

Mercury Cycling Across a Nitrogen Gradient in Manipulated Forests

M.F. FAHNESTOCK¹, J.G. BRYCE¹, C.T. DRISCOLL², M. MONTESDEOCA², S.B. MUKASA³, S.D. FREY¹

¹University of New Hampshire, Durham, NH, USA
florencia.fahnestock@unh.edu

²Syracuse University, Syracuse, NY, USA

³University of Minnesota, Minneapolis, MN, USA

Industrial activities have enhanced the delivery of nitrogen (N) and mercury (Hg) to forest ecosystems over natural background levels. Several studies have suggested that additional N may contribute to fertilization effects as well as the accumulation of soil organic matter, altering the reservoir of bioavailable Hg in forest ecosystems. This study evaluates the impacts of coupled N and carbon (C) dynamics on Hg cycling in forest ecosystems at Harvard Forest (Petersham, MA). Mercury analyses were carried out on soil cores (split into Oi/Oe, Oa, and mineral horizons) sampled from mixed hardwood plots (900 m²) that received varying N exposure (ambient versus additions of 5 and 15g N/m²-yr) over two decades.

Soils with elevated C and N contents bear lower total soil Hg/C concentrations (e.g., the Oi/Oe horizon in high N soils), likely from “biodilution” due to increased soil organic C values associated with the N treatments. Positive correlations between Hg and C, N contents are present in all treatments, but the goodness of fit decreases with soil N treatment. When considering Hg reservoirs on a per unit area of soil the high N treatment is associated with significant enhancement of Hg inventories in the Oi/Oe horizons, with comparable stable Hg isotope signatures in Oi/Oe horizons across all treatments.