Dear Reviewer,

Thank you very much for your kind comments on our paper, I will reply your comments one by one, as follows:

Question [1]: The main problem is related to the physical interpretation of the triggering mechanism. The topic is widely addressed in literature and many authors agree that two possible triggering mechanisms are possible: the evolution of shallow landslides into DF and the progressive entrainment of bed sediment material into run-off. The authors of this paper assess that both the triggering factors must occur simultaneously for effective DF formation. I don't see the reason of this assumption and as far as I know, it hasn't previously been discussed in literature. The authors should justify this assumption or modify it.

Reply: The authors sincerely appreciate the reviewer for pointing out this issue. We considered this issue carefully while reading the relating section in the manuscript, and decided not to address the debris flow classifications (landslide-induced debris flow and runoff-induced debris flow). We changed the corresponding part in order to just address the point that landslides are the key factor to DF formation:

The evolution of shallow landslides into DF is a type of formation mechanism of DF, we believed that this evolution was derived from a single slope (Iverson et al., 1997) and this evolution process is now generally accepted as the slope debris flow (Li et al., 2010) or debris flow on slope (Zeng et al., 2004; Berti and Simoni, 2005; Kim S and Lee H, 2015). This type of debris flow formation has been well studied, and its corresponding prediction models are also established based on the common view that pore water pressure is the key factor triggering this type of DF formation (Cui, 1991; Iverson et al., 1997). However, this type prediction model cannot allow us to conclude whether there is a DF formation at a catchment, because it tends to focus on a single slope. The debris flow formation at the catchment scale is defined as the gully-type debris flow (Ni, 2015). For example, debris flow occurs in Jiangjia gully is a typical gully-type debris flow, and landslides are the dominated way to supply the solid source for debris flow in this gully (Kang, 1987). Coe et al. (2008) identified the Chalk Cliffs in USA as the kind of runoff-induced debris flow, because it was found by Coe et al. (2008) that there was no any landslide source when debris flow occurred, and Kean et al. (2013) also agreed with this identification result during the field observation in Chalk Cliffs. So these observation results lead us to come to such a conclusion that rainfall-induced landslides is another kind of supplementary mode of solid sources for debris flow formation at a watershed comparing to the entrainment of bed sediment material for debris flow formation.

We plan to use the above red section to replace the original text in 4-20 lines in Page 4.

Question [2]: Another problem is linked with the calculation of DF density. It is computed by a weighted average between sediment density and water density. The total volume of sediment taken into account is assumed equal to the volume of instable mass. This is not true because soil porosity must be taken into account. Also in the computation of the water volume there is a mistake because the pore water is not considered in the calculation.

Reply: The authors totally agreed with this issue presented by the reviewer. We think the volume of soil mass participating into the coupling process will be more precise if the porosity of soil mass is taken into accounted. In fact, there is another problem when calculating the volume of soil mass for DF formation: It is assumed that once the soil mass failed, all of it will participate in the water–soil coupling process. However, portions of the unstable soil mass may stay on slopes instead of moving into the channel, and this will cause density values calculated by this system to be larger than the real case. This issue is pointed in 9-12 lines in page 19. We discussed the porosity issue proposed by reviewer and clearly pointed out that this issue was extremely necessary to be studied in future. We placed them in 12-13 lines in page 19 just following the sentence “and this will cause density values calculated by this system to be larger than the real case”. The corresponding adding texture is as follows: Additionally, another issue that can influence the soil mass volume participating in water-soil coupling process is the soil porosity. This variable can also influence the water volume due to the pore water. To obtain more accurate density values, the movement process of the unstable soil mass needs to be studied further as well as the soil porosity issue.

Question [3]: The third problem deals with the estimation of successfulness-unsuccessfulness of the predictions. The authors exclude from the computation of the success-rate some pixels in which the previsions are wrong, without a rigorous reason. In particular, as the method proposed is based on the combination of rainfall forecasting and DF triggering model, the success-rate must combine the mistakes of both these two previsions. Of course the author may preliminarily assess separately the reliability of the two previsions by comparing forecasted rainfall with measurements and by evaluate the results of the predictions of DF formation under measured rainfall (instead of forecasted ones) In this case they may provide two success-rates for the two components of the method and then one combined success-rate for the whole method.

Reply: The authors think that this is an excellent advice to evaluate the reliability of forecasted rainfall and the DF forecasting model. We even think that this proposed idea can be written into another paper for possible publication. The key problem to deal with this academic issue is that it is extremely to ask the local Weather Bureau for the measured rainfall data evening paying them for the data in China. However, we will figure out another way to obtain some useful measured rainfall data, because we think this point proposed by the reviewer has a high academic value. And we also hope that the reviewer would like to give the authors more detailed suggestions about this point.

Question [4]: The hydrological model should be briefly described.

Reply: The authors have added a brief description of the hydrological model using a sentence just following the sentence in 27th line in page 11. It is shown as follows: GBHM has been successfully used to simulate the runoff within Yangzi River and its simulating capacity of soil water content was also verified. As for the DF forecasting model, the part of the soil water content simulation is most important. In this part, the Richard equation (1931) is used to describe the water movement in soil mass and is solved by finite difference method, the infiltration border is governed by mechanism of runoff generation over infiltration.

Question [5]: The content of table 1 is arbitrary, the choices made need a justification. In my opinion for example the probability of DF occurrence first increases with mixture density but at very high mixture densities it decreases.

Reply: This table seemed to be arbitrary without listing some necessary explanations. So the authors think that it is necessary to add some sentences in order to clearly avoid this arbitrary phenomenon. These sentences are shown as follows: high density of debris flow is a key characteristic to distinguish from pure fluid or hyper-concentration flow. We want to address that inadequate soil material from landslides cannot yield DFs even during extreme rainfall in a DF watershed, because inadequate landslides cannot guarantee a water-soil mixture reaching to the density standard of DF. The volume of soil mass from landslides has the most important influence on the mixture density due to a higher density of solid material than water. The volume of unstable soil material from landslides is greater, which at least guarantees a larger density of water-soil mixture and accordingly creates a more favorable condition for debris flow formation. So we come to such a conclusion that when the mixture is denser, the volume of unstable soil material induced by rainfall is greater and the debris flow formation is more likely. However, there is no function that can be used to describe this qualitative relationship. According to the research of Kang, the density of the DFs in nature varies in the range of 1.1–2.3 g cm^{-3} (Kang et al., 2004). If the DF density in nature is divided into 5 reference intervals, the formation probabilities and warning levels of DFs can be estimated according to the reference intervals listed in Table 1.

Question [6]: It is not necessary to write the GIS instructions, it would be better to describe the methods (section 4.3).

Reply: According to the Reviewer's suggestion, we deleted the corresponding GIS instructions in 1^{st}-2^{nd} line in page 16. And we modified the sentence in 26^{th} line in page 15 as follows: the predicted precipitation data for this prediction system can be generated using resampling technique (Fig. 9).

Question [7]: The problem of long computational time for antecedent conditions could be solved by running continuously the model, in this way, the antecedent conditions are ready ever y day for the computation of possible triggering.

Reply: It's an excellent advice on improving the computing efficiency of this DF EWS. And we will change the corresponding FORTRAN program according to this advice. Thanks again for this excellent advice. Of course, we will refer to Reviewer's advice and use this idea to take place the part in 4^{th}-6^{th} line in Page 19. Please allow me to directly cite some sentences presented by the Reviewer. The modified parts are shown as follows: antecedent rainfall could be solved by running continuously the model, in this way, the antecedent conditions are ready every day for the computation of possible triggering.

Question [8]: the meaning of "contribution factors" is explained only after and it is not comprehensible for the reader in this point.

Reply: We added a sentence and a reference in 7^{th} line in page 17 in order to improve its comprehensibility for the reader. This sentence is as follows: The so called contribution factors mean the variables that can contribute to DF formation, which include rainfall, fault, lithology and slope etc. (Wei et al., 2006, 2007).

Question [9]: Please justify the sentence: "enhanced DF will last 20 to 30 years".

Reply: We just deleted this sentence, because we found that there is a same description "for a long time".

Question [10]: what does it mean "prediction regional DEM"?

Reply: We changed "prediction regional DEM" into "DEM".

Question [11]: please add measure units.

Reply: We added the corresponding units in Figure 6. Fig.6 (a) is cohesion force, its unit is kPa, Fig.6 (b) is the tangent value of internal friction angle, and we change "(b) distribution of the internal friction angle values" into "(b) distribution of the tangent value of internal friction angle". Fig.5 (a) and Fig.5 (b) represents the land use and soil units.