EGU2020-4244
https://doi.org/10.5194/egusphere-egu2020-4244
EGU General Assembly 2020

Burial and origin of permafrost organic carbon in the Arctic nearshore zone

Michael Fritz[1], Hendrik Grotheer[2], Vera Meyer[3], Thorsten Riedel[2], Gregor Pfalz[1], Laura Mathieu[2], Jens Hefter[2], Torben Gentz[2], Hugues Lantuit[1], and Gesine Mollenhauer[2]

[1]Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Permafrost Research, Potsdam, Germany (michael.fritz@awi.de)

[2]Alfred Wegener Institute, Helmholtz Center for Polar and Marine Research, Marine Geochemistry, Bremerhaven, Germany

[3]Department of Geosciences and MARUM Centre for Marine Environmental Sciences, University Bremen, Bremen, Germany

Increasing air and sea surface temperatures at high latitudes lead to accelerated thaw, destabilization, and erosion of perennially frozen soils (i.e., permafrost), which are often rich in organic carbon. Coastal erosion leads to an increased mobilization of organic carbon into the Arctic Ocean that can be converted into greenhouse gases and may therefore contribute to further warming. Carbon decomposition can be limited if organic matter is efficiently deposited on the seafloor, buried in marine sediments and thus removed from the short-term carbon cycle. Basins, canyons and troughs near the coastline can serve as sediment traps and potentially accommodate large quantities of organic carbon along the Arctic coast. Here we use biomarkers (source-specific molecules), stable carbon isotopes ($\delta^{13}C$) and radiocarbon ($\Delta^{14}C$) to identify the sources of organic carbon in the nearshore zone of the southern Canadian Beaufort Sea. We use an end-member model based on the carbon isotopic composition of bulk organic matter to identify sources of organic carbon. Monte Carlo simulations are applied to quantify the contribution of coastal permafrost erosion to the sedimentary carbon budget. The models suggest that 40% of all carbon released by coastal erosion is efficiently trapped and sequestered in the nearshore zone. We conclude that permafrost coastal erosion releases huge amounts of sediment and organic matter into the nearshore zone. Rapid burial removes large quantities of carbon from the carbon cycle in depositional settings.