



Analyzing long-term streamwater chemistry with complexity measures

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Long time series of environmental variables are reflecting the dynamics of ecosystems and catchments. We investigate data from a long-term monitoring site in Germany, the Bramke valley in the Harz mountains, where time series of ion concentrations in stream water are obtained since the 1970ies at four measurement locations from three small catchments.

The forested watershed exhibits long-term changes related to atmospheric deposition, management and changing climate. We present a number of diagnostic measures, based on symbolic dynamics or order statistics, which quantify the information content and the complexity of the time series. The ability of the measures to detect subtle changes and to describe individual as well as collective behaviour, both between different ions as well as across catchments, is demonstrated. The detection of these changes is remarkable, because linear trends have already been removed prior to analysis. Hence, the presence of these changes reflects intrinsic changes in the patterns of the time series, and are further investigated from an ecological viewpoint.