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Dependence of Total Mercury in Superficial Peat With Nutrient Status: Implications for Stability of Peat as an Archive of Hg Deposition

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Although Mercury (Hg) has decreased considerably in the atmosphere during recent decades, this potent neurotoxin still constitutes a threat to ecosystems globally through the Hg stored in soils. The mitigation of the risks related to this legacy Hg was a reason to implement the Minamata Convention. Subsequent work under the convention is dependent on assessments of the Hg stored in the environment. A way of doing this is to study environmental archives of atmospheric deposition such as ice cores, lake sediments, and peatlands. A previous study along a chronosequence of mires along the northern coast of Sweden showed Hg content differing by a factor of 2 and correlating strongly with mire age. This was hypothesized to indicate that differences in minerogenic water supply along the chronosequence influenced the stability of Hg after deposition from the atmosphere to the mire surface. Declining access of minerogenic elements with increasing peatland age results in a less nutrient demanding plant species composition as well as decreasing access to microbial electron acceptors. But that study looked at just one 10 cm layer at a depth with peat ca 50 years old. Here we present a more rigorous test of that hypothesis by presenting the total amount and vertical pattern of Hg accumulation during the last 200 years in the superficial peat along that peatland chronosequence.

Eleven peatlands along the northern coast of Sweden near Umeå were sampled. This is an area

where isostatic rebound continues to raise the land above the sea level. Triplicate peat cores were collected from both lawns and hummocks, when present. A total of 54 peat cores, each 50 cm deep, were collected and frozen immediately. The cores were then sliced into 2 cm layers, and each slice was analysed for total Hg. Due to the land rising out of the sea, the different peatlands have ages ranging from 100-2000 years since establishment, despite being located within a distance of <10 km. The peatland age correlates with availability of mineral elements and pH. This is due to the fact that the underlying postglacial mineral soil is a source of elements. The distance to the mineral soil increases as peat accumulates with peatland age. Certain elements also leach from the peatlands over time. This documentation of the vertical distribution of Hg in all the peat laid down during the past 200 years in each mire tests the hypothesis that the propensity of Hg to evade back to the atmosphere in this area is related to the amount and composition of inorganic elements.