Predicting reversibility of acidification : the European sulfur story

ID 86903
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Year 2001
Title Predicting reversibility of acidification : the European sulfur story
Journal Water, air and soil pollution
Volume 130
Number 1-4
Pages / **Article-Number** 1271-1276
Because of the deleterious effects of acid rain and the need to predict reversibility of acidification, various scientific tools such as modeling, stable isotopes and flux/budget calculations have been used in biogeochemical sulfur (S) research. The aim of this study was to evaluate consistencies and discrepancies between these different tools. While modeling has been seemingly successful in predicting S dynamics in soil solution and stream water by considering inorganic sulfate sorption and desorption only, stable S isotopes indicate that biological S turnover plays a crucial role for the sulfate released to soil solution and stream water. A comparison of budget calculations with soil S pools reveals that inorganic sulfate sorption and desorption are the controlling processes as long as deposition is high (>15 kg S ha(-1)yr(-1)) and soils have a high sulfate sorption capacity. This explains the successful model predictions of the last two decades. However, for soils with low sulfate sorption capacity and under low sulfate deposition, organic S seems to be a significant source for stream water sulfate and has to be considered in future modeling.

Publisher Kluwer
ISSN/ISBN 0049-6979
edoc-URL http://edoc.unibas.ch/dok/A5251174
Full Text on edoc No;
Digital Object Identifier DOI 10.1023/A:1013989419580
ISI-Number WOS:000172012000060