



How historical pollution sources still impact current channel sediments: case study in Panensky Creek (Czech Republic)

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Panensky Creek (the Czech Republic), similarly as most rivers in central Europe, has been impacted by several undocumented pollution sources acting in the 20th century. The only reliable archive of its pollution is the river floodplain. Their study is, however, relevant because some of the historical pollution sources still spread risk elements to the stream sediments. Several industrial pollution sources have acted along the Panensky Creek (length of 29 km, an important tributary of the Ploucnice River): a zinc-plating factory, a facility for processing and recycling of waste (formerly a part of Czechoslovak Uranium Industry) and lead-glass processing factory. The Ploucnice received most past pollution from large-scale uranium mining about half century ago. In this study we used combination of floodplain and stream sediment analysis, geographical information systems (GIS) and gamma spectrometry dating based on ^{210}Pb and ^{137}Cs .

For the pollution assessment, we sampled both floodplain (1-2 m depth profiles) and stream sediments (channel bed deposits) along the Panensky Creek and in a few sites in the Ploucnice River. Samples were dried and milled to fine powder. The bulk samples were analysed using X-ray fluorescence spectrometry and to eliminate the influence of the lithological variability on the sediment we used geochemical normalization, i.e. calculation of the concentration ratios of risk elements (Pb and Zn) to normalizing element, in this case Fe. The normalization efficiently levelled downstream fluctuations of the concentrations and nicely showed position of pollution sources. We compared the element ratios Zn/Fe and Pb/Fe with average composition in of the Earth crust to assess pollution levels, because there are no geochemical anomalies in the Panensky Creek catchment. Floodplain sediments of the Panensky Creek are polluted mainly by Pb and Zn from local factories. Analysis of stream sediments in the Panensky Creek showed concentration ratio Pb/Fe 15 - 50 times higher than in the UCC and Zn/Fe ratio 10 - 15 times higher than in the UCC. The Pb and Zn pollution enters the river system also today, and it even contributes to pollution of the Ploucnice River more than the previous U mining. The concentrations of Pb and Zn in the Ploucnice River after the confluence with the Panensky Creek are by ca. 1/3 higher than before the confluence. The results were compared with channel pollution studies conducted 20 and 10 years ago; we found that Zn and Pb concentrations decreased over time. Maximum pollution by zinc in floodplain sediments of the Ploucnice River (in the section under Mimon) was coeval with the peak of pollution from uranium mining, but later only slightly decreased due to the persistent influence of sources in the Panensky Creek.