Atmospheric Measurement Techniques Discussions

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# Comment on amt-2022-164

Anonymous Referee #2

Referee comment on "True eddy accumulation – Part 2: Theory and experiment of the short-time eddy accumulation method" by Anas Emad and Lukas Siebicke, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2022-164-RC2, 2022

**Review of the manuscript amt-2022-164 , "True eddy accumulation - Part 2: Theory and experiment of the short-time eddy accumulation method" by Emad and Siebicke (2022)**

## General overview

This, rather more practical and technology-oriented submission presents the second part of the two-part manuscript. The authors work through the mechanical arrangements of the TEA system and describe the processing and correction steps that were performed on the way from raw data to the final TEA fluxes. The field site and equipment is first described. The effects of buffer volume correction, coordinate rotation, data quality filters are discussed among other particularities. The performance of the TEA system is compared with that of a conventional EC setup. The work is detailed, interesting, and definitely deserves publication. I note that most of the previous comments have been taken into account by the authors, which leaves a relatively short list of corrections and additions provided below.

## Recommendation: accept after the below minor corrections are done

**Detailed comments**

Abstract, line 11: you can tell exactly how much the performance is improved (in relation to eddy-covariance).

Introduction/Theory sections: You briefly mention the accompanying paper on the lines 57-58, but I believe it should be given more space, perhaps in the Introduction, to explain the relationship between the two papers and how the current paper supplements Part I.

line 75-76: "… limits the dynamic range and flexibility" is not immediately clear – can you specify what problems this entails, exactly. The paper is of technical character and I believe such detail should be added.

78: shorter intervals – corresponding to the individual updrafts/downdrafts?

81-83: Not clear – basically this tells about two consequtive filters, both based on vertical wind velocity.

101-102: comment on the physical sense of the transport asymmetry coefficient.

110: please change the wording in "difference equation"

119: "…dimensionless flow rate" is unclear, and it continues to be unclear in Figure 1. Please briefly explain in the text how that is defined.

Figure 2: As I have noted earlier, it would be good to state in the caption that the photo does not reflect the state of vegetation during the experiment.

Section 2.3.2: you should add some information on weather and other environmental conditions which prevailed during the period the measurements were active.

Figure 3: explain MFC, MFM and VS in the caption

201-202: please revise the sentences.

226-227: is the median really better than mean? Are the outliers that important for the mean? The outliers can in some cases be related to strong source/sink hotspots.

233: remind here what alpha was.

Coordinate rotation in a flat site

317: are the parameters correct?

319: "stationary rotation angles" is not clear

Please do not start sentences with "whereas"

Section 3.2.2: so I understand that the difference between the two runs of coordinate rotation results from the different methods used, as the same anemometer (?) was shared the EC and TEA systems?

Furthermore, I wonder how the angles of 4-6 degree angles could be observed in a seemingly flat site – please comment on that.

350: clarify "uncommon"

344-346: given the good match otherwise, I would suggest that this phase shift is the next target for correction.

Section 3.3: as an ultimate measure of similarity between EC and TEA flux, I would recommend presenting the cumulative Re and GPP for the study period, and present it in g C m-2, with uncertainty included. This would convince those users who are concerned with getting the correct integrated flux values (they are the majority).

Section 3.4. In the lines 344-346, you mention that the buffer volumes also lead to the phase shift, which results in an noticeable deviation the from the EC flux diurnal course. How does this relate to what is described in 3.4? Can these issues be addressed simultaneously, at least in theory?

Conclusions: I think here, and also in the results section, you should estimate the effective time resolution of the TEA flux achievable with the presented technique. The community is more familiar with the EC technique and usually thinks in terms of 30 min average fluxes – how does TEA perform in that respect?