Interactive comment on "Using sonic anemometer temperature to measure sensible heat flux in strong winds" *by* S. P. Burns et al.

List of Revisions to amt-2011-195

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At the request of AMT Associate Editor Christof Ammann we list below the revisions to manuscript amt-2011-195. Because there are numerous revisions, we only list the significant changes.

1. Larry Jacobsen from Campbell Scientific, Inc (CSI) (an expert on the CSAT3) is now included as a co-author.
2. Larry Jacobsen and CSI have agreed that we should include more details from their independent experiments as well as a conceptual model of the CSAT Ts error (sections 3.4 and 3.5). The conceptual model identifies the source of the Ts error as an over-estimation of the transit times across the sonic path.
3. Using data from the NWT site, we test the conceptual model of the Ts error and show an example of the empirical correction applied to the NWT CSAT data (see section 3.5 and Fig. 10 of the revised manuscript).
4. The empirical correction of the Ts error for the sensible heat flux clearly demonstrates the connection between the mean Ts error and the heat flux error.
5. Results from the CSI tests suggest that a well-calibrated CSAT3 running version 3 of the firmware only experiences a negligible Ts error (we attempt to confirm this with NWT tower measurements by adding panel (f) to Fig. 2 and Fig. 9 to the revised manuscript).
6. We updated Table 1 to include the factory calibration date of each CSAT used in our study.
7. We include results from a NCAR/EOL wind tunnel test that compares version 3 and version 4 of the CSAT firmware (Figs. 7–9). This clearly shows the CSAT3 Ts error is worse for version 4 of the CSAT3 firmware than version 3 (a result confirmed by the CSI tests).
8. The nomenclature for the two 0.254 mm E-type thermocouples used in our study is changed from "10-Hz and 1-Hz" to "Near and Far". We now clearly show that the heat flux loss with the Far thermocouple is due to the spatial separation between the CSAT and the far thermocouple—not due to the 1-Hz sampling rate of the far thermocouple (i.e., disjunct sampling). Fig. 3b in the revised manuscript is updated to show the heat flux from the near thermocouple sampled at 1-Hz.

9. The 1-Hz thermocouple fluxes are calculated differently in the revised manuscript. In the previous version, the 1-Hz thermocouple data were linearly-interpolated to 10-Hz and then the w'Ttc' flux was calculated. In the revised version, the 10-Hz CSAT vertical wind data are disjunctly-sampled to 1-Hz and then fluxes are calculated from 1-Hz w'Ttc' data.

10. Based on the advice of Johannes Laubach, we added plots that compare the coherence and phase of the vertical wind with temperature (Fig. 5 in the revised manuscript) and the close thermocouple with the CSAT temperature and the far thermocouple (Fig. 6). These figures show more clearly the de-correlation at night between the CSAT w' and Ts' as well as the somewhat slow response of our 0.254 mm E-type thermocouple.

11. More details about the thermocouple (such as an estimated time-constant) are included (see section 3.2).

12. A paragraph that summarizes previous studies that reported problems with sonic-derived sensible heat flux measurements in high winds has been added to the introduction.

13. We reduced and simplified our discussion of the surface energy budget in section 3.6 and Fig. 11 (several reviewers recommended this).

14. We corrected a small error in the equation for the sonic-derived sensible heat flux (Eq. 5 in the revised version) where the use of T_{s} was not consistent in the previous manuscript version.