bg-2015-599

Answers to Comments of Referee #1

We'd like to thank reviewer #1 for his rapid answer and appreciate his valuable comments.

(referee comments are printed in *italic*, author responses are printed in blue)

Comment: *Both the title and the abstract focus on carbon budget. Readers, however, would be more interested in the total GHG budget actually. Thus I suggest authors describe more about the components and characteristics of the GHG budget of the system in the abstract and text and reflect it in the tile as well.*

Answer: We are well aware that the quantification of the full GHG budget of the pasture system is an important final target (application) of our research. However, we think that from a scientific point of view the quantification of the pasture carbon budget is important and complex enough to be studied in an individual paper on its own right. Thus, as clearly declared in the title and in the abstract, the focus of this paper is the carbon budget of a pasture including the discussion of the different components (fluxes) contributing to the carbon budget of the same system but with different boundaries. The additional presentation of the GHG budget at the end of the manuscript is done only for context reasons and to compare the magnitude and typical uncertainty of the carbon budget (NECB) to the other GHG fluxes. (see also response to referee #2)
A consistent evaluation of the GHG budget would need a detailed assessment of the N_2O exchange which is beyond the scope of this paper and will be presented elsewhere.

Comment: *Fluxes related the grazing were monitored for 99 days only, the way that the results were extended to a year was not clearly described. Was it a linear exploration?*

Answer: The 99 grazing days and the budget calculations for the entire year seems to lead to some confusions (also referee #2 commented on that issue).
We monitored the CH_4 and CO_2 exchange of the studied pasture field during the entire year 2013. However, the cow herd only spent a total (summed) period of 99 days on this pasture. This is first due to the seasonal cycle with a dormant winter period and secondly due to the lower than expected productivity of the pasture during this year (see P20075, L7ff). In order to better illustrate this situation, we will add a Figure with the pasture days in the revised manuscript where the different durations are marked in different colors (see Fig R1 below). While the carbon budget (NECB) for quantifying the soil C sequestration of the study field is quantified for the entire year, some animal related budget components are first determined for the cow herd and thus need then an appropriate time attribution to the study field (here 99 days for the year 2013).
We will revise the necessary sections in order to better explain this procedure (see also answers to referee #2).

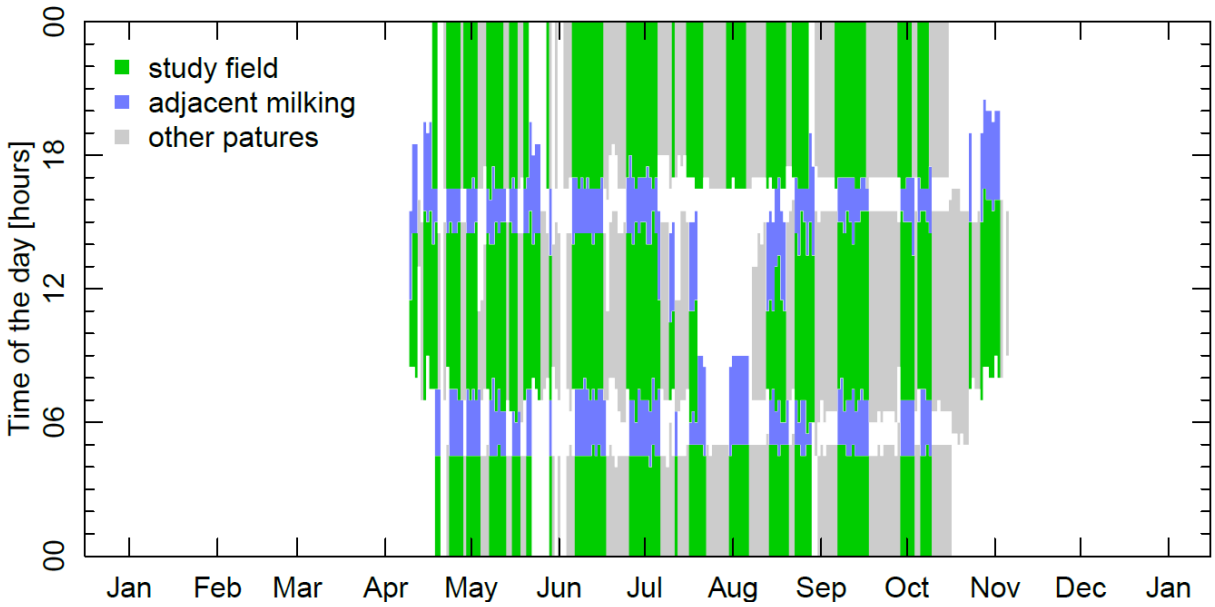

Fig. R1 Duration of grazing on the study field (green bars) and for other pastures (gray) over the day and year. The "effective pasture time" of 73.1 days (total of green bars) plus the adjacent "off-pasture days" for milking of 25.9 days (blue bars) resulted in "total grazing days" of 99 days. White areas mark other times spent in the barn. White and gray bars are not considered in the budget calculation.

Comment: *Descriptions on the determination of the uncertainties of NECB and other fluxes are over simplified.*

Answer: We concede that we partly applied a rather simple error estimation, especially for components, for which the available information was sparse. The determination of the uncertainties of the two NECBs follows Gaussian error propagation as described on P20078, L1f. We believe that it is a generally better practice to present a simple but transparent error estimation instead of a complex one that often masks the lack of appropriate information.
However, as suggested by referee #2 we will provide a more detailed description of uncertainty calculations in the supplementary material.