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Interactive comment on “Development and validation of inexpensive, automated, dynamic flux chambers” by B. B. Almand-Hunter et al.

Anonymous Referee #2

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This paper describes the development of an inexpensive dynamic flux chamber for measuring multiple atmospheric pollutants and provides an evaluation of the chamber against eddy covariance data. There is a need for measurement systems such as the one described and the preliminary results show that the system provides valuable information. While the results provided are encouraging, the study falls short of the evaluation goals due to the lack of data. There is very little data for evaluating the CO₂ measurements and no eddy covariance data for evaluating the NO_x measurements. While it is interesting to demonstrate the ability of the system to measure the flux of multiple atmospheric pollutants, the lack of evaluation information makes me question the inclusion of these in the current paper. There are more O₃ measurements available, but only for a very limited time period. It would be important to demonstrate the ability of

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the system to capture ozone fluxes during all seasons. I recommend making additional measurements before publishing this analysis. I do think this is a very worthwhile effort and with some additional work, it will be a very important addition to the literature. In addition to my concerns about the lack of data, I also have questions about some of the design and analysis. It seems that in several cases, shortcuts were taken since a more rigorous treatment would have been too much effort. One example would be the choice of flow rate (page 6887, line 18) where a flow rate was chosen rather than selected based on results from experimental testing. Perhaps the most glaring example is on page 6890 (line 26) where the corrections to the resistance analogy which “must be adjusted” (line 11) are ignored because of the “complexity of the data processing” (line 26). A more minor example would be the use of “visual inspection” to determine LAI (page 6896, line 5) rather than making the needed measurement.

From an editorial standpoint, the paper could benefit from better organization. In the introduction, it is important that the thoughts flow clearly from one paragraph to the next. On page 6879, the paragraphs get a bit confusing as you move back and forth between discussing various topics within a single paragraph. The first paragraph of the introduction sets the stage with the overall importance of deposition and the effects on ecosystems. It may work better to include the ozone damage information in this paragraph. The next paragraph moves from effects to the importance of dry deposition and that it is expensive to measure. I suggest moving the modeling discussion to this point with the notion that models are not perfect. Then you could go on to say that there is a need for the low cost systems to be able to provide more direct measurements of dry deposition to characterize ecosystem inputs and inform further model development. There is also an organization issue on page 6895 where the section about LAI measurements appears in the middle of the ozone results as you go back to discussing the O₃ from the other chambers in between the LAI discussions. No doubt, having good LAI measurements is important to modeling ozone deposition, but that concept is not tied in at this point. Perhaps LAI should be a separate section.

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There are several areas in the paper where better references could be used to illustrate your point. In the introduction, you cite an EPA policy document. It would be better to reference the original studies rather than the EPA compilation of the studies. On page 6879. Several of the references cited regarding model improvement (e.g Schwede and Lear (2014) and Zhang et al (2001)) are not model improvement studies. The remaining two (Zhang et al (2003) and Brook et al (1999) discuss a very similar model. It would be more beneficial to cite model development papers against a suite of models – e.g. Pleim et al (2013) (doi:10.1002/jgrd.50262), Saylor et al (2014) (doi:10.1016/j.atmosenv.2014.03.056).

Some improvements could be made to the Tables and Figures as well. Table 1 lists a wide variety of chamber experiments, many of which have no relevance to the current study. It would be more informative to limit the table to similar studies and provide an additional information to allow a quick comparison between the chambers, including yours in the list. In Figure 3, which shows 10 minutes of data, I am having trouble identifying the 5 minute sampling period. It might be helpful to show that on the figure to illustrate it for this example. Figure 5 might be easier to read if it were split into two plots. Also the addition of error bars would be helpful.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 6877, 2014.

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