Thallium stable isotope ratios in geogenically Tl-contaminated soils

A. VANEK[1*], A. VOEGELIN[2], M. MIHALJEVIC[3], V. ETTLER[3], J. TRUBAC[3], P. DRAHOTA[3]

[1] Department of Soil Science and Soil Protection, Czech University of Life Sciences Prague, Czech Rep. (*correspondence: vaneka@af.czu.cz)

[2] Eawag, Swiss Federal Institute of Aquatic Science and Technology, Switzerland

[3] Institute of Geochemistry, Mineralogy and Mineral Resources, Charles University, Czech Republic

Soils on Erzmatt in the Swiss Jura mountains are contaminated with Tl and As of geogenic origin due to their formation from carbonate rock hosting a weathered hydrothermal Tl-As-Fe mineralization [1].

In the present study, we determined Tl stable isotope ratios, reported as ε^{205}Tl, in two soil profiles, one under grassland and one under forest (Fig. 1). A comparison of trends in ε^{205}Tl between these profiles revealed no clear effect of land use. However, both profiles indicated a similar depth dependence of ε^{205}Tl, which increased from ~0.8 to 2.6 in the lowest C horizons to ~8.7 in the uppermost B horizons before decreasing again to ~2.5−4.8 in the superficial O horizons. Additional isotope data was collected on selected soil samples with contrasting Tl speciation from previous work. Overall, the data may point to an enrichment of heavy ^{205}Tl isotope by weathering and soil formation processes and its depletion by plant uptake [2].

In ongoing work, the Tl stable isotope record is evaluated in relation to variations in the speciation and chemical fractionation of soil Tl to underpin the interpretation of trends in Tl stable isotope ratios in relation to weathering and soil chemical processes.

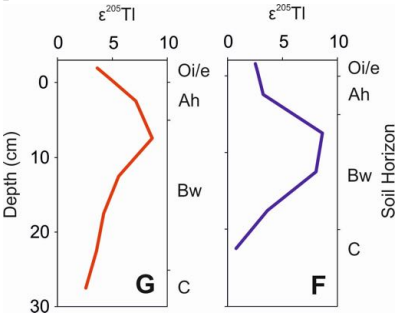

Fig. 1. ε^{205}Tl in two soil profiles. (G) Grassland; (F) Forest.

[1] Voegelin A. et al., Environ. Sci. Technol. 49, 5390−5398, 2015. [2] Vaněk et al., J. Hazard. Mater. 369, 521−527, 2019.