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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Carbonyl sulfide exchange in a temperate loblolly pine forest grown under ambient and elevated CO_2" *by* M. L. White et al.

Anonymous Referee #2

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This study presents measurements of vegetation and soil carbonyl sulfide (COS) fluxes and canopy level COS mixing ratios made at the Duke Forest FACE site during 3 field campaigns in 2004-2005. The investigation also utilizes the atmospheric CO2 enrichment capability of the FACE site and presents results for ambient and elevated CO2 levels. Recent studies of atmospheric COS have highlighted the link between vegetation uptake of COS and CO2 (e.g., Montzka et al. 2007) and stimulated interest in improving the characterization of this COS flux. Field measurements of ecosystem COS fluxes are sparse, and so this study offers a valuable additional dataset.

Sufficient data is presented to characterize several aspects of COS uptake including

its diurnal variation, vertical mixing ratio profiles within the canopy, and soil fluxes. In addition, the observed significant nocturnal COS uptake by the loblolly pine stand, independent of associated CO2 uptake, is a finding of particular interest, and indicates the need for further investigation of these night-time processes. The study is generally well-written, contains sufficient detail on methods, and is within the scope of ACP. It should be published following the mostly minor revisions outlined below.

SPECIFIC COMMENTS

1) My main recommendation is that section 3 (Results) be revised to present the various findings in a more focused succinct manner. I believe an aim of this manuscript was to present a spectrum of measurements characterizing COS exchange from the FACE site. Several different sets of measurements and calculations are therefore presented in section 3 and in the accompanying figures. However, due to the limited duration of the campaigns and additional issues with suitable sampling conditions (e.g., affecting estimation of net ecosystem fluxes (section 3.5)) only a limited set of data is available from which to draw definitive conclusions on governing processes. Section 3 currently presents most of the individual measurements in comprehensive detail, but without prioritization of their importance. I believe the readability of the manuscript, and its impact, could be improved by a more concise presentation of the results of Section 3, with an emphasis on the robust significant findings. Subsections that could be reduced in length without significantly affecting the overall conclusions include 3.2 (Vertical profiles), parts of 3.3.2 (e.g., much of the discussion on page 17238 on canopy position could be summarized), and 3.4 (Soil fluxes).

2) Section 1 : p. 1722, Lines 15-19 : This discussion of the impact of increasing CO2 levels on COS consumption could be worded more precisely and referenced more specifically (instead of 'IPCC (2007)'). E.g., if discussing the phenomenon of increasing growing seasons at high latitudes, then the specific references to this cited in Chapter 7 of the IPCC report may be more appropriate (e.g., Zhou et al. 2001, 2003, etc.).

3) Section 3.5 : Line 20, p. 17242 – Line 10, p. 17243 : The finding of significant night-time uptake of COS by the loblolly stand (independent of CO2 uptake) and the subsequent discussion on p. 17243 seems to suggest that a GPP based-model of vegetation COS uptake (e.g., as in Campbell et al. 2008) may not be sufficient, and that the COS vegetation sink is of even larger magnitude. It would be helpful if the authors clarified whether this conclusion is intended.

4) Figure 12 : The figure would be clearer with 2 contrasting colors (or patterns) for the day and nighttime fluxes. Both shades of green appeared very similar on my printer.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 17219, 2009.