



## **Regional frequency analysis of rainfall extremes in Tuscany**

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The first and second level of a hierarchical regional frequency analysis of rainfall extremes, in Tuscany, are here described. Over a territory of about 22000 km<sup>2</sup>, the time series, more than 10 years long, of annual maximum of rainfall height, for storm duration ranges from 1 to 24 hours, have been investigated. In particular, 295 time series, in the period from 1923 to 2002, of 470 rain gauges, characterized by a low spatial correlation and included in each of the five dataset (i.e. storm durations 1, 3, 6, 12, 24 hours), have been analysed and the statistical homogeneous zones and sub zones have been defined using the L-moments method. Using a joint maximum likelihood procedure the parameters of a two component extreme value distribution have been evaluated. For each sub zones, the growth factors, of the second level of the hierarchical regional frequency analysis, have been estimated. A third level of the regional frequency analysis is also here proposed, using the Mean Annual Precipitation (MAP), as the multiplicative index value of the grow factor, to evaluate the rainfall value, for storm duration from 1 to 24 hours and a given recurrence interval, in any location of the studied territory. Daily registrations from 1970 to 2004 of a dataset of 601 rain gauges have been analysed to obtain the MAP value at each gauged site. Inverse distance weighted method have been used to elaborate the spatial distribution of MAP in the analysed territory. The relation between MAP and the rainfall extreme value at the rain gauge sites for a given storm duration and an assigned recurrence interval, is also investigated.