

## ***Interactive comment on “Technical note: Dimensioning IRGA gas sampling system: laboratory and field experiments” by M. Aubinet et al.***

**M. Aubinet et al.**

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Thank you for your useful comments. We will reply point by point.

Comment : However, as pointed out by Dr Sargent in the interactive discussion, cut-off frequency is normally defined as the half-power point, and the amplitude spectrum at this frequency falls to  $1 = p^2 = 0.707$ , not  $1 = 2 = 0.5$ . Please check it and re-calculate the results if necessary.

Reply : Thanks for the remark. See also our reply to Dr Sargent. You are right concerning the lab experiment and this led us to recalculate the cut off frequencies and

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to reevaluate our theoretical approach. For the field experiment, as transfer functions were computed from power spectra, the presented values are correct.

Comment : Throughout the MS Authors used the term “rain cup” throughout this MS, but I think it should be “rain cap”. Please check it. (Note that I also used “rain cup” in this review, for convenience.)

Reply : Change made everywhere. Thank you !

Comment : P10738L11,12 The paper by Massman and Ibrom (2008) cited here is a “discussion paper” (P10747L13–15). Please cite the final version as follows. ÅŒ Massman, W.J. and Ibrom, A.: Attenuation of concentration fluctuations of water vapor and other trace gases in turbulent tube flow. Atmos. Chem. Phys., 8, 6245–6259, 2008.

Reply : Change made. Thank you !

Comment : Eqs. (2)–(4) These equations and their coefficients are not readily available from Massman and Ibrom (2008ACP). Though Foken et al.(2012) is somewhat helpful, but it will be useful and helpful to readers if the derivation of these equations (especially Eq. (2)) is provided in the Appendix. ÅŒ Foken, T., Leuning, R., Oncley, S.R., Mauder, M., and Aubinet, M.: Corrections and data quality control. in: Eddy Covariance: a Practical Guide to Measurement and Data Analysis, edited by: Aubinet, M., Vesala, T., and Papale, D., Springer Atmospheric Sciences, Springer, The Netherlands, doi:10.1007/978-94-007-2351-1\_4, 85–131, 2012.

Reply : We completely reevaluated the theoretical approach that was incorrect. It appeared that, contrary to what we supposed formerly, the tube attenuation was not critical but that the main cause of high frequency attenuation (in the absence of rain cap) was the sensor line averaging. We thus rather develop the Moore equation and used it in the new Figure 4 (see figure in attachment).

Comment : P10738L13(Eq. (2)) There is no explanation about the symbol  $f_{co}$  (cut-

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off frequency). P10738L14–15 Put “Re” following “Reynolds number” to read “the Reynolds number Re is a function of Q”. Otherwise, there is no explanation about the symbol Re.

Reply : OK, both were added.

Comment : P10738L20(Eq. (4)) There is no explanation about the symbol  $\mu$  (molecular viscosity of air). Reply : OK Done. Thank you. Comment : Section 3 Information about rain cups is quite limited. Please provide the inner and outer diameter and volume of these cups. And the photos or schematic diagram of these rain cups will be helpful.

Reply : Description was added. However, see our reply to Dr Sargent concerning rain cap design.

Comment : P10740L15–17 Again, the amplitude at the cut-off frequency would be 0.707, not 0.5. Please check it.

Reply : You're right. We corrected it.

Comment : P10742L7 and henceforth Part number of the old LI-COR rain cup (officially “Intake Screen”) is 9972-043, not 9972-43. P10741L15 and henceforth Part number of the new LI-COR rain cup (officially “Intake Tube Rain Cap”) is 9972-072, not 9972-72.

Reply : Part number was corrected everywhere in the text. The name “Intake screen” was added at some places but we kept the general appellation “rain cap” in the text.

Comment : P10742L8 non linearly ! ‘nonlinearly’ or ‘non-linearly’

Reply : Change made. Thank you !

Comment : P10742L15, P10744L5 No information was provided about the size of “exchange surface” of the filters.

Reply : The exchange surface of ACRO 50 is 19.6 cm<sup>2</sup>. Those of PALL 2 $\mu$ m membrane is 9.6 cm<sup>2</sup>. The surface exchange of the Swagelok is much greater but could not be

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quantified as the filter is constituted by a sintered element.

Comment : Section 4.1.2 According to Section 3.1.2, the cut-off frequency seems to be identified in 1-Hz resolution, but the data in Figure 4 looks not 1-Hz resolution. I think more detailed explanation is required how you identified the cut-off frequency in Section 3.1.2.

Reply : The transfer function was indeed computed with a 1 Hz resolution. However cut off frequencies were computed by interpolation between two observations, which explains the decimal values. Anyway, we re-computed these values (in order to take the 0.707 value into account) and give them with only one decimal.

Comment : Section 4.2 Though the authors concluded that the main cause of cut-off frequency decrease should be due to the rain cup, it might be due to multiple causes. The only supporting data are the ones observed using a stuffing gland, with cut-off frequency of about 8 Hz. Readers might want to know the relationship between the shape of rain cups and cut-off frequency decreases. In addition, no one can imagine the shape and size of stuffing gland because of the lack of information.

Reply : Information was added concerning the shape and size of different rain caps. In addition, as we found a clear relationship between rain cap volume and cut off frequency. In order to clarify this, we added a new figure presenting this relation.

Comment : P10744L23–24 which probably is probably site specific!which is probably site specific

Reply : Correction made. Thank you !

Please also note the supplement to this comment:

<http://www.atmos-meas-tech-discuss.net/8/C3970/2015/amtd-8-C3970-2015-supplement.pdf>

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Interactive comment on Atmos. Meas. Tech. Discuss., 8, 10735, 2015.

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