

## ***Interactive comment on “Greenhouse gas and energy fluxes in a boreal peatland forest after clearcutting” by Mika Korhonen et al.***

**Anonymous Referee #2**

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The study tested the impact of a disturbance (clearcutting) on surface greenhouse gas (CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O) fluxes in a forested boreal peatland in southern Finland. Over a 2 year period they used both eddy covariance and chamber based methods to measure GHG fluxes, as well as a number of environmental variables known to drive gas fluxes (water table, soil temperatures). The study shows a increase in CH<sub>4</sub> and N<sub>2</sub>O emissions following disturbance, however the authors deem the CH<sub>4</sub> to not be of importance regarding GWP. The paper is well written and contains valuable information regarding the impacts of forest management practices on the carbon balance of boreal peatlands.

My main concern is the conclusion drawn from the data presented here that clearcutting results in the forest turning in to a large CO<sub>2</sub> source. The study includes 2 years

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of CO<sub>2</sub> flux data collected after the clearcutting and presents the trends of these 2 years well. However, there is no reference data of the CO<sub>2</sub> balance of an undisturbed site and as such the study does not show that there has been an increase in a CO<sub>2</sub> source effect. The study mentions unpublished data that provides this information. This data needs to be either published and referenced or including in this study for the conclusions being drawn here to be substantiated and allowed. The study site is also compared to a control, undisturbed, site where there has been water table and soil temperature collected. There is no CO<sub>2</sub> flux data provided from this site, if data is provided from this site as reference point of the annual NEE budget of an undisturbed site in the area. A more detailed data set from this control site (including flux data as well as environmental variables, seasonal weather data) would allow for it to be used as a reference site and then an impact to the source/sink function of the site be commented upon. A map that shows the location of both sites would also be useful. I would suggest either including the unpublished data for a more complete study or a more detailed description of the control site as described above if the authors wish to maintain their conclusion that there is an increased source effect. As is presented here this conclusion can not be claimed.

My secondary concern is regards to the modelling of Reco. There is no influence of water table included in this model (Equation A3) and I would like to know what is the justification of this? The study has a good data set on water table depth throughout the years and a number of times in the paper it is mentioned that this rising water table may be influential on CO<sub>2</sub> fluxes and suppress them. If it is being used as reasoning for low fluxes, then it should be including in the modelling attempts. Also, what was the justification to use air temperatures and not soil temperatures in the part equation A3 that is acting similar to a Q<sub>10</sub> value?

Reco is represented well in the paper and seems to be the driving factor in annual NEE budgets that show a loss of CO<sub>2</sub> to the atmosphere. However its unclear what proportion of Reco is made up of R<sub>ff</sub> and CO<sub>2</sub> lost due to enhanced mineralization of

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the clearcutting leftovers/debris. Some kind of graphical representation of the contribution of these two CO<sub>2</sub> sources to Reco would be necessary to comment on the long term impact of peat carbon following clearcutting and not just the recently felled organic matter at the surface.

Pg. 2 L. 13 nitrogen should be nitrous?

Pg. 6. L. 15 – 16 what was the justification of using a closure time of 10 – 11 mins? For N<sub>2</sub>O closure time can be very site dependent, was this tested at this site to ensure the time was enough to capture representative flux measurements?

Reporting of GPP data is not consistent in the text. Pg. 9 L. 13 – 14 GPP rates are reported using positive values. Compare this to Pg. 10 L. 10 where GPP balances are reported using negative values. I would suggest using negative values for both as this paper is addressing NEE not NEP.

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