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Interactive comment on "Microbial community responses determine how soil-atmosphere exchange of carbonyl sulfide, carbon monoxide and nitric oxide respond to soil moisture" *by* Thomas Behrendt et al.

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Reviewer # 3

Behrendt et al. performed a series of well-designed soil chamber experiments in the laboratory to study the processes related with OCS production and OCS consumption, and point to the importance of various enzymes other than carbonic anhydrase in producing and consuming OCS by different microbial communities. This work includes measurements of the soil-atmosphere exchange of OCS, CO and NO for a total of 9 different samples representing agricultural, natural rain forest and desert soils under different soil moisture or water-filled pore space. Given that the complexity in understanding the mechanism of OCS production and consumption, this study has made quite useful progress/prediction in the direction of disentangling the challenging scientific question. The paper is well written and well structured. Therefore, I support the publication after the following comments are addressed.

We thank R#3 for the review and valuable comments. We improved the manuscript accordingly.

No uncertainty was estimated for the measured fluxes of OCS, CO and NO, and some necessary information is missing to get an idea of the measurement uncertainty, e.g. the precision and short-term repeatability of the measurements by the LGR analyzer. Although the potential bias in the scale of OCS could be eliminated by calculating the difference of cout and cref, the short-term instrument drift, on the time scale of the measurement of each chamber, will however cause a direct bias in the calculated fluxes.

Based on Kooijmans et al. (2016) the bias based on instrument drift can be estimated. Such bias cannot explain the variability we observed in our measurements.

The authors could refer to similar studies using the same LGR or similar Aerodyne OCS analyzers. It may not be necessary to add uncertainties to the figures; however, it is crucial to perform such analyses and to state the uncertainties clearly in the main text. This is also related to the limit of detection of a few parts per trillion on line 283. Please provide a quantitative number or range to the detection limit, and provide how the detection limit is estimated.

We included "The limit of detection was estimated based on the 3σ of the noise from the soil free chamber (LODNO = 0.15 ppb NO, LODOCS < 15 ppt and LODCO < 0,3 ppb). The precision and accuracy of laser spectrometers has been evaluated in detail elsewhere (Kooijmans et al., 2016)."into the method section.

The interpretation of the results should also take the uncertainties of the measurements into account. For example, it is not clear on line 364 that at _37% WFPSlab these soils flipped to a state of net OCS consumption, because the magnitude of the fluxes falls within the detection limit.

We agree that the uncertainties of the measurement should be taken into account. Since in our dynamic chamber setup we measure differences and not absolute mixing ratios, our data were never bellow the limit of detection. Instead the outlet and inlet mixing ratios in some cases have been close to each other. Thus, we included an interpretation of the noise ($\pm$ 1.09 pmol g-1 h-1.) to report all data, but exclude them if they were within the noise of the analyzer. We include NO and CO exchange rates under 50 ppt and 1000 ppt OCS in the supporting information to demonstrate better the correlation of OCS, NO and CO.

In Figure 2, "The maximum OCS exchange rate and thiocyanate concentration for A2 (green circle) are considered as an outlier, possibly due to release of thiocyanate from fine roots during the sieving procedure". Can the authors confirm this using possibly available soil samples? Why was the maximum observed OCS exchange rate used, not the average OCS exchange rate when WFPS is larger than 37%?

The maximum observed OCS rate was measured at start of the incubation, the same time when the soil for thiocyanate concentration was sampled. Since the valve system switched from one to another box, the breakdown of substrates would affect the correlation of average OCS exchange rate.

Technical corrections: P11/L269: missing "to" after "according"

Corrected in the improved manuscript.

L367-368: do the values refer to the maximum production rate? If so, weatfield and grassland soils seem to produce higher fluxes than A1.

The statement was corrected.

L469: should be “lower soil moisture” instead of “higher soil moisture”?

Correct. Discussion has been modified.

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