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TITLE: The "Arctic autumn freshet": assessing fluxes of fluvial organic matter exported during the period of maximum permafrost thaw

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ABSTRACT BODY: Frozen grounds in the circum-arctic contain more than half of all soil organic carbon (OC) stored on our planet globally. Upon thaw, this carbon is mobilized and transported to the oceans via the great Arctic rivers. The vast majority (≥ 60 %) of annual riverine OC flux occurs during the spring ice-out, or freshet, when snowmelt causes discharge to peak and OC concentrations to be high. In this study, we focus upon the historically understudied late Arctic autumn period (Sept - Oct) immediately prior to soil freeze-up and the onset of ice-cover. During this period the active layer, the seasonal thaw layer in permafrost soils, is at maximum thickness allowing the oldest permafrost OC to be released. We will present seasonal data (2006, 2007, 2010, and 2011) of concentration, composition and age of dissolved and particulate OC from two permafrost streams near Cherskiy (NE Siberia), and from the Kolyma River, the world's largest river underlain by continuous permafrost.

During the Kolyma freshet, there appears to be a dichotomy between the age of dissolved and particulate OC, with dissolved OC being modern in age and particulate OC being ca. 4000 14C-years old. This suggests that much of the dissolved OC originates in surface soils and vegetation debris, whereas particulate OC is more likely derived from bank and bottom erosion during the vigorous ice-out period.

During the autumn, mean freshwater discharge shows a second "bump" with a maximum around 6000 m3/s in mid-September (mean discharge 1999-2010) compared to a mean freshet discharge peak of ca. 20,000 m3/s. During this period, significant increases (> 60 % compared to mid-August) in both DOC and POC concentrations are observed. The age of DOC shows a small but steady increase during the autumn, whereas the age of POC shows a sharp increase from ca. 1500 14C-yrs (July/early-August) to 2100-3700 14C-yrs (late-August/early-Oct). We will present changes in DOC composition and lability during the autumn period. Furthermore, we will calculate preliminary fluxes of the aged, autumn OC pool and discuss its importance with respect to (i) fluvial OC fluxes in the Arctic, and (ii) its

potential for serving as a proxy for monitoring permafrost remobilization in the light of ongoing climatic changes.