Geophysical Research Abstracts,
Vol. 11, EGU2009-426-1, 2009
EGU General Assembly 2009

DOM along the Continuum from River to Reservoir: a Comparison of Freshwater and Saline Transects

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Dissolved organic matter (DOM) plays key roles in aquatic ecosystems: as an organic carbon (energy) link between terrestrial and aquatic systems, a food source for biota, a reactant in photochemical reactions, and a sunscreen/competitor for light for aquatic organisms. The composition as well as the concentration of aquatic DOM is believed to determine DOM's efficacy in these roles. The transport and alteration of DOM in river/estuarine systems are significant processes in determining the concentration and composition of DOM in the receiving lake or ocean system (especially in productive and economically important coastal regions). Therefore this study provides a preliminary comparison of the dissolved organic carbon (DOC) concentration, DOM optical properties, and chemical composition of high molecular weight DOM (HMW DOM) on two river-to-receiving-basin transects, one freshwater (St. Louis River/Lake Superior, Minnesota, USA) and the other with a salinity gradient (Elizabeth River/lower Chesapeake Bay/coastal Atlantic, Virginia, USA). Both transects share optical property ranges and general downstream trends toward lower DOC concentrations, less aromaticity, and lower molecular weight DOM, however, there is a stronger downstream decrease in DOC concentration in the saline transect. In HMW DOM, there is more retention of carboxylic signals downstream in the freshwater transect, relative to a downstream shift toward more proteinaceous material in the saline transect. These observed DOM differences most likely result from variations in biological activity, photochemistry, and ionic strength in the two transects. Ionic strength effects include in situ processes (e.g. flocculation) and interactions affecting DOM isolation and analysis.