SUMMARY

Pollution of surface waters by municipal landfill leachate is a well known phenomenon. The contamination of surface water by the landfill leachate is a common environmental problem, which must be solved by a combination of scientific results and political decisions on a large number of sites. Especially unmonitored landfills constructed on permeable underlying bedrock without engineering barriers represent a severe risk for the environment. Besides organic contaminants, heavy metals and metalloids are typically the most important pollutants. Commonly, the concentrations of heavy metals in landfill leachates are 0.00X-0.0X mg/l. A large number of heavy metal attenuation processes can be taken into account in such systems with neutral to alkaline pH and varying redox potential.

An extensive study of heavy metal contamination of leachate-polluted waters was done in the vicinity of the old municipal landfill of Dolní Chabry, located 5 km north of the center of Prague. The landfill was constructed without any engineering barriers preventing the leakage of landfill leachate in the source area of the Draháňský stream on the permeable bedrock. Monitoring of leachate-polluted waters was focused on monitoring of alkalinity in order to determine the highest output of leachate into the water. Waters were subsequently analysed for heavy metal using ICP-MS (scan mode). The selection of water was based on previous study of changes in water chemical composition as a function of hydrological year (flushing events/dry period) and dealt only with water with highest concentrations of heavy metals (Ni, Zn, Cd, Cu, Pb). Sampled waters were analysed for the total content of major cations and anions, as well as of trace elements and TOC. The MINTEQA2 speciation solubility modelling was used for the calculation of heavy metal speciation in solutions and the degree of saturation with respect to mineral phases.

The chemical composition of surface waters revealed a direct contamination by a landfill leachate. The waters typically showed high conductivity (up to 6 mS/cm) and dissolved organic carbon (DOC) concentrations. Heavy metal concentrations were also significant (Zn 66 μg/l, Cu 10 μg/l, Pb 2 μg/l, Cd 1.5 μg/l, Mn 550 μg/l). The MINTEQA2 thermodynamic speciation-solubility modelling showed a distinct supersaturation of waters with respect to calcite ($CaCO_3$) and other carbonate phases. A significant decrease in metal concentrations in leachate polluted surface waters has been observed after and during the rain events, exhibiting a significant shift to free ionic species of metals (MINTEQA2 calculation). Mobility of inorganic contaminants significantly increase during rain events.