The presence of flood divides, which are discontinuities or abrupt shifts in flood frequency curves, makes it challenging to accurately estimate the likelihood of rare floods. Such shifts in flood frequency curves have significant implications for hydrologic design. Additionally, fitting a smooth distribution on limited flood data that does not well represent the shift, may result in an underestimation of flood discharges. There are numerous process-based approaches in literature for understanding the occurrence of flood divides and identifying the potential factors contributing to their emergence. Despite numerous studies, there is a lack of consistent descriptors for flood divide. In this work, a new approach is proposed to combine hydroclimatic records and hillslope connectivity (Michalek et al., 2023) to explain the occurrence of the flood divide. It consists of i) determination of flood divides using a mechanistic-stochastic approach and empirical approach (Miniussi et al., 2023), ii) estimation of the Index of Connectivity (IC) of the catchment, which refers to the linkage of upstream sources and downstream transport pathways, iii) estimation of general additive model for location, scale, and shape (GAMLSS) using IC and hydroclimate data as drivers in a catchment. This approach is aimed to provide reliable descriptors of flood divides for a wide range of catchments located across different hydroclimatic zones. The methodology is demonstrated through several case studies of CAMELS datasets. This work can be extended to understand the impact of climate change on hillslope connectivity and interplay in increasing the magnitude of rare floods. Furthermore, it elucidates flood divides as an emergent property arising from the interplay between climate and landscape processes.

**References:**

