Dear Authors,

I would like to present my evaluation of the manuscript entitled "Inclination controls CO2 and N2O fluxes, but not CH4 uptake, from a temperate upland forest soil".

This study shows the effect of slope (of the land) and distance (to the stream) on GHGs in a temperate forest soil. GHG emissions are modified by the local land conditions, slopes, and topography, and it is very important to take into account these factors when looking at landscape-scale emissions. The authors used recent technological analyzers known for their high precision and sensitivity to demonstrate how CO2, CH4, and N2O fluxes vary within a short space. However, there are a number of issues that should be addressed. The main aspects that need to be revisited are the interpretation of the results, and how Inclination and distance are regarded as factors for the changes in the emissions. Distance by itself is not a factor causing the differences in the emissions across the plots, rather the changes in the soil properties, which are of course not, modified by the distance itself. The authors may look at the historical conditions at the site. The measurements are set up close to a watercourse, but the possible floods and their consequences have not been adequately discussed in this manuscript. Frequent inundation can lead to varying soil properties, and drying-rewetting enhances decomposition. High standard deviations are highly visible in the soil properties of the site, particularly at CG5 and CG15, as presented in Table 1, which indicates high uncertainty and less confidence in the results or the number of samples. Lastly, the authors compared their findings with earlier studies in the discussion section, which is good despite incomplete year measurement in this study, but the authors should also look at other studies with similar objectives where GHG emissions are investigated with respect to the slope of the land or with reference to streams or rivers. Other specific comments are listed below:

Title

Please give a more specific title. The word "Inclination" can have multiple meaning. Please make it a bit clearer in the title what inclination is being referring to. Land inclination?? Slope of the land??

Abstract

In the keywords, why is topography included? Topography has not been discussed in this paper

Introduction

L44: don't need to repeat N2O as it has already been stated above in line #38

L62-63: Please revise this statement.

L91-92: The impact of topographic variation hasn't been studied so much with regard to GHG emissions. Is it due to the difficult nature of the task or the general assumption that the slope has no impact on GHG emissions?

Methods

L115: GasFluxTrailer is a platform. This statement sounds GasFluxTrailer was used to measure GHGs, but the trailer is the platform to position your gas analyzer.

L123: The manufacturing company name, and country is missing

L133/134: Again here. The trailer is being mentioned as a system estimating the gas exchanges. This may confuse the readers. The gas samples are analyzed by the two picarro analyzers.

L142-144: Chambers closing and opening simultaneously or successively

L200: This statement should be moved from here to the above section (Field measurements, L149-152).

Results

L238: According to the results in Table 1, the soils at CG0.5 and CG10 are sandier compared to the two locations, CG5 and CG15. And the clay contents of all distances are very low.

L240: Table 1: Litter depth, litter weight, soil C, porosity, organic matter, soil pH, sand content, silt content and clay content at CG5 and CG15 have very high standard deviations indicating high spatial variability and thus uncertainty. First, why such big variability have occurred within such small area? Second, why didn't you attempt to increase the number of sampling points to reduce the variability? Moreover, in none of the sections of this manuscript have I seen explanations for why these variabilities have occurred.

L254: It seems average fluxes are reported here, but cumulative fluxes are generally a better approach to compare fluxes of different treatments. Why is average flux preferred over the cumulative flux?

L273-278: There is no need to mention the significance of the main factors (soil moisture and temperature) when the interaction between the two is significant.

L282-287: R2s in Table 2 represent marginal and conditional R2 as described by the authors. However, for each regression represented in Figure 2, no R2 values are shown. The R2 and P-values should be shown in each figure.

L311-312: This is because the interaction is significant. If the interaction is significant, it is difficult to separate the variance due to the main effects.

L319-323: Figure 3: Please see the above two comments.

Discussion

L374-375: According to Figure 1a, the lowest CO2 emission is at CG0.5 followed by CG15, which is on the sloped location. Therefore, this statement is not true. The CO2 emission at the flat area is not significantly different from the CG15 and also the major differences between two distances occur within the flat area (CG0.5 and CG5). Thus, the values presented in Figure 1 won't enable us to conclude slope as a factor influencing the CO2 emission while the most significant difference is observed within the flat locations. Distance can also not be a factor affecting the CO2 emission.

L380-381: CG5 receiving water from the steep slope cannot favour microbial activity by itself. Is the water carrying nutrients and organic matter? Then, this might lead to changes in the microbial activity. The authors haven't said anything about the water coming from the stream. The plots are located very close to the stream and there is a high possibility that there is an interaction between the stream water and the nearby plots.

L412-414: This statement contradicts to the model results mention in L410, where decreasing CO2 was associated with low pH value.

L417-419: The results showed the main drivers of the CO2 emissions are neither the slope nor the distance from the stream. All measured results showed high spatial variability with no particular pattern to slopes or distances of the plots.

L428-431: These differences may also arise from the differences in annual climate conditions such has temperature and precipitation. Please keep in mind that this study hasn't completed the full year measurements, which may give rise to the differences between this and previous studies conducted at the same sites. This needs to be explored.

L438: Is it really distance that has an effect on CH4 uptake? Based on table 3, distances of 5 m and 10 m are not significant, even though 15 m shows significance. Soil moisture and temperature seem to be the major factor controlling the CH4 uptake rate.

L448-450: In L296, it is mentioned that CH4 is marginally affected by inclination by referring to Table 3. However, inclination is mentioned here a a non-driver of CH4 uptake. Please be consistent when the results are interpreted.

L451-452: High CH4 uptake was associated with decreasing soil moisture rather than increasing?

L453-456: The model generates what has been given to it. If the data is valid and a correct procedure is followed, the model will produce the right output. Being able to correctly interpret the model result is also critical. Interpreting the main effects separately while the interaction is significant may lead to a wrong conclusion.

L458-460: Please see the comment above.