Spatial distribution of mercury and methylmercury in an industrially polluted floodplain soil.

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Mercury (Hg) is a ubiquitous global pollutant cycling through all environmental compartments. Microbially formed methylmercury (MeHg) is the most toxic and bioavailable form of Hg (Sakamoto et al. 2012). The bio-methylation of mercury is well studied in the marine environment. However, there is still a lack of knowledge concerning MeHg formation soils. The aim of this study is to characterize parameters potentially driving MeHg formation in agricultural soils and terrestrial ecosystems.

From the 1930s to 1980s, the agricultural floodplain between Visp and Raron (Canton of Valais) was polluted by an acetaldehyde producing plant. The chemical plant released an estimated 50 t of Hg into a discharge canal. During this period, the canal was dredged multiple times. The extracted Hg-rich canal sediments were used to fertilize agricultural fields and private gardens. To estimate the extent of the Hg pollution in the area, a screening was conducted by a geo engineering office. Despite these efforts, little is known about the meter-scale distribution of Hg and the concentration of MeHg in the agricultural soils in Valais.

As a first step, we aim to assess the three-dimensional distribution of Hg species in the area. Based on the previous screening, five sites were selected for this study. Soil was sampled in a rectangular grid system to a depth of 50 cm. MeHg is extracted with a newly developed method including a three-step selective extraction with 35% HCl, dichloromethane and L-cysteine. The Hg species are measured with HPLC-ICP-MS, while total Hg, and a range of selected metals, are measured by ICP-MS. Further, parameters potentially affecting MeHg formation (organic C, N, S, and pH) are measured. Maximum Hg concentrations (59.3 mg kg^{-1}) in the agricultural soils are almost 3 times the federal threshold value of 20 mg kg^{-1}.

In the terrestrial environment, future impacts on Hg cycling due to changes in climate and land-use remain unclear. Changes in soil saturation and redox may potentially promote Hg release and biomethylation. Our future research will include soil incubation experiments to assess the influence of flooding and agricultural practices on the mobilization and biomethylation of Hg in soils.

REFERENCES

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