

Interactive comment on “Forest harvesting impacts on micrometeorological conditions and sediment transport activities in a humid periglacial environment” by F. Imaizumi et al.

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We sincerely thank you for the efforts you have made to improve our paper submitted to Hydrology and Earth System Sciences. We have responded to all review comments in the following paragraphs.

<General Comments> This study carried a careful field experiment for studying forest harvesting impacts on micrometeorological conditions and sediment transport activities in a humid periglacial environment. It is important for management of the periglacial catchment, especially the vegetation-erosion processes. The observation methods were generally reliable, the datasets showed good quality, and the presentation of re-

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sults were also clear. However, the discussion section requires improvement as the present version is more or less repeating of the results rather than a discussion. The discussion should focus on showing a more general cognition that helps people understand micrometeorological conditions and sediment transport activities in a humid periglacial, and the influence of forest harvesting on such processes. In addition, the abstract should be revised with less common sense but more scientific findings from this study.

[Reply] It is our pleasure that the reviewer understand importance of our study. Based on comments from the reviewer, we will remove sentences repeating results in discussion section. In addition, we will add general findings about forest harvesting impacts on micrometeorological conditions and sediment transport activities. In the abstract, we will replace ambiguous expressions with the scientific explanations.

<Specific comments> [Comment] 2 line 5: as this study is not relevant to aquatic ecosystems, I would suggest delete the sentence.

[Reply] We will remove the sentence as suggested by the reviewer.

[Comment] Page 3 line 27: why not arrange the CC and NC at the same contours with similar slope gradient? As the steep slope is apt to failure, it is inappropriate to just neglect the influence of the different slopes. Please clarify!

[Reply] The harvesting area was decided by conditions of trees, access to the area, and ease of logging. Our study was not most important criterial for the decision of harvesting area. Although we tried to select control sites (NC) with similar tree conditions and topography as possible, topography in NC was slightly different from that in CC. We will add potential effects of the topography on differences in sediment transport activity between CC and NC.

[Comment] Page 4 Table 1: the difference of the contributing area would also affect the calculation of sediment yield, e.g. a smaller area would give a larger sediment yield

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rate. So the difference in the cross-sectional topography could not be distinguished from the comparison of the ridge, straight, and valley. Please clarify!

[Reply] We did not divide the sediment transport rate by the contributing area to avoid scaling effect pointed out by the reviewer. The sediment transport rate was divided by width of sediment traps to obtain sediment flux. We will add an explanation on this point.

[Comment] Page 5 lines 10-14: it should be explained how to deal with the non-measured periods/ or why it is acceptable with such discontinuous measurement.

[Reply] Throughfall was just analyzed in the Fig. 7. Periods without data are not shown in the figure. Because of the intermission of throughfall monitoring, throughfall was not used in the analysis of sediment transport rate (e.g., Fig. 9). We will explain how throughfall data was used in this study.

[Comment] Page 5 lines 15-20: as you have both temperature logger data and some short period radiometer data, why not try to correlate the two datasets and extension of the radiometer data?

[Reply] Thank you for your helpful comment. We will try to find relationship between temperature logger data and radiometer data, and extend the radiometer data using the relationship if possible.

[Comment] Figure 2: the high boulders at CCV acted as flow resistance structure and could reduce erosion ability of flow and may not be ignored, therefore the influence of vegetation clearance may not be distinguished by the comparison of CC and NC.

[Reply] We agree that the flow resistance in CCV is likely higher than the other plots because of the large boulder size. Therefore, impact of forest harvesting cannot be simply discussed by comparison of the data in CC and NC. Difference in the topography between CC and NC, which are pointed out by the reviewer, also affects sediment flux. In this study, the forest harvesting impact was discussed based on the comparison of

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sediment flux before and after the harvesting in each site (Figs. 10, 11, 12, table 2). We will explain this point in the first part of the paper.

[Comment] Page 10 lines 18-19, the 0-3 mm hr⁻¹ difference in rainfall intensity between the CC and NC is not clearly seen from Fig. 7.

[Reply] In Fig. 7, we will shade the range (0-3 mm hr⁻¹ higher than x=y) in order to clarify the trend. In addition, we calculated total duration that rainfall intensity in CC exceeded that in NC. Ratio of the duration (CC > NC) in the total rainfall period was 0.50 and 0.62 before and after the harvesting, respectively. We will note that in the text.

[Comment] Figure 4: typing error of “(b) after harvesting”

[Reply] Thank you. We will revise the spelling.

[Comment] Figure 8: why CC not measured for the sampling period as NC? for the different peaking rainfall intensities, how the velocities of CC and NC along slope were comparable?

[Reply] The periods when TLCs worked both in CC and NC are limited because of the mechanical troubles. Additionally, heavy rainfall events were not observed in such periods. Therefore, we could not show the figure with same sampling period. We will note that in the manuscript. As the reviewer points out, the velocity in NC and CC cannot be simply compared because of different rainfall intensities. Therefore, we did not compare soil creep velocity in Fig. 8. Alternatively, we compared the velocity in Fig. 9.

[Comment] Figure 9: the uncertainty should be indicated as there is one dot of NC having no clear displacement of ground surface sediment at the maximum hourly rainfall as high as 11 mm hr⁻¹

[Reply] As the reviewer points out, the relationship includes some uncertainty. We will note that in the text.

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[Comment] Figure 11: typing errors in the caption, see (g), (i), (j)

[Reply] We will replace COR and COS with NCR and NCS.

[Comment] Page 23 lines 13-16: I would suggest write the sentences as “Our study clarified that forest harvesting promoted changes in the micrometeorological conditions by removal of the forest canopy, such as increases in the diurnal range of ground temperature, shortening of snow cover period, and increases in the throughfall. However, sediment transport activity has been restrained due to the trap of sediment by branches of harvested trees and the growth of understories.”

[Reply] Thank you for your suggestion. We think the suggestion is better expression as conclusion of the paper. We will revise the sentence as suggested by the reviewer.

Thank you again for your helpful comments.

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