We are very grateful to the reviewers for their affirmation of the manuscript "Investigation of the functional relationship between antecedent rainfall and the probability of debris flow occurrence in Jiangjia Gully, China" (*Number*: *hess-2022-263*)", which is of great significance to authors. What moved us even more was that the reviewers were so busy that they could give such detailed comments here. From these comments, the author feels the rigorous scholarship, knowledge and responsibility of the reviewers. Thanks again!

According to the Reviewers' comments, we have amended this manuscript by using the track changes mode in MS Word.

Response to Reviewer 1:

(1) Reviewer 1: 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.

Authors: The authors have provided detailed information including environmental settings, such as climate, geomorphometry, vegetation, and soil types. Please check lines 98-109 of Pages 5 in the tracking version.

(2) Reviewer 1: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.

Authors: The authors have asked the native English speaker to improve languages of the manuscript in order to improve the readability of this manuscript. All the polishing contents are saved in the tracking mode.

(3) Reviewer 1: The description of the Dens-ID model also needs to be improved. Terms used in

equations are lost.

Authors: The authors have carefully checked each equation relating to Dens-ID, and we have mended some mistakes and terms missing in equations. Please check lines 149, 157-158. We also tired our best to improve the description of the Dens-ID model, Please check lines 127-199.

(4) Reviewer 1: Results can also be presented in a better and more concise way. 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?

Authors: We have modified the results and Discussions have been separated from results. We followed the reviewer's suggestions and tried our best to improve the Discussions contents. Please check lines 492-543.

(5) Reviewer 1: 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.

Authors: Thank you very much for raising this issue, Dens-ID model does not consider the momentum method. In fact, the model only uses conservation of mass to calculate the total amount of unstable solid matter and the total amount of runoff in the whole basin, and assumes that these sources can flow to the location of the basin outlet. The model then calculates the density of soil and water mixture at the basin outlet through Eq.6.

Response to Reviewer 2:

(1) Reviewer 2: Fig.4, Is it necessary to classify the stages into the stage 3, stage 4? Somehow, the explanation of the stages is vague. The reason of this classification is not clear.

Authors: The authors have carefully considered this very important suggestion. Just like the issue proposed by the reviewer, we also find that explanation of the stages 3 is vague. Therefore, we decided to delete Stage 3 and Stage 4. Then we found power function is the best fitting cure. The detailed modifications are listed in Lines 401-432 in the tracking version.

(2) Reviewer 2: Fig.4, Moreover, it seems that the stage 3 has too little data to analyze the result. In the stage 4, it has stable single Pdf value against AEP, contrary to the general knowledge of the debris flow occurrence. Interpretation of these matters has to be described. Anyway, more explanation on the stages is needed.

Authors: The authors have followed the first suggestion and deleted the stage. Please check lines 401-432

(3) Reviewer 2: Fig.5, (1) This relationship is should be validated using AUC (ROC) analysis or the critical index such as Threat Score.

Authors: In Fig.5, the two curves are fitted through field observation data and Dens-ID model. The two curves are nearly parallel. Eq. 12 was used to analyze the correlation of the two curves, and r is equal to 0.93, suggesting they have a very high correlation. However, a significant bias is existed between them. Basically, the probability value derived from the field observation data is larger than that from the Dens-ID model in the condition of a given AEP. Accordingly, the authors cannot use AUC (ROC) analysis or the critical index to verify the Eq.14. We analyze the error of equation 14 using field observation data as reference, and find that the error is significantly high. The authors try the best to draw several reasons inducing the situation of high error. The most important point is insufficient field observation data causing the small amount of rainfall events and a higher P_{df} comparing to the P_{df} from Dens-ID. With the accumulation of rainfall observation data of JJG, it is believed that the P_{df} derived from field observation data will gradually decrease until it is close to the calculated result of Dens-ID model. The above contents are listed in the manuscript. Please check lines 459-468. We also discussed the reason causing the large bias, Please check lines 535-543.

(4) Reviewer 2: The authors intension on this matter is not obvious (How to evaluate the achievement of this research?)

Authors: We claimed the intension on this research in Discussion 5.2. Please check them in lines 491-543.