Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., author comment AC7
https://doi.org/10.5194/hess-2022-30-AC7, 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Reply on RC3

Jian-Fang Wang et al.

Author comment on "Investigating the effects of herbaceous root types on the soil detachment process at the species level" by Jian-Fang Wang et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-30-AC7, 2022

Firstly, we really appreciate the time and effort you have dedicated to providing insightful feedback on ways to strengthen our paper.

We know that for the model it should be test with another group of independent data. Such as some hydrological models and soil erosion models. As we explained, the aim of this paper was to investigate the effects of herbaceous root types on the soil detachment process at the species level. That is, we pay much attention to the effects of root system on soil detachment process. In this paper, we explore mechanistically how the overland flow, soil properties, plant density and root system affect the soil detachment process. We thought that this basical field experimental studies is the basis for hydrological model or soil erosion model building, not that we are going to build a model.

It is for this reason, we want the relevant model would use our results. In other words, we hope that our paper can provide some useful results for the model building. For this study, the soil detachment capacity was affected by the hydraulic parameters of overland flow, the soil properties and root types. The method of stepwise was used to fit the effects of these factors on soil detachment. For one hand, factors that had no effects or little effects would be eliminated. For another hand, the selected parameters in Eq.10 would well reflect the effects of overland flow, soil properties and root types on soil detachment.

In this study, the selected two herbaceous and soil properties are typical of the hilly and gully area of the Loess Plateau. The Eq.10 might be used in this area. For other region, as you mentioned, this equation should be calibrated. Following your suggestion, we would verify this equation with another independent data in future study and make the equation more widely applicable. This is a basic experimental study, we are unlikely to treat it like regular model building, after all our data is measured and limited, not massively collected.

There is some interesting about this paper. Such as, studying the effects of plant root system on soil erosion at the species level, which is necessary to determine the mechanism of regional vegetation measures on controlling soil erosion. However, relevant studies about soil erosion pay no attentions about this. Although some hydrological process model has been noticing that. Other problems for the relevant studies are also obvious. For example, in the sampling process, the root would not completely collect due to the limitation of the sample (generally used the rectangular ring with 20 cm in length and 10 cm in width, or circular ring with 10 cm in diameter). The scouring process by overland flow may also affected by the edge wall of the steel ring. The roots of other

herbs are also mixed in the sample ring. These factors would all affect the results. It is because of this, we planted the herbs in relatively large tank (200 cm in length and 50 cm in width) to avoid these possible impacts. With these large soil samples that used in this study, our results would well reflect the effects of herbaceous plant root system on soil detachment, for the root system integrity can be maintained and the initial soil properties of all sites keep consistent, and the influence of edge effect on test results can be ignored. Besides, there are no other herbs root in the sample soil, it is helpful for us to study the effects of herbaceous plants root system on soil detachment at species level.

All in all, studies about the effectiveness of plant root system in reducing soil erosion at species level was still needed, which would have great advantages for clarifying the effects of plant root system on controlling soil erosion and improving the accuracy of soil erosion model.

Finally, we respect your decision. We hope our interpretation is acceptable. Every discussion is an opportunity for us to learn and improve. It also allows our thinking to not be limited by inherent knowledge. Thank you very much again.