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Nov 12, 2021

RE: Adjustment and corrections for amt-2021-160R

Dr. Keding Lu
College of Environmental Science and Engineering
Peking University
Beijing 100871, China

Dear Dr. Lu,

Thank you so much for your favorable decision regarding our manuscript, "Air temperature equation derived from sonic temperature and water vapor mixing ratio for turbulent air flow through closed-path eddy-covariance flux systems," for publication in *Atmospheric Measurement Techniques* (AMT). Taking your comments into account, we incorporated our adjustments and corrections into the manuscript. Afterward, Ms. Brittney Smart professionally proofread the full manuscript again. After her proofreading, Drs. Takle and Zhou conducted a final read-through, checking throughout for consistent expressions with AMT requirements.

Our adjustments and corrections in response to your comments are addressed below.

We appreciate your consideration in the publication of our manuscript in AMT.

Sincerely,

Tian Gao, Ph.D., Research Associate Professor
Remote Sensing for Forest Fluxes and Management

Adjustments and corrections in response to Associate Editor on "Air temperature equation derived from sonic temperature and water vapor mixing ratio for turbulent air flow sampled through closed-path eddy-covariance flux systems"

X.H. Zhou, T. Gao, E.S. Takle, X.J. Zhen, A.E Suyker, T. Awada, J. Okalebo, J.J. Zhu

Associate Editor's comment

All the references cited in the comments of Referee #1 are worth comment and citation in the revised paper.

Response

Referee #1 cited five references: Schotanus et al. (1983), Kaimal and Gaynor (1991), Harrison and Burt (2021), Mauder and Zeeman (2018), and WMO (2018).

The first two are closely related to our study topic. Both were deeply discussed in sections 1 and 2 and appendices A and B in all versions of this manuscript. Although results from the other three references were used to inform the text, these three were not explicitly cited. Following your comments, the conclusions from the three references are further discussed and are now explicitly cited in two paragraphs of the manuscript.

Author adjustments and corrections

(*Line numbers used below refer to those in version: _amt_2021_160R*)

1. Harrison and Burt (2021) and WMO (2018).
   The paragraph between lines 105 and 111 is revised as:

Measurements of T at high frequency (similar to those at low frequency) are contaminated by solar radiation, even under shields (Lin et al., 2001) and when aspirated (Campbell Scientific Inc., 2010; R.M. Young Company, 2004; Apogee Instruments Inc., 2013; Blonquist and Bugbee, 2018). Although a naturally ventilated or fan-aspirated radiation shield could ensure the accuracy of a conventional (i.e., slow-response) thermometer often within ±0.2 K at 0 ºC (Harrison and Burt, 2021) to satisfy the standard for conventional T measurement as required by the World Meteorological Organization (WMO, 2018), the aspiration shield method cannot acquire T at high frequency due to the disturbance of an aspiration fan and the blockage of a shield to natural turbulent flows. Additionally, fine wires have limited applicability for long-term measurements in rugged field conditions typically encountered in ecosystem monitoring.

2. Mauder and Zeeman (2018).
   The three sentences between lines 242 and 248 are revised as:

……… Sonic anemometers and infrared analyzers with different models and brands have different specifications from their manufacturers. The manufacturer of the anemometer we studied employs carbon fiber with minimized thermo-expansion and -contraction for sonic strut stability (via personal communication with CSAT structural designer Antoine Rousseau, 2021); structural design with optimized sonic volume for less aerodynamic disturbance (Fig. 1); and advanced proprietary sonic firmware for more accurate measurements (Zhou et al. 2018), which reduces the variability of T_s by several Kelvin compared to what has been reported for sonics from other models (Mauder and Zeeman, 2018). Any combination of sonic and infrared instruments has a combination of the ΔT_s and $\Delta \chi_{H2O}$, which are specified by their manufacturers. In turn, from Eq. (25), the combination generates ΔT of equation-computed T for the corresponding combination of the sonic and infrared instruments with given models and brands. Therefore, Eqs. (23) and (25) are applicable to any CPEC system beyond our study brand. The applicability of Eq. (23) for any sonic or infrared instrument can be assessed based on ΔT against the required T accuracy for a specific application.

3. Insert the three references into the References section.

   a. Between Lines 799 and 800 is inserted:

   Harrison, R.G. and Burt, S.D.: Quantifying uncertainties in climate data: measurement limitations of naturally ventilated thermometer screens, Environ. Res. Commun., 3, 1–10, https//doi.or/10.1088/2515-7620/ac0d0b, 2021.

   b. Between Lines 837 and 838 is inserted:

   Mauder, M. and Zeeman, M.J.: Field intercomparison of prevailing sonic anemometers, Atmos. Meas. Tech., 11, 249–263, https//doi.or/10.5194/amt-11-249-2018, 2018.

   c. Between Lines 871 and 872 is inserted:

   WMO: Guide to Instruments and Methods of Observation, WMO-No. 8, Volume I — Measurement of Meteorological Variables, World Meteorological Organization, Geneva, 548 p., 2018.

4. Additional proofreading.

   This manuscript was once more proofread and checked in its entirety. Some minor corrections are indicated in the latest submitted version with change trackers.

References

Harrison, R.G. and Burt, S.D.: Quantifying uncertainties in climate data: measurement limitations of naturally ventilated thermometer screens, Environ. Res. Commun., 3, 1–10, doi: 10.1088/2515-7620/ac0d0b, 2021.

Kaimal, J.C. and Gaynor, J.E.: Another look at sonic thermometry, Boundary-Layer Meteorol., 56, 401–410, 1991.

Mauder, M. and Zeeman, M.J.: Field intercomparison of prevailing sonic anemometers, Atmos. Meas. Tech., 11, 249–263, doi: 10.5194/amt-11-249-2018, 2018.

Schotanus, P., Nieuwstadt, F.T.M., and de Bruin, H.A.R.: Temperature measurement with a sonic anemometer and its application to heat and moisture fluctuations, Boundary-Layer Meteorol., 26, 81–93, 1983.

WMO: Guide to Instruments and Methods of Observation, WMO-No. 8, Volume I — Measurement of Meteorological Variables, World Meteorological Organization, Geneva, 548 p., 2018.