

A multivariate approach to environmental- and structural-risk in hydrology

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The concept of return period is fundamental for the design and the assessment of many engineering works. In a multivariate framework, several approaches are available for its definition, each one yielding a different solution. A consistent theoretical framework for the calculation of return periods in a multidimensional environment will be outlined, based on Kendall’s measure. This approach solves the problems raised in previous publications concerning the coherent foundation of the notion of return period in a multivariate setting. In turn, the notions of environmental- and structural-risk will be discussed, and suitable techniques for the multivariate design of structures will be sketched. In addition, a puzzling “dimensionality paradox” will be presented. Finally, some of the problems raised by the presence of ties (i.e., repeated data) in environmental observations, which represents a theoretical challenge, will be discussed, and empirical solutions proposed. As an illustration, practical hydrological case studies will be presented.

This talk is based on joint work with Fabrizio Durante and Carlo De Michele.

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