Geophysical Research Abstracts
Vol. 21, EGU2019-9, 2019
EGU General Assembly 2019

Trace and rare earth elements of Sphagnum mosses from the Upper Harz Mountains (Germany)

Elke Bozau (1) and Nina Zupančič (2)

(1) TU Clausthal, Hydrogeologie, Clausthal-Zellerfeld, Germany (elke.bozau@tu-clausthal.de), (2) University of Ljubljana, Geology, Ljubljana, Slovenia (nina.zupancic@geo.ntf.uni-lj.si)

Trace element concentrations of Sphagnum mosses can be used to estimate atmospheric deposition and to monitor air pollution (e.g., Anicic et al., 2009; Wojtun et al., 2013). However, there may also be rock-water-plant interactions as a second potential source of trace elements in Sphagnum mosses (e.g., Halbach et al., 1980). To distinguish between these two processes Sphagnum samples of the Upper Harz Mountains were collected on several litho-geological units (shale, quartzite and granite) and at variable altitudes in 2017 and 2018. The samples were carefully washed in deionized water, ground, digested with aqua regia and analyzed for main components, REE and trace elements by ICP-MS.

First results and statistical data interpretation (analysis of variance, cluster and factor analysis) do not allow for the clear identification of elements reflecting rock-water-plant interaction and/or atmospheric depositions. In contrast to the results of Zechmeister (1984), increasing elevation and increase in precipitation are not reflected in the samples studied. REE and U concentrations of the mosses sampled on granite are generally higher than the concentrations of samples from the other lithologic substrata. Therefore, REE and U could be tracers of litho-geological units from where the mosses were sampled. However, local inputs of soil and rock particles to atmospheric dust can also contribute to the measured concentrations of mosses. Compared to data from Poland and samples analyzed about 25 years ago, single trace metal concentrations (e.g., Fe and Pb) have decreased. This could indicate measures of air pollution control within the last decades. Our results confirm the conclusions of Aboal et al. (2010) that atmospheric deposition cannot be accurately estimated from the concentration of metals in moss tissues. Further studies (e.g., artificial moss samples, isotope ratios) and the investigation of other study areas with different rocks and climatic conditions (e.g., sea water contribution to rain water) are needed to improve tracers for atmospheric deposition and rock-water-moss interaction.

References:

Aboal, J.R., Fernandez, J.A., Boquete, T., Carballeira, A., 2010. Is it possible to estimate atmospheric deposition of heavy metals by analysis of terrestrial mosses? Sci. Tot. Environ. 408, 6291-6297.

Anicic, M., Tasic, M., Frontasyeva, M.V., Tomasevic, M., Rajsic, S., Mijic, Z., Popovic, A., 2009. Active moss biomonitoring of trace elements with Sphagnum girgensohnii moss bags in relation to atmospheric bulk deposition in Belgrade, Serbia. Environ. Poll. 157, 673-679.

Halbach, P., von Borstel, D., Gundermann, K.-D., 1980. The uptake of uranium by organic substances in a peat bog environment on granitic bedrock. Chem. Geol. 129, 117-138.

Wojtun, B., Samecka-Cymerman, A., Kolon, K., Kempers, A.J., 2013. Decreasing concentrations of metals in Sphagnum mosses in ombrotrophic mires of the Sudety mountains (SW Poland) since late 1980s. Chemosphere 91, 1456-1461.

Zechmeister, H.G., 1984. Correlation between altitude and heavy metal deposition in the Alps. Environ. Poll. 89, 73-80.