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The frequency of unusual hydrological events, a measure of hydrometeorological complexity

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The behavior of catchments can best be understood under unusual conditions.
Unusual hydrological events can be defined on the basis of precipitation or discharge time series. Observations corresponding to a number of consecutive days (3 to 7) are considered as a vector in a multidimensional space. Such a vector is considered as unusual if it lies on or near the boundary of the set of all such vectors. The half-space depth can be used to detect these points. It can be shown that these events are sufficient to calibrate hydrological models. Thus in order to obtain a measure of hydrometeorological complexity the time series of the occurrence of unusual events can be used. The curves corresponding to discharge and precipitation show similar behavior for non snow dominated catchments. The slope of the curves provides information for the length of the record necessary for model calibration. Examples from different German and US catchments illustrate the methodology.