

Research Project

Linkage between deposition and air-surface exchange of mercury: a comparative study between Switzerland and China

Third-party funded project

Project title Linkage between deposition and air-surface exchange of mercury: a comparative study between Switzerland and China

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Forest ecosystems in China and Switzerland exhibit distinct Hg deposition trends. While there is continuously increased Hg deposition in China, the deposition rate of Hg has been decreased since 1960s in Switzerland. In this study, we propose a collaborative project to investigate Hg biogeochemical behaviour in the remote forested ecosystems in Switzerland and China to understand how different chronologies of Hg deposition impact Hg biogeochemistry in remote forest ecosystems with a specific focus on atmosphere-land exchange of Hg.

We will characterise the profile distribution of Hg at both sites to reveal at which horizons the recently and historically deposited Hg tends to accumulate. Using isotope dilution technique, we will quantify the pool of exchangeable Hg in soils. We will perform the first ever research to quantify gaseous elemental mercury (Hg(0), GEM) fluxes above and below the forest canopy utilising REA and dynamic flux chamber at both sites, in addition to mass balance analysis of Hg. This approach will complete our understanding on Hg biogeochemical cycles in the terrestrial environments at Chinese and Swiss sites.

Mesocosm systems with litterfall, O layers and subsoils will be carried out to measure Hg reemission and leaching from soils at the Chinese and Swiss sites under manipulated precipitation, temperatures, biological activities and irradiance to examine how environmental factors affect Hg reemission and leaching from litterfall, O layers and subsoils at both sites.

We will also measure Hg isotope compositions of Hg in atmospheric Hg, wet precipitation, litterfall, soils and bedrock at both sites to assess Hg sources along the soil profile to gain more insights into historical changes in deposition sources at both Chinese and Swiss sites. In mesocosm systems, the magnitude and direction of Hg isotope change during incubation will be utilised to identify possible Hg reduction pathways in soils and furthermore to elucidate how the pathway of Hg reduction in litterfall, O layers and subsoils.

The proposed research will deliver quantitative information on the air-land exchange of Hg in forest ecosystems with distinct Hg deposition fluxes at the two study sites. This information is crucial for better understanding of global cycling of Hg in the environment, and has the potential in understanding how effective the implementation of the Minamata Convention will curb the process of recovery from Hg accumulation not only in China but also in Europe and North America.

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Add publication

Published results

4614149, Huang, Jen-How; Shetaya, Waleed H.; Osterwalder, Stefan, Determination of (Bio)-available mercury in soils: A review, 0269-7491 ; 1873-6424, Environmental Pollution, Publication: JournalArticle (Originalarbeit in einer wissenschaftlichen Zeitschrift)

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