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Assessing anthropogenic pressure on catchments using the correlation dimension approach

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It has been argued that most of the available hydrological models are highly over-parameterized with respect to available data. The reasons relate to the complexity of model structure, but also to the lack of extracting effective information hidden in the data. Therefore, how to utilize the hidden inherent information of data gains considerable interest. The correlation dimension (CD) method (Grassberger and Proccacia, 1983), applied to time series according to Takens (1981), is one way to assess the intrinsic dimensionality. It can provide an assessment of the minimal number of hydrological processes that is required to map the observed dynamics. Strong anthropogenic pressure on hydrological processes is assumed to increase the intrinsic dimensionality of the observed discharge. In this study, we applied the CD method to observed discharge data of 42 catchments (located in the Federal State of Brandenburg, Germany) and classified these catchments into different groups using empirical cumulative distribution functions. The intrinsic dimensionality of these catchments ranged from 2.2 to 5.8. In a next step, the reasons for different dimensionalities of the observed hydrographs were investigated. In addition, it was studied whether anthropogenic pressure (i.e. land use types, changing groundwater levels, urbanisation, etc.) had an impact on the dimensionality.

Grassberger, P., Procaccia, I. (1983): Measuring the Strangeness of Strange Attractors. Physica D: Nonlinear Phenomena 9 (1[U+2012]2): 189[U+2012]208.
Takens, F. (1981): Detecting strange attractors in turbulence. In Rand, D.A., Young, L.-S.: Dynamical Systems and Turbulence. Lecture Notes in Mathematics 898: 366-381