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Characterisation of trace metal carriers in the Seine River sediments

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As metallic contaminant loads in major urban rivers such as the Seine in France vary widely, the characterisation of their different sources is important in water quality monitoring and moreover the river basin management. Trace metal carriers in deposited sediments and suspended particulate matter carry morphologic and geochemical signature that can be linked to specific natural, industrial or urban sources.

A protocol for the identification of trace element carriers in the Seine River was developed using scanning electron microscopy (SEM) coupled with energy dispersive spectroscopy (EDS). Most analysed sediments originate from Achères, a sampling site close to a wastewater treatment plant for 80% of the population of Ile-de-France region. Several concentration methods were applied, including magnetic and density separation before subsequent microscopic observation. Additional identification of the crystalline fraction using X-Ray diffraction gives further insight into the composition of the bulk and concentrated samples. The findings are supported by ICP-MS analysis on the acid-digested sediments.

Various interesting Pb-, Ni-, Zn-, V-, Cr-, and Cu- bearing phases were identified by electron microscopic analysis. Each of these metals appears to be bounded to specific minerals in the sediment, such as quartz, calcite, or barite. These results are used as an indication of the possible origin and formation mechanisms of the particles. Further observations of back-scattered imaging and EDS spectra of certain particles confirm

the detected phases and possible associations between the observed metal and the bulk sediment. Implications on trace metal mobility and the possible risk of water pollution resulting from the release out of the deposited river sediment may therefore be evaluated from this information.