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Atmospheric Measurement Techniques Discussions

AMTD

Interactive comment on "The Polar 5 airborne measurement of turbulence and methane fluxes during the AirMeth campaigns" *by* Jörg Hartmann et al.

Anonymous Referee #2

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1. General comments This paper is a valuable contribution to the scientific scope of AMT. It shows a new method to perform a calibration of inflight data without time consuming flight hours for in-flight calibration. Especially as these calibration flights require perfect weather conditions it might be a time consuming and cost intensive phase within a measurement campaign. The calibration method describes in this paper show an alternative method to calibrate data from the air-data probes without specific flights. This method is based in principle on numerous flights and therefore is a kind of statistical approach. All equations show a "-" instead of "=". This is quite confusing and should be addressed by the author or editor. It might just be a problem of creating the pdf.

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Discussion paper

2. Instrumentation The description of the instrumentation and the aircraft is detailed and easily understandable. All relevant sensors and technical data are given.

3. Calibration of TAS The assumption of the wind changing by less than 0.25 m/s should be addressed more detailed. Which time period is considered? It is unlikely that the wind remains constant over the leg distance of the more than 150 km (first data in table 1). The derivation of equation (2) is missing. I understand this value not as ground speed but corrected speed in aircraft longitudinal direction. So the label of the value v_g is confusing. It might be easier to perform an addition of the two vectors V_g and V (as in equation (1)) to get the reference speed for the TAS calibration. The accuracy of this method is highly depending on the constancy of the wind. A constant change during the two legs seems to stay undetected as this could not be found in the differences of mean values in table 1. Each leg should be analysed separately with respect to time. A standard deviation per leg would be helpful to address this point. Equation (5) implies that the total pressure is measured correctly by the 5-hole probe and the error is only occurs in the static port of this probe. This is not a valid assumption for this kind of probe unless the flow angle at the probe is zero. As the flow angle at the probe is not mentioned a typical calibration curve of the 5-hole probe should be taken into account. The requirements to speed constancy are not mentioned at all. In principle the wind measurement should be independent of TAS but problems might arise by the fact that two legs are averages separately. What happens if one leg is flown at a different speed? The authors should address this point. It is not mentioned whether the computed values for wind and their differences in table 1 are obtained before calibration or thereafter.

The major question is the constancy of the wind during the whole roundtrip. What is the influence of a change in the wind over time and how can it be detected and eliminated?

4. Angle of attack calibration The method of angle of attack calibration is described in detail with sufficient explanations. The results are good especially as the flight conditions at low level over open sea are ideal. The comparison with the second method is

very helpful und shows the effectiveness of both approaches.

5. Angel of sideslip calibration The derivation of equation (11) is missing. For the sideslip angle calibration the same principle problem occurs as for the TAS calibration: a change of wind and / or TAS over time. An increased wind on one leg will lead to an increased residual error of the sideslip angle. This problem cannot be solved by this method unless the wind and TAS remain constant.

6. Static pressure precision The assessment of static pressure precision can only refer to a relative accuracy of the measurement. This is not addressed clearly. It is an interesting approach based on statistical methods.

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