

## ***Interactive comment on “Global Soil Consumption of Atmospheric Carbon Monoxide: An Analysis Using a Process-Based Biogeochemistry Model” by Licheng Liu et al.***

**S. Yonemura (Referee)**

yone@affrc.go.jp

Received and published: 18 October 2017

At first, as authors submitted this manuscript to ACP, I consider that ACP is more appropriate journal than Biogeosciences for the publication of this study because results of this study can highly contribute to Atmospheric Chemistry.

General comments Most of the global estimation of CO soil consumption from previous studies is simple estimates of sum using deposition velocity and there is no sophisticated model study with biogeochemistry. After a long break of 15 years, authors did their best to estimate global soil CO consumption and production with extensive compilation of previous studies and with IPCC scenarios. So, the most advanced estimation

C1

of the global soil CO consumption/production is shown in this study. This study summarized almost all the previous studies about soil CO processes. So, this study is important as a review paper. I recommend “accept” of this manuscript in ACP after a minor revision. Hereafter, I point some comments.

Specific comments Abstract The time step of the simulation in this study is monthly. Time step of the calculation is very important. So, please explicit describe about the time step of the calculation even in abstract.

Page 2 line 31 I do not think that this sentence is necessary.

Page 5 line 118 are in -> is

Page 5 line 127 withan-> with an

Page 6 line 139 Please spell out TEM at the first place.

Page 6 line 157 Vertical grid of 1cm can be used for simulation of CO<sub>2</sub> and CH<sub>4</sub> diffusion processes in soil, but, I consider that 1cm is still not so finely-gridded for the simulation to model soil CO consumption because of rapid CO consumption in soil (especially very active soil to consume CO). Some soils are strong consumers of CO and these soils absorb CO within 2-3cm of top soil layer. Though this comment does not deny robustness of the results of this study, I recommend that these technical aspects should be mentioned in the Discussion section (as in line 376) to be kind for readers who may study soil CO consumption. Furthermore, authors properly used implicit (Crank-Nicolson) method in order to be independent from time-step which must be set as short as possible in case of explicit method because the vertical grid must be finer for soil CO consumption for explicit method.

Page7 line 160 “i” and “t” should be italic.

Page 12 line 297 Figure 3 (a2,b2,c2,d2) I cannot understand which observations in Table 1 were plotted in the sub-figures.

C2

Page 12 line 305- Page 13 Direction of consumption and production or net flux is misleading. I felt that minus expression of values is difficult to see through.

Page 16 Model Uncertainties and Limitations I consider that CO concentrations at soil surface (environmental CO concentration for soil) is a little different from CO data from MOPITT. Boundary-layer processes are also complex. A comment about this point is necessary.

Table2-6 Values were centered but should be formatted to be easily understood. For example, Earea/R (K) in Table 2 In place of 8801 14165, 8801 14165 is better.

Figure2 Units of soil moisture are different among (a2), (b2) (c2) and (d2). My concern is about the highness of the volumetric soil moisture. The soil moistures in (a2) (d2) are too high? Volumetric soil moisture contents (a2) are too high, as high as 80%. Normal soils have no capacity to hold such high moistures. The units of the soil moisture contents are all volumetric (m3/m3) ? Please check and if the shown volumetric soil moistures are correct, please mention reasons.

Figure 3 (c2) and (d2) Why authors showed over-scale (CO emission) graph? The y-axis of (c2) should be -10 to 2

Figure 4 Please write clear the meaning of "global land surface". Global land surface includes Antarctic area? Normal readers think that global average temperature is about 15C but the shown temperature (a) is between 7.5-9C.

Figure 6 Why SOC increases sharply before 2100?

---

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-526>, 2017.