Biogeosciences Discuss., 4, S2083–S2085, 2007
www.biogeosciences-discuss.net/4/S2083/2007/


Biogeosciences Discussions



# *Interactive comment on* "Soil atmosphere exchange of Carbonyl Sulfide (COS) regulated by diffusivity depending on water-filled pore space" *by* H. Van Diest and J. Kesselmeier

**H. Van Diest and J. Kesselmeier**

Received and published: 5 December 2007

Specific Comments 1) Yes we fully agree with the referee. See potential explanations under answers to Referee 1, point 1.

Specific Comments 2) We have no explanation, but we may speculate. We expect that the range of uptake rates is depending on the microbial populations. We assume that the micro-organisms of the boreal soils (Chinese, Finnish and Siberian soil) are adapted to more extreme temperature ranges and thus will be active at higher temperatures. The German soil belongs to a temperate zone, where temperatures are not varying so extremely over the year.

Intro1) We will introduce this reference.

Intro 2) Yes, we agree. Seasonality is not “obviously visible”. There are clear reports existing.

Intro 3) We will introduce a paragraph such as: One of the main controlling parameters for soil atmosphere exchange is the ambient trace gas concentrations which influences the direction as well as the magnitude of the COS flux between soils and the atmosphere. The net exchange within a certain biotic system is interpreted as the result of simultaneously operating production and consumption processes. This implies the existence of the so-called compensation point, which reflects an ambient concentration where the consumption balances production and the net flux is zero.

Section 2-1) Yes, the source reference is Hillel (1980); will be improved.

Section 2-2) This flux calculation was performed as described in Sandoval-Soto et al. (2005). We will cite this paper here.

Section 2-3) It was possible to normalize the COS fluxes because of the existence of a linear correlation between COS concentration and COS uptake (Kesselmeier et al., 1999). See also Ref. 1, comment 8.

Section 2-4) We will reword this chapter.

a. We tried several mathematical equations in order to get the best fit for our data. The one of Meixner and Yang (2006) turned out to be the best one. This mathematical equation uses the same matrix which takes the same biological and physical background into account.

b. The mathematical equation developed by Meixner and Yang (2006) gave the best fit to describe the COS exchange dependence on soil WC and WFPS. The net COS flux, $F_{\mathrm{COS}}$ is described by $F_{\mathrm{COS}}$(WC) = $aWC^b$ exp($-cWC$).

The parameters $a$, $b$ and $c$ are related to observed values by

$$a = F_{\mathrm{COS}}\left(WC_{\mathrm{opt}}\right) / \left[WC_{\mathrm{opt}}^{b} \exp\left(-b\right)\right]$$



BGD

4, S2083–S2085, 2007

Interactive Comment

$$b = \ln\left[F_{\mathrm{COS}}\left(WC_{\mathrm{opt}}\right)/F_{\mathrm{COS}}\left(WC_{\mathrm{upp}}\right)\right] / \left[\ln\left(WC_{\mathrm{opt}}/WC_{\mathrm{upp}}\right) + WC_{\mathrm{upp}}/WC_{\mathrm{opt}} - 1\right]$$

$$c = -b/WC_{\mathrm{opt}}$$

Thus, the COS exchange at a given temperature was described as a function of $WC_{\mathrm{opt}}$, this is the soil WC at which the maximum deposition velocity ($V_d$) is observed and as a function of WC$_{upp}$, this is the soil WC at which $V_d(WC)$=$V_d(WC_{\mathrm{upp}})$ ≈0 for $WC$>$WC_{\mathrm{opt}}$ (Meixner and Yang, 2006).

c. The mathematical fit described the overall behaviour reasonably well, but failed to accurately take the maximum $V_d$ into account. Nevertheless, this data point was considered in the discussion because it is the mean value of at least five measurements.

Section 3-1) see Answer 1 to Referee 1

Section 3-2) As reference we cite here: Meixner and Yang (2006)

Section 3-3) We will drop “surprisingly”.

Section 3-4) This sentence will be changed in:

In the range of 15 to 40% WFPS, deposition velocities for the Finnish soil are higher than those for the other soils.

Section 4-1. See specific comments point 2. The text will be adapted accordingly

---

Interactive comment on Biogeosciences Discuss., 4, 3701, 2007.