**Reviewer # 1**

Klaus Butterbach-Bahl (Referee)

Received and published: 23 April 2020

*"That is a nicely written paper on soil $CO_2$, $CH_4$, $N_2O$ fluxes on a largely understudied tropical montane region in the Andes. My main concern, which is rather substantial, is that all interpretations are based on one week measurements (per strata) in August and again in September. I don't think that such a rather limited dataset allows for fundamental conclusions on site differences, magnitude of fluxes, correlations, temperature effects etc. as e.g. seasonal effects can't be considered and response ratios, e.g. to soil pH might change depending on sampling time and soil environmental conditions. I am bit puzzled that data restrictions are not at all mentioned in the abstract, and conclusions. Conclusions: far reaching, but given the dataset, highly speculative as well as comparisons to existing datasets as done in the discussions. Sorry, but, what is needed here is to cook down the messages and implications within the paper as the dataset is very limited so that results, statistical interpretations etc. remain speculative. I do see the potential for an opinion paper, i.e. focusing on why such measurements are needed and how one might address the challenge to get tangible datasets for such remote regions and what can be achieved by short targeted campaigns (and as well important: what can't be achieved). For me the data are a starting point for a proposal for longer term measurements as would broaden the scientific knowledge on the contribution of these regions to the GHG balance and potential changes which might occur given the dynamic environmental changes occuring.*

*All the best*

*Klaus"*

**Reviewer # 2**

Anonymous Referee #2

Received and published: 24 April 2020

*"In this study, the authors quantified soil fluxes of $CO_2$, $CH_4$ and $N_2O$ of four tropical forest sites located along an altitudinal gradient in northern Ecuador. This is an interesting study and we definitively need such dataset to complete our understanding of GHGs balance in tropical forest. Yet the spatial (one plot with 5 measurement points at each elevation and 4 different elevations: 20 measurement points) as well as the temporal coverage (one measurement per day during 5 consecutive days repeated twice: 10 measurements per sampling points only during the dry season) of the study are low. Moreover, collar insertion was done only 12h before the measurement. A longer period between collar insertion and measurement is generally recommended in order to avoid effect of root death on $CO_2$ effluxes. These limitations are not mentioned in the abstract nor in the conclusion and can give the false impression that this study is presenting a larger dataset. Moreover, the review that is included in the last part of the paper is not complete, including only paper published before 2016 (see supplementary table). This review needs to be completed and the period of measurement (dry vs. wet) need to be specified. My conclusion is therefore that this paper is not suitable for publication in its current form. I nonetheless think that these data are worth being published but rather more as a short note presenting preliminary data."*

**General response to reviewers:**

We would like to thank the two reviewers for their assessment of our manuscript. We acknowledge that this dataset is limited and agree with the reviewers that we should interpret the data likewise. Hence, we can review the manuscript for overstatements, and shorten the general manuscript. We are still convinced, however, that tropical montane forests are largely understudied in terms of GHG emissions [especially at higher elevations], asking for reporting – even with currently limited datasets. Moreover, the combination of the isotope analysis with a range in $N_2O$ fluxes (from net emission to net consumption, along the elevational gradient) is – in our opinion – novel and important. Additionally; only a few full soil GHG balances have been reported for tropical forests that range so strongly in environmental conditions and most of those also suffer from similar temporal constraints. This is in part due to the generally poor accessibility of these forests, especially at high elevation, hampering the deployment of novel portable analyzers and more automated systems to obtain a longer temporal coverage. Although the temporal coverage is indeed limited, the observation of a shift from a net positive to a net negative non-$CO_2$ GHG balance with increasing altitude is new and seems to be of interest to the readership of Biogeosciences. Therefore, we are willing to shorten and restructure the manuscript as suggested, as a shorter research paper, or in another manuscript type.

**List of relevant changes:**

In general, the manuscript has been restructured as an "ideas and perspective" piece. The length has been shortened. A better interpretation of the results has been carried out. Data limitations -mainly related to temporal and spatial coverage- have been clearly stated in the abstract and conclusions sections. We have focused on the importance of GHG studies in tropical regions, and as proposed by Reviewer #1, we have indicated the relevance of short-term campaigns, and we have provided insights for future and more detailed studies in tropical montane forests; explaining why those measurements are needed and how it might be possible to obtain tangible datasets in remote regions. Additionally, as indicated by Reviewer #2, the review included in the supplementary material ("Measured and estimated annual $CO_2$, $CH_4$ and $N_2O$ fluxes from tropical forest soils of South America") has been completed; a wider range of studies has been included (from 1983 to 2019), specifying in each case, the period of measurement.

- The title of the manuscript has been changed from "$CO_2$, $CH_4$ and $N_2O$ fluxes along an altitudinal gradient in the northern Ecuadorean Andes: $N_2O$ consumption at higher altitudes" to "Ideas and perspectives: varying sources and sinks of $CO_2$, $CH_4$ and $N_2O$ along an altitudinal gradient - a pilot study from an Ecuadorian Neotropical forest"
- The title of each section has been renamed; thus, the introduction is divided into two sections: "1 The importance of tropical forests for GHG budgets" and "2 Altitudinal gradients as a biogeochemical open-air laboratory"; and the discussion of the results obtained are under a new section called: "3 What did we see in Ecuador?"
- The materials and methods, as well as results (sections 2 and 3 in the previous version) have been included in the supplementary information.
- Data restrictions (spatial and temporal coverage) are mentioned in the abstract and conclusions.
- The statistical differences on GHG fluxes between sites have been removed, as well as the linear regressions performed to determine the physicochemical soil characteristics able to explain the net GHG fluxes.
- The discussion of the results does not include anymore a comparison with the existing datasets.
- The conclusions section now includes insights for future studies in tropical regions.