Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2018-65-RC1, 2018

Atmospheric Measurement Techniques Discussions

Interactive comment on "Considerations for temperature sensor placement on rotary-wing unmanned aircraft systems" *by* Brian R. Greene et al.

Anonymous Referee #2

Received and published: 24 May 2018

General Comments: The manuscript describes comprehensive laboratory tests and observations on the optimal placement of temperature sensors on small unmanned rotary wing aircraft. This study presents the first systematic investigation on the corresponding sensor placement and is without doubt highly beneficial for the RPAS (Remotely Piloted Aircraft System) community working on atmospheric research and therefore clearly in the scope of AMT. However, at its present stage, I evaluate this manuscript in the transition between a comprehensive laboratory report and a scientific publication and suggest major revisions and improvements before considering it for final publication.

The introduction, in particular the first parapgraph (lines 2 to 9), is rather messy and should be restructured and in several places be formulated more accurately. It is a collection of statements that are not wrong but also not 100% correct and I miss a clear thread guiding through this motivational part. Some examples: - "The PBL is the lowest part of the troposphere which exchanges energy with the Earth's surface" would be only correct if you add "on a time scale of one hour or below"; otherwise I argue that at least the whole troposphere is exchanging energy with the surface - "balloons are costly and have limited vertical resolution", that might be correct for radiosoundings, but not for tethered balloons

Specific (major and minor) comments:

p.1, lines1-4 : the first two sentences are more motivation and not typical content of an abstract

p. 2, line 21: I suggest to replace "integration of rwUAS with observational networks" by "integration of rwUAS into observational networks"

p.3, line 1: replace ", and thus the temperature" by ", and thus the air temperature"

p. 3, line 11: " "dissipation of heat from the rotary motor": I feel that dissipation is not the correct expression here and suggest to replace "dissipation" by "emission"

p. 3, line 12: replace "Flow in proximity" by "Flow in the proximity"

p. 3, line 21: A picture of the CopterSonde, preferably outside the laboratory, would be great here to show the reader what you are talking about

p. 3, line 22: replace "total all-up weight" by "total take-off weight"

p.4, line 2: what is the underlying sensor type for the iMet temperature sensor; I assume they did not develop them from scratch on their own

p.4, line 5: replace "and is ideal" by "and are ideal"

p.4, line 26: give a proper type description/type definition for the sensor; “known as the 109” sounds rather unscientific

p.5, line 3: remove “one”

p.5, line 5: can you comment on/explain what is “as close as possible to the temperature sensor location”; a value in mm or cm would help here; in addition you should state and discuss which disturbances on your measurements you have to expect by this setup

p.5, line 21: “Prior to analysis of the sensor placement temperature profiles detailed in later sections. . .” makes in this form no sense; should it read “Prior to the analysis of the sensor placement, detailed in later sections, . . .””

p.5, line 21: “depiction” sounds wrong here; better “characterization” or “investigation”

p.5, line 29: replace “A time series of the iMet temperature responses are displayed” by “The time series of the iMet temperature response is displayed”

p.6, line 13 insert comma aroung “however”

p.8, line 20 “At minute 15.5 the probes intercepted a warm stream of air likely owing to turbulent fluctuations and compressional heating”; both figures A4 and A5 show that the temperature increase starts clearly (about 30 s) before the increase in the wind speed, therefore I doubt in the explanation of compressional heating

p.8, general please add arrows and labels to the plots showing where exactly you want the reader to look at and refer to those labels in the text (in addition to the time stamp you give); see also comment on figure 4A

p.8, line 33 “the primary driver of this temperature rise was likely a warm air stream originating from the hot wire anemometer”; couldn’t it also be simply self-heating?

p.9, line 10 insert “level” after “critical”

p.9, line 17 “.. as other trials not described. . .”; as the manuscript is not so long, you might consider to include some additional material in it

comments on figures: âĂć Is there any reason for numbering the Figures with A1, A2, etc instaed of simply using 1, 2, . . . âĂć I suggest to remove the figure titles, e.g. “Coptersonde Fan Aspiration Experiment” in 2,4,5, and 6; this is redundant information to the figure caption âĂć The figures of the time series are not really consistent in their layout

figure A2: Have you an explanation for the “bump” in all three temperature time series around 8 minutes? Could this be an effect of a circulation that builds up inside the chamber? I have seen similar structures in flow test experiments with quadcopters in a larger hall; a pity that you shortened the the motor-on time to 2 minutes (I hope this did not happen on purpose to avoid a discussion of this issue); the legend could be shortened (iMet 1, iMet 2,. . ..), it is clear that it is temperature here

figure A3: the two pictures are not very illustrative, mainly due to the low contrast; it is highly recommended to replace them by better ones

figure A4: “Compressional heating off tip of propeller at minute 15.5 just as wind speeds picks up”; what I see is; wind picks up at 16, while the main temperature jump happens at 15:30; how can this be related to compressional heating? I also highly recommend to include markers e.g. “A”, “B”, “C” and so on, in the figure to exactly point out for the reader what specific feature you are describing in the text; this was really hard to figure out without this help; What is the reason to show the temperatures here as absolute values, when they will be presented in all follow-on figures as differences relative to the NSSL background?

figures A6: for a better comparison with experiment 1 you should also present the second half of figure A4 in the form relative to the NSSL background temperature

---

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-65, 2018.