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History of Alaskan mountain glaciers analyzed by derital Nd and Pb isotopes

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Changes in atmospheric CO2, ocean circulation, the extent of the cryosphere, or a combination of these boundary conditions are believed to have caused the Late Pliocene climate Transition (LPT, ˜3.6 to 2.6 million years ago), characterized by development of more glaciated conditions. Yet, cryospheric evolution in northern high latitudes is not constrained well enough to properly understand the effect of high latitude cryosphere dynamics on LPT. Here, we present 4.1-million-year neodymium (Nd) and lead (Pb) isotope records of detrital sediments?tracers of sediment provenance?from the Bering Sea (Hole U1341B). We show that Bering Sea detrital sediments represented a mixture of sediments from the Aleutian and Alaskan sectors. During glacial and deglacial periods the contribution of Alaskan-origin clastics exceeds 50% due to melting of Alaskan glacier. We also found a stepwise increase (>˜10%) in Alaskan-origin clastic supply beginning at ˜4.1 Ma, implying that the northern high latitude cryosphere had started to grow 1 Ma before the major onset of Northern Hemisphere Glaciation. The early growth of Alaskan glaciers might be a result of combined effects of decreased atmospheric pCO2 and enhanced moisture supply due to stagnation of Pacific meridional circulation induced by the Panamanian seaway closure during the early Pliocene.