Historical deposition and fluxes of mercury (Hg) in Papua New Guinea

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Here we summarize results from a recent study to reconstruct past mercury (Hg) deposition in Papua New Guinea (PNG). We recovered a sediment core from Lake Kutubu, a highland lake with a small watershed ideally situated to record past amospheric Hg deposition rates.

Our sediment core spans the past ~2500 years. Background (i.e., pre-industrial) atmospheric deposition rates ranged from 2 to 15 ug/m^2/yr and exhibited a high degree of temporal variability. Modern sediment presents a peak in Hg, which coincide temporally with regional gold mining activities; however, Hg fluxes are within the range of pre-industrial atmospheric deposition rates of 2 to 15 ug/m^2/yr. The presence of two volcanic tephras, Tibito (~280 yr BP) and Olgaboli (~1200 yr BP), can be identified by significant reductions in organic matter in the sediment profile, though there is no clear indication that these eruption events contributed significantly to Hg deposition in the lake. Background atmospheric deposition rates of 2 to 15 ug/m^2/yr are similar to those reported in the Amazon in preindustrial time and after the Late Glacial Maximum, however, slightly higher than preindustrial Hg deposition in other remote parts of the world typically recorded as 5 to 10 ug/m^2/yr. Hg atmospheric deposition fluxes appear to be strongly controled by regional variation in precipitation, evident from the correspondence to Australian Monsoon trends recorded in speleothem $\delta^{18}O$ in NW Australia. We conclude that the overall Hg deposition flux variations within core are likely to be related to regional climate drivers, including the Australian Monsoon, and more recently anthropogenic activities associated with local gold mining.