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Analysis of spatiotemporal rainfall objects in hydrological ensemble forecast predictions

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Initial works on forecasting focused their efforts on one-dimensional precipitation time-series analysis. However, rainfall phenomena are sometimes quite heterogeneous and spatially variable in space and time, especially in extreme events. To address this issue, an integrated approach might be needed, where not only the spatio-temporal variability of rainfall is considered, but also the uncertainty that is present in forecasting. The objective of this research is to analyse the relationship between spatio-temporal rainfall objects estimated from numerical weather prediction models and their hydrological response in a river basin. It is assumed that a better understanding of this relation could help to characterize and forecast extreme phenomena. For this study, the Dapoling-Wangjiba catchment is evaluated, where observed precipitation and discharge data from 2006 to 2009 were available. The analysis is based on four main components: first, the rainfall perturbed members data are obtained through the TIGGE dataset from ECMWF. Second, the object-based methodology ST-CORA is used in order to characterize the possible rainfall events via its spatio-temporal characteristics such as centroid, spatial coverage and duration. Third, a fully distributed and calibrated HAPI model is used for obtaining a simulated discharge in the catchment outlet and finally, an analysis between the statistics of the object's characteristics and the hydrological response is carried out. The results of this research are expected to be used in future improvements on how forecasting and early warning and nowadays emitted and understood.