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The fate of terrestrial carbon in the Arctic Ocean supplied by increasing coastal erosion

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Arctic permafrost thaw and sea ice retreat lead to enhanced coastal erosion and a contemporary increase in the transport of terrestrial carbon to the Arctic Ocean. However, the influence of this carbon supply on the marine carbon cycle and the CO2 uptake of the broad Arctic shelves is poorly understood. We use the global ocean-biogeochemistry model ICON-Coast with a dedicated representation of coastal carbon dynamics to investigate the impacts of erosive coastal carbon input during the 20th century and quantify its partitioning into burial, transport and air-sea gas exchange in the Arctic Ocean. Anthropogenic climate change increased the carbon supply from coastal erosion by 1.5 Tg C yr-1. We find that about 50% of this increase is remineralized on the shelves and released to the atmosphere. Another 30% get deposited in near-shore sediments, whereas 10% are exported to the open ocean via advection, and 10% reside in the shelf waters as accumulating DIC. This means that the anthropogenically induced increase in coastal erosion reduced the CO2 uptake during the past century by 0.8 Tg C yr-1 (3% of the total uptake by Arctic shelves) and may further weaken the CO2 sink of the Arctic Ocean as global warming continues.