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Aged carbon dynamics and lateral transport on the Chukchi Sea Slope: Insights from organic and lithogenic tracers

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To investigate the ocean carbon cycle and understand its dynamics in the rapidly changing Arctic Ocean, we examined sinking particles from sediment traps on the Chukchi Sea slope (2017–2021). Sinking particle fluxes showed a distinct seasonal pattern with summer peaks, showing substantial interannual variability linked to the timing of sea ice retreat. Throughout the year, aged organic carbon, evidenced by depleted radiocarbon signatures and high lithogenic content, accounted for a considerable fraction of the flux, likely supplied by sediment resuspension and lateral transport.

To further elucidate the mechanisms behind this aged carbon supply, we used neodymium isotopic signatures of detrital fractions ($\varepsilon Nd_{detrital}$) to investigate provenance and transport pathways. The $\varepsilon Nd_{detrital}$ values exhibited clear seasonal variations, with more radiogenic values during the ice-covered winter and spring, and less radiogenic signatures during sea-ice breakup and open-water seasons (summer). These patterns suggest seasonal shifts in sediment provenance, highlighting the critical roles of sea-ice rafting and ocean currents as major vectors for lithogenic material and associated organic carbon dispersal in the Arctic Ocean system.