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Atmospheric Measurement Techniques Discussions

Interactive comment on "Towards higher accuracy and better frequency response with standard multi-hole probes in turbulence measurement with Remotely Piloted Aircraft (RPA)" *by* N. Wildmann et al.

Anonymous Referee #1

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This paper presents an analysis of the way to retrieve atmospheric parameters from a multi-hole probe on remotely piloted aircraft (RPA). It describes in detail how to connect the ports to the transducers, which kind of transducers to use, and how to process the signals in order to improve the quality of the computed parameters at the frequencies of boundary-layer turbulence. Given the actual development of RPAs throughout the world, and the generalization of the multi-hole systems to measure turbulence, I consider this paper useful and warranting publication in AMT. The work presented by the authors has been done seriously, and the results are convincing. However, I

have some criticisms regarding the presentation, which sometimes lacks of information and/or clarity. This harms the paper, which is thus in some parts frustrating, even irritating, because the required information is not (or is only partially) available. This is probably not very difficult to correct – I give some indications below. In addition, a list of specific comments will be given at the end of the review.

In Figs 4 and 5, it must be clearly indicated what is really measured (how many transducers and where). In Fig. 5, what is Ps? What is the length of the “long tube”?

In Fig. 10, the tubing system connected to the acoustic box must be represented in detail (with its various branches, lengths, etc.).

In p. 9788-9789, the equations must be developed in a logical way. The starting point is (2) and (4), and it must be clearly explained how the various terms in these equations are obtained from the measurements. In (3), k_p and k_q are presented as dependent on k_alpha and k_beta, whereas in Table 1, they depend on p and q (which are “final” atmospheric parameters). This is really confusing and needs clarifications. If the authors think this requires too long developments for the section, they could put them in an appendix at the end of the paper, but these developments are indispensable. I consumed a lot of time in trying to understand the physical connexions of the sensors and the computations, but I failed.

More specific comments:

1. p. 9785, line 13: Why is the fuselage disturbance reduced on RPA with respect to manned aircraft?

2. p. 9787, lines 6-7: Is there a reference to support this sentence?

3. p. 9788, line 14: Give the order of the polynomial fit.

4. p. 9789, (4): Define p and q.

5. p. 9789, line 4: Why use of dry air constants? Which is the resulting error?

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6. p. 9789, line 21: Number the figure.

7. p. 9790, line 17: “not only on” instead of “on not only”.

8. p. 9795, line 1: Expand MEMS.

9. Fig. 13 and related comments p. 9795: Why is there no correlation between the acceleration along the y direction and the membrane-based sensor signal?

10. p. 9796, line 18: Why 10%?

11. p. 9797, line 7: Is the the digital or the combined filter considered here?

12. p. 9797, lines 14-15: Wrong! On a signal sampled at a frequency f_s, an aliased frequency f_a would appear at the frequency f_a – f_s.

13. p. 9797, line 22: Remove extra dot.

14. Section 6: No sounded conclusion can be drawn from the comparison between two single runs performed at different times, different heights, etc.. So, this section should be restricted to the analysis of the “MASC” signal.

15. p. 9798, lines 18-19: The structure function is computed according to time lags, not to frequencies.

16. Table 1: What is dP?

17. Fig. 1: Indicate where the MHP is located.

18. Fig. 5, caption: Indicate what are LP and HP.

19. Fig. 6 and foll.: The units on the axes must be given between parentheses (instead of after a forward slash).

20. Fig. 6, caption: Which pressure ports?

21. Fig. 6: A correspondence between uncertainties on pressure (in Pa) and on velocities (in m/s) should be given.

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22. Fig. 7: I did not find any comments of this figure in the text. The black lines are impossible to distinguish on the plots.

23. Fig. 9: The spectra computed through the two methods exhibit differences at high frequencies, as stated by the authors, but also at medium and low frequencies. Why?

24. Fig. 11: The caption should describe all the elements of the figure.

25. Fig. 12, caption: Which “tubing system” and which “transducers” signals are illustrated here?

26. Fig. 14, caption: Describe all the elements of the figure.

27. Fig. 15: True airspeed is not a “meteorological” velocity (the signal involves the movements of the RPA with respect to the ground), so why should it follow the -5/3 power law in the inertial subrange?

28. Fig. 15: Use conventional scientific notation on the axes (instead of “1e-05”, etc.).

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