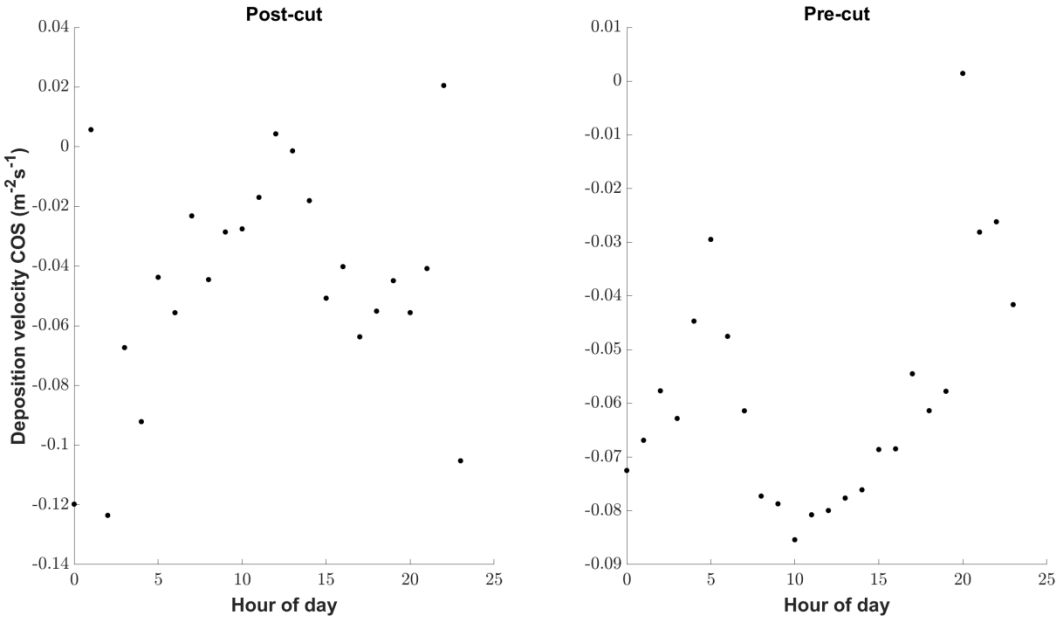
Minor comments in general:

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?

Yes, since the exchange across the soil surface is driven by the concentration gradient between the ambient air just above the soil surface and within the soil. We will add a sentence containing this information to the discussion.

Out of interest, what does the FCOS/[COS] (COS deposition velocity) look like?

We attach a plot of the COS deposition velocity. We will also provide this in the revised supplement.



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.

We agree and we will move the parts accordingly.

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.

The data is online now and the font size of the text within the figures will be increased.

I'm really impressed at how well the FP+ model works for grass (Fig 5b/d).

Thank you, we were also very happy with the fluxes resulting from the model.

What drives the large change in CO2 variability between day and night?

As shown by Wohlfahrt et al. (2005), the large variability of NEE during nighttime conditions is due to the combination of low wind speeds and stable stratification which results in highly intermittent CO2 fluxes compared to daytime. On a half-hourly basis, fluxes may even be negative (i.e. net uptake of CO2), which is biologically impossible, but results from the intermittent nature of the CO2 exchange and is typically compensated for by large emission fluxes in a subsequent averaging period. As recommended by Wohlfahrt et al. (2005), CO2 fluxes were filtered for u, but not for the sign of the fluxes in order not to bias nighttime fluxes towards too large CO2 emission.*

We will add this reference and information to the manuscript.

#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?).

The data has unintentionally not been filtered fur u. We determined the threshold at ~0.2 m $s^{-1}$for CO_2 and used the same value for COS. After reanalyzing the data, we observed only minor changes within daytime values and the products of the flux partitioning +. Due to the filtering of the nighttime data some minor changes of stated values within the results part will have to be applied. The overall patterns of fluxes remain and the manuscript will not have to be reworded.*

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.

We thank reviewer 3 for the advice but prefer to keep the sections separated.

Minor comments by line number:

14: soil flux

We will change this according to the reviewer comment.

31: do you mean relative uptake? COS is in ppt vs CO2 in ppm

Yes, we will reword the sentence to more accurately correspond to the cited paper (Montzka 2007).

38: Extra bracket

We will add a comma and remove the bracket.

86: What kind of fertilizer (dairy? beef? pig?)? And when was it fertilized previously? Before the winter?

The grassland is fertilized with solid manure and cattle slurry (see Hörtnagl 2018) once a year at the end of the growing season in October. We will add the information to the manuscript:

Each year, the field site was fertilized with organic solid manure and slurry (Hörtnagl et al 2018) at the end of the season (07.10. in 2015).

140: Ambient COS from what height? There is a massive COS gradient so this will be important.

The intake height was at 0.12m above the ground and thus within the canopy. This information will be included in the method section.

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.

The OOB score can be interpreted as a pseudo-R2 and is widely used in random forest analyses (regression and classification), especially in the absence of a proper test dataset. It uses the data not seen by the trees (random forest uses bootstrapping) as a test dataset. We will add this information to the methods section.

168: What heights along the tower were the gradients sampled from? How often were they sampled vs eddy flux sampling?

The air was sampled at 0.02m, 0.05m, 0.1m, 0.20m, 0.3m, 0.4m, 0.5m and 2.5m for 1 minute at each height at 2,2 slpm and at 1 Hz sampling frequency, compared to the eddy sampling frequency of 10 Hz. We will add this information to the methods section.

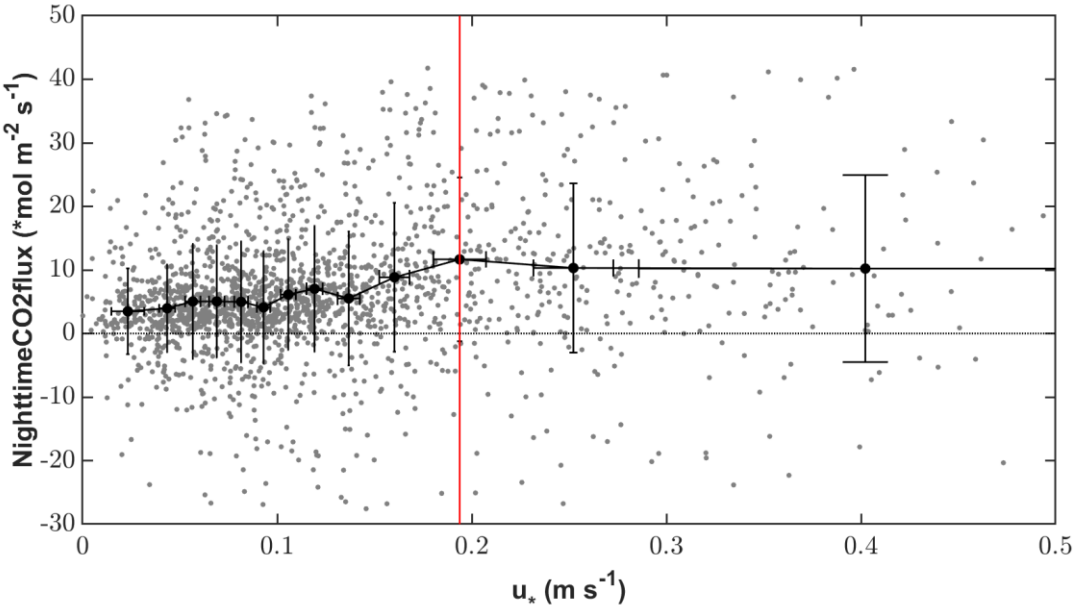
173: Was the eddy flux data filtered for insufficient turbulence? If so, what u* filter was applied? How was the u* threshold quantified? A plot of the FCOS and FCO2 vs u* would be helpful here to understand the micro met dynamics for the site.

The u threshold was determined by running the change point detection algorithm of Barr et al (2013) on nighttime NEE. The u* for the CO_2 flux (~0.2 m s^{-1}) was then applied for COS. We also tried to determine the u* threshold for COS, but a satisfying change point couldn't be determined.*

We noticed that the eddy flux data was unintentionally not filtered for u in the plots (which almost exclusively has only an effect during the night). We will update the plots and the corresponding values in the text.*

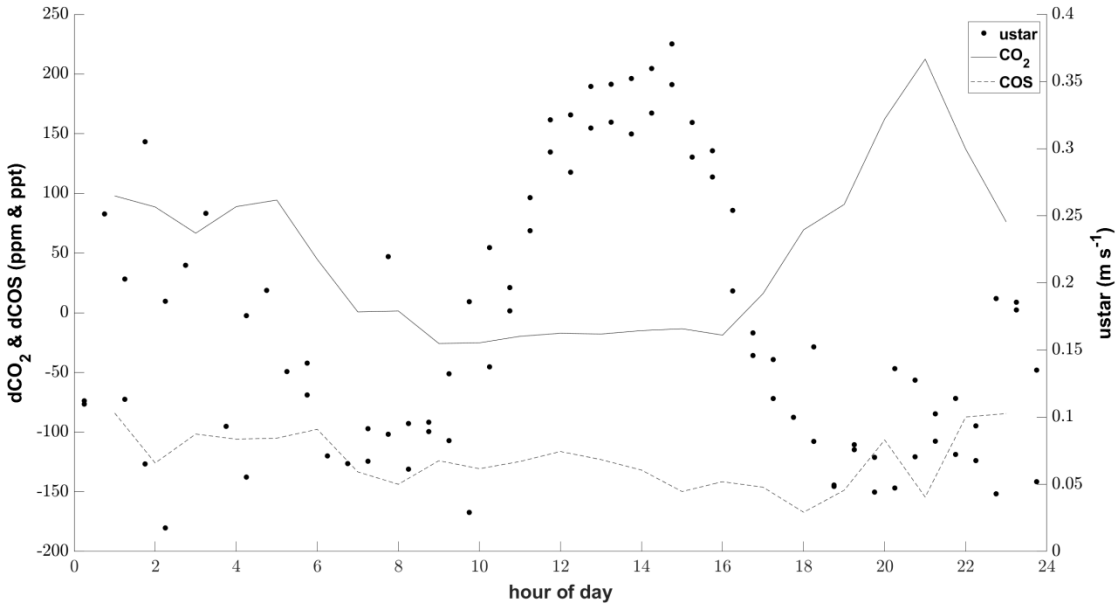
The data has also been filtered for stationarity, integral turbulence test and footprint, as detailed by Gerdel. We also filtered for extreme values (< -100 pmol m^{-2} s^{-1} & > 100 pmol m^{-2} s^{-1}).

We will add the plots of the FCO2 vs u to the supplement:*



329: What does the [CO2] drop down to? Is there a relationship between u*/turbulence and the d[COS] and d[CO2]? That would be an interesting figure to see.

The CO2 mixing ratio drops down to 339 ppm at 0.1m above ground at 10 a.m. We will add a plot containing the u values and the differences of the CO_2 and COS mixing ratios between canopy level (0.4m) and 0.02 m for COS and 0,1m for CO_2 to the supplement. The two lowest measurement heights were excluded for CO_2 since the CO_2 mixing ratio increased due to the soil respiration.*



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)

We observed a steep morning increase in COS mixing ratios until about 11 a.m. (see attached figure). We will include this plot in the supplement and add the requested information to the discussion.