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Are there signs of acidification reversal in freshwaters of the low mountain ranges in Germany?

C. Alewell[1], M. Armbruster[2], J. Bittersohl[3], C. D. Evans[4], H. Meesenburg[5], K. Moritz[3], and A. Prechtel[1]

[1]Department of Soil Ecology, BITÖK, University of Bayreuth, D-95440 Bayreuth, Germany

[2]Institute of Soil Science, Technical University of Dresden, D-01735 Tharandt, Germany

[3]Bavarian Water Management Agency, D-80636 Munich, Germany

[4]Centre for Ecology and Hydrology, Wallingford, Oxon, OX10 8BB, United Kingdom

[5]Forest Research Institute of Lower Saxony, D-37079 Göttingen, Germany

Email for corresponding author: christine.alewell@bitoek.uni-bayreuth.de

Abstract. The reversal of freshwater acidification in the low mountain ranges of Germany is of public, political and scientific concern, because these regions are near natural ecosystems and function as an important drinking water supply. The aim of this study was to evaluate the status and trends of acidification reversal after two decades of reduced anthropogenic deposition in selected freshwaters of the low mountain ranges in the Harz, the Fichtelgebirge, the Bavarian Forest, the Spessart and the Black Forest. In response to decreased sulphate deposition, seven out of nine streams investigated had significantly decreasing sulphate concentrations (all trends were calculated with the Seasonal Kendall Test). The decrease in sulphate concentration was only minor, however, due to the release of previously stored soil sulphur. No increase was found in pH and acid neutralising capacity (defined by Reuss and Johnson, 1986). Aluminum concentrations in the streams did not decrease. Thus, no major acidification reversal can currently be noted in spite of two decades of decreased acid deposition. Nevertheless, the first signs of improvement in water quality were detected as there was a decrease in the level and frequency of extreme values of pH, acid neutralising capacity and aluminium concentrations in streams. With respect to nitrogen, no change was determined for either nitrate or ammonium concentrations in precipitation or stream water. Base cation fluxes indicate increasing net loss of base cations from all ecosystems investigated, which could be interpreted as an increase in soil acidification. The latter was due to a combination of continued high anion leaching and significant reduction of base cation deposition. No major improvement was noted in biological recovery, however, initial signs of recovery were detectable as there was re-occurrence of some single macroinvertebrate species which were formerly extinct. The results of this study have important implications for water authorities, forest managers and policy makers: the delay in acidification reversal suggests a need for ongoing intensive amelioration of waters, a careful selection of management tools to guarantee sustainable management of forests and the reduction of nitrogen deposition to prevent further acidification of soils and waters.

Keywords: freshwater, acidification reversal, drinking water supply, forested catchments, Germany

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