Reduction processes in forest wetlands : tracking down heterogeneity of source/sink functions with a combination of methods

Author(s) Alewell, C.
Author(s) at UniBasel Alewell, Christine ;
Year 2006
Title Reduction processes in forest wetlands : tracking down heterogeneity of source/sink functions with a combination of methods
Journal Soil biology & biochemistry
Volume 38
Number 5
Pages / **Article-Number** 1028-1039
Keywords wetland soils, reduction processes, sulfate retention, CH4 emissions, sequential reduction chain
Wetlands are considered to be the biggest unknowns regarding the influence of global climate change on element dynamics, so knowledge of processes and conditions controlling sink and source functions of redox processes is crucial. The aim of this study was to investigate the sink/source function of nitrate, Fe, sulfate reduction and methanogenesis of an upland and a lowland fen within a boreal spruce catchment, southern Germany. We used suction cups and anaerobic dialysis chambers for soil solution sampling, FeS probes for the determination of S oxidation potential and stability of anoxic conditions and analysis of the soil solid phase (contents of C, S and Fe species). Both fens had high rates of nitrate reduction and potentially high rates of CH4 production. The upper few cm of all profiles were oxic with low CH4 concentrations, suggesting low CH4 emission rates from the soil, though emission by vascular plants cannot be excluded. Sulfate and Fe reduction processes differed significantly in the fens. The upland fen was characterized by relatively stable anoxic conditions, low Fe contents but high contents of organic S and low C/S ratios. We concluded that the upland fen is an effective sink for sulfate with long-term S storage. In contrast, the lowland fen was characterized by alternating oxidation-reduction cycles with high Fe contents, lower contents of organic S and higher C/S ratios. Thus, even though low sulfate and high Fe concentrations in soil solutions indicated high reduction rates in the lowland fen, long-term storage of S is not likely in this fen. Differences in biogeochemical processes between sites are most likely not associated with hydrology but rather with the role of vascular plants.
Publisher Pergamon Press
ISSN/ISBN 0038-0717
edoc-URL http://edoc.unibas.ch/dok/A5251157
Full Text on edoc No;
Digital Object Identifier DOI 10.1016/j.soilbio.2005.09.001
ISI-Number ISI:000237545900020
Document type (ISI) Article