

Review of: “Interferences of volatile organic compounds (VOC) on methane concentration measurements” by Kohl et al.

The paper studies experimentally the interferences of several VOCs on the measurement results of several CH₄ analyzers. VOCs interfere strongly with FTIR but not with laser absorption spectroscopy measurements of CH₄. The results indicate that the FTIR instruments are not suitable for CH₄ measurements in high-VOC conditions, e.g. when estimating CH₄ fluxes from plants or soil. Laser absorption spectrometers are much less affected by VOC interference, thus can be used in high-VOC conditions. Including the main VOCs in the FTIR library corrects for part but not all the interference on methane. A by-product of this study is the finding that VOCs can be quantified by FTIR, at least at the high concentrations used here.

The paper is very useful given the recent increase in attention to CH₄ emissions from or via trees, and the increasing availability of field capable instruments.

The paper is well written and I recommend publication after the comments below are addressed.

General comments

- I think it is important to discuss the relevance of these findings for the recent studies of methane emissions from trees (e.g. summarized in Covey et al., 2019). Did any of these studies use FTIR instruments?
- “Concentration” is not the correct term for molar ratios (i.e. all the quantities expressed as ppm or ppb). “Mole fraction” or “mixing ratio” should be used instead.
- An explanation is missing on how the VOCs to be tested were chosen. Are these representative for real world emissions from vegetation?
- The VOC concentrations used in the lab experiments seem quite high. Are these representative for what one can expect in a tree chamber? Consider mentioning this in the method already.
Also, when discussing the sensitivities of CH₄ to VOCs, it would be useful to relate to real world expected VOC levels.
- not all VOCs from Test 1 were used in Test 2 – why? Did the ones that were removed not have an influence? Especially alpha-pinene, which the authors mention it is the main VOC emitted by spruce.
- two different FTIR instruments were used, one in the field campaign and Test 2, and the other one in Test 1. Are these similar enough that the results can be considered together? If yes, please state in the text. Otherwise they should probably be treated separately through the paper.

Specific comments

- at the end of Introduction the authors state that the test setup was built. I suggest adding one sentence stating clearly what is presented in this paper: the field experiments? or the lab test setup? the results of both?
- page 2 lines 14-19: the phrase is a bit long and hard to follow, with some commas missing. Please consider reformulating.

- page 3 lines 6-7: specify what the inhouse pressured air supply is based on: e.g. gas cylinder(s) or a large compressor taking outside air. This is relevant for how the uncertainty is calculated (page 4, and see comment below)
- page 3 line 21 and page 4 line 9: are δ^3 -carene and Δ^3 -carene the same chemical?
- Fig. 3: Caption – specify the experiment these data come from. For panel *a*, the text says “development of VOC concentration” but only beta-pinene is shown.
- page 4 lines 22-30: if the inhouse supply of pressured air takes atmospheric air from outside, there will be non-random variations on diurnal time scales, with e.g. possibly large methane increase during night. Is this taken into account in the bootstrap, i.e. are the 500 time intervals from the same part of day as the VOC experiments? Or was the day/night variation in the inhouse air estimated?
- Fig. 4: I find some parts of Fig. 4 confusing. In panels *a* and *b* it is not easy to understand which trace corresponds to which y-axis. E.g., in the upper middle panel, do the the methane data correspond to the blue unlabeled scale, or to the side scales labelled “CH₄”? What does the blue y-axis represent, and what are the units? Consider splitting the panels. Similar for panels *g*, *h*, *i*. Also, please consider splitting Fig 4 into two figures.
- page 5 Sect 3.1: suggest to refer to Fig 1.
- page 7 line 13: was alpha-pinene not included in Test 1?

Text comments:

- page 1, line 7: typo “strong strong”
- page 2 line 29: typo “Summer”
- page 3 line 6: “Fig 3a” – should it also be “Fig 2a”, since this is the setup decription?
- page 3 lines 9-10: “The flow air” – should it be “the air”?
- page 3 line 29: “measure of VOC interferences” should be “measure the VOC interferences”?
- page 3 line 30: “Fig 3b” – should it be “Fig 2b”?
- page 4 line 25: “those by a random period” should be “by those from a random period” – please check
- page 4 line 29: “Significance interference” should probably be “Significant interference”
- page 4 line 31: “to evaluate”
- page 4 line 32: “we evaluated calculating” should be “we calculated” ?
- page 5 line 26: probably typo: [spikes?]
- page 6 line 10: typo “/beta”
- page 6 line 14: I think “and not part of ...” should be “was not part of ...”
- page 6 line 15: “)” missing after “VOCs”