SUMMARY

The city of Příbram (Czech Republic) is located in a traditionally industrial, mining and metallurgical district. During the hundred years of these activities, the area has been severely contaminated by toxic elements, including antimony (Sb). Generally, the acceptable Sb concentration limit in soils is supposed to be 5 $mg.kg^{-1}$. In the Příbram area, the Sb concentrations in soils are exceeding more than 200x this limit. The main source of Sb in the studied environment is related to emissions from primary and secondary Pb smelting. This study is focused on application of sequential extraction procedure (initially used by Wenzel et al., 2001 for As speciation) to forest and tilled soil profiles heavily polluted by Sb and located in the vicinity of the Příbram smelter (1 km).

Maximum concentrations were 1720 mg $Sb.kg^{-1}$ and 467 mg $As.kg^{-1}$ in horizon B of forest soil. In the tilled soil, significantly lower concentrations of Sb and As were determined (100 mg $Sb.kg^{-1}$ and 170 mg $As.kg^{-1}$ in horizons A and B, respectively). These results can be related to higher interception of smelter emissions by tree canopies in the forest system and/or to intense agricultural practice in tilled soils (tillage, biomass loss,...). In the tissues of plants growing on these contaminated soils, the Sb concentrations reached 163 mg $Sb.kg^{-1}$, significantly exceeding limits for plants according to current literature review (50 $mg.kg^{-1}$).

The sequential extraction procedure revealed a similar chemical fractionation of Sb and As in the tilled soil, where these elements are mostly bound to Fe oxides. Furthermore, the correlation between Sb, As and physiochemical soil parameters also indicated that Sb and As are mostly associated with hydrous Fe oxides. Different behaviour was observed for Sb and As in the organic forest soil horizons (A and B). Here, Sb was predominantly present in the residual fraction, presumably bound to organic matter (70 – 90 % Sb), whereas As was rather associated with amorphous and crystalline hydrous Fe oxides. More complex binding mechanisms of Sb can occur in organic forest soil horizons, probably also influenced by other parameters (mainly organic matter content, soil pH, ...). A BCR sequential extraction procedure (with "organic matter" extraction step) would probably be more suitable for understanding the extent of Sb binding to organic matter in contaminated forest soils.