

Interactive comment on “Meteorology triggering factors analysis for rainfall induced hydrogeological events in alpine region” by Andrea Abbate et al.

Anonymous Referee #1

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Title: Meteorology triggering factors analysis for rainfall induced hydrogeological events in alpine region

Overview and general comments:

Authors studies the past meteorological (mainly rainfall) conditions that lead to certain hydrogeological events. They applied a systematic analysis, and fairly self-criticize their results. The study is relevant for particularly landslide researchers that use rainfall I-D curves. Although the technical frame work of the manuscript seems sound and robust, the presentation of the work is rather poor in the current state. Overall, I got

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the impression that this manuscript is not properly edited before submission. There are several tiny mistakes in the text, which makes it hard to follow. With proper editing the manuscript will get considerably shorter and understandable. This manuscript deserves publication, after considerable changes in its current presentation.

Major comments:

Authors evaluate/discuss the rainfall I-D curves only based on “false negatives”, but ignore “false positives”. A certain rainfall might remain above the I-D curve of Guzzetti et al. (2007) or Mid-latitude Climate without triggering any landslide as well.

The authors avoid discussing their results on a broader scale beyond their study area. They rather give an event summary in the analyses. They should extend their discussion and explain what do we learn from this study that is valid also for other high relief areas?

Minor comments:

There are wrong use of words and tenses throughout the manuscript. It should be proof read. Authors prefer to use passive voice; I believe this practice is not recommended anymore.

Excessive use of connecting statements, such as “on the other hand”, “conversely”, “Therefore”, “In conclusion”. Please omit the ones that are not absolutely necessary.

Title can be a bit punchier.

Abstract

It is long and it lacks providing a motivation and a take home message. For example, first two sentences of the abstract sounds similar. There are also a few sentences without any information, e.g. “The results obtained from the application of the two methodologies have been discussed.”. It also does not involve any clear take home message at the end, as expected.

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Introduction The introduction is really hard to follow, it does not develop logically leading to the research questions of - Are these approaches sufficient for a complete description of triggering factors? - Can rainfall analysis be improved considering also other meteorological variables, which could better describe the rainfall events and the linked consequences? Why “other meteorological variables” are not mentioned before? Which approaches could be an alternative? These questions are not returned at the discussion one more time.

A topic in a paragraph is returned after a few paragraphs again that confuses the reader. There are a few references, e.g. Guzzetti; Rosi; Gao, that appear frequently in different paragraphs. Authors should review the global literature carefully and reformulate the introduction leading to the research questions also beyond their study area.

Line 47: “However, for shallow landslides. . .” I can’t understand this sentence.

Line 52: “These thresholds data are calibrated looking at the past events occurred in the area and directly correlated with the nearest rain gauge measures (Rappelli, 2008).” Rainfall intensity might vary considerably during an event, gauge data might miss this variation. We see this especially when rainfall radar estimates are compared with the gauge observations. Authors should also mention this effect in the same paragraph.

Line 58: “. . .rainfall thresholds have been widely used in different parts of the world.”, but the authors refer usually to the studies from Italy, if I am not wrong.

Line 74-82: Similar statements are mentioned in the Abstract as well as early in the Introduction, please refrain using same statements again and again.

Data, Methods and Models Authors should consider using dedicated chapters as “Data” and “Methods”.

The method part explains how the computation works but lacks information about the meaning of the results for the current study.

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Line 96: "...estimated in 2 billion of euros." reference missing.

Line 98: "...glacier melting increased by high-altitude summer temperatures." reference missing.

Line 143: "...extratropical cyclone structures" Different type of rainfalls that effect the regions might be important for the entire study. Authors should consider providing more info about these effect in the introduction.

Line 146: "...the traditional rainfall approach and the meteorological reanalysis approach." They are not mentioned before.

Line 154: "...by several authors.' Who are they and how they mention it?

Line 187: "...extratropical cyclone (EC), as described in Figure 2" I am not sure whether I can see the message in the figure.

Results and Discussion

It is hard to follow what is the new result and what is the discussion point. Please consider using a dedicated section for each, "Results", "Discussion".

Line 236: "...rain rate \dot{R}_{ij} ..." I guess rain intensity Line 255: "...possible indicator of the magnitude of the hydrogeological events..." ...of...of... Line 262: "...does not permit. . .", do you mean "hinders", I recommend authors to use either negative prefixes and suffixes, or negative verbs directly instead of negative verb conjugation throughout the manuscript. For example, in line 281: "...it does not exist a unique method for the magnitude assessment. . ." → "...a unique method lacks that assess the magnitude. . ."

Conclusion

The section is dedicated to summarize the applied analyses, I could not really find a clear take home message that evolved from the results and discussion.

Line 384: What are those "hydrogeological issues"? After reading the entire

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manuscript, I am still not sure about this term? Are the authors refer to hydrogeological evets, such as rainfall induced landslides? Or are there other events?

Tables:

Table 1: The caption is repeating the column titles of the table.

Figures: There are several bar plots, which does not provide so much information. They may be fit for the appendix, but they are poor for the main body of the manuscript. Authors should consider re-generating figures that provide clear messages. They could consider combining several of the figures in a more creative manner.

Figure 1: X and Y labels and ticks are missing. Fonts are larger than in the main text.

Figure 2: What is the purpose of the arrows?

Figure 4: What is mid-latitude-and highlands climate?

Figure 6 and figure 7: I cannot understand the message of these two, especially the figure 7 shows nearly constant Geostrophic velocity ($\sim 42 \pm 5$ km/h)

Figure 8: Location of the Alps are different in each subplot; Lat Lon data is missing the numbers on the isolines are too small to read.

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