

Interactive comment on “Application of Gauss’s Theorem to quantify localized surface emissions from airborne measurements of wind and trace gases” by Stephen Conley et al.

Anonymous Referee #3

Received and published: 20 June 2017

The paper by Conley et al. presents and validates a technique to infer point-source emission rates from in-situ aircraft observations of the atmospheric concentrations in a cylindrical volume around the source. The techniques is approached theoretically through LES modelling as well as experimentally through the analysis of actual aircraft observations. The observation part is, however, rather short deserving more detailed discussions.

The writing of the paper is somewhat unclear in some places and, it appears like the manuscript lacks some text at the end wrt. discussing Figure 8-10 and conclusions. I recommend reworking the manuscript for clarity along my comments below and ex-

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tending the discussion of Figures 8-10.

Comments

line 103, throughout the manuscript: Check usage of "`\citep`" vs. "`\citet`".

line 137: Check usage of "ABL" vs. "CBL".

line 155: Several symbols undefined. Use real equations instead of in-line math.

line 176-178: I do not understand what the paragraph refers to. Isn't it redundant?

line 199: "the two terms that make up the path integral in equation (5)". There is only one term in equation (5), the horizontal divergence term dropped out before. In general, the ordering of equ. (1) through (6) appears confusing. Please check whether section 3.1 can be improved wrt. clarity.

line 200: Are all symbols defined? Use real equations instead of in-line math.

line 235: What is U, what is T?

line 254: "Assuming." Remove.

line 258: Explain what a cospectrum is.

section 3.4: Rework for clarity considering background of the general reader of AMT.

line 331: This paragraph explains the mass derivative term in equation (6). Mass m , however, does not occur in any of the explanations. What is "beta"? Why is the time rate of change of mass an uncertainty per se that needs to be added in quadrature? Please rework this paragraph for clarity.

line 415: The version of the manuscript I reviewed (downloaded from the AMT website) ends with "rendering this technique completely unsuitable." I wonder whether this is actually intended to be a take-home message of the manuscript. Should there be a conclusion section which was accidentally missed out?

Table 1: What are the question marks?

Tables 2 and 3: Please use date formatting that is unambiguous for international readers (e.g. YYYY-MMM(string)-DD).

Table 2: hr-11 -> hr-1. The difference column refers to ethane.

Table 3: The difference column refers to methane, right? Please make this clear.

Table 4: Why is there the additional column "Hour"? What is the unit of the CO₂ emission rate ("T"?)?

Figure 1: "to right" -> "to the right."

Figure 2: "Equation (4)" Isn't it equation (3)?

Figure 3: The title and color bar label of the figure "Cross wind concentration" are misleading since the contours represent the integral in cross wind direction not any kind of cross wind dimension.

Figure 4: Please explain in more detail what a cospectrum is.

Figure 5: Define "d" in mathematical terms and relate it to one of your equations. Is "Q" the same as "Q_c" in the text?

Figure 6: "This figure shows" ... unnecessary to say in a figure caption.

Figure 8, 9, 10: Are these figures ever used/referred to in the manuscript? Please discuss in detail.

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