

Abstract for ATLAS Symposium 2022

Title: A snapshot of mercury sources and transport in the Yukon River Basin

Kasia Staniszevska; Dept. Earth and Atmospheric Sciences

The Yukon River has the highest mercury concentrations and yields of the world's six largest Arctic drainages. Mercury can convert to methylmercury, a potent neurotoxin that magnifies through aquatic food webs and can damage valuable traditional food resources. The primary source of mercury in the Yukon River basin may be atmospheric emissions from East-Asia, melting glacial ice, which contains legacy mercury accumulated over millennia, old organic-bound mercury from thawing permafrost, sediment disturbed by mining, or fine glacial sediments. To resolve this enigma, we sampled water at twelve Yukon River tributaries during July of 2021. Total mercury concentration (57 nanograms per litre) was highest in glacier-fed White River, which is ~20 times higher than most of the other Yukon River tributaries we sampled. These relatively high total mercury concentrations persisted over 300 km downstream, presumably due to transport of mercury in the high suspended sediment load of the glacier-fed tributaries. However, mercury concentrations were low in glacier-fed tributaries sampled downstream of lakes or wetlands. This suggests that these features act as sinks for this sediment-bound mercury, effectively removing it from the river system. The lowest total mercury concentrations were observed at tributaries with active placer gold mines and those in discontinuous permafrost. These results suggest that glacier driven export of suspended sediment and associated mercury may drive the high concentrations in the Yukon River. The results showcase the importance of evaluating physiographic factors, such as the presence of glaciers, permafrost, wetlands and lakes, in understanding sources and sinks of mercury.