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Reply on RC1

Yongcai Lou et al.

Author comment on "Rill Erosion on Slope of Spoil tips: experimental study of runoff scouring erosion in multiple times" by Yongcai Lou et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-399-AC3, 2021

Thank for your suggestions on this article, and we have revised the content of the article according to your suggestions. The following answers to your questions about the article are provided in detail.

Ln 70, More accurately than what?

Nearing et al. (1997),Reichert and Norton (2013) and Shen et al. (2016) found that stream power can more accurately than other hydrodynamic parameters to characterize the dynamic mechanisms of rill erosion.

Ln 156, Do you mean flow hydrodynamic parameters are important for describing runoff and sediment production characteristics?

We consider that mean flow hydrodynamic parameters are important for describing runoff and sediment production characteristics. The slope runoff hydrodynamic characteristics greatly determine the slope rill erosion and morphological characteristics. The hydrodynamic characteristics of runoff can reflect the energy changes of runoff, which in turn have an impact on the stripping, transport and deposition of soil on slopes.

Ln 231-233, These exponents do not necessarily tell us the relative importance of the inflow rate, slope and scouring times as these variables have different dimensions and magnitudes.

We agree with the views you raised. In order to accurately quantify the effects of inflow rate, slope and scouring times on the slope erosion of the spoil tips, it is necessary to eliminate the effects of the magnitudes between the different influencing factors. For this purpose, we used a multiple linear regression method. The specific steps to calculate the degree of influence or contribution of each independent variable to the dependent variable are: (1) establish a multiple regression equation and obtain its coefficient of determination R^2. With R^2 equal to the sum of the contribution of each independent variable. $1-R^2$ being due to other factors that are beyond the scope of the analysis. (2) standardize the regression coefficients of each independent variable in the multiple regression equation to obtain the standardized regression coefficients, which are used to eliminate the effect of the magnitude (Eq. 1). (3) calculate the contribution of the independent variables to the dependent variable in the regression equation using the standardized regression coefficients (Eq. 2)(Nan et al., 2013). The specific formulas are as follows:

$$\beta_i = b_i \frac{\sigma_{xi}}{\sigma_y} \quad (1)$$

$$P_i = R^2 \frac{\beta_i^2}{\sum_{i=1}^{n} \beta_i^2} \times 100\% \quad (2)$$

where βi is the standardized regression coefficient of the i th independent variable, bi is the regression coefficient of the i th independent variable, σ_{xi} is the standard deviation of the i th independent variable, σ_y is the standard deviation of the dependent variable, and P_i is the contribution of the i th independent variable.

Ln 246-247, Are these your results or results of Peng et al., 2014 and Niu et al., 2020?

These are results we observed during our experiments, and similar phenomena were observed by Peng et al. 2014 and Niu et al. 2020. To avoid misunderstandings, we have modified the original sentence. Specifically, as follows:

"With the blocking and scouring of the side walls, the erosion and collapse occurred repeatedly, and erosion fluctuates, so that multiple peaks and lows occur during the erosion process. Similar phenomena were observed by Peng et al. (2014) and Niu et al. (2020)."

Ln 321-323, Not sure these interpretations are correct and please see comment above on the same issue.
As mentioned above, we re-quantified the effects of different influencing factors on rill width, rill depth and rill width-to-depth ratio based on a multiple linear regression approach.

Ln 349-351, It is not clear what this means. What is a significant variable rule?

What we want to express is that Fr does not show an obvious variation (increase or decrease) with increasing slope, inflow and scouring number, the reason may be related to the complexity of the development of rill morphology on the slope. we have modified the original sentence. Specifically, as follows:
"No obvious variation existed between Fr and the inflow rate, slope or scouring times may be related to the complexity of the rill morphological development on the slope."

Ln 355-358, Poor English and please reword

we have modified the original sentence. Specifically, as follows:
"The Darcy-Weisbach coefficient (f) ranged from 1.14 to 3.15. No obvious relationship existed between f and the inflow rate, slope and scouring times (Fig. 10(j-l)) because the rill beds became more irregular, resulting in rill development."

Ln 412-413, These statements may be correct, but the authors should consider the dimension and magnitude of these variables when comparing them.

As mentioned above, consider the dimension and magnitude of these variables, we used a multiple linear regression method and re-quantified the effects of different influencing factors on soil erosion of the spoil tips.

References

Nan S.,Wang Z.,Liu J.,Yang X.,Jiao N., and Tan Z.: The Impact and Contribution of Influx of Sediment onto Rill to Rill Erosion on Loess Hillslope, J. Mt.

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