

Review of
**A Framework for Improving Data Quality of Thermo-Hygrometer Sensors aboard Unmanned Aerial
Systems for Planetary Boundary Layer Research**

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Recommendation:

Accept with minor revisions

Summary:

The authors present a method for correcting temperature/RH observations collected by small UAS with particular focus on addressing errors associated with sensor response. The method is described thoroughly and includes the motivations and justifications for the decisions made. The method is tested using both synthetic and actual data and performance is evaluated using appropriate techniques.

Overall, this is a solid manuscript describing a method for addressing a common source of measurement error applicable to many observation platforms. I have one “major” comment listed below with minor comments listed according to a reference line in the text.

Comments:

This is a rather elaborate method for addressing errors principally originating due to sensor response. I believe the authors have made a compelling case for the merits of this method but they haven't demonstrated its performance relative to much simpler methods designed to correct for hysteresis (e.g., Miloshevich et al. 2004). This is the 800 lb gorilla in the room and it really should be addressed using both the synthetic and actual data included in their evaluation.

Line 25: It's probably worth emphasizing that the measurement errors due to the “turbulent micro-environment around the body” are much more of an issue with multi-rotor UAS than fixed-wings.

Line 216: Need to cite Waugh (2021) here.

Line 233: If temperature changes significantly across a RH shock (which is often the case), doesn't this add to the error when assuming a mean temperature? Is this dealt with during optimization?

Line 402: An airspeed of 45 m/s for small fixed-wing UAS is not typical. I've worked with a number of FW sUAS and they all operate at airspeeds around 15-30 m/s. Sure, some of them can fly 45 m/s but this operation mode is in the tails of the distribution.

Line 423: Need to include the FAA authorization under which data were collected (e.g., COA number or “Part 107” [including exemptions required to operate up to 1300 m AGL]).

Miloshevich, L. M., Paukkunen, A., Vömel, H., & Oltmans, S. J. (2004). Development and Validation of a Time-Lag Correction for Vaisala Radiosonde Humidity Measurements, *Journal of Atmospheric and Oceanic Technology*, 21(9), 1305-1327.

Waugh, S. M. (2021). The “U-Tube”: An Improved Aspirated Temperature System for Mobile Meteorological Observations, Especially in Severe Weather, *Journal of Atmospheric and Oceanic Technology*, 38(9), 1477-1489.