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Biogeosciences Discussions

Interactive comment on "Methanol and other VOC fluxes from a Danish beech forest during springtime" *by* G. W. Schade et al.

Anonymous Referee #3

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In this manuscript the authors report their findings obtained from a field campaign in a Danish beech forest. Using relaxed eddy accumulation above canopy fluxes for methanol and for the sum of monoterpenes were determined. In canopy and sub canopy concentration gradients were used to find hints with respect to deposition of methanol and other OVOCs on soil and plant surfaces. These measurements were completed by checking deposition of OVOCs to litter or to bare soil using a quasi static chamber.

The main results shown here are net emission fluxes important for assessing impacts of vegetation on atmospheric chemistry as well as the diurnal cycles of monoterpene and methanol emissions. The diurnal cycle of measured for monoterpene emissions is consistent to the light dependence of these emissions from European beech and

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the diurnal cycle of methanol emissions is attributed to the mechanisms of methanol emissions. Methanol emissions are coupled to leaf growth and the leaves of European beech predominantly grow during darkness. Fluxes for acetaldehyde and MEK were found to be insignificant and those of acetone and methanol were bidirectional showing also an impact of deposition. The authors also observed a strong increase in OVOC concentrations concurrent with hay mowing near to the measurement site. This finding confirms results from other studies that show agricultural activities may be a significant OVOC source in rural areas.

The manuscript is quite good structured, in most cases easy to read, it contains important data and addresses relevant scientific questions within the scope of Biogeochemistry. Some of the basic results shown here have been reported before. However, the importance of the data as well as the difference between the observations made here and the observations reported in literature make this manuscript interesting and worth while to be published. Nevertheless, some points have to be mentioned or discussed in more detail.

Here are my points:

1) Concerning methanol emissions it is written (abstract and page 4332 first line) "Emission fluxes occurred dominantly late at night"

From figures 3 and 4 I cannot see a clear and convincing hint for this statement. Furthermore, this statement is not supported from the sentence: "In addition, observed methanol fluxes did not follow a clear diurnal cycle on most days" (p. 4329 lines 4-6).

Using the quite noisy data shown for the diurnal cycle of methanol emissions alone, this statement of dominant methanol emissions during night-time are indeed not convincing. In contrast, from the figures it seems that the diurnal cycle measured for the methanol emissions is due to an overlap of darkness emissions from growing leaves and emissions from mature leaves with a maximum during daytime. Both together might lead to a diurnal cycle as shown in the figures. This would also be understand-

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able as the measurements were made in June when the majority of beech leaves are mature. I believe that this part of the discussion should be deeper. This will improve the manuscript.

Page 4328 lines 19 and 20 and p. 4334 last line (both sections consider the main emissions of methanol being during night-time) The phrases: "this is sharply contrasting the observations by Karl and coworkers" and "Methanol appears to be emitted dominantly at night" are written in a way implying that this behaviour is general. This is not the correct because diurnal cycles of methanol emissions might be different in another forest consisting of other trees. The parts discussing maximum methanol emissions during darkness should be written in a way that misunderstanding and generalization is clearly excluded.

2) On page 4319 line 25 it is written: "groves of conifers comprising 20% of the total footprint" and on page 4331 lines 4 to 14 it is mentioned that the contribution of conifers to atmospheric monoterpene concentrations may largely exceed that of beech. Both statements imply a role of conifers for the monoterpene concentrations at the measurement site. In figure 2d it is shown that monoterpene concentrations during darkness were near to zero for the early warm phase of the field campaign. But monoterpene emissions from conifers are supposed to be independent of light intensity and quite strong during darkness. Therefore the statements regarding the role of conifers and the near to zero concentrations in darkness during the first warm phase seem to be inconsistent. If the contribution of the conifers was less than 20 % during the first warm phase - may be because of the predominant wind directions - the authors should add some words. This will avoid confusion for a reader.

By the way, the finding that monoterpene emissions from European beech are light dependent is not a recent finding; this was published already more than 10 years ago.

3) Two multiple ion detection programs were used, in both m/z = 81 and m/z = 137 were measured with dwell times of 2 s (page 4324). Please add some words why one

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of the programs had a much better detection limit (p. 4325, lines 9 and 10).

4) On page 4326 lines 5 - 7 it is written: "Additional quality control included the removal of periods after a new bag had been installed, measured friction velocity was smaller than 0.2 ms, or rain had influenced the measurements." Nevertheless figure 2 shows data probably taken during rainfall and on page 4332 effects are mentioned that were observed during rainfall. Both statements together seem inconsistent. Please check and correct.

If the authors decide to leave the data taken during rainfall there is an interesting point that should shortly be discussed. Figure 2b shows methanol concentrations and rainfall. No clear drop in methanol concentrations were observed, instead in one case an increase is shown (DOY 167). This behaviour should shortly be discussed as it might imply a negligible role of wet deposition for methanol.

5) In some cases gradients are given in ppb (e.g. Figure 8: y-axis). Please check units for gradients.

Interactive comment on Biogeosciences Discuss., 5, 4315, 2008.