

## ***Interactive comment on “Rainstorms able to induce flash floods in a Mediterranean-climate region (Calabria, southern Italy)” by O. G. Terranova and S. L. Gariano***

**Anonymous Referee #2**

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General comments.

The work describes a statistical analysis of rainstorms based on the overcoming of heuristically predetermined threshold values of cumulated rainfall, maximum intensity and kinetic energy. The database is formed by a set of short duration rainfall data series observed in 155 sites of Calabria (Italy). In the first part, the work is mainly focused on the evaluation of the statistical features of the different storm events. Successively, the method proposed for selecting and characterizing the rainstorms able to induce flash floods is applied to a set of erosive events selected according to previous criteria (Wischmeier and Smith, 1978). The empirical analysis of the statistical features

C392

of the heavy rainstorms events provide useful results for characterizing the main rainstorm types observed in Calabria. Finally, a further selection of the storms based on prefixed thresholds is effected, with a discussion of the spatial and temporal features of the heavy rainstorm database. The work is good enough, mainly for the efforts in elaborating such a detailed time-resolution rainfall database. Moreover, the effective characterization of the heavy storms events in Calabria is actually accomplished. Anyway, the description of the methodology and the discussion of results can be improved in some parts, for example through the comparison with other analogous investigations. The readability of the whole paper is notable, but it can be improved by making some corrections. The English language is good enough. Though satisfactory and well drawn, figures, tables, and references have to be improved, as regards captions and some unclear specific details. It has to be noted the presence of some references in Italian language not easy to find.

Specific comments.

The introduction is good enough and self-explaining. Anyway, some other references about the spatial and temporal variability of rainfall can be added. Moreover, useful information about economic estimation of damages due to heavy rainfall and flash floods can be found in the Munich Re reports.

The climatic description of the Calabria is too long if compared to the whole paper. An effort can be done for slightly shortening the paragraph.

Nevertheless the reference to Terranova and Iaquinia (2011), some details about both the quality and the homogeneity of the rainfall database should be added (rows 137–141). Moreover, the localization of the set of 155 rain gauges on the map of Calabria can be useful.

A brief mention on the different criteria used in literature for separating single at-site storms can give value to the choice of the authors (6 hours). Moreover, since the aim of the authors is the “quantitative and qualitative characterization of extreme events

C393

affecting Calabria”, it is better to clearly remark that in this phase the number of rainstorms does not refer to areal rainstorms (rows 140-143).

Before describing the main statistics of the chosen storm database (rows 148-154), the criteria provided by Wischmeier and Smith (1978) for identifying erosive storms could be briefly presented. Anyway, it has to be evaluated if the part devoted to the main statistical features of the database (from rows 143 to 154: “First, the analysis was carried out. . .”) could be better placed in the paragraph of the preliminary analysis of rainstorms.

Although the reference to Terranova and Iaquineta (2011), the rules for determining the value of BSC parameter (0 or 1) can be briefly defined (rows 163-168). Some details on Huff’s quartiles can improve the comprehension of both the text and the figure 3 (row 169).

It is not clear if the percentage of the number of thunderstorms (over a third of the examined events) is a result showed in fig. 3 (rows 169-170) or is a different evaluation of the authors. The same thing can be said for the following lines 170-172. Try to improve readability.

Do the three different sets of events (903, 909, 909) overlap ? It seems a strange coincidence that the numbers of events are quite the same (row 174). Provide some clarification.

Actually, the spatial distributions of the most important events become worthwhile if a map with all the 155 rain gauges of the database is added to the paper, as noted for paragraph 3 and figure 1 (rows 188-189). The phrase in rows 234-237 is not clear, maybe a parenthesis has to be added.

Technical corrections.

#### 1. Introduction.

There is a word written in two different ways (“run-off” and “runoff”) (row 49).

C394

#### 2. Geographical framework and climatic outlines.

Iaquineta and Terranova (2010) is not easy to find.

#### 3. Rainfall data.

Define the symbol DEV (row 151). Define the symbol  $E_j$  (row 154).

#### 4. Preliminary analysis of rainstorms.

Change “august” into “August” (row 185).

#### 5. Method.

Change “Km” into “km” (row 235).

#### 6. Results and discussion.

Change “a method” with “a heuristic method” (row 241). Change “Countries” with “countries” (row 243). Change “Fig. 9A-F” with “Fig. 10A-F” (row 270). Change “Fig. 9C-F” with the words corresponding to events #10, #18, #17, #24 (row 271). Event #12 is not showed in figure 9 (row 273).

Tables.

Table 1. Add the number of the rainfall events to the title. Table 2. The caption of the table contains some minor errors.

Figures.

Several captions contain useless repetitions concerning binary shape codes (fig. 2), axes labels (figures 3, 4, 8), timelines and legends on the map (figures 5, 6, 7).

Figure 1. The localization of the whole set of the considered rain gauges can be added (as for figures 9-10).

Figure 2. BSC for Thunderstorms and Convective rainfall event are the same (1111). If this is correct, provide a further explanation.

C395

Figure 3. To improve readability of the insets, add a brief explanation of Huff's quartiles in the text with the call to the figure.

Figures 5, 6, 7. It is not clear what is the parameter represented in the map of each figure. Moreover, for a better comprehension, write the total number of the considered storm events in the figure (or in its caption).

Figure 9. The caption shows sequences of word written in two different ways.

References. A drawback of the paper is the presence of some reference (in Italian language) not easy to find.

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