



## **Three decades after peak acid deposition: Environmental memories of legacy pollutant sulphate in the northern Czech Republic**

Anne Marx (1), Simone Hintze (1,2), Martin Sanda (3), Jakub Jankovec (3), Filip Oulehle (4), Jaromir Dusek (3), Tomas Vogel (3), Robert van Geldern (1), and Johannes A.C. Barth (1)

(1) Friedrich-Alexander-University Erlangen-Nuremberg (FAU), Department of Geography and Geosciences, GeoZentrum Nordbayern, Schlossgarten 5, 91054 Erlangen, Germany (anne.marx@fau.de), (2) Université de Neuchâtel, Centre d'Hydrogéologie et de Géothermie (CHYN), Rue Emile-Argand 11, 2000 Neuchâtel, Suisse, (3) Czech Technical University in Prague, Faculty of Civil Engineering, Thakurova 7, 166 29 Prague, Czech Republic, (4) Czech Geological Survey, Department of Environmental Geochemistry and Biogeochemistry, Klárov 3, 118 21 Prague, Czech Republic

A hydrological and physicochemical analysis was conducted in the granitic Uhlirská headwater catchment (1.78 km<sup>2</sup>) located in the Jizera Mountains in the northern Czech Republic. Due to its location in the Black Triangle (an area with excessive acid rain deposition in the 1980s) it received among the highest inputs of anthropogenic acid depositions in Europe. An analysis of sulphate distribution in deposition, soil water, stream water and groundwater compartments allowed to establish a sulphate mass-balance (deposition input minus surface water export) and helped to evaluate which changes occurred since the last evaluation of the catchment in 1997. The determined sulphate concentrations decreased in the following order:

peatland groundwater > groundwater from 20 m below ground level (bgl) > groundwater from 30 m bgl > stream water > groundwater from 10 m bgl > hillslope soil water > peatland soil water > bulk deposition. Our results show that average deposition reductions of 62 % did not result in equal changes of the sulphate mass-balance, which changed by only 47 %. This difference indicates that sulphate must have been stored over decades in the catchment and still originates from internal sources such as the groundwater body and peatland soil. This suggests that the Uhlirská catchment is subject to delayed recovery from anthropogenic acid depositions and remains a net source of stored sulphur even after three decades of declining inputs. Elevated stream water sulphate concentrations after the unusually dry summer 2015 may imply importance of weather patterns for future recovery from acidification.