

Interactive comment on “Water vapor density and turbulent fluxes from three generations of infrared gas analyzers” by Seth Kutikoff et al.

Anonymous Referee #1

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Review of Water vapor density and turbulent fluxes from three generations of infrared gas analyzers, submitted to Atmospheric Measurement Techniques.

This manuscript performs a sensor comparison of water vapor sensors for the eddy covariance method of deriving latent energy fluxes. They compare three version of the Li7500, and find relatively similar (and positive) performance of the three sensors. While generally well put-together and written, there are some gaps. Notably, the pre-publication comments from Referee 2 seem to have been missed and were un-addressed. I know the Copernicus system sometimes makes it difficult to see the attached comments (please find them). Those major comments and mine here below should be addressed and resolved prior to publication.

Important highlights from the missed review that generally denote “major revisions”:

C1

1. Define how 20 Hz data spike thresholds of 30+ and 2- g/m³ were determined.
2. The Lasslop et al., 2008 paper seems mis-cited.
3. The use of rmsd is sometimes used to indicate that one instrument is performing well, rather than to indicate merely a difference in performance between instruments.
4. Consider seriously the issues of transducer shadowing and other non-IRGA instrument errors (including possible errors in R_n, G, and J and why EBC may not be the best metric).

Major comments:

1. “advective conditions” are referred to without a definition of how they were determined.
2. Fig 7 should add the energy balance terms (At least their sum, in accumulation) and then discussed in more detail in the text
3. In general where Fig 7 is described the term “Energy balance closure” should appear at least once (and described, compared to literature, etc.)
4. Discuss the possible differences in CO₂ flux (or, if that is coming in a different paper), about the implications of the LE flux differences on the WPL corrections for CO₂ or CH₄ fluxes (or other gas fluxes).
5. L409 “. . .no conflict of interest”. I fail to see how this can be true. One of the co-authors works for the company that produces these sensors. I don’t think it’s likely or necessarily an unethical conflict of interest, but it should certainly be stated and justified. The paper helps make the point that this company’s sensors are well-suited for purchase and use.

Minor comments:

1. L18 “means” is too jargony. Consider: Water vapor density fluctuation means

C2

exhibited. . . , while their variances were occasionally. . .

2. L19 “following rainfall events” – for how long?
3. L20 “recent” and “results” seem out of place; “widened cospectra” should be quantified.
4. L39 add a paragraph break before “The accuracy of”
5. L46 “optical approaching” seems like the wrong word
6. L52 “showed that zero drift” – sounded like “showed no drift” – “zero” here is a jargon word. Say something more clearly like “drift of the calibration zero, i.e., the bias”
7. L64 define “relatively low”
8. L85 I think both “error” can be “errors”
9. L96 sounds biased; replace “a newer” with “one set of”, analyzer with analyzers, and change “earlier” to “other”
10. L100 is there a reference for this field and instrumentation? It’s written about as if it is well-known.
11. L114 add “Each” before “gas analyzer” and “the” before “sonic”
12. L155 “rotation” not “rotations”
13. L161 “results of” can be “the”
14. L229 “are” seems jarring after the previous sentences in past tense; I think “Were” is better
15. Fig 1 caption use “turbulence” and not “turbulent”
16. Fig 2 the dots for the HMP155-S are almost impossible to see over the shading.
17. Section 4.1 needs paragraphs; perhaps one with the However in line 333. Consider

C3

also outlining and clarifying the focus and main points; the section wanders.

18. L369 remove “different”
19. L369, 371, 373, and elsewhere – be careful with “This” that lacks a follow-up noun; these words all generate ambiguity.
20. L377 swap “into” and “primarily”
21. L393 add “the” before “corn”

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C4