Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2017-626-RC2, 2017

Hydrology and Earth System Sciences
Discussions

Interactive comment on "The temporally varying roles of rainfall, snowmelt and soil moisture for debris flow initiation in a snow dominated system: the compound trigger concept" *by* Karin Mostbauer et al.

Anonymous Referee #2

Received and published: 2 December 2017

The paper presents results of the analysis of potential factors responsible for debris flow initiation. The study explores possibilities of the use of semi-distributed conceptual rainfall-runoff modelling results to identify possible critical values of triggering factors which could indicate or lead to occurrence of debris flows. The authors use measured (e.g. rainfall data) and modelled factors (e.g. snowmelt, different underground storages) and try to identify their potential role as debris flow triggering factors in view of corresponding exceedance probabilities.

I find the manuscript in line with aims and scope of HESS. Generally, the paper is well

Printer-friendly version

Discussion paper

structured. However, there are some issues that need to be solved in order to improve the presentation and discussion of the results.

General comments:

While the main topic of the paper are triggering factors related to hydrological conditions, the authors should give some stress (in the Introduction section) also to other possible factors especially related to geological or hydrogeological conditions. These are only briefly mentioned on Page 3 (line 10). Namely, the geological setting strongly pre-define the possible effects of all the hydrological conditions discussed in the paper.

The Study area and Data presentation (Section 2) as well as the Model structure and model calibration and validation process (Section 3.1) is concise and informative. Additional information on past successful applications of the proposed hydrological model structure for any other purposes (besides the analysis of debris flow triggering) would be helpful. There seems to be some discrepancies in the abbreviations used for the model parameters in section and the ones listed in Table 1 (e.g. metlf, M, Mgalcier etc). If I understand correctly, only free calibration parameters are listed in Table 1. All the model parameters mentioned in section 3.1 and in Figure 3 should be listed together in one place (Table) in order to enable reader easier understanding of the model structure. Otherwise, it is extremely difficult to follow the explanation of the role of different parameters that could be potentially considered as important in view of debris flow triggering analysis (Section 3.2).

The discussion on the relevance of potential triggering factors in Section 4.3 is relatively lengthy and extremely difficult to follow. It seems that most of the discussion relies on the authors pre-knowledge about the particular characteristics of the debris flow events and, unfortunately, many of the statements on authors speculations. I believe author should put more effort in extracting the most relevant information from the data analysis instead of commenting particular events in view of available measured and modelled data. On possible solution could be classification of the events based on some pre-

Printer-friendly version

Discussion paper

defined criteria, one of them could be e.g. seasonality, as this could lead to possible easier identification of the relevance of discussed triggering factors during particular debris flow events (e.g. convective storms occur mostly in the late spring, summer or early autumn; snowmelt occurs in spring). Sections (4.3.1-4.3.2) discussing the role of high-intensity rainfall events and snowmelt could in my view directly fit into some predefined classification criteria (e.g. seasonality). The influence of seasonality is indicated in several parts of the manuscript but should be more clearly pointed out. Data shown in Figure 7 and discussion in section 4.3.4 could be very useful for developing further discussion in that direction.

Although the proposed approach of using semi-distributed hydrological model in combination with relatively scarce data is interesting, my overall concern is, that the complementary effect of different triggering factors is not clearly demonstrated (the so called "compound triggering concept"). Namely, in many parts of the manuscript, authors clearly state that for many debris flow events, only single triggering factor was recognized as the prevailing one. It seems the complementary effect of different triggering factors has much smaller role as the authors try to present.

Specific comments: Page 1, lines 24-27: The last sentence of the abstract is extremely long, contain too much information and is consequently unclear. I suggest to rewrite and shorten the sentence.

Page 2, Line 5: What is meant by "hydrological disposition"?

Page 3, line 17: "Meteorological conditions" instead of "meteorological forcing"?

Page 8, line 13: Related to my general comment on presentation of model parameters. What is parameter SI? As far as a can see, here it is mentioned for the first time and its explanation is give in line 9 (Page 9).

Page 9, line 12: . . . on days when a specific variable. . . (add when).

Figure 5: The meaning of red vertical lines should be explained in the figure's caption.

Page 11, lines 12: I believe it is not useful to discuss possible hourly threshold rainfall intensities derived from daily rainfall data.

Page 13, line18: Related to general comments above, could precipitation be generally considered as a factor of low relevance for debris flow triggering during some seasons or maybe months?

Page 13, lines 19-20: Do authors have any data that would support the speculations about the occurrence of convective cells?

Page 14, line 14: In my view, the complementary nature of triggering factors is not so evident or significant as the authors try to present. Could they clearly demonstrate (e.g. for a particular debris flow event) possible evidences of the “complementary” effect?

Conclusions: I believe the authors should try better to summarize the main findings of the study and suggest possible steps forward.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2017-626, 2017.

Printer-friendly version

Discussion paper