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Comment on hess-2022-263

Anonymous Referee #1

Referee comment on "Investigation of the functional relationship between antecedent rainfall and the probability of debris flow occurrence in Jiangjia Gully, China" by Shaojie Zhang et al., Hydrol. Earth Syst. Sci. Discuss.,
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Peer review report on "Investigation of the functional relationship between antecedent rainfall and the probability of debris flow occurrence in Jiangjia Gully, China" (hess-2022-263)

This paper presents the effect of the antecedent effective precipitation (AEP) on rainfall ID threshold of debris flow (DF) using a physics-based model (Dens-ID) with extensive long-term monitoring rainfall and DF data at a well-known DF study site, Jiangjiagou, in China. This research focus on the very important topic of understanding the generation of DF and the link between the probability of DF and rainfall ID as well as AEP. This paper can be a significant contribution after revisions that will address the presentation issues and following comments.

Jiangjiagou is ideal for DF study because the extensive monitoring data are available and preliminary studies. However, it is still necessary to provide more environmental settings, such as climate, geomorphometry, vegetation, and soil types, since they all highly related to DF generation and behavior. A comprehensive description of the background also informs readers a proper analogue to DF that happened in a similar setting they are familiar. It also informs an effective comparison to DF that happened in a different setting. Both of which could improve the significance of the study.

There is a great space to improve the presentation of this manuscript. First, it is worthy to substantially improve the language. I have trouble to follow this work due to its language. BUT I found it becomes easier for me if it is literally, word by word, translated into Chinese, which is my first language. The description of the Dens-ID model also needs to be improved. Terms used in equations are lost. Results can also be presented in a better and more concise way.

This work is built up from a previous model development paper (Zhang et al., 2020), in which the density-based identification of DF was introduced in detail and the development of the rainfall ID curve was also described. The description of the Dens-ID model here should be concise but convey key information, rather than simply rephrasing or copying the text from Zhang et al (2020). Additionally, I am wondering how the Den-ID model represent the DF generation without consideration of momentum law. It seems the occurrence of a DF is determined by the density of the soil-water mixture, in which soil and water are estimated by a safety factor equation and a infiltration method, respectively.

Discussion should be separated from results for this study. I'd like to read a comprehensive discussion on insights of certain results and observations. For instance, we already know the small DF probability compared with rainfall from existing data. What is the additional information the simulations provide? What can I learn by reading the simulated data? Is the Pdf and AEP curve unique to Jiangjiagou or how can I transfer this curve to other watersheds? Could you compare the different stages of this curve with previously studies of DF in this watershed and other watersheds in different geographic environments?

References

Zhang, S.J., Xu, C.X., Wei, F.Q., Hu, K.H., Xu, H., Zhao, L.Q., Zhang, G.P.: A physics-based model to derive rainfall intensity-duration threshold for debris flow. *Geomorphology*, 351, 106930, 2020.