

Response to comments from Referee #1

We thank Referee #1 for the thoughtful comments. The specific questions and suggestions posed, in black, are answered below in blue.

Detailed comments directed to the authors:

P 4 LL 119-122: You describe that a standard axis rotation was performed within Eddypro. Could you elaborate a bit more on how this rotation was performed? The abrupt terrain change can pose a problem for measurements obtained at an EC station set up at a shoreline. Especially for the wind sectors that might have contributions from land and water surface. Paw et al. (2000) and Finnigan et al. (2003) suggest considering such terrain structures in the rotation procedure of the eddy-covariance data, which can be obtained by a sector wise application of the planar-fit method according to Wilczak et al. (2001).

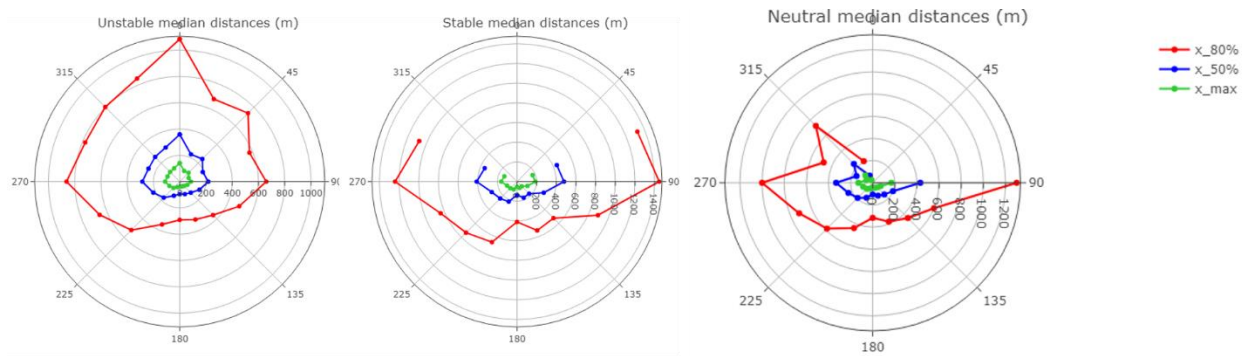
Response: We used the standard double rotation for the fluxes given in the manuscript (i.e. zeroing the average cross wind and vertical wind components). The slope of the shoreline of the pond was very gentle, and the wind was not expected to experience any significant perturbations near the flux tower. However, to evaluate the reviewer's suggestion, we recalculated the fluxes using a sector wise planar-fit method Wilczak et al. (2001). Four sectors were defined: $286^{\circ} - 76^{\circ}$ (pond sector); $76^{\circ} - 124^{\circ}$ (east shoreline sector), $124^{\circ} - 259^{\circ}$ (the south sector); $259^{\circ} - 286^{\circ}$ (west shoreline sector). The resulting half-hour CH_4 EC flux and the original flux were within $0.0 \pm 0.1 \text{ g m}^{-2} \text{ d}^{-1}$ of each other (mean and standard deviation of the difference). Therefore, as expected, during this campaign at this site the planar fitting method did not significantly change the final CH_4 EC flux results.

Section 3.2: Are there any influences of waves to be expected on the calculation of the gradient fluxes?

Response: The pond surface was mostly calm during this study. We observed that the pond surface behaved somewhat differently from natural ponds, since it was partially covered by oil slicks that suppressed wave action. Given the size and shallowness of the pond, waves would have been no more than a few cm in height and therefore insignificant even in relation to the gentle landscape features surrounding the pond.

Section 4.2: Could you please clarify how the shown footprint fits to the flux data set? Particularly I would find it interesting to see a separation of the footprint for the overall data set as well as unstable, stable and neutral conditions. In general an overlay of the entire footprint map over a land use map/aerial photo could provide a more useful inside to interpret the data.

Response: Thank you for the suggestion. We have added the footprint to a revised Fig. 1 and removed Figure S3. As can be seen on Fig.1, the 80% footprint contour lies completely within the liquid water surface of the pond. During this study, 98.6% half-hour periods were associated with unstable stratification when the wind came from the pond. Below, we show footprints under unstable ($z/L \leq -0.0625$), neutral ($-0.0625 < z/L < 0.0625$), and stable ($z/L \geq 0.0625$) conditions. We also included more text to describe this in Section 4.2.



You mentioned that one reason for the differences between chamber and EC flux calculations, is the local deployment of the chambers. One further approach to gain more information during a comparison of is to use the Kljun model to calculate the land use contribution for each half hour EC flux. This could help to understand the influence of the mentioned bubbling areas on the flux estimates.

Response: In the revised Figure 1, the locations of the 15 flux chamber measurements were labeled in white circles. They were all well within our 80% footprint, whereas any potential land contributions to the flux are shown by the footprint analysis to likely be insignificant. The bubbling zones on the pond surface were random and cannot simply be distinguished from inactive zones by the surface characteristics from the Google Earth image.

Figure S2: In my opinion it does not add much extra information since there is no clear daily pattern. Maybe a marking which direction represents the pond and land sectors would help.

Response: We agree and have removed this figure.