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A statistical characterization of the Northern Italy rainfall regime through a precipitation events classification

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Several approaches exist in the literature about the study of the spatial-temporal characteristics of the precipitation. In the most part of the operational cases the rainfall fields are obtained through interpolation techniques starting from the ground raingauges network observations, while in other cases space-continuous fields are available from satellite or meteo-radar estimates. Approaches for the study of the characteristics of these datasets are constituted, for instance, by the formulation of stochastic models that describe the correlation structures between the time series of the single cells of the domain or by the study of the multi-fractal properties of the field. In this study, an approach based on the definition of "precipitation events" is proposed, in order to statistically characterize the space-time variability of the rainfall regime in a given region. For this purpose, given a 3D rainfall field (a temporal sequence of 2D continuous rain maps) an "event" is defined as an aggregate, continuous in time and space, of cells whose rainfall height value is above a certain threshold. Given this definition it is possible to classify, on a given region and for a given period, a population of events and characterize them with of a number of statistics, such as their total volume, maximum spatial extension, duration, average intensity, etc. The probability distribution and the statistical moments of these variables consitute a series of sinthetic indexes that characterize the rain field and allow the comparison with other field on the same region or between different areas. This methodology was employed on rainfall fields obtained by interpolation of the raingauges observation in northern Italy for the period 2006-2013.