Geophysical Research Abstracts
Vol. 21, EGU2019-11407, 2019
EGU General Assembly 2019

Terrestrial-aquatic linkages of dissolved organic matter in permafrost regions: a synthesis of interdisciplinary research in Alaska, USA

Kimberly Wickland
U.S. Geological Survey, Boulder, Colorado, United States (kpwick@usgs.gov)

The key components broadly controlling organic matter (OM) dynamics and connections across terrestrial and aquatic landscapes include OM source strength, OM processing, and hydrologic transport. Change in any of these components can quantitatively affect terrestrial-aquatic OM delivery, sequestration, and metabolism. Large stores of soil OM in northern permafrost regions accentuate the importance of focusing research to improve understanding of the effects of climate change on the release of sequestered OM and its movement and biogeochemical processing along the terrestrial to aquatic continuum. Permafrost characteristics and subsurface conditions of thaw have direct implications for how terrestrial OM sources are mobilized and for determining OM flowpaths and residence times across hydrologic landscapes. In addition, climate-related disturbances such as wildfire and thermokarst formation have immediate and long-term impacts on OM sources and hydrology. Understanding and predicting changes in terrestrial-aquatic OM connections in these regions is made more complex by the extreme spatial heterogeneity in geology, permafrost extent, and vegetation. This presentation will synthesize results and progress of nearly two decades of coordinated interdisciplinary research by US Geological Survey investigators and colleagues focused on understanding terrestrial-aquatic dissolved OM (DOM) dynamics in permafrost regions across interior Alaska, USA and the real and potential impacts of changing climate. Field, experimental, and modeling studies have utilized a broad array of biogeochemical, isotopic, hydrological, and geophysical methods in small catchments, stream and river networks, and lakes to identify important terrestrial DOM sources and their transport and fate in aquatic systems. These investigations highlight the importance of spatial heterogeneity, geomorphology, and disturbance regime in deciphering terrestrial-aquatic OM dynamics in permafrost regions vulnerable to thaw.