T-2020-212-43

Sub-Theme 2: Observing in Support of Adaptation and Mitigation

Tracking nutrient potential of ice melt in a southcentral Alaskan fluvial and coastal marine system with inputs from glacier and permafrost sources

Rachel Sussman, Carli A. Arendt, Chris Osburn
North Carolina State University

As the extent of southcentral Alaskan glaciers and permafrost is shrinking in response to climate change, previously unavailable nutrients from these systems are mobilized via fluvial processes to coastal marine environments. These changes in nutrient fluxes have potentially significant but poorly understood impacts on downstream ecosystems, extending to effects on socioeconomically important Alaskan fisheries. The relative contributions of Alaskan ice melt and associated impacts of changing nutrient regimes on biological productivity are largely unquantified, making adaptations for future conditions difficult to inform. The interplay of melting glaciers, thawing permafrost, an urban population, potentially sensitive coastal ecosystems, and recent drastic warming, provide a microcosm for challenges other sub-Arctic and Arctic coastal systems might soon face. To investigate these climate impacts in southcentral AK, water samples were collected along a spatial transect extending from the Matanuska Glacier terminus, following the Matanuska River, and into the Cook Inlet. Meltwater contributions from adjacent permafrost landscapes were also sampled. Samples are analyzed for dissolved organic matter (DOM), major cations, and nitrogen speciation to assess how nutrient compositions vary during transport. Spatial changes in these compositions should provide insight to permafrost and glacial inputs and their availability after transit to downstream organisms. The results of this study will further the scientific understanding of the journey that meltwater nutrients undertake upon mobilization and the potential impact of those nutrients on the coastal waters into which cryosphere runoff flows. This new knowledge will hopefully allow southcentral Alaska to prepare for upcoming changes resulting from a rapidly warming climate.