

Tuesday 18<sup>th</sup> October 2022, 4.15 pm – 5.15 pm

### The presence and solubility of antimony in soils of the historical mining sites and shooting ranges – the case study from south-western Poland

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**ABSTRACT.** In Poland the knowledge about regions of soil enrichment with antimony (Sb) is only partial. Based on literature we selected areas, where concentrations of Sb in soils can be increased, in particular considering historical mining sites, waste dumps, impact areas of the copper industry and shooting ranges. Increased or very high concentrations of Sb were found in more than half of the 20 analysed sites, the maximum concentration of antimony was 5650 mg kg<sup>-1</sup> in Radzimowice, a historical mining site.

In the second part of our research, we conducted pot experiments to evaluate the influence of the applied additives on Sb solubility. We focused on the reduced conditions, in which Sb can be particularly intensively mobilized from the solid phase. Soils were incubated in containers, in which MacroRhizon suction samplers were installed. The experiments were carried out in conditions of variable moisture and with the use of additives that enriched the soil with iron oxides (waste generated in the process treatment of ground waters that is rich in iron and manganese compounds) or organic matter (in form of beech litter). Leaching tests showed, that antimony in military shooting range soils is highly susceptible to leaching and extraction, while the tests of extraction of antimony from mining dump soils by 1 M NH<sub>4</sub>NO<sub>3</sub> and 0.01 M CaCl<sub>2</sub> solutions demonstrated that the solubility of this metalloid varied, which was related, among others, to the pH of soils.

The conducted research demonstrated that organic additives increased the mobility of Sb in soils contaminated with this element, however this effect depends on soil type. It also confirmed the possibility of effective immobilisation of Sb by applying waste rich in

iron and manganese compounds. Additionally, we demonstrated that the application of concentrated  $\text{HNO}_3$  for the digestion of soil samples is insufficient for effective dissolution of Sb present in soil solid phase, and thus for the proper identification the most contaminated sites.

Next step of the research is to verify the factors which can affect Sb mobilization, taking into account presence of different substances in soils, seasonal variability (climate changes, weathering, precipitation), microbial activity and hazards related to the presence of pollutants with different release mechanisms into the environment like in shooting range areas.

**BIO.** Dr Karolina Lewińska is an associate professor at the Adam Mickiewicz University in Poznań, Poland, where she has been a member of the Faculty of Geographical and Geological Science since 2013. In 2019 she obtained the title of habilitated doctor in the discipline of Earth and Environmental Sciences.

Her research focuses on the availability and mobility of potentially toxic elements, their behaviour under different environmental conditions and after soil treatment with various amendments. Dr Lewińska investigates the factors that can modify the solubility of different elements in contaminated soils in the prospect of their biological remediation. Additionally, she is involved in the studies on using spectral images and measurements obtained at various altitudes (laboratory, drones, aviation, satellites) in environmental research.

She is a member of Commission 3.5 of the International Union of Soil Sciences “Soil degradation control, remediation and reclamation”, International Society of Trace Element Biogeochemistry (ISTEB), Soil Science Society of Poland, Polish Geographical Society (Branch of Remote Sensing).

The presentation will be followed by a talk by Ursina Morgenthaler, doctoral candidate from the Soil Science Group, on the topic:

*“Antimony release from flooded shooting range soils.”*

You are welcome to attend in person in  
Hallerstrasse 12, seminar room 002.

