

Impacts of watershed characteristics on the biogeochemistry of the Kolyma River basin, Northeast Siberia

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The Kolyma River basin in northeast Siberia drains from 250,000 square miles of land into the Arctic Ocean and is currently experiencing accelerated permafrost degradation and alteration of the hydrological cycle owing to climate warming. The basin is comprised of a diverse set of subwatersheds that are underlain by carbon-rich, permafrost dominated Pleistocene-aged loess deposits. Warming temperatures may cause this stored carbon to be unlocked from permafrost and released to the atmosphere as CO₂ and CH₄, but also likely to adjacent streams and rivers as dissolved organic carbon (DOC). In July 2009, a survey spanning 150 miles of the Kolyma River was conducted to describe the biogeochemical constituents of an assorted set of streams, rivers and mainstem locations. A total of eleven subwatersheds and eight mainstem locations were sampled, at which dissolved oxygen (DO), conductivity, and pH were measured. In addition, water samples were collected for analyses of dissolved organic carbon (DOC), chromophoric dissolved organic matter (CDOM), and total dissolved nitrogen (TDN). Watershed areas were delineated in a GIS in order to extract watershed characteristics such as land cover and permafrost characteristics, which were then subsequently compared with our point observations of biogeochemical data from stream and river sampling sites. Results show that spatial variability in DOC concentrations decreases as waters travel from small streams to the Kolyma mainstem, suggestive that watershed characteristics may have a significant impact on DOC concentrations. Developing general relationships for assessing the impacts of

watershed characteristics on the biogeochemistry of streams and rivers is critical for predicting how future warming will likely impact the flux of carbon and nutrients to the Arctic Ocean.