

26/10/15

To the Editors at Biogeosciences,

Re: Resubmission of "Quantifying wind and pressure effects on trace gas fluxes across the soil-atmosphere interface"

Please find enclosed our revised version of the manuscript. We appreciate the opportunity to make changes and resubmit and still have great confidence that this paper provides an important contribution to the field through exploration and quantification of a phenomenon that is widely recognized but rarely measured. We have taken the opportunity to revise the paper very assiduously and have addressed a number of the reviewer (and editor) concerns, as listed below.

From most recent to oldest reviews we have:

Addressed the editor concerns (7th Sept, 2015) that the description of the inner toroid was not sufficiently clear. We have since added three CAD schematics (as Supplementary Figures 1a-c) that show the inner toroid from a number of angles, with sampling ports, anemometers and fans all clearly labelled. While we continue to rely on the methods text to describe the toroid we note the supplementary figures wherever the unit is described (red font text, wherever these changes were made). We would be happy to include more description with the supplementary figures to clarify if needed.

We have also completely recalculated our data using the HMR R-script (Pedersen et al., 2010) and have therefore also revised our figures, tables and text where appropriate, including the method description from lines 279-289 (in red). The changes wrought by this recalculation are throughout the article; nearly every reported number, figure and graph was affected. These have all been shown in green font. To be clear, the overall impact on our stated conclusions is negligible, while the individual fluxes tended to increase the ratio of static to high wind fluxes remained nearly constant, in fact overall the change in recorded ratios was exactly 0% (+/- 15%). Overall this suggests a higher variability in the HMR results relative to our previous linear approach, but this has negatively affected the pressure differential correlation (r^2 has shifted from 0.41 to 0.37) as well as the wind speed correlation (from 0.82 to 0.67) with trace gas fluxes. There were no substantive changes in the planar fit to the data, as shown in figures 3a-c.

We have chosen not to respond within the article regarding the first and last comments made by reviewer 3, as we have already addressed our disagreement with their opinion in our rebuttal. The reviewer did point out that our reported values for the toroid were not exact however, and we have since gone back to the CAD

diagram values (Supp Fig 1a-c) to recalculate the volume and footprint of the inner toroid. These changes have been marked in red in the text from lines 145 to 149. We have addressed this reviewer's concerns regarding linear versus HMR-calculated fluxes, as described above.

We have addressed a number of the concerns raised by reviewer #2, who provided an extensive list. While we have already outlined our disagreements and the reasons therefore in our previous rebuttals we outline here the changes requested that we have honoured and attempted to address. For instance, we have now added text and references to Massman, 2006 and Massman & Frank, 2006 to more fully credit their model in lines 98-100, 118, 384-386 (in red).

We have clarified the discussion on various diffusion terms, as well as removed the comment "there is more than half a century..." and have developed the argument for the measurement of wind-based advective processes through different text, as shown in lines 38-69 (in red).

We have added much more detail to the figures presented now as Supplementary Figures 1a-c, as requested by the reviewer.

We have added references to support our methodology for flux calculation and choice of trace gas measurement device, in lines 240 and 253 (in red), as requested by the reviewer.

We have added the analyser flow rate as requested on line 254 (in red).

We have changed all pressure units from mbar to hPa, as requested by the reviewer. These changes are made on lines 365, 366, 607, 624, and 627 (in red) and in Figures 2 and 4 (not marked). We have also removed the word "in" from all figure captions. True for all figures (not shown).

We have reduced the number of significant figures in Tables 2 and 3 (not shown).

Our comments and changes to the first reviewer have already been made and are not addressed in this report.

We hope that you find this latest version addresses your concerns and look forward to the next steps in this process,

Sincerely,

Kelly Redeker, Andrew Baird, and Yit Teh