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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 #1

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General Comments

This is a well-written and organized paper containing significant new data relevant to the topic of the ecosystem exchange of carbonyl sulfide and how it relates to that of carbon dioxide. The data were collected at Duke Forest under conditions of ambient and elevated carbon dioxide conditions. In my opinion, this paper has significant results of interest to ACP readers and should be published.

The most extensive measurement data set reported consists of hourly pairs of canopy measurements (at 16 m in the ambient and enhanced CO2 rings) collected during a 2-week period in Sep 2004. This revealed distinct diurnal patterns reflecting a nighttime

COS sink, independent of CO2 assimilation. Dynamic branch enclosure measurements to estimate vegetation fluxes made in June 2005 were marred by the fact that the Pd catalyst used to remove O3 also removed a variable fraction of COS and CO2. This depletion was compensated for, but lowered estimated uptake rates and increased the uncertainties associated with the results.

Other sampling was less extensive, ie a single pair of vertical profiles, 5 samples each, were made in Sep 04, while 5 pairs were made in June 05. Soil flux measurements were collected during a single daytime period (8am to 6pm local) during each campaign (June 9 and Sep 20).

Unfortunately, conditions were appropriate for net ecosystem uptake rate calculations based on a single night during each campaign (June 4-5 and Sep 15-16) when the inversion layer heights had to be assumed. Based on these results, the authors conclude that nocturnal vegetative uptake dominated nighttime net ecosystem COS fluxes, while soil uptake was a minor component.

The limitations to these data mean that the authors are careful with how far they push their conclusions. However, given the wide range of uncertainty regarding COS consumption by terrestrial ecosystems and its relationship with CO2, I consider these data to be a worthwhile addition to the literature, while underlining the need for further studies of COS and its interaction with vegetation and soils, in context with CO2.

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