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Rainstorms in Calabria (southern Italy)

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Many regions belonging to the Mediterranean basin are subject to a large number of catastrophic geo-hydrological events with high economic and social impact. Calabria, composed of several small basins with steep slopes and erodible soils, is frequently subject to rainfall-induced natural processes that cause dramatic consequences on the population (i.e. flash floods, intense soil erosion, fast slope movements). Proper understanding, interpreting and forecasting of rainfall events is a prerequisite for the adoption of appropriate mitigation measures and reducing the connected risk. This information is rarely available at the appropriate time scale (at the order of minutes) and does not have sufficient coverage in space. Thanks to the availability of observations with high temporal detail related to 155 sites in Calabria, a considerable amount of data were analysed in order to contribute to the quantitative and qualitative characterization of extreme rainfall events affecting the Calabrian territory. In particular, the study considers more than 152 thousands storms having different durations that took place in different seasons between 1989 and 2008. In order to classify rainfall events as "significant" with regard to their contribution to soil erosion, flooding and/or other geo-hydrological processes, 45534 storms were selected and analyzed. First, the analysis was carried out to characterize, in simple but effective, the rainfall events with regard to: i) magnitude; ii) locations with high frequency per year; iii) locations where they are most severe; iv) within-storm temporal patterns; vi) the season in which they occur, even in relation to their temporal structure and severity.
As concerns the structure of the storm, the use of standardized rainfall profiles (SRP) to compare them, by simplifying analyses and presentation of data, is adopted in this study. In addition, the regional statistical analysis of the total rainfall of the events, due to its major significance on the natural processes considered in this paper, was conducted. This analysis was also carried up in terms of regression (having a seasonal structure) with its potential erosive energy. Finally, after the identification, location and characterization of the most intense storms, the the spatial evolution of the most two severe rainfall events that recently caused massive economic damage and loss of life is described.