Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-851

Anonymous Referee #2

Referee comment on "Interannual variability of terpenoid emissions in an alpine city" by Lisa Kaser et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-851-RC2, 2021

Review of Kaser et al.

SUMMARY

The authors present eddy-covariance VOC measurements over an urban footprint in Innsbruck, Austria. They examine the observed terpenoid (isoprene, monoterpenes, sesquiterpenes) fluxes in terms of tree species coverage within the flux footprint and in terms of the T and light dependencies driving emissions. They go on to compare results from two summers to assess interannual variability and the degree to which it can be understood mechanistically. There are not very many urban VOC flux datasets, and fewer still that explore interannual differences. I find the paper makes a useful contribution and is suitable for publication in ACP. Below I include some minor comments for the authors to consider.

GENERAL COMMENTS

81-100, A nicely comprehensive summary of prior work, but quite long. Since the current paper doesn't address seasonal variability, it may be helpful to shorten this paragraph to only focus on those prior studies examining interannual changes.

119, to avoid confusion please clarify if you mean into the NE/SW or out of the NE/SW

121-122, please provide information here on the distribution of building heights within the flux footprint, and the degree to which the inlet is above versus within the roughness sublayer.

137-146, it would be helpful to show some spectral analysis here to quantify how well the different frequency contributions to the fluxes were captured by the sampling system.

153, "Monoterpene and sesquiterpene eddy covariance fluxes are known to be purely temperature dependent". Not true. Some mono- and sesquiterpene emissions have been shown to also be light-dependent.

156-159, please indicate how these timescales were estimated

183-189, the validity of this ratio approach relies on the assumption that the ISO, MT and SQT emitters don't differ systematically in size (i.e. dry leaf weight). I imagine this is not strictly true. So some language here about this caveat is warranted.

200, Very interesting! I would not have guessed that so much of the flux came from just 12 trees.

226-227, Guenther 2012 lists a light-dependent fraction of 0.5 for all sesquiterpenes. If you have evidence that sesquiterpene emissions are "mostly temperature dependent" it should be cited here. In the case of monoterpenes it is true that the most globally predominant emissions are mainly T-dependent but some individual species have >50% light dependence. So the extent to which "monoterpene emissions are mostly temperature-dependent" would depend on the monoterpene speciation in the flux footprint. Do you see any evidence for light-dependent MT/SQT emissions in your dataset?

241-244, "Measured monoterpene and sesquiterpene measured fluxes at lower temperatures (280K-295K) were higher than the predicted values based on the Guenther et al. (1994) algorithm. This could be an indication that at lower temperatures other, non-biogenic sources contributed to monoterpene and sesquiterpene fluxes at this site." Along similar lines to the above, could this reflect partly a light-dependence?

305-319, are any of the isoprene-emitters juvenile trees? I.e. could tree growth within the 3 years be relevant?

365-366, “Mild to severe drought conditions would reduce isoprene emissions further and therefore could not explain an increased isoprene emission potential”. This is confusing because paragraph (c) above discusses isoprene fluxes increasing under drought. Some more clarity in the arguments is needed.

MINOR / TECHNICAL / WORDING SUGGESTIONS

27, suggest deleting “formation”, it is redundant here

35, suggest “in predominantly isoprene-emitting forests”

50, “determined by PMF to mainly (60-70%) originate from vegetation”

51, “… isoprene, attributing it therefore”

58, “Whereas all the studies cited above…”

60, comma after “dilution”

60 & 82, period rather than colon

70, “as well as via storm water interception”

72, “are very plant-species dependent”

78-80, this sentence appears out of place

81, “even fewer such studies”

97, “is with 18% in July” is awkward

230, should say “Mean daytime maxima”