

Interactive comment on “Rapid mineralization of biogenic volatile organic compounds in temperate and Arctic soils” by Christian Nyrop Albers et al.

Anonymous Referee #1

Received and published: 18 March 2018

General comments

This paper investigates the mineralization of five BVOCs in four different soils. By using BVOCs labelled with ^{14}C the paper clearly shows the mineralization process of BVOCs occurring in the different soil types. The methodology is adequately described and the experimental procedures are well written, as well as the introduction, results and discussion sections. The fact that soil microbes can metabolize soil BVOCs is already known but, as the authors say, there are still not many studies directly proving microbial degradation of BVOCs. The authors say that one important value of this study is that the incubated soils were exposed to realistic environmental concentrations of BVOCs, not like the other studies, where higher concentrations were used. It would be interesting for the readers to have a table where one could see the real initial

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concentration (not a range), together with the concentration measured of these BVOCs in the environment (in this experiment or in the literature, if some atmospheric BVOC measurement is missing), the amount of BVOC metabolized to CO_2 and the amount of BVOC extracted at the end of the incubation, for each BVOCs and soil incubated. This information would help to evaluate the main points of the paper: that some BVOCs can be degraded completely in soil (by giving the recovered BVOCs at the end of the experiment one could see how much was incorporated in the microbial biomass or how much was adsorbed to soil particles) at the relevant environmental concentrations measured. Regarding this point, for the BVOCs that were measured in the atmosphere (not methanol), the highest atmospheric concentrations shown in Table 4 (around 3 ng/L in the coniferous forest, measured at 10 cm above soil) would be still 21 times lower than the minimum concentration used in the incubations (64 ng/L). There are of course technical difficulties, as the authors say, to measure mineralization at the very low atmospheric concentration, thus that table would highlight to what extent the authors have narrowed this challenge.

Specific comments

Page 4, line 115: Table 1 instead of Table 2

Page 5, line 137: As suggested in the general comments, it would be nice to have a table with the initial concentrations for each BVOC and soil type, the corresponding atmospheric concentrations, etc.

Page 5, line 138: This range 0.8-11 ug/Kg soil FW, is environmentally realistic? Regarding monoterpenes White (1991) reports 12-47 ug/g soil DW in the organic horizon and 0.03 to 0.23 ug/g mineral horizon of Ponderosa pine forest. That would be much higher than the values in this experiment, at least for the organic layer. Is there any information for other BVOCs ? But I guess it's very difficult to find this information. . . Reference: White, C.S., 1991. The role of monoterpenes in soil-nitrogen cycling processes in ponderosa pine results from laboratory bioassays and field studies. Biogeo-

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chemistry 12 (1), 43–68.

Page 6, line 170: Table 2 instead of Table 1

Page 8, line 208-213: It is very nice to read the investigations about the transfer rate of CO₂ in the supplementary information Fig. S1.

Page 11, line 280: This 5% is then adsorption to soil? Again, a table to compare values between soils and BVOCs would be useful in my opinion

Page 11, line 298: what do you mean by dissipation? Do you mean you recovered all the p-cymene added with the extraction?

Page 13, Table 4: Assuming the 3 columns represent the sites where BVOCs were measured at 10 cm surface, where is the Arctic heath site?

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2018-32>, 2018.