Reversibility of soil solution acidity and of sulfate retention in acid forest soils

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To quantify the effects of reduced sulfate input on the chemistry of soil solution and soil S storage in acid forest soils, an experiment with undisturbed soil columns from two different sites was implemented. The acid cambisol of the Solling is subjected to a high sulfate input and especially the B-horizon has a high sulfate content. On the contrary, the podzol of the Fuhrberg site is subjected to low input and has low sulfate content. Undisturbed soil columns were taken from both sites and were irrigated at 6-degrees-C with a precipitation rate of 3 mm d-1 over 10 mo. In treatment No. 1, an artificial throughfall with pH 5.2 and reduced sulfate load (45 mumol L-1) was applied. In treatment No. 2, an artificial througfall representing a high sulfate deposition (427 mumol L-1, pH 3.2) was used. In case of the Solling soil, the pH of soil solution was unaffected by treatments during the entire experiment. Alkalinity of the soil solution was slightly increased in treatment No. 1 at a depth of 20 cm. While treatment No. 1 resulted in a reduction of the sulfate concentrations of the soil solution in the top soil, sulfate concentrations were unaffected at a depth of 40 cm. The B-horizon of the Solling soil prevented deacidification of the soil solution by desorption of previously stored sulfate. In case of the Fuhrberg soil, treatment No. 1 resulted in reduced sulfate concentrations of the soil solution even in deeper soil layers with concentrations approaching input levels. The pH of the solution was slightly elevated and the alkalinity of the solution increased. Organic S compounds in the soil seemed to have no influence on sulfate release in either soils.

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