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Environmental and biological controls on mercury records in collocated tree rings, peat deposits, and lake sediment archives in northern Sweden

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The reconstruction of the historical atmospheric Mercury (Hg) concentration level is crucial for understanding the influences of anthropogenic activities on the biosphere environment and implementing the *Minamata Convention on Mercury*. Here we report the atmospheric Hg concentration and deposition history recorded in collocated environmental archives in remote northern Sweden during the last two centuries. The reconstruction is based on Hg concentrations and Hg accumulation rates in tree rings from three coniferous species (Norway spruce, Scots pine, and Europe larch), peat deposits, and varved lake sediments. The dated peats and varved lake sediments, in agreement with previous studies on remote northern hemisphere sites, showed a comparable smooth increasing trend from 1800, peaked in the 1970s, and gradually decreased afterward. However, diverse trends of Hg records in the three tree species were observed. European larch and Norway spruce reproduced the general trend of Hg records in peat and lake sediments, while the peak Hg record was shifted to the 1930s in the pine tree. In addition, all tree rings from three tree species showed increasing Hg concentration in the recent decade, i.e., since the 2010s. This rebound in the Hg concentration trend in tree rings is synchronized with nutrient mobilities but opposed to the in situ atmospheric Hg concentration measurements that showed a decreasing trend. Our results suggest the Hg records in the tree ring archive are controlled by atmospheric Hg concentration and tree physiological activities. We call for future studies to take biological factors such as tree physiological activities into consideration when using dendrochemical analyses to reconstruct Hg pollution history.