



Decreasing mercury levels in the Bohemian forest catchments - the Czech Republic, central Europe

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Plešné lake (PL) and Čertovo lake (CT) catchments located within the central European lake district within the Bohemian forest and Bavarian forest Mountains have been oligotrophic with catchments dominated by Norway spruce (*Picea abies*). These two lakes separated by distance of 65 km are located at 1087 and 1027 m a.s.l. and were studied since 2016 in detail with respect to Hg biogeochemical cycling.

Wet deposition was observed at PL catchment only. In 2016 and 2017, mean volume weighted annual Hg concentration in bulk precipitation at PL was 2.7 ng/L and bulk Hg deposition flux amounted at 4.5 $\mu\text{g}/\text{m}^2$.

Much more important flux for total Hg deposition to forest catchments were the litterfall fluxes amounting at 31.4 and 22.0 $\mu\text{g}/\text{m}^2$ at PL and CT, respectively. Forest litterfall fluxes have been primarily driven by amount of biomass deposited and its quantification may cause difficulties due to its high aerial variability. Thus we used Hg concentration in individual litterfall components to observe possible trends in temporal changes of Hg deposition. The available archived spruce litterfall samples cover period 2003-2016 and its major components were needles, bark, lichen, twigs, cones and mixture of unidentified organic debris(mix). Overall means of Hg concentrations in litterfall material at PL and CT were 237 and 238 $\mu\text{g}/\text{kg}$ in mix, 225 and 201 $\mu\text{g}/\text{kg}$ in lichens, 158 and 110 $\mu\text{g}/\text{kg}$ in bark. Mercury concentrations in litterfall spruce needles averaged at 76 and 85 $\mu\text{g}/\text{kg}$, only. Comparing site specific annual means at PL and CT in years 2003 and 2015, Hg concentration in needles, bark, lichen, twigs and mix decreased at both sites by 22 to 76%.

The data with sufficient detail to assess possible effects of deposition on soil, stream water and lake water Hg exists only at site PL. Although PL catchment forest was infested by the bark beetle (*Ips typographus*) in 2004, and 88%–99% of trees died by 2011. Thus there are multiple processes acting against each other i.e. decreased total Hg deposition flux due to decrease of Hg concentration in deposited litter vs increased Hg deposition due to the forest infestation – deposition of the dead biomass.

It is not clear which process acts as a main driver. Available PL catchment soil data from 2000, 2010 and 2015 indicate decrease of mean Hg in O horizons from 424, through 409 to 311 $\mu\text{g}/\text{kg}$. In A horizons the situation was reversed and Hg increased from 361, through 486 to 501 $\mu\text{g}/\text{kg}$. In mineral soil the means of Hg concentration remained relatively similar at 121, 153 and 145 $\mu\text{g}/\text{kg}$. The changes in soil reprint into chemistry of lake tributaries with mean Hg ranging from 1.8 to 13.8 ng/L. Decrease of Hg by ~ 1.1 and 3.5 ng/L was observed in two of four lake tributaries and in lake by ~ 0.7 ng/L. to the short timescale of stream and lake water monitoring these decreases are not clear especially with respect to seasonality.

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