**Referee #4**

Your comments were very assertive and precise, so we thank you for your commitment to a thorough revision of the article.
The major revisions indicated by the reviewer for the different topics are all included in the new version of the manuscript. Responses to minor comments are as follows.

**List of minor comments:**

L.81: How is the secondary and tertiary objective linked to the information about torrential flows that has been the focus of the introduction?)

The objectives have been revised.

L.123: The factors for P should be as a power, right?

The mathematical formula was corrected. It was a formatting error.

L.126: What is the sensitivity of choosing k=0.9 compared to k=0.8? Would it have influence on the proposed thresholds? The authors write later about low permeability of the study area (l.154), how does this relate to the choice of a high k value? Doesn't low permeability mean that water run-off is much higher, so less water infiltrates?

It should be noted that K is a sensitivity parameter. Naturally, opting for K=8 would be sufficient to influence the proposed thresholds.
The question of the relationship between the K parameter and the permeability of the land (rock surfaces and soils), in the context of determining the weight of previous precipitation (days and weeks) in triggering floods, is complex.
Indeed, low permeability mean that water run-off is much higher (especially during heavy rainfall events), but the surface layers of the land are mostly made up of soils with an average thickness of up to 1 metre. In soils with these characteristics, rainfall over several days and weeks (less intense, but abundant) tends to contribute to soil saturation.

The calibrated antecedent rainfall equation was created to determine whether it rained a lot or a little in the days and weeks prior to a given moment and what influence this rainfall has on the saturation level of the soil. The K parameter within it results from the combination of various factors such as the lithology and permeability of the terrain, the inclination of the slopes, and vegetation cover. In fact, both the K parameter and the CN curve number parameter aim to recreate the specific soil saturation conditions at a given time.

L.214: Why was it necessary to include the rainfall event from 2023?
In fact, the June 2023 event did not give rise to significant torrential flooding, nor does it influence the data pattern in the graphs in figure 4, so it will be removed in the new version of the manuscript.

L. 216: The auhors mention that a statistical analysis is necessary for precipitation data froam years with and without torrential flood records to detect patterns. It seems however, that the authors have done the analysis mostly by means of visual analysis using Fig. 4. More elaboration would be helpful to clarify how the statistical analysis between different years has been done.
The following information has been added to the methodology: In the case of the sample of years with no record of intense precipitation events—torrential floods—the maximum values of the hydrological year were taken, referring to the maximum 24-hour precipitation (and corresponding CAP value) and the maximum CAP (and corresponding 24-hour precipitation value).

L.210: Why are the two events from 2011 not in Table 2 as well? Should the 2023 event also be added there (no information whether torrential flow occurred).
Information corrected by creating a new table (Table 1).

**L.243:** Using the case of Dec/20 and Jan/21 is a bit misleading. The authors state in regards to the Dec/20 'daily and sub-daily maximum precipitation values (Table 3) were sufficiently high to cause catastrophic floods'. At the same time, the 2021 torrential event has even higher Pmax24 so following that logic, we cannot say that CAP15 plays a role here or not. Would be good to clarify.

The paragraph has been revised accordingly:

The information summarized in Fig. 5 pertains to a specific case involving two events of heavy rainfall-to-runoff torrential floods. These events occurred within the same hydrological year (2020/2021). In this particular scenario, the calibrated antecedent precipitation (CAP) at 5 and 15 days on the date of the first event (December 25, 2020) was relatively low. During the second event (January 7, 2021), the precipitation from the first event significantly influenced the high value of the CAP at 15 days (158 mm). However, the January 7, 2021, torrential event has even higher Pmax24 than the previous event. Thus, in this specific case, it is not possible to ascertain the role of CAP15 in triggering the flood.

L. 295: Fig5 the axis are not readable.

The size of the characters has been increased.

L.312: Why did the authors disregarded the events in 2010 and 2011 (and 2023) for the analysis?

L. 320: I strongly advise the authors to have a clear input data section in their introduction to explain consistently which data-sets are used for what and why those data-sets were chosen.

A new table was created to fulfil this purpose at the beginning of the manuscript. The new information contained in this table clarifies the data samples used.

L.345: Is figure 6 now using the information from torrential flow events, all inputs from between 2009 and 2021 or the extended data-set with the extra 6?

Figure 6 is using data from the set of 11 heavy rainfall events listed in the new Table 1. In this new table, a column has been created to indicate the purpose of the data being

considered. For some heavy rainfall events, data from more than one rain-gauge is taken into account.

L.365: Why are the authors only reporting these information for the five events and not the full set of 11 (?)

There are no records of maximum sub-daily rainfall for all the heavy rain events, but it was possible to add data from the event on 20 February 2010 to the table 4.

L.550: I don't understand the asterisk. Has this been discussed beforehand? How do the authors make this claim?

This issue has been corrected in the new version of the manuscript (2 Data and methods/ The case study area), in order to relate the information from the data samples (Table 1) to the critical thresholds shown in Table 5.