Variability of transparent organic particles in Arctic floodplain lakes

January 15 2013

In the North American Arctic the Mackenzie River courses into the Beaufort Sea, the outlet of a watershed that drains a vast swath of the western Canadian landscape. At the river's mouth, the Mackenzie Delta is a broad floodplain peppered with roughly 45,000 lakes carved into the permafrost. Depending on their connectivity to the river, these floodplain lakes have different mixtures of organic compounds, and such differences affect carbon cycling and sediment processes in the lakes.

Among the organic compounds prevalent in these Arctic lakes are transparent exopolymer particles (TEP), a gel-like substance formed by the spontaneous aggregation of sticky chains of organic molecules that are secreted by algae, bacteria, and other organisms. Previous research found that aggregates of TEP form habitats for microscopic life and reaction surfaces for aqueous chemicals and can help promote sedimentation. In the ocean, TEP is a key component of ocean "snow." The role and variability of TEP in Arctic lakes and other inland waters, however, has been relatively unstudied.

Collecting weekly water samples from three Mackenzie Delta lakes over a 2-month span in 2006, Chateauvert et al. measured how the concentrations of TEP and other organic compounds varied following the annual flooding of the Mackenzie River. The authors find that the concentration of TEP varied by up to two orders of magnitude over the course of the study period, peaking immediately following the June flood and declining steadily afterward. They also find that the lake best connected to the river had the highest TEP concentrations. These

findings ran directly counter to the authors' initial hypothesis of how TEP concentrations should evolve in the lakes. The authors find that changes in the concentration of chromophoric dissolved organic matter—a form of organic material derived almost exclusively from river water in the region—could account for more than half of the measured TEP variability.

More information: Abundance and patterns of transparent exopolymer particles (TEP) in Arctic floodplain lakes of the Mackenzie River Delta, *Journal of Geophysical Research–Biogeosciences*, doi:10.1029/2012JG002132 , 2012

Provided by American Geophysical Union