Geophysical Research Abstracts,
Vol. 10, EGU2008-A-02740, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-02740
EGU General Assembly 2008

Tracing biogeochemical processes in small catchments using non-linear statistics

G. Lischeid (1), P. Krám (2), C. Weyer (3)

(1) Ecological Modelling, University of Bayreuth, Dr.-Hans-Frisch-Str. 1-3, D-95440 Bayreuth, Germany (Gunnar.Lischeid@bayceer.uni-bayreuth.de); (2) Department of Environmental Geochemistry and Biogeochemistry, Czech Geological Survey, Klarov 3, CZ-11821 Prague 1, Czech Republic (pavel.kram@geology.cz); (3) Ecological Modelling, University of Bayreuth, Dr.-Hans-Frisch-Str. 1-3, D-95440 Bayreuth, Germany (Christina.Mohr@bayceer.uni-bayreuth.de)

Since the 1980s a variety of biogeochemical catchment studies have been set up to investigate the cycling of water and solutes. Groundwater and streams have been sampled to investigate the dominant processes of solute turnover in the subsoil and to monitor their long-term changes. Usually a variety of processes interact, partly in a highly non-linear manner. Consequently, identifing the dominant processes is not an easy task. In this study, a non-linear variant of the principal component analysis was used to identify the dominant processes in groundwater and streamwater of two forested catchments in the East Bavarian-West Bohemian crystalline basement. The catchments are approximately 60 km apart, but exhibit similar bedrock, soils, climate, land use and atmospheric deposition history. Both have been monitored since the end of the 1980s until today, that is, during a period of dramatic decrease of atmospheric deposition of sulphur and accompanying base cations. Time series of component scores at different sites were investigated. Non-linear long-term trends were determined using a low-pass filter based on a Lomb-Scargle spectrum analysis. The first four components accounted for 94% of the variance of the data set. The component scores could be interpreted as quantitative measures of biogeochemical processes. Among these, redox processes played a dominant role even in apparently oxic parts of the aquifers. Low-pass filtered time series of the component scores showed consistent, although mostly non-linear trends in both catchments.