

Unequal Anthropogenic Enrichment of Mercury in Earth's Northern and Southern Hemispheres

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Remote Northern Hemisphere (NH) and Southern Hemisphere (SH) lake sediment and peat records of mercury (Hg) deposition have shown a $\times 3$ to $\times 5$ Hg enrichment since pre-industrial times (<1880 AD), leading to the perception that global atmospheric Hg enrichment is moderate and uniform across the hemispheres. Anthropogenic Hg emissions in the NH are, however, approximately 4 times higher than those in the SH. Here, we reconstruct atmospheric Hg deposition in four remote SH peatlands and review sediment and peat Hg records from both hemispheres. We observe a $\times 4$ all-time enrichment in SH Hg deposition from pre-anthropogenic (<1450 AD) to the late 20th-century periods, which is lower than the large $\times 16$ all-time enrichment in NH Hg deposition. We attribute this difference to lower anthropogenic Hg emissions in the SH, and higher natural atmospheric SH Hg concentrations, supported by $\times 2$ higher natural background Hg accumulation in SH peat records. We suggest that the higher SH natural atmospheric Hg deposition reflects the SH land-ocean distribution, and is driven by important SH marine Hg emissions. Our findings indicate that atmospheric Hg background levels and anthropogenic enrichment in both hemispheres are different and should be taken into account in international Hg assessments and environmental policy.