



Identification and characterization of extraordinary rainstorms in Italy

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Despite its generally mild climate, Italy, as most of the Mediterranean region, is prone to the development of “super-extreme” events with extraordinary rainfall intensities. The main triggering mechanisms of these events is nowadays quite well known, but more research is needed to transform this knowledge in directions to build updated rainstorm hazard maps at the national scale. Moreover, a precise definition of “super-extremes” is still lacking, since the original suggestion of a second specific EV1 component made with the TCEV distribution.

The above considerations led us to consider Italy a peculiar and challenging case study, where the geographic and orographic settings, associated with recurring storm-induced disasters, require an updated assessment of the “super-extreme” rainfall hazard at the country scale.

Until now, the lack of a unique dataset of rainfall extremes has made the above task difficult to reach.

In this work we report the results of the analysis made on a comprehensive and uniform set of rainfall annual maxima, collected from the different authorities in charge, representing the reference dataset of extremes from 1 to 24 hours duration. The database includes more than 6000 measuring points nationwide, spanning the period 1916 - 2014.

Our analysis aims at identifying a meaningful population of records deviating from an “ordinary” definition of extreme value distribution, and assessing the stationarity in the timing of these events at the national scale.

The first problems that need to be overcome are related to the not uniform distribution of data in time and space. Then the evaluation of meaningful relative thresholds aimed at selecting significant samples for the trend assessment has to be addressed.

A first investigation attempt refers to the events exceeding a threshold that identify an average of one occurrence per year all over Italy, i.e. with a 1/1000 overall probability of exceedance. Geographic representation of these “outliers”, scaled on local averages, demonstrates some prevailing clustering on the Thyrrenian coastal areas. Subsequent application of quantile regressions, aimed at minimizing the temporal non-uniformity of samples, shows significant increasing trends on the extremes of very short duration.

Further efforts have been undertaken to explore the selection of a common national set of higher order parameters all over Italy, that would make less arduous to identify the probability of occurrence of “super-extremes” in the country.