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Pattern recognition techniques in estimation of rainfall extreme events spatiotemporal characteristic: case study of a subtropical catchment in south-eastern Brazil

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Characteristics of rainfall events such as magnitude, duration and spatial extension determine the level of damage associated with natural hazards. This research uses pattern recognition techniques to estimate spatiotemporal characteristics of rainfall extreme events. A two-step approach is applied: First, the analysis in time is carried out where statistical information (mainly quantiles) is obtained for each cell. Second, a spatial 3D cluster analysis method is used to identify connected components of extreme rainfall events. This approach is applied to Near-Real-Time (NRT) satellite-derived rainfall products using connected component labelling cluster algorithm in three-dimensions. By using the 90th quantile threshold to denote an extreme condition, four types of rainfall events are defined: (1) local and short magnitude events, (2) long temporal duration events, (3) large spatially extension events and (4) spatially extended and long temporal duration events. Here a skill score evaluation of NRT satellite derived rainfall products is performed to assist the detection of these different type of extreme events. In this research, four NRT satellite products (CMORPH, PERSIANN-GCCS, TRMM-RT and the Hydro-Estimator) are compared against the recently released Multi-Source Weighted Ensemble Precipitation MSWEP (our reference model) in a subtropical catchment in southeastern Brazil during monsoon seasons from 2007 to 2014. The presented methodology allows for clustering and visual representation of spatial intensity, location and extension, as well as for classifying the dominant type of events in the region. Results show that CMORPH showed the best performance (close to the reference) for identifying different types of spatiotemporal extreme events in the study area. Further research is aimed at linking this approach to hydrological flood modelling.