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Interactive comment on "A new procedure for processing eddy-covariance data to better quantify atmosphere-aquatic ecosystem CO_2 exchanges" *by* Tatsuki Tokoro and Tomohiro Kuwae

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The study introduces a new method for filtering eddy covariance data with the aim to improve the accuracy of the measurement. It is based on the criteria of standard deviation values. The data utilized is from a shallow lagoon in Japan. The content of the paper and data are potentially interesting but it contains a lot of unclear sections and details and I am not sure whether the authors themselves know what they were doing; I got the impression that the authors want to demonstrate something in which they believe but don't know how to do it since the amount of data is limited or partly

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biased itself. Also, the structure of the paper is not optimal. I may have misunderstood the main points, but the paper is not written with the style that it would demonstrate unambiguously its results and conclusions. I am sorry for being very critical but I feel I must.

Major:

1. The data is collected by an open-path sensor. Under conditions in the study it is more or less OK although for small fluxes a closed-path sensor is preferable. So EC measurements are probably OK, but the problem is the absolute concentration to get to know fCO2air, which is used in the BF method, and also in the analysis assuming fCO2water zero. How was the sensor calibrated and what was the absolute accuracy for the concentration? i) In addition, related to the EC measurements, there is no information on the actual set-up, e.g. how was the sensor positioned beside the anemometer?

2. The section of 3.3. BF data is very confusing. Reading it you get the impression that only data, which is reliable, is from 15 July. If yes, why the data from other periods are used in the analyses? If only 15 July remains, can you make any conclusions based on the BF data based on the so small data set?

3. My biggest problem is with the whole main result of the paper: how do we know that the filtered data is erroneous? When you look the Fig. 5 it is quite clear (by subjective analysis) that two data points, the biggest and smallest ones are very probably outliers. The two other smaller (in absolute sense) data points may be outliers, maybe not, but if we accept that the most left data point is outlier based on the criteria presented in the paper, how from that stems the conclusion that all data points with higher nSD, Sk or Ku values are outliers? This is not explained/demonstrated in the paper so that I could understand and digest it. How do you know that so high nSD, Sk or Ku values are "wrong"? i) The argumentation based on the flux values found in the literature is not fully sound; you have quite special case, the lagoon with vegetation, which can

cause quite high uptake. ii) I do not understand why the 1 day and $\frac{1}{2}$ frequencies show up in the filtered data; iii) The argumentation using Fig. 9 is not very strong: in July you can't say that the PP2 data essentially differ from PP1 data, neither in September, excluding one single point (flux value c. 6). iii) L. 382: only 3% data indicated "too low flux values", is this really a strong argument? iv) L. 394-396: I understand that the convection discussed is related to very shallow layer in the water-side close to surface, and the depth of 2 m is not shallow at all in that sense.

4. Fig. 11 and the whole discussion on that (L. 414-437) is very obscure; I don't understand the arguments based on the ideal gas law, in my understanding the concentration is governed by the strength of the sink/source on the surface and the atmospheric transport (turbulent or advection); thus the message of Fig. 10 is also obscure; what is the discussion related to the Fick's law? The Fick's law becomes important in small scales, sub millimetre or so?

5. Problems in the structure: i) Fig. 4 is introduced (L. 301) before Fig. 3b was introduced/discussed. ii) There are three Figs. introduced in Discussion although they present basic information, especially Figs. 9 and 10; I would put at least Figs. 9 and 10 in Section 3 Results.

Minor:

1. Line 87: what is "vide infra"?

2. L. 194-195: what was the 1-D extension of the footprint? From what distance e.g. 90% of the flux signal was originated?

3. L. 216: what is "objective gases"? More generally, why there is discussion on methane although it wasn't studied?

4. L. 281: "up to 20 cm"? So the closest distance to the water surface was 20 cm? I know that it is difficult to measure very close to surface but do you know how well the depth of 20 cm represents the surface concentration?

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5. L. 282-284: what was the number of the sampling sites?

6. There is no information how the possible movements of the platform were handled/corrected?

7. The reference Vesala is incorrect: it should be Vesala T, Eugster W and Ojala A 8. Explain RSSI and HP in Fig. caption.

9. L. 630-631: what is "long-term effect of CO2 change"?

10. Fig. 9: Explain all abbreviations in Fig. or give info where there are found.

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