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Soil water content plays an important role in soil-atmosphere exchange of carbonyl sulfide (OCS)

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Carbonyl sulfide (OCS) is a quite stable gas in the troposphere and is transported up to the stratosphere, where it contributes to the sulfate aerosol layer (Crutzen 1976). The tropospheric concentration seems to be quite constant, indicating a balance between sinks and sources. Recent work by Sandoval-Soto et al. (2005) demonstrated the enormous strength of the vegetation sink and the urgent needs to understand the sinks and sources. The role of soils is a matter of discussion (Kesselmeier et al., 1999; Van Diest and Kesselmeier, 2008; Maseyk et al., 2014; Whelan et al., 2015).

To better understand the influence of soil water content and OCS mixing ratio on OCS fluxes, we used an OCS analyzer (LGR COS/CO Analyzer 907-0028, Los Gatos, CA, USA) coupled with automated soil chamber system (Behrendt et al., 2014) to measure the OCS fluxes with a slow drying of four different types of soil (arable wheat soil in Mainz, blueberry soil in Waldstein, spruce soil in Waldstein and needle forest soil in Finland).

Results showed that OCS fluxes as well as the optimum soil water content for OCS uptake varied significantly for different soils. The net production rates changed significantly with the soil drying out from 100% to about 5% water holding capacity (WHC), implying that soil water content play an important role in the uptake processes. The production and uptake processes were distinguished by the regression of OCS fluxes under different OCS mixing ratios. OCS compensation points (CP) were found to differ significantly for different soil types and water content, with the lowest CP at about 20% WHC, implying that when estimating the global budgets of OCS, especially for soils fluxes, soil water content should be taken into serious consideration.

References

Crutzen, P. J. 1976, Geophys. Res. Lett., 3, 73-76.
Sandoval-Soto, L. et al., 2005, Biogeosciences, 2, 125-132.
Kesselmeier, J. et al., 1999, J. Geophys. Res., 104, 11577-11584.
Van Diest, H. and Kesselmeier, J. 2008, Biogeosciences, 5, 475-483.
Maseyk, K. et al., 2014, PNAS, 111, No 25, 9064-9069.
Whelan, M. E., and Rhew, R., C. 2015, J. Geophys. Res., 120, 54-62.
Behrendt, T. et al., 2014, Biogeosciences, 11, 5463-5492.