Using radiocarbon to fingerprint ancient sources of dissolved inorganic carbon to the Alaskan Arctic Shelf

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Ongoing warming of the Arctic Ocean is expected to release ancient carbon stored in continental shelves as subsea permafrost and methane (CH_4) gas hydrates. Likewise, warming of the active layer in terrestrial environments may increase riverine delivery of terrestrial permafrost-derived organic carbon (OC) to the Arctic Ocean margins [1]. Similar to the injections of anthropogenic CO_2 into seawater, the remineralization of subsea and terrestrial-OC from thawing permafrost [2] as well as the oxidation of CH_4 released from gas hydrates may add additional CO_2 into Arctic Ocean seawater and enhance ocean acidification [3]; yet this potential influence largely remains unquantified. To assess the influence of OC and CH_4 remineralization on pH, dissolved CO_2, and the dissolved inorganic carbon (DIC) pool, we present data from samples collected in August of 2015 on the Beaufort Sea Shelf, offshore of the Colville and Kuparuk Rivers. High precision pH data as well as natural radiocarbon measurements of DIC, CH_4, and OC are used to evaluate the contribution of CH_4-derived and OC-derived carbon to seawater CO_2.

[1] Lecher, A.L., et al. *Methane transport through submarine groundwater discharge to the North Pacific and Arctic Ocean at two Alaskan sites*. Limnology and Oceanography (2016) 61, S1, 344-355. [2] Semiletov, I., et al., *Acidification of East Siberian Arctic Shelf waters through addition of freshwater and terrestrial carbon*. Nature Geoscience (2016) 9, 361–365. [3] Biastoch, A., *Rising Arctic Ocean temperatures cause gas hydrate destabilization and ocean acidification*. Geophysical Research (2011) 38, L08602.