

Interactive comment on “Seasonal dynamics of the COS and CO₂ exchange of a managed temperate grassland” by Felix M. Spielmann et al.

Anonymous Referee #1

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This manuscript conducted concurrent ecosystem scale CO₂ and COS flux measurements above an agriculturally managed temperate mountain grassland to test the applicability of COS as a tracer for GPP at larger temporal scales. The results indicated that a high correlation between the COS flux and GPP across the growing season under high light conditions with rather stable LRU except for the short periods after the cuts. Additionally, a new finding was also present in the manuscript, e.g., the grassland turned into a net source for CO₂ and COS on ecosystem level after the cuts especially during daytime under higher incident radiation hitting the soil surface. This reviewer recommends the manuscript be published in the journal after considering the following minor comments:

Line 31. Are you sure that “the summer drawdown for COS is 6 times stronger than for

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CO₂”? The magnitude of the times seems too large to be believable. Line 130. “while air was sucked through the chamber to the QCL at a flow rate of 1.5 l min⁻¹”. The heights of air inlets for the chamber and ambient environment should be noted because remarkable vertical distribution of COS mixing ratio near the ground was observed in this study. If the height of air inlet for the chamber was within the canopy of the grass, the COS uptake flux would be largely overestimated, e.g., the COS mixing ratio could drop to 134ppt within the canopy in comparison with about 500ppt over the canopy. Line 228. What’s the plant available water? Fig. 1 only presents the SWC (%) which is below 38% during almost all days, rather than 21 days. Line 248. “During nighttime (RSW = 0, n = 43), the soils of the grassland acted as a net sink for COS 74.4 % of the time” is better replaced by “During nighttime (RSW = 0, n = 43), 74.4 % of the COS emission fluxes were negative, implying soils of the grassland acted as a net sink for COS”. Line 263. Why did you use both circles and open diamonds for depicting COS soil fluxes? What’s the difference between them? Lines 276-278. “Especially after the cuts we observed a strong decline in COS uptake and even times where the grassland turned into a net source for COS with midday means of up to 24.5 pmol m⁻²s⁻¹ (Fig. 4 b) for up to 8 days after the cut, when the dried litter had already been removed (Fig. 2 a-c)”. This sentence is suggested to be replaced by “Especially after the cuts we observed a strong decline in COS uptake ((Fig. 4 b)) and the grassland even turned into a net source for COS in middays (Fig. 2 a-c) with a highest emission flux of 24.5 pmol m⁻²s⁻¹ in August after the cut.”. Lines 280-281. “The cut in October led to a reduction in COS uptake, which was lowest three days after the cut (Fig. 2 d)”. The description seems to be inconsistent with the Fig. 2d. Lines 297-298. I don’t understand the meaning of the sentence. Fig. 4a is the seasonal cycle of CO₂, rather than COS. Lines 325-328. I wonder why the COS mixing ratio dropped so large during the nighttime when the COS uptake was much less than that during midday. Lines 375-377. I don’t understand the logic of this sentence. Because the chamber enclosed both soil and the residual grass after the cuts, the COS emission under sunlight irradiation might be due to the residual rather than the soil itself, e.g., the photochemical formation

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of COS from the possible liquid released from the cut grasses (JGR, 109, D13301, doi:10.1029/2003JD004206, 2004; JES, 51 (2017) 146–156). If the COS emission was ascribed to soil, the authors are suggested to verify it by using a flow tube method under dark and irradiation conditions. Line 413. Why did the lowest COS mixing ratio appear in winter when vegetation COS uptake is relatively low? Lines 419-421: The above sentences didn't mention the difference in concentrations during day and nighttime. Lines 421-422. Considering the much stronger COS uptake by the grass in daytime than in nighttime, COS mixing ratio above the canopy should decrease in daytime, rather than nighttime despite of the variation of PBL.

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