

## ***Interactive comment on “Seasonal dynamics of the COS and CO<sub>2</sub> exchange of a managed temperate grassland” by Felix M. Spielmann et al.***

### **Anonymous Referee #3**

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This is a nice paper describing COS and CO<sub>2</sub> fluxes in an alpine managed grassland. The authors also evaluate their model that includes a light dependent COS/CO<sub>2</sub> relative uptake to account for differences in the uptake pathways. They also observe a soil emission of COS after harvest and discuss photolytic sources of that OCS emission.

I recommend publication after the authors address what I hope are minor comments described below.

Minor comments in general: There seems to be a really strong gradient within the grass canopy. Would the really low COS above the soils (100-200 ppt) influence the COS flux? Out of interest, what does the FCOS/[COS] (COS deposition velocity) look like? I also think the concentration discussion (Sections 3.4, Fig 6, 4.3) should come before the flux discussion. It really sets the context to fully appreciate the flux discussion.

Data needs to be made public before publication! Make sure in the final version that the text in the figures is big enough. I was having to zoom in a lot to read things.

I'm really impressed at how well the FP+ model works for grass (Fig 5b/d). What drives the large change in CO<sub>2</sub> variability between day and night? Has the data been filtered for  $u^*$ ? Has any of this large variability been taken into account in the Reco vs temp calculation for GPP uncertainty (something to think about in future if not?).

There is a little repetition with the Results and Discussion being separate. I wouldn't object if the authors decided to combine both and tightened the text up. But obviously that's just a suggestion.

Minor comments by line number: 14: soil flux 31: do you mean relative uptake? COS is in ppt vs CO<sub>2</sub> in ppm 38: Extra bracket 86: What kind of fertilizer (dairy? beef? pig?)? And when was it fertilized previously? Before the winter? 140: Ambient COS from what height? There is a massive COS gradient so this will be important. 160: I think this needs more explanation. What does an OBB represent? Is that good? Not good? If you aren't going into enough detail for readers to evaluate the model, then cut it. It's kind of hanging there with not enough info. And most of the packages mentioned will represent some mathematical approach to data analysis. Since packages come and go, it would be really helpful to have a sentence or two about what these packages actually represent. 168: What heights along the tower were the gradients sampled from? How often were they sampled vs eddy flux sampling? 173: Was the eddy flux data filtered for insufficient turbulence? If so, what  $u^*$  filter was applied? How was the  $u^*$  threshold quantified? A plot of the FCOS and FCO<sub>2</sub> vs  $u^*$  would be helpful here to understand the micro met dynamics for the site. 329: What does the [CO<sub>2</sub>] drop down to? Is there a relationship between  $u^*/$ turbulence and the  $d[\text{COS}]$  and  $d[\text{CO}_2]$ ? That would be an interesting figure to see. 422: How long does the morning increase in COS last for? Do you start to see a decrease in COS as the daytime uptake influences the air in the valley? Other sites have also seen this morning peak in COS. Maybe include a reference to those here. (e.g. Redwoods, Harvard Forest, etc).

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