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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Hydrogeomorphological analysis and modelling for a comprehensive understanding of flash-flood damaging processes: The 9th October 2018 event in North-eastern Mallorca" *by* Joan Estrany et al.

Anonymous Referee #1

Received and published: 18 December 2019

The paper of Estrany et al. provides an analysis of the devastating flood that hit the North-eastern side of the Mallorca Island in October 2018, considering: 1) the hydrological response of the catchment; 2) damage assessment; and 3) geomorphic changes. The analysis presented is quite detailed, and represents a very good starting point that, linked to a study from a meteorological perspective and to a hydraulic study about the flooding dynamics (two aspects that –I acknowledge- go beyond the scopes of the paper), would provide a rather comprehensive picture of the event from a civil protection perspective. The data provided by the water level station are particularly

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interesting and valuable.

My major comment is that the paper has the potential to go beyond the 'simple' description of a case study, where three single pieces (rainfall-runoff modelling, damage assessment and geomorphic changes) are discussed separately. Discussion section could help to bridge this gap. It introduces several topics (e.g., land-use changes, fires, etc.), which, however, are treated in an increasingly qualitative and general way during the discussion itself. What are their actual (and relative) effects on this event? Can they be quantified? Also, the triggering effect of the karstic reservoir(s) should be somehow addressed with more detail (I mean, the authors should try to go beyond the conceptual modelling and provide insights about the physical process, which involves, e.g., specific geological features in specific areas). I wonder about the sudden increase in discharge from 120 to 442 cms (an impressive peak flow rate per unit area) in 15 minutes (very fast response time). The reason for this behaviour is not totally clear. Is it mainly due to the karstic environment or to other reasons (e.g., the failure of a temporary dam)?

Another important point is that authors should take care of the English language and grammar. At the end of the review, I provide some examples, limited to the Abstract and the Introduction, but a thorough review should be carried out throughout the paper.

Finally, please find below a list of other specific comments. I hope that my comments help to improve the quality of the paper.

Abstract: it could be much more concise, avoiding unnecessary comments (e.g., "comprehensive analyses of catastrophic events are crucial. . ."). It is of the foremost importance that the abstract is as much straightforward as possible

L24: maybe remote sensing is better

L31: Copernicus EMS: it's better to avoid acronyms in the abstract without explanation

L45: also the interaction with the (warming) sea surface is an extremely important and

peculiar feature of the Mediterranean area (e.g., Cassola et al., 2016; Avolio et al., 2019)

L79: ok, but the main uncertainty in predictability is linked not only to hydrological uncertainty but also (mostly, I would say) to the meteorological uncertainty. This aspect should be also introduced.

L109: since the structure of the paper is complex, a brief introduction to the next Sections could be useful

L136: please explain what you exactly mean with “torrentiality”. This index could be ignored by most of the audience

L193: a reference is needed to justify the sentence

L200: Please add in a figure (Fig. 2?) the radar location

L201: “due to these effects”. What effects? Not clear. Please explain and justify with adequate reference(s)

LL206-213: this paragraph is not clear. What were the driving data for this analysis? Those provided by the rain gauges surrounding the catchments? If so, the authors should provide some proofs about the reliability of their analysis (e.g., a scatterplot, even in the Supplement).

Furthermore, if rainfall data are gridded in 2x2 square cells, why in fig. 6 it looks like they are spatially interpolated? Maybe, because they are related to the GSM-SOCONT scheme (for which the authors refer to inverse distance weighting)?

L218: When introduced, the acronym MEDhyCON (such as any other) should be explained

L251: “a second hydrograph was designed”: with what Q values?

L262: I would like some more details about the percentages of obstruction detected

and how they were calibrated. Do they rely (only) on the three ground control points? Why those points? When/how were the water levels measured on them? Does the simulation consider 0% obstruction up to below the bankfull and 85% immediately after? No transient state?

L321: in my opinion, the best tool for this kind of assessment would have been a complete 2D hydraulic study. Please discuss briefly your choice and its advantages (e.g., it's time-saving, etc.)

Table 1 needs more explanation. Terms like IPmax should be explained

Figure 7 is not very clear. Maybe it could be divided into more figures. However: in Fig. 7a, are the red dashed polygons all derived from the Copernicus EMS? Also zone 2 and 3? Do the latter perfectly correspond to the Government survey? Figs. 7b and 7c are not very readable/useful, in my opinion.

LL510-511: I guess it is Fig. 8c.

LL535-536: "Despite these antecedent . . . as reported by these authors." Why?

LL547-548: it's not clear why the authors need to adjust the initial conditions manually. Does the model not perform well if used for long periods?

LL556-585: the discussion introduces many arguments in a general and qualitative way. I suggest to skip/reduce much of the discussion (especially that about the weather predictability, which is not addressed in this study) and/or try to quantify the different effects (please refer to my main concern).

English language and grammar review:

L25: at the catchment scale

L26: peak discharge of 442. . .

L28: "i.e." not needed

L38: For that reason, they usually affect/impact basins. . .

L46: very close to the coastline

L48: “scarce soils”. What do the authors exactly mean?

L51: elucidates

L51: “the hydrological processes from an extreme flood”? Do you mean the hydrological processes activating during an extreme flood or so?

L54: small spatial scale usually means low-resolution (e.g., scale 1:50000 is a smaller scale than 1:500). Please rephrase to make the sentence clearer

LL67-68: in order to reduce the uncertainty of the Q estimate, I suppose

L69: “. . . also adding that. . .” please rephrase

L87: regarding vulnerability

L88: “understanding. . . are developed”. Understanding is not developed. Please rephrase

L92: evaluates

L97: “with that Copernicus EMS one”. Not clear

L112: why “precipitation as well as the Q”? I would write either “Precipitation and discharge” or “P and Q”

Captions: please check also all figure captions (e.g., “left” and “right” pictures in Fig. 3, in Figure 7 there are two references to (f))

Supplement: please check grammar also here (e.g., L’independent; “Schema”). The caption of Figure S2 should declare the meaning of the variables.

Cited references:

Cassola, F., et al.: The role of the sea on the flash floods events over Liguria (northwestern Italy). https://doi.org/10.1002/2016GL068265, 2016.

Avolio, E., et al.: Brief communication: Preliminary hydro-meteorological analysis of the flash flood of 20 August 2018 in Raganello Gorge, southern Italy. https://doi.org/10.5194/nhess-19-1619-2019, 2019.

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