Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.5942

Why productive lakes are larger mercury sedimentary sinks than oligotrophic brown water lakes

MARTIN SCHUETZE[1], BENJAMIN S. GILFEDDER[2], PHILIPP GATZ[1] AND **HARALD UWE BIESTER**[1]

[1]Technische Universität Braunschweig

[2]University of Bayreuth

Presenting Author: h.biester@tu-braunschweig.de

Mercury accumulation in lake sediments is a widespread environmental problem due to the biomagnification of Hg in the aquatic food chain. Soil Hg concentrations, catchment vegetation, erosion and lake productivity are major factors controlling the accumulation of Hg in lakes. However, their influence on the Hg mass balance in lakes with different catchment characteristics and trophic state is poorly understood. In this multi-lake study, we decipher the effects of catchment vegetation (coniferous versus deciduous forest), soil Hg content and trophic state on Hg sedimentation at six lakes in Germany. We investigated Hg concentrations in leaves, soils and the lakes' water phase. Hg sedimentation rates were derived from sediment trap analyses. Soils under coniferous stands show slightly higher Hg concentrations than under deciduous forest. Hg concentrations in the water phase were higher in the oligotrophic brown water lakes at the coniferous forest sites (8.1 ± 5.6 ng L^{-1} versus 3.0 ± 1.9 ng L^{-1}). Lower Hg concentrations in sediment trap material indicate dilution by algae organic matter in the mesotrophic lakes at the deciduous sites (0.12–0.17 µg g^{-1} versus 0.57–0.89 µg g^{-1}). However, Hg accumulation rates in sediment traps were up to fourteenfold higher in the deciduous forest lakes (113–443 µg m^{-2} y^{-1}) than in the brown water lakes (32–144 µg m^{-2} y^{-1}), which could not be explained by higher Hg fluxes to the productive lakes. Hg mass balance calculation reveal that water phase Hg scavenging by algae is the major reason for the intense Hg export to the sediments of productive lakes which makes them significantly larger sedimentary sinks than oligotrophic brown water lakes.