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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Temporal variation of VOC fluxes measured with PTR-TOF above a boreal forest" *by* Simon Schallhart et al.

Anonymous Referee #1

Received and published: 21 June 2017

The paper by Schallhart et al. describes NMVOC flux measurements above a forested site in Finland using two PTR instruments. They calculate fluxes based on the direct eddy covariance and the indirect gradient method.

1) It is interesting that a much smaller number of actively exchanged VOCs were observed during this study than by Park et al., 2013, using similar methods for analyzing the entire mass spectrum. Is there an explanation? Was it a problem of the analysis (e.g. shifting time synchronization) or are Boreal forest generally just low (or not very active) BVOC emitting ecosystems? It appears that the measured net-fluxes are generally quite low when comparing with similar measurements from temperate and tropical forests.

2) No flux footprint analysis is presented. Why? It would seem important for the inter-

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Discussion paper

pretation of the results, especially for a site which is largely comprised of a managed forest (with clearings). I also see there is a nearby lake. Knowing the footprint might also be a very relevant issue for the comparison between the two flux methods. The analysis would also seem to be crucial for the interpretation of butanol contamination from aerosol measurements (section 3.4). The plotted wind rose suggests that a large proportion of the wind-direction is from the S-W sector, where the buildings of the research station are situated.

3) m/z 93: While this mass is commonly shown to be associated with toluene using PTR ionization, there is evidence that a fragment from cymene can exhibit some interference (e.g. 20-30%) above evergreen forests. Have the authors verified that this is not the case – e.g. by correlating fluxes or concentrations of the corresponding ions? I also wonder whether benzene fluxes were detectable, and whether benzene to toluene (concentrations and/or fluxes) ratios could indicate local pollution.

4) Section 3.2. While being a valuable section, a number of studies are missing here – it would benefit the manuscript to conduct a more thorough literature review.

5) Table 2: 24 h flux average are chosen quite randomly and are often problematic, because most of the studies do not apply corrections to night time fluxes (e.g. storage and advection). A couple of clarifications would be important. Which (if any) corrections were applied to night time fluxes? Also why compare a 24h average with an 8h average – this does not make much sense. One should average the current dataset over the same period as each of the referenced datasets to be a meaningful comparison.

6) Page 10 Line 32: So if you conclude that the SMEAR station generally suffers from widespread butanol contamination from aerosol instrumentation, why talk about a 'butene flux' in this paper?

There are a large number of grammatical errors or confusing statements– I suggest copy-editing if this cannot be easily resolved by the authors. A small number of examples is listed below.

Page 5 Line 28: Overall 22 compounds with flux – change to “with a flux”

Page 5 Line 29: “C1” is an odd way to present a sum formula – I suggest to change it to “C” throughout the manuscript

Page 6 Line 4: measured in mid-afternoon – change to “during mid-afternoon”

Page 6 Line 6: methane is typically not considered a VOC – I suggest changing VOC to NMVOC throughout the manuscript as this is a more commonly used expression

Page 6 Line 6: The entire sentence here is confusing – I suggest to rephrase it.

Page 6 line 9: “for all months”

Page 6 line 10: “detectable fluxes”

Page 6 line 20: The heaviest measured compounds with detectable flux was - > “were”

Page 9 line 4: using surface layer profile method - > using “THE” surface layer method

Page 9 line 7: “ON” the same order

Page 9 line 8 : between the two measurements ?

Page 9 Line 12: “by” both methods

Page 11: “air chemistry”

Table 1 and 2, Figure 3, 6, 7: change “C1, O1, N1, etc.” in the elemental composition column to “C, O, N”

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