

## ***Interactive comment on “Ecohydrological effectiveness of litter crusts in sandy ecosystem” by Yu Liu et al.***

**Yu Liu et al.**

kingliuyu@nwafu.edu.cn

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Dear Referee, Thank you for reviewing the manuscript and providing your short comments. We are glad to response all the comments, which would help to improve the message and the quality of our manuscript. The following is point-to-point responses to your comments.

This manuscript reports on the positive effects of litter crusts on soil water holding capacity and water interception capacity by comparing between litter crusts, biocrusts and the bare soil. They synthesized multi hydrological-related properties of crust soils to give the whole picture of the hydrological processes differences between litter crust and biocrust in sandy lands. They found litter crusts significantly increased soil organic

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matter than biocrusts and bare sandy lands, and also increased soil porosity and decreased soil bulk density, which can help to maintain maximum infiltration rates. They also found the effect of crusts on water infiltration rate was depending on the level of water supply: significant different was only found at high water supply (>1000 mL) as the litter crusts increased the water infiltration. This research highlights the instrumental role for litter crusts in many hydrological processes, which is of great value under the context that national ecological programs in China improved vegetation recovery and developing litter crust intensively. In my opinion, this is an interesting and important study in understanding the ecohydrological functioning of litter crust and thus deserved to be published in HESS.

Response: Thanks for the reviewer's positive comment.

I also suggest several specific revisions as follows. L52. Considering the term "litter crust" is not familiar to the reader, it is better to define what is "litter crust", and what is the difference between "litter crust" and more commonly "litter layers".

Response: Thank you for your comment, we have given the definition of litter crust and the difference between it and litter layer in introduction. Unlike the commonly litter layer, litter crust is a hard shell formed by the mixing of litter and sand under external forces such as rain, wind, etc. In this study, litter crust was defined as the crust formed by "all dead organic material made of both decomposed and undecomposed plant parts which are not incorporated into the mineral soil beneath".

L76. "(China)" is better to move upward to L74 when "Loess Plateau" is first appear.

Response: Thank you for your comment, following other referee, we have deleted the sentence "Preventing and controlling erosion in an urgent issue to require resolution on the Loess Plateau, China (Fu et al., 2011)".

L126. The unit "dm<sup>-2</sup>" is incorrect, please revise it.

Response: Thank you for your comment, we have revised the unit for "dm<sup>2</sup>".

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L126. The unit for biocrust evolution needs to be added.

Response: Thank you for your suggestion, we have added the unit “g dm<sup>-2</sup>” for biocrust mass.

L129 and L130. As you’ve mentioned the unit for other factors you measured, it’s better to address the unit of Max WIC and Max WHC here as well.

Response: Thank you for your suggestion, we have added the unit “g dm<sup>-2</sup>” for Max WIC and Max WHC.

L132. ->”at depths of 0-3 cm, 3-5 cm, and 5-10 cm”

Response: Thank you for your suggestion, we have revised the sentence to “The samples in the soil layers were collected at depth of 0-3, 3-5, and 5-10 cm”.

L134. ”: : was measured using a soil bulk sampler (100 cm<sup>3</sup>) stainless steel cutting ring: : ”: the sentence is incorrectly phrased. Please revised it.

Response: Thank you for your suggestion, we have revised the sentence to “Bulk density (BD, g cm<sup>-3</sup>) was measured using a soil bulk sampler (100 cm<sup>3</sup>) stainless steel cutting ring”.

L141.” : : : and holding capacity of litter crust” ->” : : : and water holding capacity of litter crust”

Response: Thank you for your suggestion, we have revised the title to “Water interception and water holding capacity of litter crust”.

L149 and L152. You can give the unit of Max WHC and MIC at their first appearance as suggested at L129 and L130. L154. The unit for SOM needs to be added.

Response: Thank you for your suggestion, we have added the units for Max WHC and MIC, and SOM in the sentences.

L169. “The time duration for the end of water infiltration : : :”. I understand your point,

but this expression is not correct.

Response: Thank you for your suggestion, we have revised the sentence as “The amount of time required for water to infiltrate in the ring was recorded to determine the water infiltration rate”.

L203. Table 1, the data source for these changes of BD and TP, need to be cited here.

Response: Thank you for your suggestion, we have cited Table 1 in the sentence.

L207. The abbreviation “BSL” doesn’t need to be explained again and placed in “()”, as you have already explained it and used the “BSL” in the former passages.

Response: Thank you for your suggestion, we have deleted “bare sandy land” and the “()” in the sentence.

L213. Here comes the confusing that what does “crust mass” mean because you didn’t mention such term in Methods. I suppose it refer to the same thing as ”biocrust evolution” which you’ve mentioned in L126. If so, please be consistent through out the text.

Response: Thank you for your suggestion, we have changed “biocrust evolution” to “biocrust mass” throughout the manuscript.

L277. “Our study showed that the 5 cm litter crusts measured from 2-year and the 9 cm litter crusts measured from 4-year-old *Populus simonii* forests.” This sentence is not complete. Please revised it.

Response: Thank you for your suggestion, we have revised the sentence to “Our study showed that litter crusts can reach 5 cm in 2-year-old and 9 cm litter crusts in 4-year-old *Populus simonii* forests”.

L289. “maximum WHC of litter crust was 1.7 g water – g litter”. You use the unit “g dm<sup>-2</sup>” for maximum WHC in previous text, please be consistent throughout the manuscript. “The maximum volume of litter crust was 1540 cm<sup>3</sup>”. It is confusing here to use “maxi-

imum volume”: does “1540 cm<sup>3</sup>” indicate the volume for the whole crust sample, or the relative volume for the pores inside the crust sample? I guess you mean the later one, as you sampled the crust by the same volume.

Response: Thank you for your suggestion, we have revised the unit “g dm<sup>-2</sup>” for Max WHC. “The maximum volume of litter crust was 1540 cm<sup>3</sup>”, it means the whole crust sample. Our sampled the litter crust by the same bottom area but the crusts have different thickness, so all samples have different volumes.

L460. The caption needs to provide the information of which statistic test was used. The significant level also needs to be noted in the footnote.

Response: Thank you for your suggestion, we have added the method of statistic test in the caption, “The results of GLM analysis for effects of crust types and the amount of water supply on the water infiltration time, infiltration depth and infiltration rate in the study.”. The significant level was shown in the table by the value of p.

L464. Bare sandy land didn’t have any crust. It is not appropriate to summarize the four sub-figure using” in different crusts”.

Response: Thank you for your suggestion, we have revised the caption to “The vertical soil profiles in bare sandy land and different crusts in the study”.

L465-. The meaning of the error bar needs to be given in the caption (eg. M+SE). The meaning of the abbreviation “BSL” is also need to be included in this caption (same as in figure 4 and figure 5).

Response: Thank you for your suggestion, we have revised as suggested.

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