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The index–flood and the GRADEX methods combination for flood frequency analysis.

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Flood frequency analysis is used in many applications, including flood risk management, design of hydraulic structures, and urban planning. However, such analysis requires of long series of observed discharge data which are often not available in many basins around the world. In this study, we tested the usefulness of combining regional discharge and local precipitation data to estimate the event flood volume frequency curve for 63 catchments in Mexico, Central America and the Caribbean. This was achieved by combining two existing flood frequency analysis methods, the regionalization index–flood approach with the GRADEX method. For up to 10–years return period, similar shape of the scaled flood frequency curve for catchments with similar flood behaviour was assumed from the index–flood approach. For return periods larger than 10–years the probability distribution of rainfall and discharge volumes were assumed to be asymptotically and exponential-type functions with the same scale parameter from the GRADEX method. Results showed that if the mean annual flood (MAF), used as index–flood, is known, the index–flood approach performed well for up to 10 years return periods, resulting in 25% mean relative error in prediction. For larger return periods the prediction capability decreased but could be improved by the use of the GRADEX method. As the MAF is unknown at ungauged and short–period measured basins, we tested predicting the MAF using catchments climate–physical characteristics, and discharge statistics, the latter when observations were available for only 8 years. Only the use of discharge statistics resulted in acceptable predictions.