

Interactive comment on “Debris flows recorded in the Moscardo catchment (Italian Alps) between 1990 and 2019” by Lorenzo Marchi et al.

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General comments The manuscript presents data from the debris-flows monitoring system in the Moscardo catchment, which seems to be the oldest in Europe (monitoring over 30 years!). The topic of the ms is perfectly fitting with the themes of the journal and the outcomes are relevant for researchers and practitioners. However, the ms needs some improvements before publications in NHESS. In the following, the major and minor critiques are listed.

Major critiques: I. A general, but important critique is that the explanations and descriptions are in some parts of the ms too short. This lack of complete information makes the understanding of some outcomes a bit complicate. I will describe the parts that

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need to be enlarged in the major and minor critiques.

II. The text of some sections is sometimes mixed up and the authors should follow the defined structure or adapt the structure and titles. First example: the contents of Sections 2 (Settings) and 3 (Data): L74-82 should be placed into Section 2, while L65-66 may be stated at the beginning of section 3. Another example is between section 4.1 (occurrence) and 4.2 (rainfall), where the rainfall is already analysed in section 4.1. In addition, I propose changing the title of 4.2 into “Rainfall threshold” (or similar).

III. The relation between rainfall characteristics, sediment availability and debris-flow triggering may be better explored. Detailed data on the sediment availability are not available, but it may be approximated indirectly by number of days between two debris-flow events, volume of previous event etc. Finally, this information should be analysed together with the rainfall characteristics. A similar approach was applied in our monitoring site in the Pyrenees (see Pastorello, R.; Hürlimann, M.; D’Agostino, V. (2018) Correlation between the rainfall, sediment recharge and triggering of torrential flows in the Rebaixader catchment (Pyrenees, Spain). *Landslides*. 15(10),1921-1934)

IV. The definition of rainfall thresholds is a complex task. The section regarding this topic is very short and more information is necessary of the method how the two thresholds were defined (which rain gauges, how the rainfall duration was determined, how the curves were finally defined etc.). In addition, non-triggering rainstorms must also be added in the plot and commented in the text (explain false positive, false negative etc.). In conclusion, I strongly recommend to improve this part of the ms and enlarge the text.

V. Some Figures need to be improved since information is lacking (legend and more detailed figure captions: see comments below). On the other side, Fig3 and maybe Fig2 are not really substantial and do not refer to the main topics of the ms (debris flow occurrence, rainfall characteristics, hydrographs). I propose including some additional plots on these three topics and maybe delete Figure 3.

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Minor critiques: 1. Introduction may be enlarged including some additional information, experiences and open questions of debris-flow research and in particular of instrumental monitoring of debris flows.

2. The title of section 3 may be changed into “Monitoring system and data” (or similar). I propose adding technical details on the ultrasonic sensors and rain gauges used during the last 30 years and some experiences gathered.

3. L83-84: the information on the number of surges would be helpful and should be added in Table 2.

4. L103-118 and Fig.4: add legend in Fig.4. Explain, which rain gauge was used to draw the plot of the potential triggering rainstorms. If the plot includes multiples or all rain gauges, then you have to explain, what was the procedure to avoid duplications. In general, I recommend to better explain the text between L103-118 (especially the last part).

5. L119-122: Good arguments. You may propose some ideas to resolve this aspect. See point III in major critiques.

6. L127: you may create a plot of the time of triggering and add it as Fig. 5b

7. L132-140: This part should be at the beginning of Section 4.1. Afterwards, I would start with the rainfall analysis

8. L185-193 (Fig.8 and Table2): the analysis of the hydrographs is very interesting. I have two suggestions: i) could you provide the return period of three hydrographs? ii) Is it possible to also add the statistics of the surge volumes in Table 2?

Specific comments:

L60. Could you be more precise and replace “several”

L74-75: English is not very clear (to me).

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L80 and Fig.2: please add “near the monitoring sites A and D” in the caption of Fig.2

L88 and Fig.1: please add the position of the video camera in Figure 1.

Fig. 7. Add legend

L168: please correct the citation format

L207 and Fig9: please add the cross-section labels D and E in the text and in the plot.
This would clarify the actual names (up/downstream) in the plot.

Table 1: please also add the slope angle in degrees

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