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Environmental contamination associated with artisanal gold mining in Guyana

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A meta-analysis revealed that while there is often a greater degree of contamination of soils and sediments with metals, contamination by mercury (Hg) is a large concern owing to its toxicity. Here we deployed moss bags and *Mer*PAS passive samplers to measure atmospheric Hg around a gold mine in Mahdia, Guyana over a 90-day period as well as a 2-day period that encompassed a periodic burning period (typically 2-h). Mercury in moss and *Mer*PAS were positively correlated over both deployment periods, but Hg concentrations measured during the 2-day event were several-fold higher in both moss and *Mer*PAS compared with the 90-day exposure demonstrating that most of the Hg sorbed to both moss and passive samplers is lost during periods of inactivity. Using the 2-day as a conservative estimate of atmospheric Hg exposure, Hg air concentrations around exceeded 100,000 ng m^{-3} averaged over a 48-h period, and moss Hg concentrations were greater than 250,000 ng g^{-1} around the burning station, although Hg concentrations in both media decreased rapidly with distance. There was no relationship with Hg concentration in soil and sediment with either distance from the burning station or Hg measured in the deployed moss bags. Instead, Hg concentration in soils and sediment were strongly related to organic matter content, which tended to be higher away from the mine site. These controls of organic matter (carbon; C) cycling on Hg distribution and movement are clear at sites exposed to high atmospheric Hg and exists at the global scale, although Hg:C ratios in foliage, litter, soil, surface waters and sediments are greatly elevated at the gold mine site compared with the global average.

