



To be, or not to be conventional - unbiased analysis of polluted channel sediments (The Ploucnice River, Czech Republic)

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Conventional monitoring of fluvial pollution is commonly performed in the following manner: channel sediments of unclear origin are sampled, sieved using 0.063 mm mesh, subjected to pseudototal decay using aqua regia or nitric acid, analysed for selected risk elements (exclusively), and the resulting raw concentrations are compared to some concentration limits. Each of those steps may be biased, that can be shown by the following examples: site near erosion bank in river transfer zone (erosion much prevailing over deposition), pollution by metallic fragments, coarse ore grains, or glassy slag fragments, chemically quite stable toward acids, risk elements bound to Fe,Mn-oxide films on coarse sand grains, and/or geogenic anomaly in the river catchment. Perhaps those examples are exaggerated or not-representing a typical case? Then let us ask: What is the purpose and possible benefits of those conventional steps? Is it sound to sample channel sediments without any specification of the actual fluvial deposition pattern in a given site? Is pollution carried only by some pre-defined grain-size fraction? What is actual relevance of the finest fraction in sediment consisting mostly of gravelly sand, covered by algae? Is pollution always in the chemically reactive form? Is concentration independent on the sediment matrix, let it be organic mud, quartz of fine-silt size, clay, or Fe-oxide plus organic matter precipitate formed in water column?

We traced historical and actual pollution sources that have impacted channel sediments of the Ploucnice River (Czech Republic) and its tributaries with a scale of relevant processes, from historical diffuse pollution since the end of 19th century, lead glass (crystal processing) in one factory, uranium ore mining in the second half of 20th century in large area, several villages and cities etc. distributed unevenly in the catchment. We sampled fresh, unconsolidated sediments in calm places in the river channel, analysed their bulk composition by X-ray fluorescence spectroscopy, and compared them with concentrations of lithogenic (reference) elements suitable for geochemical normalisation. From the tested reference elements, Fe most efficiently decreased the concentration variability between neighbouring sampling sites by eliminating the grain size effects. We used median smoothing for the downstream trends, because the variability among the nearest neighbours was by no means Gaussian and thus average and standard deviations were not substantiated for data processing. We obviously obtained results allowing for unequivocal identification of pollution sources. We also proved that sieving is not necessary to distinguish pollution degree. We thus recommend (1) not to be too conventional in analysis of polluted sediments and (2) to avoid unsubstantiated and potentially biased steps.