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Joint Distribution of Rainfall Characteristics: Intensity, Total Depth, Spatial and Temporal Moments

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Determination of peak flow or flow hydrograph in ungauged basins can be affected by considerable degree of uncertainty. Despite the considerable efforts to overcome this challenge, current methods provide design flood estimates that are still highly uncertain in ungauged catchments, even in the UK where the gauged network is relatively dense. A possible solution may be found in stochastic approaches and more specifically in the Derived Flood Frequency method, which gives the possibility to decompose runoff response effects dictated by the dominant hydrological processes for a catchment under study. Data scarcity can be then circumvented by application of UK-specific stochastic models, from which rainfall events and their relevant features are sampled. In this work, the latter rainfall model will be presented as a joint distribution function of spatial and temporal moments of catchment rainfall, along with their Intensity and Total Depth. The marginal distributions for each rainfall characteristic are studied through the L-moment method, which was previously developed for regional frequency analysis. The multivariate distribution of these rainfall characteristics will be described through the Vine Copula method, which can account for dependence very flexibly among several variables. Parameterisation procedures still require more development to allow application over ungauged case of studies.