Patterns of stable S isotopes in a forested catchment as indicators for biological S turnover

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Despite intensive biogeochemical research during the last thirty years, the relative importance of biological S turnover for the overall SO42- budget of forested catchments remains uncertain. The objective of the present study was (i) to gain new insight into the S cycle of the Lehstenbach catchment (Northeastern Bavaria, Germany) through the analysis of stable isotopes of S and (ii) to differentiate between sites which are 'hot spots' for SO42- reduction and sites where mineralization and adsorption/desorption processes are more important. The delta(34)S values and SO42- concentrations of soil solutions, throughfall and groundwater at four different sites as well as runoff of the catchment were measured. The relatively low variability of delta(34)S in throughfall and bulk precipitation was in contrast to the high temporal and spatial variability of delta(34)S in the soil solution. Sulfate in the soil solution of upland sites was slightly depleted in S-34 compared to input values. This was most likely due to S mineralization. Sulfate in the soil solution from wetland soils was clearly enriched in S-34, indicating dissimilatory SO42- reduction. The observed spatial and temporal patterns of S-34 turnover and SO42- concentrations might explain the overall balanced S budget of the catchment. At a time of decreasing anthropogenic deposition SO42- is currently released from upland soils. Furthermore, mineralization of organic S may contribute to SO42- release. Wetland soils in the catchment represent a sink for SO42- due to dissimilatory SO42- reduction.

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