Multivariate hydrological frequency analysis for extreme events using Archimedean copula. Case study: Lower Tunjuelo River basin (Colombia)

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By analyzing the spatial and temporal variability of extreme precipitation events we can prevent or reduce the threat and risk. Many water resources projects require joint probability distributions of random variables such as precipitation intensity and duration, which can not be independent with each other. The problem of defining a probability model for observations of several dependent variables is greatly simplified by the joint distribution in terms of their marginal by taking copulas. This document presents a general framework set frequency analysis bivariate and multivariate using Archimedean copulas for extreme events of hydroclimatological nature such as severe storms. This analysis was conducted in the lower Tunjuelo River basin in Colombia for precipitation events. The results obtained show that for a joint study of the intensity-duration-frequency, IDF curves can be obtained through copulas and thus establish more accurate and reliable information from design storms and associated risks. It shows how the use of copulas greatly simplifies the study of multivariate distributions that introduce the concept of joint return period used to represent the needs of hydrological designs properly in frequency analysis.