Geophysical Research Abstracts
Vol. 14, EGU2012-3212, 2012
EGU General Assembly 2012

Seasonal Variability and Chemical Composition of Carbon Export by the Yukon River, Alaska

R. Striegl (1), G. Aiken (1), D. Butman (1,2), M. Dornblaser (1), P. Raymond (2), P. Schuster (1), R. Spencer (3), A. Stubbins (4), and K. Wickland (1)

(1) United States Geological Survey, Boulder, CO, USA (rstriegl@usgs.gov), (2) Yale School of Forestry and Environmental Science, Yale University, New Haven, CT, USA , (3) Woods Hole Research Center, Falmouth, MA, USA , (4) Skidaway Institute of Oceanography, Savannah, GA, USA

The flow and chemical composition of Arctic rivers are highly variable and reflect the mix of sources and flow paths of surface and ground water contributing to them during any particular season. Annual Yukon River carbon (C) export is dominated by the spring flush, with more than 50% of organic C and 30% of inorganic C exports occurring during May and June. As part of the US National Science Foundation's Arctic Great Rivers Observatory Project, which is studying the six largest rivers discharging to the Arctic Ocean, we measured Yukon River flow and water chemistry at high frequency during the critical periods immediately preceding, during, and following ice melt in 2009 – 2011. Springtime flows had high dissolved organic carbon (DOC) concentrations that rose quickly with water discharge at ice out and decreased with flow into summer. Waters collected near peak flow had high specific ultraviolet absorbance (SUVA) values and high aromatic C content. The rising limb of the spring flush hydrograph also had the greatest bioavailable DOC (BDOC) content, relative to the remainder of the year. The bulk of the DOC exported in spring was of terrestrial plant origin and 14C modern, with respiration carbon dioxide collected from BDOC incubations having similar 14C content to that of the bulk DOC. Interestingly, FT-ICR MS characterization of the DOC exported during the spring flush indicated the presence of labile, atmospherically deposited DOC components having apparent fossil fuel combustion origin, similar to those identified in direct glacial runoff. The importance of the spring flush period and of DOC exports to the total C budget of the Yukon River will also be discussed in the context of seasonal patterns of water discharge, watershed C yields, and of dissolved, particulate, and gaseous inorganic and organic C concentration and flux.