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Biogeosciences Discussions

Interactive comment on "Seasonal dynamics of the COS and CO_2 exchange of a managed temperate grassland" *by* Felix M. Spielmann et al.

Anonymous Referee #2

Received and published: 14 April 2020

Spielmann et al. presented COS and CO2 flux and concentration measurements of a season long campaign on ecosystem, soil and canopy levels in a managed grassland in Neustift, Austria. The results are of particular interesting due to the four times of cuttings of the grass, providing opportunities to study the disturbed grassland. The collected dataset is rather comprehensive, followed by thoughtful analyses. The paper is well structured and clearly written, and is suitable for the journal of Biogeosciences. The reviewer suggests publication after addressing the following comments.

General comments:

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.

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.

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.

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?

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?

Other technical comments:

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

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

L165: obtain-high resolution → obtain high-resolution

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

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

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

Figure 3 caption. open diamonds?

L312: why is an increase in RECO expected?

L319: should be COS instead of CO2

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

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.

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.

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