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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Eddy covariance VOC emission and deposition fluxes above grassland using PTR-TOF" *by* T. M. Ruuskanen et al.

Anonymous Referee #2

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General The authors discuss the results from eddy covariance VOC flux measurements using the innovative new PTR-TOF technique over managed grassland. This technique is superior to the traditionally used PTR-MS technique allowing 10Hz measurements of a wide range of mass spectra with high resolution almost simultaneously. The authors use the technique over managed grassland before during and after harvesting thereby clearly demonstrating the applicability of the method for obtaining total VOC emission fluxes. In general the technique and methods used are well described and the quality and significance of the measured emissions is thoroughly tested. This paper clearly demonstrates that this innovative technique gives promising results and certainly deserves publication in acp. I have a few minor comments that are mainly

related to specific data corrections.

Minor comments

Section 2.2, line 6: the authors apply a three-axis coordinate rotation to the data according to Wilczak et al. (2001). However, they do not mention which of the three methods presented in this reference is used.

Section 2.2, line 6: the authors describe that they determine the maximum covariance using smoothed and de-trended VOC concentrations. I guess that "smoothed" is related to the 20Hz vertical velocity data. Please adjust the text accordingly.

Section 2.2, line 8...10: the authors use a lag-time window of -2 to 2 seconds to determine the maximum covariance. The closed-path EC set-up as described by the authors leads to a time lag between the vertical velocity and VOC signals of about +1 second (tube volume $\sim$0.14 l and a flow of 9 l/min). First of all I would like the authors to comment on the refresh rate of their system in the paper. Second I expect a positive delay or lag-time between 0 and +2 seconds for this system and do not understand why -2 seconds, i.e. a negative lag-time, can be physically valid as a maximum covariance. A trace gas cannot travel faster through a tube than the refreshment rate of the system allows and will always lead to a positive delay time unless you can convince me otherwise. Please comment and correct accordingly.

Section 2.2, first paragraph: the authors discuss the criteria to obtain reliable flux measurements but do not comment on any data treatment/correction that relates to high frequency damping. Such corrections are well known and commonly applied in the flux community since they can have an important impact on the EC measured fluxes. Especially closed path measurements, such as presented in this paper, are affected by tube damping and tube delay. Other corrections relate e.g. to sensor displacement or path length averaging. Please add comments concerning the importance of such corrections to the data presented in the paper.

ACPD

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Section 3.1: in this section the authors mention the influence of water vapor on the measurement of VOC. Water vapor fluctuations cause density variations for which a (very common) correction is necessary (the so-called WPL correction) if density (or another volume related unit like ppbv) is measured by the instrument. In case of PTR-TOF mass ppbv is measured and WPL corrections should be applied unless proven unnecessary somehow. Please comment specifically on the necessity of these corrections for the measurements presented in the paper.

Section 3.3, line 25: "Class A fluxes . . ...", please leave out, this was mentioned earlier line 20. Adjust accordingly.

Fig. 5: in the caption the authors mention ". . .intact grass (2 August),.." while in the upper Figure title "1 Aug" is mentioned. Correct accordingly.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 21077, 2010.