1. Definition of "LRU on ecosystem scale": note that most LRUs in the literature were derived from branch chamber measurements, and were then used in the relationship between Fcos and Fco2 (Eq.1), with the implication/assumption that LRUs derived from branch chamber measurements are representative of the entire canopy. Here the authors infer the LRU (of the entire canopy) from ecosystem flux measurements. Please clarify this.

We will add that the LRU is calculated using eddy fluxes without the need to use chambers to the introduction.

2. CO2 observations: IRGA CO2 measurements were used in the analyses. I believe that the QCL also measured CO2. Were those data used somehow? If IRGA CO2 measurements were calibrated to the WMO scale, CO2 should be reported as mole fractions instead of mixing ratios, because the WMO scale (NOAA calibration gases) is reported on mole fractions. The difference between mole fractions and mixing ratios is significant for CO2, and not significant for COS.

The COS and CO_2 fluxes were calculated using the QCL data as stated in section 2.5.2. We followed the processing steps of Gerdel et al. 2017 to retrieve the fluxes using the same filters, which as stated by Gerdel et al. 2017 has the advantage that the influence of the high pass filter on the ecosystem relative uptake (ERU) largely cancels out, if applied on COS as well as CO_2. The ambient COS and CO_2 concentrations both originated from the QCL data, which puts out mixing ratios. We will change the method section accordingly since neither CO_2 nor H_2O fluxes of the IRGA were used in the final version of the manuscript. We apologize for the confusion.

3. What are the reasons for the relatively low enhancements of daily maximum PAR values reaching the soil surface after the third and the fourth cuts (Figure 1)? These are not consistent with the "incident shortwave radiation reaching the soil surface" in Figure 3e.

The data of the PAR reaching the soil surface in Fig 1 originated from a PAR sensor that was likely overgrown by short vascular plants and mosses growing directly at the soil surface at the end of the season. We will change the data from this sensor to the data of Fig 3e, which was calculated using the Beer-Lambert law (see line 151).

4. Fcosmedian turned to positive after the third cutting while remained largely negative after the fourth cutting (Figure 2c&d), given that COS soil fluxes would be both positive. What could explain the difference here?

The modelled soil fluxes were always relatively small compared to the ecosystem scale fluxes and shouldn't be the reason for the difference between fig 2c&d. Also, there is less incoming solar energy at the end of the season, likely also decreasing the emission strength of the residual litter. It might also be connected to a decrease in soil nitrogen content over the course of the season, as the grassland is only fertilized at the end of the growing season.

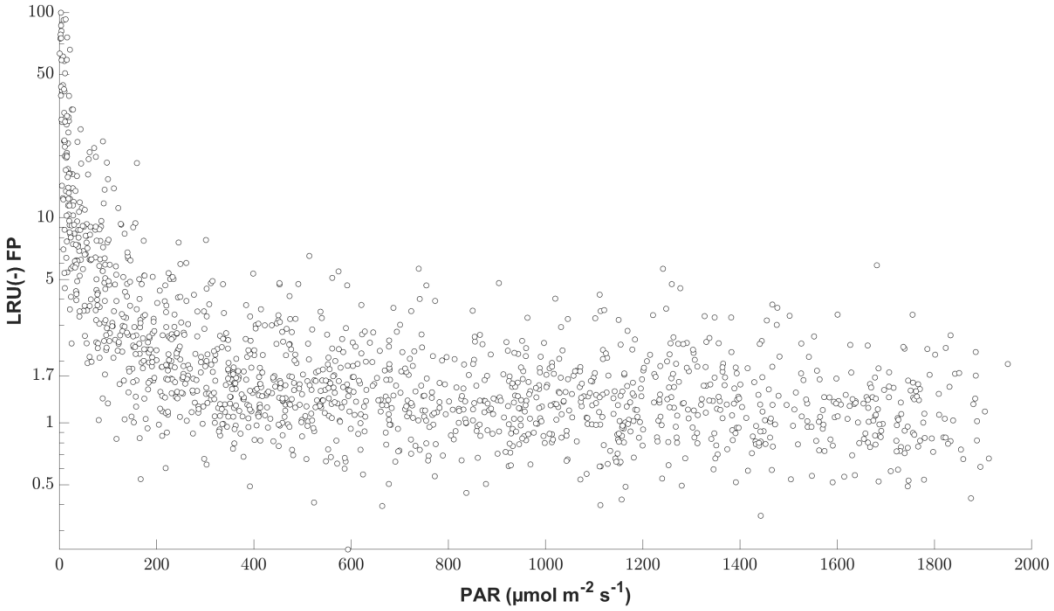
We will add a sentence containing this to the discussion.

5. High-light conditions: what is the definition of high-light conditions? How sensitive is the estimated LRU at high light intensity to the choice of high-light conditions?

The parameter "iota" – LRU under high light conditions results from equation 8. The second parameter "kappa" controls the exponential decrease of LRU when the incoming photosynthetic active radiation (PAR) is decreasing and limiting GPP but not the COS flux.

$$LRU = \iota\, e^{(\frac{\kappa}{R_{PAR}})}$$

While mathematically iota is only obtained at infinitely high PAR, in practice above about 800 PAR only insignificant change in the ecosystem relative uptake, reflecting the relationship between the COS and the CO_2 flux, can be observed (see attached figure).



We will include the definition for high light into the methods part.

Other technical comments:

Line 111: I think it is more likely by a GC-MS than a GC, please double check.

We will change GC to GC-MS within the revised document.

L154: The unit of RSW-soil should be Wm-2, and for other places as well.

We will change this according to the reviewer comment.

L165: obtain-high resolution ! obtain high-resolution

We will change this according to the reviewer comment.

L191: Eq.7 was developed in earlier studies, please refer to the original work.

We will change this according to the reviewer comment and add (Sandoval-Soto 2005) as reference.

L198-203: It will read better if these are moved to after L188.

We will change this according to the reviewer comment.

L230: It needs a bit more explanation of NDVI, what does it indicate?

We will change the manuscript accordingly:

They also reduced the normalized difference vegetation index (NDVI) (Fig. 1), which is a measure of canopy greenness (Tucker,1979).

Figure 3 caption. open diamonds?

We will remove the text part about the open diamonds, which are not present in the figure.

L312: why is an increase in RECO expected?

Even though there is a reduction in plant respiration, the increase in incoming radiation reaching the soil surface leads to an increase in soil temperature and consequently soil respiration (see Fig.5a). We will add this information to the manuscript.

L319: should be COS instead of CO2

We will change this according to the reviewer comment.

L433-435: LRU is a normalized ratio, and should not depend on the ambient COS. I do not get the point here.

This is not quite right. LRU is calculated in order to normalize for differences in COS (and CO_2) concentrations, which affect the fluxes. For the same COS and CO2 flux and the same CO2 concentration, LRU will differ whether the ambient COS concentration is 400 or 500 ppt. This is what we quantify in the linear perturbation analysis and what this sentence refers to.

L437-439: Please specify which are the exact "those observations". Figure 4 indicates that low COS fluxes took place shortly after the cuttings, which coincides with COS emissions from soils after the cuttings.

We will clarify this by changing the sentence to:

For the calculation of LRUs we had to remove the canopy flux data containing COS and/or CO_2 emissions since they would yield negative values for LRU (see Eq.8).

L419-422: It may be worth pointing out that the vertical gradient of COS between the canopy level and below the canopy levels exists throughout the day and night, but that of CO2 does not.

We will add the sentence:

Compared to the consistent decrease of COS below the canopy level during day and nighttime, the gradient for CO_2 reverses during nighttime due to ongoing respiration processes while plants are not photosynthetically active.