

Interactive comment on “Recovery of the 3-dimensional wind and sonic temperature data from a sonic anemometer physically deformed away from manufacture geometrical settings” by Xinhua Zhou et al.

Anonymous Referee #1

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Title: Recovery of the 3-dimensional wind and sonic temperature data from a sonic anemometer physically deformed away from manufacture geometrical settings

Authors: Xinhua Zhou^{1,2,3}, Qinghua Yang¹, Xiaojie Zhen⁴, et al. Atmos. Meas. Tech. Discuss, doi: 10.5194/amt-2018-92

Summary:

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This paper describes the recovery of data from a sonic anemometer which was physi-
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cally deformed during the shipping/installation process. The subject matter is appropriate for the AMT journal and the topic is practical and interesting. It is a useful to see the equations laid out and a practical application of "reverse engineering". With that said, I have one major complaint—the mean wind and temperature are good indications of the quality of the sonic data. However, the strength of a sonic anemometer is to measure wind fluctuations and fluxes. The important quantities that should be examined are the effect of the deformation on the fluctuations and fluxes (this is only vaguely described in terms of the surface energy balance on p. 16, but no mention of how the fluxes from the deformed instrument were affected). This important aspect of the study should be included before publication. Also, though the English has been improved, there are still many spots where further improvement is needed (I list a few below).

General Comments:

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1. There is still a typo in the title. "manufacture" should be "manufacturer". I would suggest a shorter title such as:

"Recovery of the 3-dimensional wind and sonic temperature data from a physically-deformed sonic anemometer"

2. The effect of the deformation on the fluctuations and fluxes should be described. It's clear the mean values were affected, but sonics are primarily used to measure fluxes.

3. Thank you for including the code in MATLAB format (Appendix C). Can the actual MATLAB program itself be included as a supplement to the paper?

4. Throughout the manuscript the ultrasonic signals (sound pulses) are described as "flying" between the transducers. This terminology seems a bit colloquial—would a better term be "transmitted"?

5. One thing that struck me in your equations/description is that the speed of sound is shown to be affected by the wind velocity...it seems like most papers I have looked

at describing sonic anemometers use only a single speed of sound which is a function of temperature, humidity. And then the wind velocity affects the time of travel across transducers, but not the speed of sound itself...I think what you have done is correct, but is there another reference that shows the speed of sound depends on the crosswind value (i.e., c_i vs c_{Ti}).

6. The drawings/schematics in the manuscript are quite nice/clear, but the english language usage needs to be improved (examples from the first 2 pages are below, but there are more throughout the manuscript).

Specific Comments:

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- * p.1, l.25, "had been" should be "was"...
- * p.1, l.25, remove, "To recover data from this deformed sonic"
- * p.1, l.30, replace "to the studies on" with "for"...
- * p.2, l.5, what does "structuring" mean?
- * p.2, l.6, what does it mean by "optimized" angles. Optimized for what?
- * p.2, l.11, this reference to "entropy" seems out of place? Don't see entropy mentioned anywhere else in the manuscript...
- * p.2, l.12, "geometry embedded" should be "geometrical information embedded"..
- * p.2, l.15, remove "any more."
- * p.2, l.16, replace "cannot output" with "no longer outputs"
- * p.2, l.23, remove "at the time"
- * p.2, l.23, remove "to which the anemometer can be shipped back with care."
- * p.2, l.28, replace "site" with "situation"

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- * p.2, l.36, remove "then"
- * p.2, l.38-39, awkward sentence, fix the end of it.
- * p.3, l.17, It seems odd to mention the funding in the manuscript?
- * p.3, l.21, replace "4-way net radiometer" with "4-component radiometer" (also, not necessary to describe the components, the radiation is not really important to the study, so be as brief as possible in this description.)
- * p.4, l.7, "unexpectedly various individually"?
- * p.4, l.35, replace, "production of recalibration" with "the calibration".
- * p.4, sec 2 (and photo in Fig 2). I don't quite understand..there was a CSAT3B there, but you are not comparing the "deformed" sonic results to it (especially for the fluxes)? The best comparison would be to have the "deformed" sonic mounted side-by-side with a "normal" sonic, and then the post-processing correction of the deformed sonic could be evaluated quite well. Was this never done and/or impossible to do (even after it was recalibrated)?
- * p.5, eq 3 and 4: probably don't need eq3?
- * p.5, l.25, replace "based" with "depending"
- * p.8, eq. 21, this is only true for dry air, correct?
- * p.11, l.3, isn't the point of the paper verifying that the recovery works?
- * p.11, l.22, what does "bare satisfactory" mean?
- * p.16, l.2, "Li-Cor" should be "LI-COR".
- * p.16, l.9, "popularly used around the world", should be "used around the world". Considering several of the authors work for Campbell Sci. such subjective word choices should not be used.

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