Geophysical Research Abstracts
Vol. 20, EGU2018-15527, 2018
EGU General Assembly 2018

Influence of mineral dissolution and organic matter decomposition on dissolved organic carbon and trace and major elements release in peat bog – microcosm and field studies

Ayokunle O. Akindutire and Harald Biester
Insitut für Geoökologie, AG Umweltgeochemie, Technische Universität, Braunschweig, Germany

Based on long term scale preservation assumption, historical atmospheric deposition records of trace lithogenic and pollutant elements are often inferred from depth profile studies in peat bog. Although increasing number of reports on porewater enrichment and export of elements from the bog present a contrary evidence of such records preservation, the major processes controlling the element release and mobilization in the bog are still not well understood. However, bog plants (especially Sphagnum mosses) are known for their bioaccumulation of elements and the biogeochemical conditions (e.g., low pH and high organic matter content) in bog are not favorable for mineral particles preservation. Hence, we here propose plant decay and mineral particle dissolution as the major processes controlling elements release from the bog. To investigate this, we have an ongoing monitoring of the progress of element release and the quality of dissolved organic carbon (DOC) in porewater samples of three 30 cm-peat microcosms in the lab and that of their corresponding field sampling location (FSL) in the Odersprung bog (OB), Harz Mountains, Germany, since November 2016. Additionally, three 50 cm-peat cores (one from each microcosm FSL) and randomly sampled 5 cm apical shoot of fresh vegetation and its partially decomposed underlying material (PDUM) from the OB were also analyzed. With SPSS Principal component analysis, two major components (consisting of group1: Pb, Cr, Ti, Zr, Al, As, V, Ni; group2: Ca, Mg, Fe, pH, Ba, Sr, As, Ni, Mn) in the microcosms and 3 to 4 major components (consisting of group1: Ti, Cr, Ni, REEs, Sr; group2: Mg, Ca, Mn) in the field could be identified. In the vegetation and its PDUM samples, 3 groups of elements (I: K, Mn, Rb - bioconcentrate in the living vegetation; II: Fe, Cr, As, Pb, Ti, V - accumulate in the PDUM; III: Ca, Zn, Ni, Sr - significantly present in both phases simultaneously) were also identified. The DOC did not consistently group with any of the components in the microcosms and in the field, but was up to factor of 5 greater in the microcosm. Group1 (which are mostly lithogenic and pollutant elements) and group2 (which are mostly nutrient and redox elements) components in the lab were, respectively, by a factor of > 2 and < 2 more than their corresponding field values. Based on these results, it appears that element enrichment from mineral dissolution and vegetation decomposition separately grouped together. We intend to corroborate these findings with decomposition proxies (e.g., C/N) in the porewater and peat samples and do microscopic analyses of the peat materials in further studies.