

Interactive comment on “Abiotic CO₂ sources confound interpretation of temperature responses of in situ respiration in geothermally warmed forest soils of Iceland” by Marja Maljanen et al.

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1. I advise to use in the title ‘biotic CO₂ efflux’ instead of ‘respiration’ Reply: We will change respiration to biotic CO₂ as suggested by the reviewer
2. There are 3 weak methodological points in the work. - The first is a very small repetition of CO₂ emission measurements, which is insufficient for obtaining truthful results due to the very high spatial and high variability of soil CO₂ fluxes; Reply: This is true, the study plots were small and only limited amounts of samples could be taken. However, we wanted to focus our study on the transect and wanted to include several plots differing in temperature, also we wanted to take at the same time the isotope samples,

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therefore we compromised on the number of replicates to make this practically feasible. Still, we have high confidence in our results, since the three replicates taken from each plot were very similar and the changes along the gradient were seen very well. A similar sampling approach with three replicates was also chosen in Maljanen et al. (2017), and the results matched ours. The main differences in CO₂ fluxes were seen between the sites (and not between the replicates) along the gradient. This manuscript focuses on interpreting these differences, by mainly studying if there are any (and how much) non-biological CO₂ emissions.

- The second is the difference in vegetation and its density in the study plots where the CO₂ fluxes were measured. Since the authors did not remove the vegetation, this is a significant moment that could affect the CO fluxes from soils. The comparison between plots in this case cannot be considered legitimate. The convincing explanations on these issues are required; Reply: It is true that vegetation affects the CO₂ flux. These marked sampling plots were very small and also many other experiments were going on by other scientist there and therefore we were not allowed to remove vegetation or otherwise disturb the study plots. We will add this explanation to a revised version of the manuscript. However, as mentioned above, the present study focuses on the existence of non-biological CO₂ emission, and tries to find correlations between environmental factors and non-biological fluxes in order to be able to correct for these abiotic fluxes in future studies (which was proved impossible). Therefore, the discussion on the temperature sensitivity of the biological fluxes has here minor importance. In the revised version of the manuscript, we would clarify this issue.

- The third is the absence of any statistical analyses of soil and CO₂-flux data. 3. Due to the region studied is very exotic it would be nice to include more information on relevance of this study for other regions. It may be analysis of the temperature sensitivity (e.g. Q₁₀ values) of biotic components of total CO₂ emission using the data for plots FN+0, FN+1, FN+2, FN+6, and FN+10 plots. Reply: First, as the reviewer also mentioned in his/her pervious comment, the results on the biological respiration

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are impacted by vegetation and thus Q10 values, unfortunately, are not very useful. But the main aim was not here to study the biological respiration but the amount of abiotic sources of CO₂, by using isotope analysis. This is very important to know if these sites are used for studying the effects of soil warming on biological processes (e.g. soil respiration). We tried to correlate the abiotic CO₂ fluxes with temperature and other environmental parameters but could not find any correlation. It seems that these emissions are random and not easy to predict, thus isotope analysis are always necessary, making it difficult to generalize the results. We mention that temperature gradient studies from volcanic areas need to consider the two components of the CO₂ fluxes, however, we would add some more text to the these concluding remarks in a revised version.

4. Some specific comments: - in Fig. 1, the lines for designating total and geo- CO₂-fluxes are very similar. Use, please, more contrasting symbols for lines; Reply: We will change the lines/symbols - Table 1 in Supplement: Include, please, mean and SE in this table instead of the individual measurements; - Fig 1 (Supplements): Change please the scale (1/concentration), using the 10⁻³ for scaling. The Figure will be more readable. Reply: We will do these changes to make the figures more readable.

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