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Fractionation of mercury stable isotopes in lichens over a period of one year

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Biomonitoring of mercury (Hg) in the air using transplanted and *in-situ* lichens were studied at three locations in Slovenia: 1) the former Hg mine Idrija, with known Hg contamination; 2) vicinity of a Hg point source of pollution near the cement production plant in Anhovo, and 3) a noncontaminated reference site at Pokljuka. Total Hg concentrations and Hg isotopic composition were measured. Lichens were transplanted from Pokljuka, exposed at different sites in three locations and sampled four times, once per season. Lichens were exposed under tree branches, on fences and also under cover, allowing them different exposure to natural light. Additionally, the *in situ* lichens were sampled at the beginning and the end of the one year sampling period. As expected, the trend of concentrations in transplanted lichens increased over time, especially in the area of Idrija, and significantly less in the area of Anhovo, which is consistent with previous research. Significant mass dependent fractionation has been observed in transplanted lichens. $\delta^{202}\text{Hg}$ changed from winter to summer from -2.5 to -0.5 ‰ and dropped again to -2.5 in autumn/winter of the following year. The most likely mechanism for this is Hg reduction (biotic or abiotic) and / or Hg evaporation in summer due to elevated temperatures, leaving heavier isotopes on the lichen thalli. The *in situ* lichens that were sampled one year apart show no major changes in isotopic composition. Such a trend has been observed in all of the samples apart from the ones from the most polluted Idrija sampling site directly above the former smelting plant. This is probably due to the new Hg constantly being deposited to the lichen with local isotopic fingerprint. Small mass independent fractionation was observed, likely due to photo-reduction as was concluded in similar foliage studies, but no trends in its change over time were seen.