

Biogeosciences Discuss., referee comment RC2
<https://doi.org/10.5194/bg-2021-144-RC2>, 2021
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Comment on bg-2021-144

Aiming Qi (Referee)

Referee comment on "The carbon budget of the managed grasslands of Great Britain - informed by earth observations" by Vasileios Myrgiotis et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-144-RC2>, 2021

General comments:

This manuscript has shown the results of carbon dynamics and other related ecosystem indicators in managed grasslands across Great Britain (GB) using a process model (DALEC-Grass) which was integrated into a probabilistic model-data fusion (MDF) algorithm - Carbon Data Model (CARDAMOM) framework. The data as inputs testing and validating the coupled framework were the satellite-derived leaf area index (LAI) time series in a total of 1855 selected fields in 2017 and 2018. The coupled framework was used to address four objectives. The research methods and materials were complicated and thus results should be interpreted in the context of the situations in which the materials and methods were specifically applied. In addition, the research findings have limited values because the events on cutting dates were not definitely identified and consequently the division between cutting and grazing grassland fields was not definite, and also the authors rightly pointed out that the process-model DALEC-Grass has not been calibrated for different pasture species components, soil types and fertilisation conditions. However, they should have practical implications since the UK government has been engaged with policies to reach the target of net zero greenhouse emission by 2050 in order to mitigate the negative impact of climate change.

Specific comments:

(1) it may be more proper to replace the "constrained" used in the title "The carbon budget of the managed grasslands of Great Britain constrained by earth observations" with "adjusted" or "estimated".

(2) What were included in the managed grasslands? Did they include rough-grazing grasslands in the context of three UK grassland types – temporary, permanent and rough-grazing ?

(3) It was said that there were 1855 fields selected for simulations across GB in 2017 and 2018. How many fields were selected in 2017 and 2018, respectively? How many fields were grazed only, how many fields were cut only and how many fields were both grazed and cut? What were the total areas for 1855 fields and in each management grassland type? It would be good to make a box plot showing the size distribution of selected 1855 fields.

(4) When selecting fields to be included, the passing criterion was 50% overlap limit. What did the overlap measure specifically? It was also necessary to know how many fields were ignored when simulations were compared with LAI from EO data.

(5) The manuscript was not cleanly finalised before it was submitted to the journal website because there were many places that had unanswered question marks in the manuscript.

(6) Flow of information between models used in the coupled MDF algorithm framework was not clearly presented. So, an added diagram may be helpful.

(7) The "Removed biomass" item in Table 1 was 220 in 2017 and 280 in 2018. If 2018 was extremely hot and dry summer, why was there more biomass for removal because of limited pasture herbage yields? What was included in the "Removed biomass"?

Specific points that need attention:

PG2 L28 Livestock Unit (LSU). It is more customary in the UK that "LU" is short for livestock unit.

PG3 L80 "(i.e. ...)"

PG3 L91 "inputs?."

PG4 L93-94 "Vuichard et al. (2007); Rolinski et al. (2018)" should be put in a bracket.

PG6 L172-184 It is difficult to understand how the different spatial resolution between LAI data from CGLS (300 m) and LAI from EO data (30 m) were integrated.

PG7 L186 "21-day average photoperiod(sec)". When was the starting date from which the 21 days were counted?

LG7 L197 The agricultural census data for England was in 2010. The LAI from EO data was in 2017 and 2018. The temporary grasslands must have been changed into other land use types during these 7-8 years gaps. So, the grassland supporting animal number statistics cannot be accurately compared between the two time points.

PG7 L209 (Fig, ??)

PG8 Figure 1 needs to add latitude on Y-axis.

PG8 L215-219 It is necessary to give a legitimate reference for the details of definition of a standard livestock unit. There were many types of sheep. The 0.11LU is a sheep. What was the sheep used here, lowland sheep or highland sheep? 70kg or 80kg sheep?

PG9 L250-258 It was necessary to tell readers how the mean LSU was calculated and also mean LSU on cutting and grazing grasslands, respectively?

PG10 Give longitude and latitude on the x- and y-axis in Figure 2.

PG11 Give longitude and latitude on the x- and y-axis in Figure 4.

PG12 L265 "permanent grasslands (10% of UK grassland area)" in which "permanent" should be replaced with "temporary".

PG12 L279 "ny" should be "by"

PG14 L297 (Fig.5. should be (Fig. 5)

PG14 L298 (Fig.??

PG14 L300 (Fig.5. should be (Fig. 5)

PG15 Give longitude and latitude on the x- and y-axis in Figure 6.

PG17 L352 "The MDF-predicted GB-average pasture dry matter yield (6 ± 1.8 tDMha⁻¹y⁻¹)". Was this referred to 2017 or 2018 or in both years? It was for both years, can values be given for each year, too?

PG18 Give longitude and latitude on the x- and y-axis in Figure 8.

PG19 L359 (could could). Remove the repetition.

PG19 L367 (et al, 2011) Give the correct author(s) here.

PG19 L374 (?Ciais et al., 2005.....) Give a proper replacement for the question mark here.

PG21 L445 "were soil moisture and nitrogen are not limiting factors for grass growth." In which "were" should be "where".

PG26 Give longitude and latitude on the x- and y-axis in Figure A2.

PG27 Give longitude and latitude on the x- and y-axis in Figure A3.

PG28 Give longitude and latitude on the x- and y-axis in Figure A4.

PG30 L488 Correct the first reference in the Reference List.