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Remobilization of Old Permafrost Carbon to Chukchi Sea Sediments During the End of the Last Deglaciation.

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Abstract: Climate warming is expected to destabilize permafrost carbon (PF-C) by thaw-erosion and deepening of the seasonally thawed active layer and thereby promote PF-C mineralization to CO2 and CH4. A similar PF-C remobilization might have contributed to the increase in atmospheric CO2 during deglacial warming after the last glacial maximum. Using carbon isotopes and terrestrial biomarkers (?14C, d13C, and lignin phenols), this study quantifies deposition of terrestrial carbon originating from permafrost in sediments from the Chukchi Sea (core SWERUS-L2-4-PC1). The sediment core reconstructs remobilization of permafrost carbon during the late Allerød warm period starting at 13,000 cal years before present (BP), the Younger Dryas, and the early Holocene warming until 11,000 cal years BP and compares this period with the late Holocene, from 3,650 years BP until present. Dual-carbon-isotope-based source apportionment demonstrates that Ice Complex Deposit-ice- and carbon-rich permafrost from the late Pleistocene (also referred to as Yedoma)-was the dominant source of organic carbon (66 ± 8%; mean ± standard deviation) to sediments during the end of the deglaciation, with fluxes more than twice as high (8.0 ± 4.6 g·m-2·year-1) as in the late Holocene (3.1 ± 1.0 g·m-2·year-1). These results are consistent with late deglacial PF-C remobilization observed in a Laptev Sea record, yet in contrast with PF-C sources, which at that location were dominated by active layer material from the Lena River watershed. Release of dormant PF-C from erosion of coastal permafrost during the end of the last deglaciation indicates vulnerability of Ice Complex Deposit in response to future warming and sea level changes.

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