Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC1
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Comment on amt-2021-249

George Burba (Referee)

Referee comment on "Importance of the Webb, Pearman, and Leuning (WPL) correction for the measurement of small CO_2 fluxes" by Katharina Jentzsch et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-249-RC1, 2021

This is a simple, clear and useful manuscript.

Implementation of the proposed quality flagging scheme when WPL correction is large when compared to the actual gas flux makes good sense, and will improve flux data quality.

I have several minor, a few medium, and one major comment. Minor editorial suggestions are comments # 1-3, 6-10, 13, 15 in the attached file.

Medium comments:

#5 - The surface heating correction seems constant in Fig 1, but it is supposed to change with temperature. Is this a maximum range for coldest temperature on that day?

#11 - The sentence is perhaps a bit too broad. This would not hold over water surfaces.

#12 and #16 - It may be important to also add that relatively imperfections in both zero and slope of the sensor calibrations will affect open-path fluxes during periods with very small natural flux. Especially if calibrations are performed in the field, these calibration-related errors in small fluxes are quite frequent.

#14 - Surface heating correction should not really be applied in warm periods. It is still there, but very small, and modeling it brings more harm than good.

#17 and #18 - I get nearly identical numbers for Table 1 in some cases but very-slightly different for others. It may be because I am using 50% humidity and constant Cp and lambda. It may be helpful to list what humidity, Cp, and lambda are used in this table.

#19 - This sentence seems too categorical. Surely people gave special attention to WPLprelated uncertainties in the past. Tables 3,4,5 from Burba et al, 2018 (https://onlinelibrary.wiley.com/doi/abs/10.1111/gcb.14614) is just one example, but many others did similar calculations before that.

What did not seem to have happened in the past is the QC scheme involving such uncertainties in relation to the flux itself. This is a great idea and seems novel.

By the way, something similar can also be achieved by simply assuming a WPL uncertainty error bar of 15%. When this error bar crosses zero, the flux should be flagged. But your proposed QC scheme looks much less arbitrary and more sophisticated.

Major concerns:

My only major concern is with how to use MAD in this case and avoid excluding perfectly good data when fluxes are highly variable (sun-shadow for CO2, ebullition for CH4, N2O episodic emissions, etc.). There certainly should be a way to use MAD but successful use would greatly depend on how exactly MAD is implemented.

Please also note the supplement to this comment:
https://amt.copernicus.org/preprints/amt-2021-249/amt-2021-249-RC1-supplement.pdf