

## ***Interactive comment on “Effect of restoration vegetation on the stochasticity of soil erosion in a semi-arid environment” by Ji Zhou et al.***

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We very thank for the referee's some positive comments on our original manuscript, and also appreciate these detailed comments which can undoubtedly improve the quality of this paper. We have carefully read all the comments and make some brief responses by point to point. After that, we will rewrite and restructure the original manuscript on the basis of the referee's useful suggestions and comments.

Comment 1: In the abstract L32. Change the “erosion random events” into “random erosion events”

Response 1: In the original manuscript, the expression of “erosion random events” is incorrect. Random erosion events is right expression stressing the stochasticity of erosion events. We will carefully check the similar incorrect expression in manuscript,

such as changing the rainfall random events into random rainfall events and so on.

Comment 2: In the introduction section L93-95. Deleting this sentence or putting it on the end of introduction

Response 2: In the introduction L93-95 highlights the value for improving the understanding of the stochastic interaction between rainfall and erosion. Just like the referee's comment, the content of L93-95 is irrelevant to the corresponding paragraph. In the revised manuscript, we will delete this sentence and restructure this paragraph.

Comment 3: At the end of introduction (L117-126). Restructuring this part, or adding L93-95 and L111-115 into this part.

Response 3: According to referee's comment, we will adjust this part at end of introduction which claim the aim and meaning of this study in the revised version. In fact, we will also restructure the whole introduction section and make the argument processes to be more logic and clear.

Comment 4: In the method and material section (L178-206). Modification of the terminology about random event expression.

Response 4: There are some incorreced terminological expressions about random events from L178 to L206 which is the similar to the L32 in the abstract. According to the referee's comment, we will carefully check these incorrect expression and modify in revised manuscript.

Comment 5: In the result section (L314-351). Explanation of the reason for using two probabilistic approaches, and the difference between the two approaches

Response 5: In the result section, in order to quantitatively describe the stochasticity of environment affecting the generation of runoff and sediment. Firstly, we introduce the OCIRS system to calculate the probability of random runoff and sediment events occurring in different plot types based on probability theory in the study area. Actually, the OCIRS system could be regarded as an event-driven conceptual model indicating

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the relationship between all observed different weather conditions and erosion events based on the exploration of stochastic information. Because, OCIRS provide a platform to compare the risk of erosion generation through probability values. Therefore the causal effects of erosive rainfall events on the randomness of runoff and sediment could be constructed on the basis of the application of OCIRS system.

On the other hand, as a second method, Bayes model, however, could be regard as an “inverse” application of OCIRS on describing the stochastic relationship between environment and erosion events. Because, in this study, the Bayes model could be considered as a feedback of a random erosion events on four different rainfall event types. Just like the referee’s mention, the Bayes model supply more stochastic information about erosion properties, it implies how much contribution of rainfall events to any random erosion. Especially, under information deficiency conditions, Bayes model is an important supplement for assessing the randomness of erosive events occurring in different vegetation types.

Consequently, the combination of OCIRS and Bayes model finally form a whole analysis loop patten (OCRIS-Bayes framework) to systematically describe the effect of restoration vegetation on erosion randomness. We will follow the referee’s suggestion, and highlight the meaning of OCIRS-Bayes in discussion section.

Comment 6: In the result section (L356-380). Explanation of the reason for using binomial and Poisson distribution function, rather than using other probabilistic distribution functions?

Response 6: In the study, we generally hypothesize that the stochastic information or signal of rainfall is one of most important and indispensable factor to be transmitted into erosion phenomenon and at last affect the randomness of erosion events. Reported by former literatures, especially depending on the relevant research by Eagleson, binomial and Poisson distribution method were applied to describe the probabilistic distribution of rainfall events, which moreover have good predictive effect on annual rainfall events.

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Therefore, the closed causal relationship between stochasticity of rainfall and erosion generation is our first reason for selecting binomial and Poisson distribution to describe and predict the probability distribution of runoff and sediment events.

The second reason for choosing binomial and Poisson is that the phenomenon of soil erosion can be simplified to a series random variable satisfying the theoretical hypothesis of binomial distribution. These characteristics of random variables also more satisfy with the fundamental and premise of binomial distribution application than other probabilistic models. As to the response of the referee's comment, we will added the relevant explanation in revised manuscript.

Comment 7: In the discussion section (L385-422). Making clearer explanation of the reason for designing OCIRS-Bayes framework

Response 7: This comment is similar with comment 5. We will follow the referee's suggestion in revised version to highlight the reason and meaning of introducing and employing the OCIRS-Bayes framework on the stochasticity of soil erosion.

Comment 8 Checking the clerical error in figure caption and simplifying the content of tables

Comment 8 The "total reason" in L944 is an obvious clerical error, we are very sorry, and we will change it to "total season or whole season". We will also adjust the content in table 2 and 3 to make the information in these two tables be more effectively indicate the main properties of different random rainfall event types. Finally, we will carefully check other clerical errors in original manuscript and probably invite a native English speaker to polish the language.

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