb/^{204}Pb$ from 18.7 to 19.0) ; the Laptev Sea (εNd from -15.2 to -12.2, $^{87}Sr/^{86}Sr$ from 0.715 to 0.719 and $^{206}Pb/^{204}Pb$ from 18.6 to 19.0). Data from particulate matter in sea-ice rafts from the Arctic Ocean and the Bering Sea fall within the range defined by surface sediments from these margins.