Geophysical Research Abstracts, Vol. 8, 09179, 2006
SRef-ID: 1607-7962/gra/EGU06-A-09179

Beryllium-7 Rainfall Input and Mobility in acidified Soils

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The rainfall input and the transport of Beryllium-7 in the upper soil zone of acidified soils in the Black Forrest was investigated. The investigations were carried out in order to provide experimental data on the mobility of Beryllium-7 in acidified soils. Beryllium-7 is one of the cosmogenic radionuclide that is produced in the stratosphere and troposphere through spallation and reaches the earth-surface by wet and dry deposition. It decays with a half-live of 53 days via electron capture, accompanied by the emission of a 477,6 keV gamma ray.. It is an element of the second group of the periodic table, and has a small ion radius. For this investigation the Beryllium-7 activities in the samples were measured with a HPGe gamma spectrometer by the Federal Office for Radiation Protection. Analysis of the rainwater samples showed that most of the Be-7 in wet precipitation is absorbed on dust particles with diameters of more than 10 μm, only a little fraction is attached to particles smaller than 0.45μm or dissolved. Acidification of the rainwater shifts the fractions of dissolved Beryllium-7 to particles or complexes smaller than 0.45μm. The net input of Beryllium-7 by rainfall during the monitoring period amounted to 1.25 mBq/l. The mobility of Beryllium-7 in soil columns was studied using undisturbed soil samples taken from the first 10 cm of 3 acidified soil profiles. The samples were exposed to infiltration experiments with Beryllium-7 containing rainwater under controlled laboratory conditions. The turnover of the experiment corresponded to the annual amount of rainfall. While up to 90 % of Beryllium-7 were absorbed on the soil columns during the infiltration experiments a fraction of 10% was found to pass the first 10 cm of the acidified soils. These experimental findings confirm the general tendency of Beryllium-7 to be absorbed on

mineral and organic surfaces of soils. However, the observed existence of dissolved fractions passing the topsoil indicate an increased mobility in acidified soils.