Geophysical Research Abstracts, Vol. 9, 09392, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-09392

The use of Compositional Data to classificate rainfall events: Application to rainfall intensities in Catalonia (Spain)

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Intensity-Duration-Frequency (IDF) curves are a very important statistical summary of precipitation events used for hydrologic engineering design. Hyetographs are a useful tool to describe precipitation events as well.

In this work, different methods for classification of rainfall events on the basis of their hyetographs are discussed. Among them, a method based in a Compositional Data approach is presented.

In compositional data analysis only the relative magnitudes of the components of a composition matter, not their absolute values (e.g. concentrations, percentages, probability vectors . . .). The development of the statistical methods for compositional data has lead to the characterization of the structure of the simplex (sample space) as a Euclidean space, the so-called Aitchison geometry. The geometric structure of the simplex has consequences in the statistical development of this data type and the reinterpretation of many statistical concepts. This approach has been used succesfully with wave-height data and seems to be also suitable for daily rainfall data.

This work includes a thorough discussion of the validity of the assumptions introduced and a first application to the intensity series of the Fabra Observatory (Barcelona, Spain). The methodology presented here has important implications for improved design procedures of water resources and hydrologic systems.