

## ***Interactive comment on “Carbon dioxide fluxes and carbon balance of an agricultural grassland in southern Finland” by Laura Heimsch et al.***

### **Anonymous Referee #1**

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Heimsch et al. present data of an agriculturally used grassland in southern Finland that recently transitioned from intensive to sustainable management. Although the results are interesting, the large differences between the years (like the number and heights of harvests/cuts, the type of fertilization, the amount of precipitation, the progression since seeding and the reseeding of a different species composition) hinder the authors to draw specific conclusions as to what the changes are related to. In this regard, I am not sure if comparing the years makes sense.

The authors also state, that their soil temperature sensor malfunctioned for the first year and that the soil temperature had to be modelled for the whole year. This modelled soil temperature was then used to model the ecosystem respiration, which was used to gap fill the eddy covariance data for the carbon balance. In a publication focus-

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ing on the carbon balance the major variables needed should only be gap filled over a short period, not a whole year (50% of the duration of this study). Beside these two major problems, when calculating the ecosystem respiration, the authors use a fixed value for the sensitivity of the ecosystem respiration and state that it describes the temperature response of the soil respiration. In a highly dynamic grassland, the changes in the respiration of the above ground biomass should not be missed. Thus, sensitivity parameter should be based nighttime NEE data using a moving time window to account for these changes. I recommend rejecting this publication and let the authors recalculate the data and rewrite the manuscript with a different angle as the problems mentioned will likely not be solved in one major revision and result in a different publication. As a possible solution for their soil temperature modelling problem, I suggest that the authors try to use the air temperature to calculate the ecosystem respiration for both years as many other studies do. (see <https://doi.org/10.5194/bg-9-5243-2012> for consequences)

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Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2020-422>, 2020.

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