Geophysical Research Abstracts, Vol. 7, 01149, 2005
SRef-ID: 1607-7962/gra/EGU05-A-01149

The effect of acid deposition on ion leaching and weathering rates of an Andosol and a Cambisol.

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An evaluation of the respond of an Andosol and a Cambisol to acid deposition and weathering rates was studied by using a controlled laboratory leaching experiment. Both soils where derived from basic parent material, a Histic Andosol from Western Iceland and a Cambisol from North East Scotland. De-ionized water and water acidified with H_2SO_4 (pH 3) was leached through reconstructed soil columns to simulate 34 years of precipitation. Soil solution leachates where collected weekly for chemical analyses. Measured cations were Ca, Mg, Fe, Na, K, Mn and Si. Measured anions were $SO^{2-}_{4,}Cl^{-}$ and NO^{-}_{3}. Cations from soil solution samples were used to calculate weathering rates of both soil types.

Acidic input increased cation and anion leaching in both soil types and reduced pH levels. The Andosol proved generally to have higher weathering rates, which were calculated according to Zulla & Billet (1994), leaching potential, ion exchange and buffering capacity. This was due to differences in parent material and mineral composition. The Andosol developed from volcanic tephra, which had higher dissolution rates due to its amorphous mineral structures. The Cambisol was developed from gabbro with more stable mineral structures.

Towards the end of the experiment, after 26.6 equivalent years of acid deposition, the Andosol pH values decreased rapidly. At lower pH values SO_4^{-2}concentrations where higher in the output solution than the input solution. This was due to the Andosol sampling location, 300 m from a smelting factory. The Andosol was therefore receiving SO_4^{-2}input from the factory prior to the experiment, suggesting a build up of SO_4^{-2}in the soil. After intense acid leaching and weathering, pH values decreased due to a decline in the buffer capacity of the Andosol resulting in increased SO_4^{-2}concentrations

in leachates.

Andosol is a soil type known for its great capacity to retain pollution due to its

variable charge surfaces and high cation exchange capacity. This experiment shows however that despite the Andosol great capacity to receive pollution, exchange sites can be fully occupied as a consequence of intense leaching of pollutants. This would lead to a decrease in the soil buffering capacity and leaching of pollutants to ground-water until a new equilibrium is reached.

References

Zulla, Y., & M.F. Billet. 1994. Long-Term Changes in Chemical-Weathering Rates between 1949-50 and 1987 in Forest Soils from Northeast Scotland. EJSS. 45:327-335.