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On the return period and design in a multivariate framework (STAHY Best Paper Award Lecture)

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Calculating return periods and design quantiles in a multivariate environment is a difficult problem: this paper tries to make the issue clear. First, we outline a possible way to introduce a consistent theoretical framework for the calculation of the return period in a multi-dimensional environment, based on Copulas and the Kendall's measure. Secondly, we introduce several approaches for the identification of suitable design events: these latter quantities are of utmost importance in practical applications, but their calculation is yet limited, due to the lack of an adequate theoretical environment where to embed the problem. Throughout the paper, a case study involving the behavior of a dam is used to illustrate the new concepts outlined in this work.

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