



Dissolved organic matter sources in large Arctic rivers

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The composition of dissolved organic carbon (DOC) of the six largest Arctic rivers was studied between 2003 and 2007 as part of the PARTNERS Project. Samples were collected over seasonal cycles relatively close to the river mouths. Here we report the lignin phenol and p-hydroxybenzene composition along with optical properties of Arctic river DOC in order to identify major sources of carbon. Arctic river DOC represents an important carbon conduit linking the large pools of organic carbon in the Arctic/Subarctic watersheds to the Arctic Ocean. Most of the annual lignin discharge (>75%) occurs during the two month of spring freshet with extremely high lignin concentrations and a lignin phenol composition indicative of fresh vegetation from boreal forests. The three large Siberian rivers, Lena, Yenisei, and Ob, which also have the highest proportion of forests within their watersheds, contribute about 90% of the total lignin discharge to the Arctic Ocean. The composition of river DOC is also characterized by elevated levels of p-hydroxybenzenes, particularly during the low flow season, which indicates a larger contribution from mosses and peat bogs. The lignin composition was strongly related to the average ^{14}C -age of DOC supporting the abundance of young, boreal-vegetation-derived leachates during spring flood, and older, soil-, peat-, and wetland-derived DOC during groundwater dominated low flow conditions, particularly in the Ob and Yukon Rivers. We observed significant differences in DOC concentration and composition between the rivers over the seasonal cycles with the Mackenzie River being the most unique, the Lena River being similar to the Yenisei, and the Yukon being most similar to the Ob. The observed relationship between the lignin phenol composition and watershed characteristics suggests that DOC discharge from these rivers could increase in a warmer climate under otherwise undisturbed conditions.