

Whole-lake spatial distribution of As, Co, Cu, Ni, Pb and Zn revealed by sediment geochemistry and organic composition

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It is well known that the sediment composition varies greatly across a lake basin, however, this is rarely considered when it comes to trace metals. Especially in complex lake basins, with an uneven distribution of organic matter (OM) trace metals might display large spatial variability [1, 2].

Härsvatten is a small (0.18 km²) acidified lake with a complex morphology consisting of 3 basins (10, 12, and 24 m deep) separated by shallow areas (<4 m) [1]. We analyzed 45 surface sediments collected across the whole lake for their geochemical composition (28 elements by X-Ray fluorescence spectroscopy) and OM characteristics (Pyrolysis-Gas Chromatography-Mass Spectrometry). The aim of the study was to understand the process affecting sedimentation and how this affects the spatial distribution of both OM and trace metals.

Our results show that in the deeper basin (24 m; steep slopes), OM and trace metal distribution were well-explained by sediment focusing (i.e., a preferential accumulation of light, fine-grained, material in deeper areas). However, in the two others basins (10 and 12 m), OM and trace metal distributions were more homogeneous and not related to water depth. This could be explained with help of the Py-GC-MS data, which indicates a high presence of aquatic macrophytes and more algal growth in the shallower areas of these two basins. Aquatic macrophytes act as sediment traps and result in an accumulation of light, fine-grained, material rich in OM and trace metals (especially As, Ni and Zn) also at shallow locations. For the shallow areas between the three deep basins the accumulation of some trace metals (As, Cu, Co and Pb) seems to be favored by the presence of Fe- and Mn-hydroxides. This study gives a better understanding of trace metal accumulation in aquatic system and its relation to OM distribution.

[1] Bindler *et al* (2001). *Limnol. Oceanogr.* **46**: 178–188 [2] Rydberg *et al* (2012). *J. Geophys. Res. G: Biogeosciences* **117**: 1-13