

Atmos. Meas. Tech. Discuss., referee comment RC1
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Comment on amt-2021-160

Anonymous Referee #1

Referee comment on "Air temperature equation derived from sonic temperature and water vapor mixing ratio for turbulent airflow sampled through closed-path eddy-covariance flux systems" by Xinhua Zhou et al., Atmos. Meas. Tech. Discuss.,
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Air temperature is certainly a very important parameter for describing the state of the atmosphere from high-frequency turbulence to climatological means. There are very reliable and inexpensive measuring instruments for this purpose. It certainly makes sense to look for a measuring method that can accurately measure the air temperature without the influence of solar radiation (radiation error). For this purpose, ventilated thermometer screens are used for very accurate measurements. This is a good way to meet the World Meteorological Organisation's requirement of an accuracy of ± 0.2 K at 0 °C (WMO, 2018). Even with naturally ventilated thermometer screens, this accuracy can be achieved in many cases (Harrison and Burt, 2021).

It therefore seems somewhat absurd - if I have understood the authors correctly - to use device combinations of sonic anemometers and closed-path gas analysers to obtain an accurate temperature measurement, especially since operators of these systems often also use a simple temperature-humidity sensor for quality assurance. This request of the authors seems all the more doubtful, as the requirement of measuring accuracy for temperature measurements is not achieved. However, an accuracy of ± 1 K is quite sufficient to determine the temperature-dependent densities and specific heats for trace gas measurements. In most cases, the sonic temperature can be used directly, if necessary with a small correction.

The authors start from the basic work on the conversion of sonic temperatures into air temperatures (Kaimal and Gaynor, 1991; Schotanus et al., 1983). At first sight, the calculation seems to be correct. However, due to the deviousness of the procedure, no examination in detail was carried out.

The authors used a sonic anemometer, which allows a fairly accurate measurement of the sonic temperature. Since the measurement depends strongly on the mechanical stability

of the device, there are also devices with much worse values (Mauder and Zeeman, 2018) with deviations up to several kelvin, so that the proposed method is only applicable for selected types of sonic anemometers.

The reviewer strongly doubts that there is a reader of AMT who would find this method interesting for application.

References:

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