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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical note: Water vapour concentration and flux measurements with PTR-MS" *by* C. Ammann et al.

C. Ammann et al.

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We thank Rupert Holzinger for his very careful reading of the manuscript and the detailed comments. We agree with all technical comments and the suggestions concerning formulation and adding of references, and we will modify the text accordingly. In the following we respond individually to the scientific comments and questions:

p5334, 1-2: was the flow in the 30m tubing turbulent or laminar?

>>> Considering the Reynolds number of the tube flow (1660), we assumed a laminar flow in the tube and used the corresponding transfer function (after Lenschow and Raupach, 1991) for the theoretical damping calculation. We will add this information in the manuscript.

p5335, 3: accurate determination of the delay time is quite critical. So information on

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how the lag-time was determined should be given.

>>> We determined the effective delay time by searching the maximum of the covariance function within a physically plausible range. We will modify the text to make this procedure more clear.

p5336, 26: how is “reliable” defined here?

>>> The criterion for the selection of "reliable" ogive data and damping factors has been described in detail only later in the text (chapter 3). To make the paper more easily readable we will transfer the respective paragraph to section 2.4.

p5338: please, explain the term “stationarity” in the context.

>>> Stationarity as defined by the test described by Aubinet et al. (2000) means "temporal homogeneity" of the turbulent flux and is tested by comparing the EC fluxes obtained with different averaging intervals. We will add this information in the text.

p5338, 7-10: the sentence “As a ...” is confusing and needs to be clarified. Since it contains a lot of information it probably should be split...

>>> This problem was solved by transfer (to section 2.4) and reformulation of the respective paragraph (see comment above).

p5338, 24: Since the theoretical damping factor is extensively used as reference, I suggest the authors should briefly explain in a separate paragraph how this was calculated.

>>> A short general description of the determination of the theoretical damping factor is already given (together with references) in Section 2.4. However, we will add some specific information about the calculation of the theoretical damping factor for the PTR-MS m37 flux. It was determined by combining spectral damping functions for (a) sensor separation, (b) sonic path averaging, (c) the 0.7 s averaging interval of the PTR-MS signal, and (d) laminar flow in the sampling tube.

ACPD

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p5339: I could not follow the discussion on clustering in the PTR-MS very well. Especially the sentence “The choice...” (line 15) is very unclear. What is an “increase in sensitivity” (line 19) in this respect.

>>> The sentence means that, instead of a polynomial, also other function types (e.g. exponential) could have been used. They would have shown a different course outside the measured data range. The sensitivity of the m37 detection is the number of (normalized) counts per unit of water vapor concentration (ncps per mmol/mol) corresponding to the curve slope in Fig. 4. Due to the non-linearity of the m37 signal (Fig. 4), this ratio increases with higher water vapor concentrations (if the offset value is subtracted). We will slightly change the formulation of these sentences to make them more clear.

REFERENCES

Aubinet, M., Grelle, A., Ibrom, A., et al.: Estimates of the annual net carbon and water exchange of forests: the EUROFLUX methodology, Adv. Ecol. Res., 30, 113-171, 2000.

Lenschow, D. H. and Raupach, M. R.: The attenuation of fluctuations in scalar concentrations through sampling tubes, J. Geophys. Res., 96, 15’259-15’268, 1991.

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