Geophysical Research Abstracts
Vol. 16, EGU2014-16803, 2014
EGU General Assembly 2014

The role of dissolved organic matter and its adsorption for the fate of heavy metals in clay-rich soil

Yasser B. Refaey (1,2), Boris Jansen (1), Abdel-Hamid El-Shater (2), Abdel-Aziz El-Haddad (2), and Karsten Kalbitz (1)

(1) University of Amsterdam, Institute for Biodiversity and Ecosystem Dynamics, Earth Surface Science, Amsterdam, The Netherlands (k.kalbitz@uva.nl), (2) Geology Department, Faculty of Science, Sohag University, P.O. Box 82524 Sohag, Egypt

Heavy metals (HMs), due to their toxic and hazardous nature, are possibly the most widespread contaminants imposing a serious threat to human health. To find out the effect of dissolved organic matter (DOM) and soil constituents on the uptake of Cu, Ni, and Zn, batch adsorption experiments were conducted using five soils sampled from Egypt. Sorption data were interpreted in terms of the initial mass (IM) isotherm model. In all soils, for all metals and in all experiments, the majority of the HMs were immobilized on the solid phase. The addition of DOM and timing thereof was found to play a pivotal role in determining the affinity of the HMs for the solid phase. When DOM and HMs were added simultaneously, Cu affinity decreased in Fe-(hydr)oxide rich soils (by 7%) and increased in soils poor in Fe-(hydr)oxide (by 6-10%). When DOM was added first, followed by HMs in a later stage affinity of Cu strongly increased in most soils. In contrast, for both Ni and Zn the affinity to the solid phase was enhanced (3-18%) in presence of DOM regardless of whether the DOM was added simultaneously with or prior to HMs addition. The difference is explained by Cu binding to the solid phase and to DOM through strong inner-sphere complexes, whereas Ni and Zn interacted predominantly through weaker electrostatic interactions. As a result Cu was able to bind more strongly to previously adsorbed DOM on the solid phase in case of smectite, while this effect was counteracted by the coating of available specific binding sites on Fe-(hydr)oxides.