Bioavailability of organic matter in aquatic environments throughout Siberia's Kolyma River watershed during summer baseflow

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There is increasing evidence that inland freshwater ecosystems play a significant role in the global carbon cycle due to the metabolism of terrestrial-derived organic matter as it moves in fluvial networks from land to sea. Recent research suggests that Arctic watersheds may increasingly augment the global role of freshwater ecosystems in the flux of terrestrial carbon to the atmosphere and ocean as a result of global warming. Here we document the bioavailability of dissolved and suspended organic matter in a wide variety of freshwater environments (including shallow wetlands, stratified lakes, small streams, major tributaries, and main-channel locations) throughout Siberia's Kolyma River watershed at baseflow during July 2009. The Kolyma River watershed is one of the Arctic Ocean's largest and is dominated by continuous permafrost that is underlain with rich, unglaciated organic soils that are susceptible to increased fluvial transport. We used biological oxygen demand bioassays on freshly-collected water samples to calculate 24h carbon respiration rates at ambient temperatures and amounts of respired carbon following 5d laboratory incubation. Additional bioassays were conducted to assess the potential of N and P limiting heterotrophic respiration. Overall, the Kolyma River's fluvial network had appreciable, yet highly variable amounts of bioavailable organic carbon (mean = 0.59 mg/L, SD = 0.82 mg/L, n = 40 locations). Headwater locations generally had the highest amounts of bioavailable organic carbon relative to mainstem locations suggesting that the Kolyma River's fluvial network is efficiently respiring terrestrial-derived organic matter during summer baseflow.