Geophysical Research Abstracts
Vol. 16, EGU2014-1380-3, 2014
EGU General Assembly 2014

Thallium isotope variations in anthropogenically-affected soils

Ales Vanek (1), Vladislav Chrastny (1), Vit Penizek (1), Martin Mihaljevic (2), Michael Komarek (1), and Jerzy Cabala (3)

(1) Czech University of Life Sciences Prague, Prague 6, Czech Republic (vaneka@af.czu.cz), (2) Charles University, Prague 2, Czech Republic, (3) University of Silesia, Sosnowiec, Poland

Our preliminary data from soils impacted by long-term Tl deposition in the vicinity of a primary/secondary Zn smelter at Olkusz (Poland) indicate apparent variability of ε205Tl within soil profiles. The identified ε205Tl values presented for the forest soil profile reached –1.7 in the surface/organic horizon, +1.9 in the organo-mineral horizon (Ap), and +1.0 in the mineral horizon (C). This finding suggests both the enrichment of 203Tl isotope in the topsoil, as well as its preferential release during smelting operations, as "lighter" Tl tends to enter the emissions during a high-temperature process. The maximum ε205Tl value in the subsurface horizon Ap is in accordance with the concentration peak of oxalate-extractable Mn, indicating the presence of amorphous/poorly-crystalline Mn oxides with a potential to isotopically fractionate Tl toward the "heavier" fraction. The Tl isotope signature in the bottom horizon probably reflects the composition of a local geochemical anomaly of Tl. However, a portion of mobile (anthropogenic) Tl with negative ε205Tl moving downwards in the soil profile cannot be neglected.
In general, there is no detailed information about the biogeochemical cycling and variations of Tl isotopes in areas affected by significant anthropogenic inputs of the metal (e.g., coal burning and primary metallurgy); the questions of the degree to which the factors such as soil (and sediment) chemistry, mineralogy, local biota, and pollution source control Tl isotope fractionation remain unresolved. Therefore, further research on the topic is needed before any principal conclusions will be made.