

## ***Interactive comment on “Effects of environmental factors and soil properties on topographic variations of soil respiration” by K. Tamai***

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I appreciate the anonymous referee #2 for his valuable comments and suggestions. The following is the list of the author's reply to the interactive comments on “Effects of environmental factors and soil properties on topographic variations of soil respiration” by K. Tamai. I am very sorry that this reply has not proofread by native English speaker. I shall submit the revised manuscript after proofread by native speaker.

General comments: This manuscript tried to explain the difference in soil respiration rate measured in two forest sites in mountainous regions in Japan. The temporal variations of the year-long measurements of soil respiration and environmental conditions were presented. The parameterization of the soil respiration was performed using the soil temperature, soil water content, and soil properties. The dataset may have the  
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potential to provide useful information for inter-site comparison of soil respiration and to bring more understandings of the controlling factors of decomposition processes in forest ecosystems.

[Comment] However, at present, it seems difficult to find enough new scientific findings or original interpretations in the manuscript. I would suggest the author to revise the manuscript substantially to include necessary information and more original analyses based on scientific questions and hypotheses on the soil respiration processes. I would present two major concerns on the manuscript. [Reply] The following result and discussion are thought to be new insights. “To compare the effects by soil moisture and soil property on the spatial variations of soil respiration in slope scale, the soil property has a little effect in the immature soil. It has more effect in the more mature soil than soil moisture.” “The cause the fewer soil respiration at the lower part of the slope is from the soil property, not wetter soil moisture in this study.” I shall revise the explanation of “Result” and “Discussion” to make clear these ideas.

[Comment] 1. The author tried to compare soil respiration in different forest sites, which had different soil properties and environmental conditions. However, the definition and interpretation of the conditions were not well provided. For example: 1) What is the difference in the mature soil and the immature soil? Is it the year from disturbance? How did the maturity affect the results specifically? [Reply] The mention of “immature soil” in Yamashiro site is from the identification by Araki et al. (1997). The mention of “mature soil” means that the soil in Kahoku site is more mature than that in Yamashiro site. Because the soil in Kahoku site is identified to be brown forest soil by Kobayashi and Shimizu (2007). The Yamashiro area is completely bare land without any vegetation caused by exploitative carbon taken out (from 6th century) and erosion until 1875 (Goto et al., 2004). We can confirm that the land had already covered with no vegetation before 17th century according to the old picture painted in 1684 (Editorial board of Yamashiro town history, 1986). Thus, the Yamashiro site had been completely bare land without any vegetation for more than 300 (- 1200) years. The difference of

immature and mature soil is years from the disturbance and their intensity. I shall add these information in "Site description".

2) How did the author select the location of the observational plots in the two forests in different topography? It seems arbitrary at present. The observed slope is selected with the convenience for the observation using the electric power. The plots were settled with the relative height difference.

[Comment] 2. In the discussion part, the author described that several parameters such as total C, microbial biomass and activity, root biomass and activity, and porosity affected the 'soil property' term EF(Soil) (Page 10946, Lines 13-15). The author also stated 'This study cannot identify which factors are effective' (page 10946, Lines 15-16). However, a lot of papers were already published to make clear the mechanism of soil respiration and to present important individual parameters (such as autotrophic and heterotrophic respiration and their seasonality, etc.). Comparing to such detailed experiments and discussions in other studies, it is regretful that this paper does not have enough new findings at present condition. [Reply] The reason of large EF(Soil) is discussed after Page10946,line16. Thus the mention 'This study cannot identify which factors are effective' is not correct and I shall delete the mention of Page 10946, Lines 13-16.

Specific comments: [Comment] 1. Abstract (Page 10936, Line 9): The name of the plot (Plot L) was used without definition. [Reply] The mention "Plot L" is revised to be "Lower part of slope".

[Comment] 2. Introduction: There are many descriptions about the literatures. However, the following points are still unclear. Please describe more specifically and rigorously. 1) What kind of important scientific issues we have now? 2) What are the author's question and hypothesis? How they are verified? [Reply] I define the solid hypothesis is "Soil moisture is supposed to vary in slope. Soil property is also supposed to vary in slope. Because, soil is developed under the different moisture envi-

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ronment." The definition of critical scientific questions is which has more large effect on the soil respiration variations in a slope". They are verified with Eqs (2)-(4) to estimate EF(T), EF(A<sub>s</sub>) and EF(Soil), individually. I shall improve the "Introduction" to show them clearer.

Reference Goto, Y., Tamai, K., Miyama, T., and Kominami, Y.: Stand structure and dynamics during a 5-year period in a broad-leaved secondary forest in southern Kyoto Prefecture, central Japan, *Japanese Journal of Ecology*, 54, 71-84, 2004 (in Japanese with English summary). Kobayashi, M. and Shimizu, T.: Soil water repellency in a Japanese cypress plantation restricts increases in soil water storage during rainfall events, *Hydrological Processes*, 21, 2356-2364, 2007. Palmroth, S., Maier, C. A., McCarthy, H. R., Oishi, A. C., Kim, H. -S., Johnsen, K. H. Katul, G. G. and Oren, R.: Contrasting responses to drought of forest floor CO<sub>2</sub> efflux in a Loblolly pine plantation and a nearby Oak-Hickory forest, *Global Change Biology*, 11, 1-14, 2005. Yamashiro town history editorial board : Yamashiro town history -text part-, pp.999, Yamashiro town hall 1986 (in Japanese).

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