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The influence of mercury contamination and vegetation type on atmospheric Hg(0) concentrations and vegetation-air fluxes in the Tagus estuary salt marshes

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Abstract

In situ air concentrations of gaseous elemental mercury (Hg^0) and vegetation-atmosphere fluxes were quantified in two saltmarshes of the Tagus estuary colonized by plant *species Halimione portulacoides* and *Sarcocornia fruticosa*. One site presented high Hg-contamination due to a nearby chlor-alkali unit (CN) and the other located in the Natural Reserve had low-to-moderate (ALC) Hg levels. Air Hg^0 concentrations were measured using a Tekran 2537A and the fluxes through a dynamic flux chamber. Concentrations of Hg^0 were higher at CN (1.08–18.15 ng/m^3) than in ALC (1.18–3.53 ng/m^3). While air Hg^0 concentrations at ALC varied diurnally and were positively correlated with meteorological parameters, the highest air Hg^0 concentrations at CN were found during the nighttime. These results suggest that photoreduction was not driving the air Hg^0 concentrations at CN. Vegetation-air Hg^0 fluxes were low in ALC and ranged from -0.76 to 1.52 ng/m^2 (leaf area)/h^1 for both plants. Higher Hg fluxes were observed for both plants in CN, ranging from -9.90 to 15.45 ng/m^2 (leaf area)/h^1. Here, the mercury fluxes were considered less reliable due to large and fast variation of ambient air Hg^0 concentrations, which may have been influenced by emissions from the nearby chlor-alkali plant and/or the known historical contamination. Additionally, the lower height of planetary boundary layer might also have influenced the ambient air Hg^0 measurements and consequently the calculation of vegetation-air Hg^0 fluxes. Nevertheless, diel variation of land and sea breezes may have an effect on the regional distribution of atmospheric Hg^0. Further investigation is required concerning the improvement of the experimental setup to verify and monitor local sources of atmospheric Hg^0 emissions, and evaluate vegetation-air Hg^0 fluxes, especially in heavily contaminated sites. Future work should investigate similar Hg “hotspots” with seasonal variations and with different saltmarsh plant species.

Keywords

Gaseous elemental mercury, Mercury volatilization, Salt marsh vegetation, Mercury contamination