



Stochastic generation of flood events to extend observed hydrological series by combining a copula model with hydrometeorological modelling

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A multivariate flood frequency analysis is required for designing some structures like dams. Multivariate copula models are usually used to obtain joint return periods of the flood variables. There exist several families of copulas and a selection procedure is required to find the copula that best fits the observations. Moreover, observed hydrological series are usually short and the fit of the right tail of the copula remains highly uncertain. In this work, a procedure to extend short observed series is proposed by the use of both hydrometeorological modelling and a copula model to generate synthetic hydrographs. The procedure takes synthetic rainstorms events generated by the RainSim software as input. The RIBS rainfall-runoff model is used to simulate the hydrological processes in the basin. The procedure was tested in the Santillana reservoir in Spain, where both RainSim and RIBS models were calibrated prior to this study. A sensitivity analysis was conducted in order to find the minimum synthetic length that makes the copula selection process robust enough. As computational time of hydrometeorological modelling is not negligible, the extended record from modelling results could be re-extended by the fitted copula, reducing the computation time. This final extended hydrological series can be used to improve flood risk assessment studies.

Key words: Stochastic generation, copulas, rainfall-runoff modelling

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