SOIL SCIENCE COLLOQUIUM

Guest speaker

Tuesday 23rd of Nov 2021, 4.15 pm – 5.15 pm

When the good meets the evil: Impact of iron on antimony mobility in redox-dynamic soils

Dr Kerstin Hockmann
Department of Hydrology, University of Bayreuth

ABSTRACT. Antimony (Sb) is a priority pollutant of increasing concern. It is among the world's most-exploited metal(loid)s and is used in a vast array of products of our daily lives, such as textiles, plastics, alloys, and glassware. Antimony is also central to the development of a wide range of emerging so-called "green technologies". This has triggered surges in Sb production which, along with historic Sb mining activities, have led to extensive Sb release into the environment.

The environmental behaviour of Sb is tightly linked to sorption or co-precipitation reactions with iron (Fe) oxides. Understanding the interaction of Sb with Fe is therefore a key to understanding the metalloid's mobility in the environment. The reactivity of Fe minerals, however, is often dynamic, and many Fe oxides undergo mineralogical and geochemical changes in response to changes in environmental factors, which has also consequences for the mobility of Sb. For example, microbial reduction of Fe(III) oxides can release co-associated Sb under anaerobic conditions. Counteracting this release, the produced Fe(II) may catalyse rapid transformation processes of metastable Fe oxides, which have the potential to trap Sb into their structure. Our recent research also demonstrated that re-aeration of Fe(II)-rich water and subsequent of Fe(III) oxide precipitation may play an important role in immobilizing Sb. Interestingly, Sb had a substantial impact on the mineralogy and crystallinity of the newly formed Fe(III) oxides during these reactions, which in turn may also affect the behaviour of co-occurring contaminants or nutrients.

A robust understanding of Sb geochemistry redox dynamic environments is central to managing risks arising from Sb-impacted sites. This talk will present recent advances of our understanding of Fe-Sb interactions under redox-dynamic conditions. A special focus will be made on how the coupled redox geochemistry of Sb and Fe impacts Sb speciation in soils and how this translates into changes in Sb behaviour.

BIO. Dr Kerstin Hockmann obtained her doctoral degree from ETH Zurich at the Institute of Terrestrial Ecosystems on the topic "Antimony leaching from contaminated soil under changing redox conditions" for which she was granted the ETH medal award for outstanding doctoral thesis. Afterwards, she continued her research activities with an SNSF early postdoc mobility grant at the Southern Cross University in Australia at the GeoScience group with the project „Exploring the coupling of antimony mobility to sulphur transformations in anoxic environments." Since 2017 she is a Postdoctoral researcher at the University of Bayreuth as a part of the university's program "Outstanding Female Scholars" funded by the Female Professors Program of the German Federal Ministry of Education and Research. She is part of the Department of Hydrology of the Centre of Ecology and Environmental Research.

You are welcome to attend in person in Hallerstrasse 12, seminar room 002 or virtually in the Zoom seminar room.

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

" Characterization of colloidal antimony in soil pore water using Asymmetric Flow Field Flow Fractionation."