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Regional frequency analysis of extreme precipitation for Sicily (Italy)

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The analysis of extreme precipitation has always been included among most relevant hydrological applications because of the several important activities linked to the availability of tools for the estimation of extreme rainfall quantiles. These activities include the design of hydraulic civil structures and the evaluation and management of hydraulic and hydrological risk.

In this study a frequency analysis of annual maxima precipitation measurements has been carried out for the area of Sicily (Italy). A typical hierarchical regional approach has been adopted for the parameter estimation procedure based on the L-moments method. The identification of homogeneous regions within the procedure has been pursued with a data driven procedure constituted by a principal component analysis of an ensemble of selected auxiliary variables, and a K-means cluster analysis algorithm. Auxiliary variables comprise meteo-climatic information and a representation of the average seasonal distribution of intense events. Results have been evaluated by means of a Monte Carlo experiment based on the comparison between at-site and regional fitted frequency distributions. Moreover, results have been compared with previous analyses performed for the same area.

The study provides an updated tool for the modelling of extreme precipitation for the area of Sicily (Italy), with different features respect to previous tools both in terms of definition of homogeneous zones and in terms of parameters of the frequency distribution. Meteo-climatic information and the seasonality of extreme events retrieved from the dataset has been proficuously exploited in the analysis.