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Atmospheric Measurement Techniques Discussions

Interactive comment on "Correcting high-frequency losses of reactive nitrogen flux measurements" *by* Pascal Wintjen et al.

Anonymous Referee #1

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The manuscript outlined that high-frequency measurements of reactive nitrogen species – required for eddy covariance observations of reactive nitrogen fluxes – are subject to high-frequency attenuation due to chemical reactions and adsorption/desorption along the intake tubing. The authors investigated five methodologies for correcting these losses, and applied them in a critical manner for two datasets taken over different surfaces. They were able to show that theoretical spectral corrections were lacking in characterizing the chemical losses in the eddy covariance system, and hence concluded that experimentally-derived corrections in the high-frequency range – in particular in-situ cospectral corrections – were the most appropriate method for their dataset.

The manuscript presents a good overview of the usual methods to correct for inlet

attenuation with a closed path flux sensor. The conclusion that corrections based on spectral similarity with an in-situ (non attenuated) scalar cospectrum like sensible heat work best, is very reasonable and undoubtedly correct.

Overall, methods and conclusions seem appropriate for terrestrial flux measurements where you have big signals, but will be tricky or impossible to apply when signals are weak.

While my work overlaps with eddy covariance flux research, I lack the depth of expertise to thoroughly evaluate the applied methods and their evaluation. The manuscript is overall very well organized and written. It considers and nicely builds on previous literature. Without doubt, the authors are leading experts in this field. This gives me confidence that this part of the paper is of high quality.

While overall the English language is easily understandable and pretty good, the paper would benefit from careful editing by a native English speaker. I believe the Copernicus staff will do that during the proofsetting, which will likely cover this need.

Here are a few pointers for a start: Commas should probably be inserted in lines

2,9,12,21,22,36,42,59,61,77,116,119,119,129,129,131,131,132,135,138,140,
146,148,180,187,190,196,197,202,215,220,242,245,247,247,252,254,256,269,
273,273,277,279,284,284,284287,289,290,296,314,316,317,337,330,337,340,
341,360,366,382,396,403,439,440,444,451,452,463,498.

Please review and consider placing commas according to 'Oxford comma' rule.

Other minor comments:

Abstract: I suggest adding a sentence or two that summarize the value of this work to a general audience.

Line 13: I recommend using past tense (underestimated) here and in similar situations (Line 101, ...).

Line 75: Please provide detail about the sampling inlet.

Line 92: This study may also be of relevance: “Characterization and mitigation of water vapor effects in the measurement of ozone by chemiluminescence with nitric oxide”, by Boylan, P.; Helmig, D.; Park, J. -H., ATMOSPHERIC MEASUREMENT TECHNIQUES Volume: 7 Issue: 5 Pages: 1231-1244 Published: 2014.

Lines 204, 213, 221: Can the authors provide reasons for choosing their frequency cutoff limits?

Figs. 4+5: Values for n are in an awkward location – perhaps at the very top or bottom of figure?

Table 1: Why would the lag time be different by a factor of 8, when the tubing length is different by a factor of 4, at similar flow rates?

Line 125: Isn’t the time lag actually zero given the nature of the measurement?

Line 145: So, do I understand this right that actually only $\sim$10% of the observations were retained for the data analyses after all filters had been applied?

Line 147: I suggest to delete ‘as well as’.

Figure 4, 5: I found it hard to keep track of the many abbreviations used in the text and figures. Maybe the authors could provide a table that lists them all in one place? It would also help to explain/spell out abbreviations again in the Figure caption.

Line 241: What are the likely reasons for dampening of the temperature power spectrum?

Line 265: I would not call these graphs time series plots. They show statistical analyses of monthly data.

Line 278: “platinum gaze” = “platinum gauze”?

Line 287: It is not entirely clear in this sentence whether these periods of poor instru-

ment performance were removed or included in the analysis. Perhaps a minor reword to make this clear.

Table 2: Consider swapping location of FOR and BOG for consistency with other figures.

Lines 303 to 305: Appears to repeat already-presented information. Consider beginning paragraph at “For investigating. . .”

Fig. 7: Swapped ordering of FOR and BOG again, as opposed to order in Fig. 6.

Line 330: Can you explain what the response time actually represents? It’s obviously not the time from the entry of the sample in the inlet to when the instrument gave a signal?

Sec. 3.3: Could the analysis given between meteorological variables and alpha be repeated for tau? It seems that alpha and tau have an inverse relationship (covered briefly in the conclusions) and therefore might it be possible to include this in Sec. 3.2.

Line 364: Correct to ‘ppb’.

Line 371: Can a similar analysis to that in the later section of Sec. 3.2 be used to investigate the influence of humidity on CO2?

Line 379: How can a logger contribute to the noise?

Line 486: Correct to ‘low-frequency’.

Line 499: Based on your results and experience, can you comment on the possible complication from water vapor and NO having different lag times in the converter and sampling system, and how that then effects the interference from quenching of the NO signal?

Conclusions section: It was not clear to me whether the damping factor values translated directly into flux value reductions. Therefore, as the results/discussion was re-

lated largely to damping factor values, the introduction of flux value reductions in the conclusions seemed somewhat new. I would also suggest here to place again these flux reduction values within the previous literature, as cited earlier in the paragraph beginning in Line 45.

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