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Flood-rainfall scaling properties for regional flood-duration-frequency modeling

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Flood frequency data for different durations of flood hydrographs are required in many practical hydrologic applications. Estimation of flood frequency as an integrated function of return period and flood duration can be accomplished by flood-duration-frequency (QdF) models. This study introduces a new approach to regional QdF modeling based on scaling properties of combined flood-rainfall events. The proposed regional scaling QdF model has only one local parameter, which accounts for site-specific physiographic characteristics. The regional parameters of the model are determined from statistical properties of regional rainfall depth-duration-frequency curves. The main advantage of the proposed approach is that it relies on rainfall data, which are spatially and temporally more abundant than streamflow data, and usually available also in hydrologically ungauged areas. The regional scaling QdF model was applied to a set of homogeneous catchments in south-western Ontario, Canada. The performance of the model was compared to the performance of the regional converging QdF model by means of a jack-knife procedure. The results showed that the proposed approach significantly outperformed the former QdF model, leading to quantile estimates with 3-times lower average bias and RMSE. The proposed model based on flood-rainfall scaling properties seems to be a promising alternative for the regional QdF modeling of floods in the study area.