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Land-ocean connections during last deglaciation: transport of biospheric terrestrial carbon beneath the Svalbard Barents Ice Sheet

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The last deglaciation is a rapid warming phase that ends the last glacial period. Models suggest that, during this transition, glacial soils might have exerted a positive feedback on climate change by releasing CO_2/CH_4 into the atmosphere together with deep oceanic sources. Several reconstructions from permafrost regions have shown indirect evidence of enhanced land-to-ocean transport during last deglaciation. However, processes, timing and composition of the released material remain elusive, in particular in ice sheet dominated systems. In this study, we reconstructed the transport of land-derived material over the last 30ka in a glacial trough located at the edge of the Svalbard Barents Sea Ice Sheet using a sediment archive (HH11-09GC). We used a suite of analytical methods including bulk data (TOC, $\delta^{13}C$, $\delta^{14}C$), biomarkers (alkenones, lignin phenols, *n*-alkanes, *n*-fatty acids and highly branched isoprenoids) and compound specific radiocarbon analyses on high molecular weight wax lipids and lignin phenols. Our results show a pulse of pre-aged biospheric carbon with limited petrogenic contribution at the onset of the Bølling–Allerød warming period which lasted for about 1k years. The amount of terrestrial carbon in this pulse is comparable with what is being deposited today in river-dominated/coastal erosion affected shallow marine sediments in Siberia. Alkenones fingerprint indicates a strong contribution of freshwater alkenones in phase with the massive deposition of terrigenous carbon. We infer a subglacial flow transport of soils through a well-developed tunnel valley network beneath the Svalbard Barents Sea Ice Sheet capable of connecting the high Arctic with the catchments of northern European rivers, possibly involving subglacial lakes in between. In addition, we envision that the subglacial water pressure changes associated with the retreat and readjustment of the Svalbard Barents Sea Ice Sheet is likely the main mechanism causing the massive pulse of biospheric terrestrial carbon.