Calibration of MTLs

with CTD-cast as temperature reference

METEOR cruise M 60/3

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Introduction

A detailed description of the miniaturized temperature data loggers can be found in Pfender, M. and Villinger, H. (2002). Miniaturized data loggers for deep sea sediment temperature gradient measurements. *Mar. Geol.* 186: 557-570. Their absolute accuracy (and inter-changeabilty) without calibration is 0.1 °C.

The MTLs were strapped to the CTD frame during the CTD cast M60/3-17 (21.1.2004). The temperature data of the CTD are regarded as temperature reference although it's absolute accuracy is unknown at this time. The calibration consists simply of using stable bottom water conditions to remove the temperature offset between individual MTLs.

Calculation of calibration offsets

For the calculation of the temperature offsets, only the part of the whole temperature data were used which were measured in stable bottom water. The difference between the CTD-temperature and the MTL-temperatures was calculated (see Table 1)

$$D = T_{MTL} - T_{CTD} \ [°C]$$

and plotted vs time (see Fig. ???).

Table 1 contains then minimal and maximal temperature difference (D_{min}, D_{max}) as well as the mean difference (D_{mean}) and standard deviation D_{std}.

MTL Id	D_{min} (°C)	D_{max} (°C)	D_{mean} (°C)	D_{std} (°C)
MTL 18541-61	0,0359	0,0672	0,0456	0,00300
MTL 18541-62	-0,0535	-0,0218	-0,0420	0,00279
MTL 18541-63	0,0149	0,0492	0,0270	0,00268
MTL 18541-64	0,0525	0,0832	0,0632	0,00272
MTL 18541-65	-0,0195	0,0142	-0,0075	0,00266
MTL 18541-67	-0,0315	0,0032	-0,0186	0,00275
MTL 18541-69	-0,0085	0,0262	0,0037	0,00273

Table 1. Calculated temperature offsets and statistics.

To correct the temperatures obtained with the WINTEMP-software of the MTLs one has to use the following formula:

$$T_{calibrated} = T_{MTL} - D_{mean.}$$

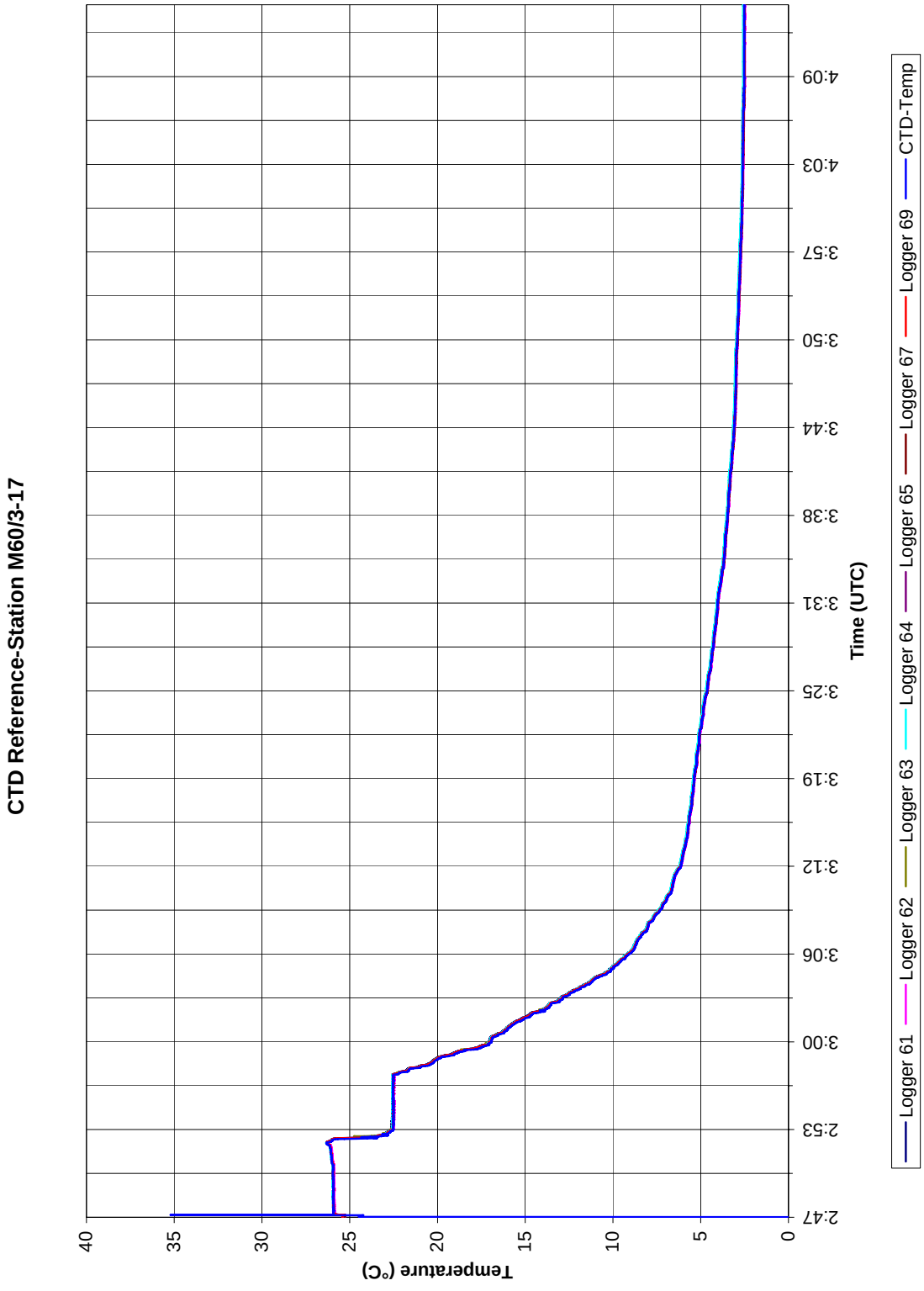

Figure 1. Temperature vs. time plot of the CTD cast M60/3-17 (21.1.2004). The time window from 03:43:00 until 04:14:00 is used to calculate the offsets.

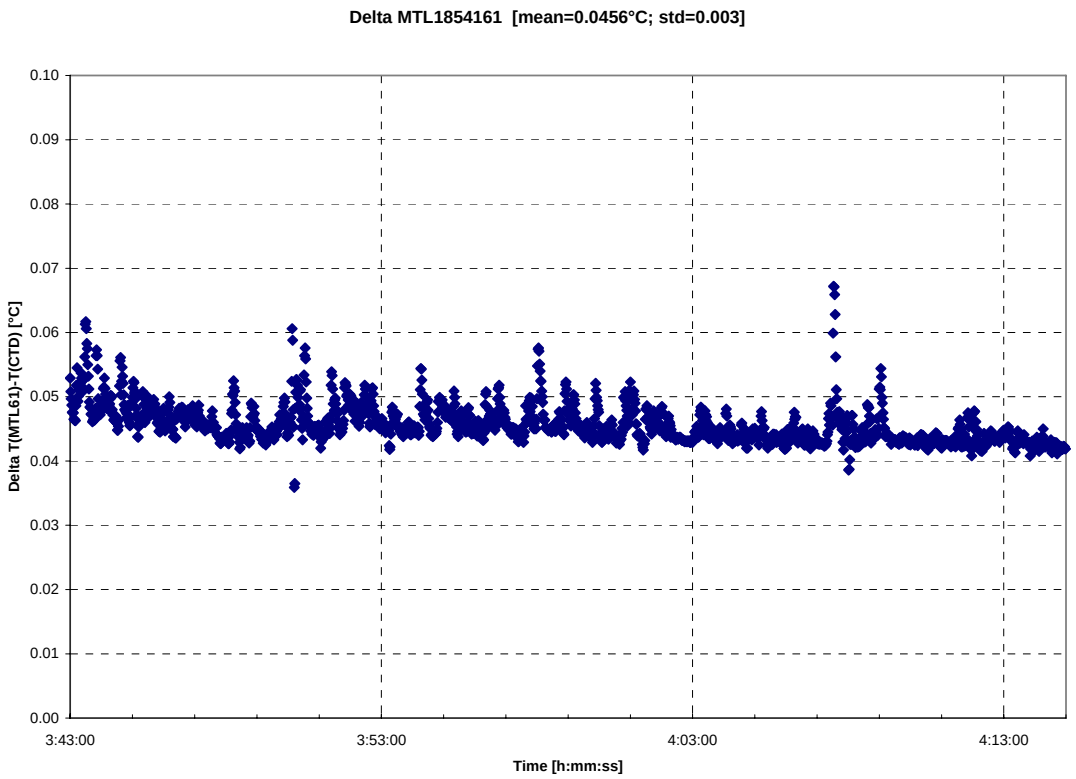

Figure 2. Temperature difference between MTL and CTD temperature vs. time.

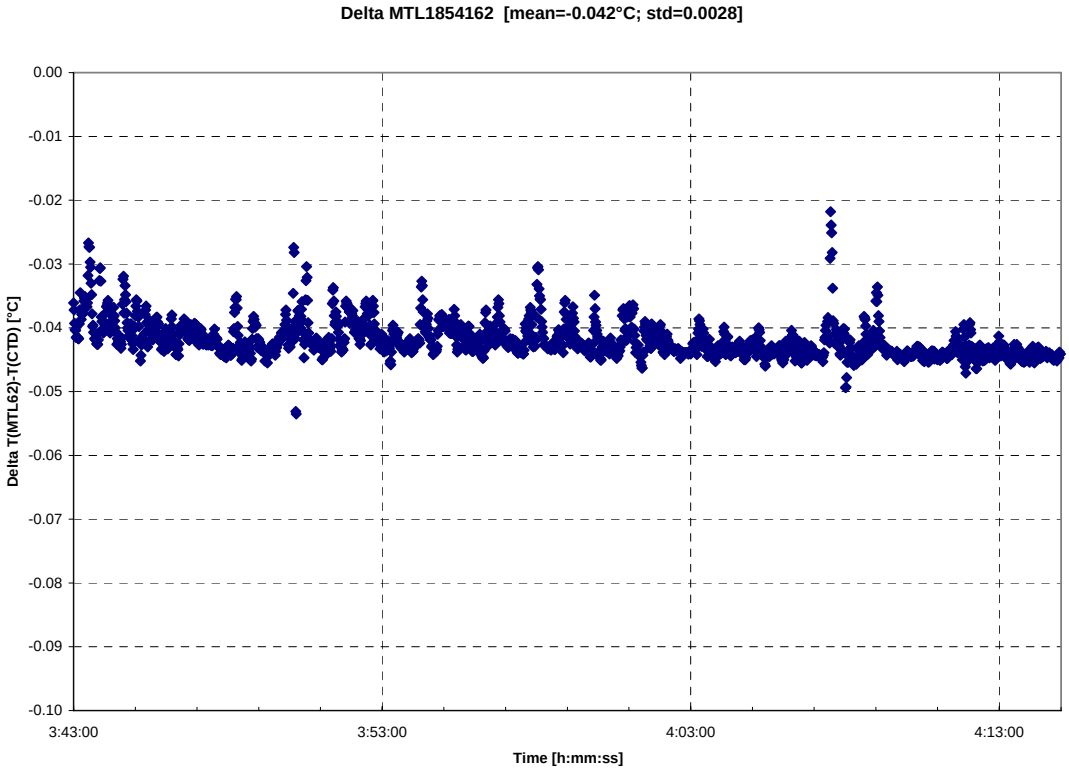

Figure 3. Temperature difference between MTL and CTD temperature vs. time.

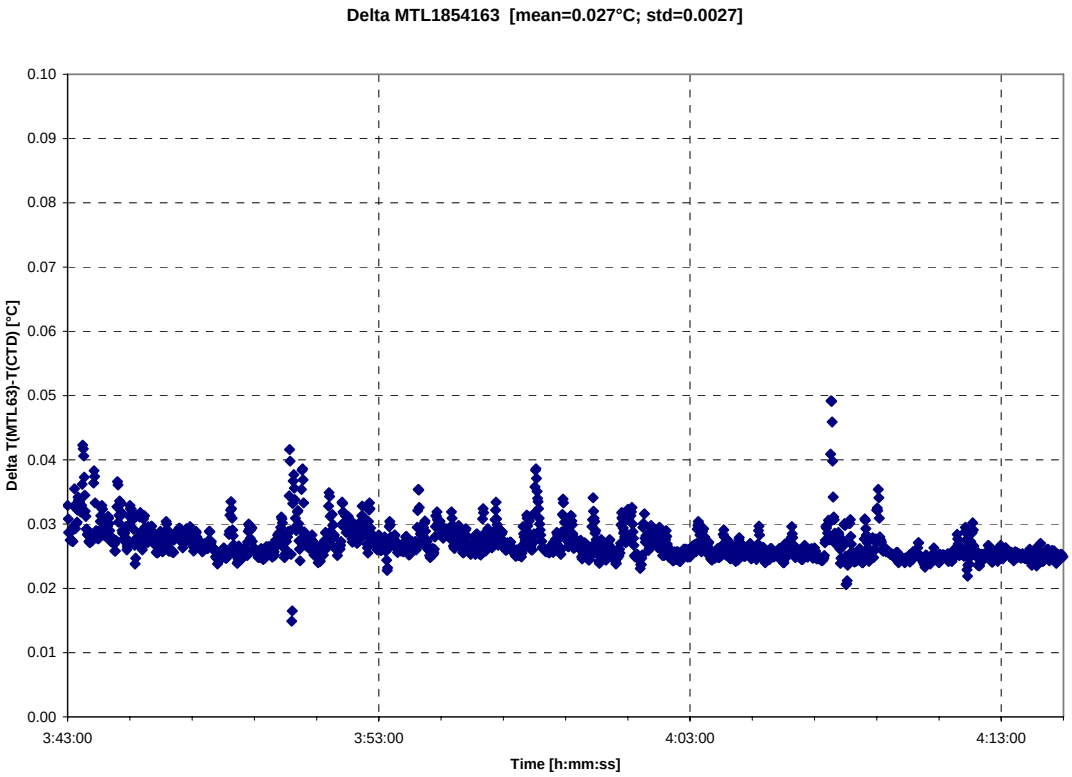

Figure 4. Temperature difference between MTL and CTD temperature vs. time.

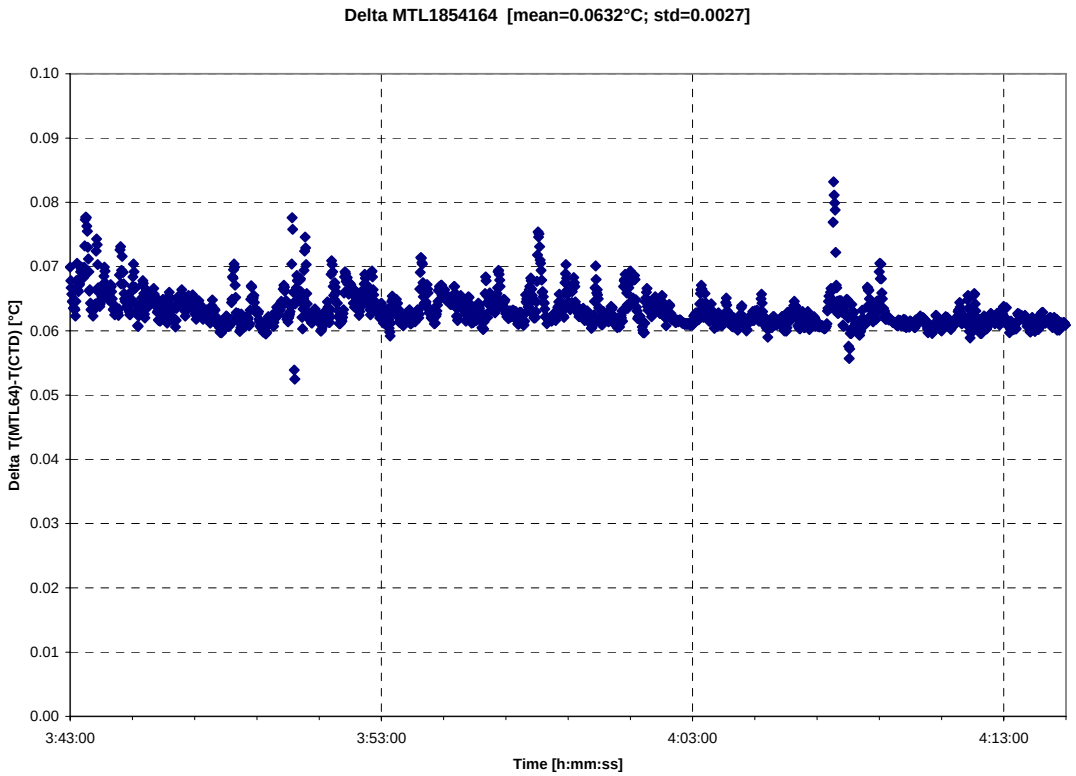

Figure 5. Temperature difference between MTL and CTD temperature vs. time.

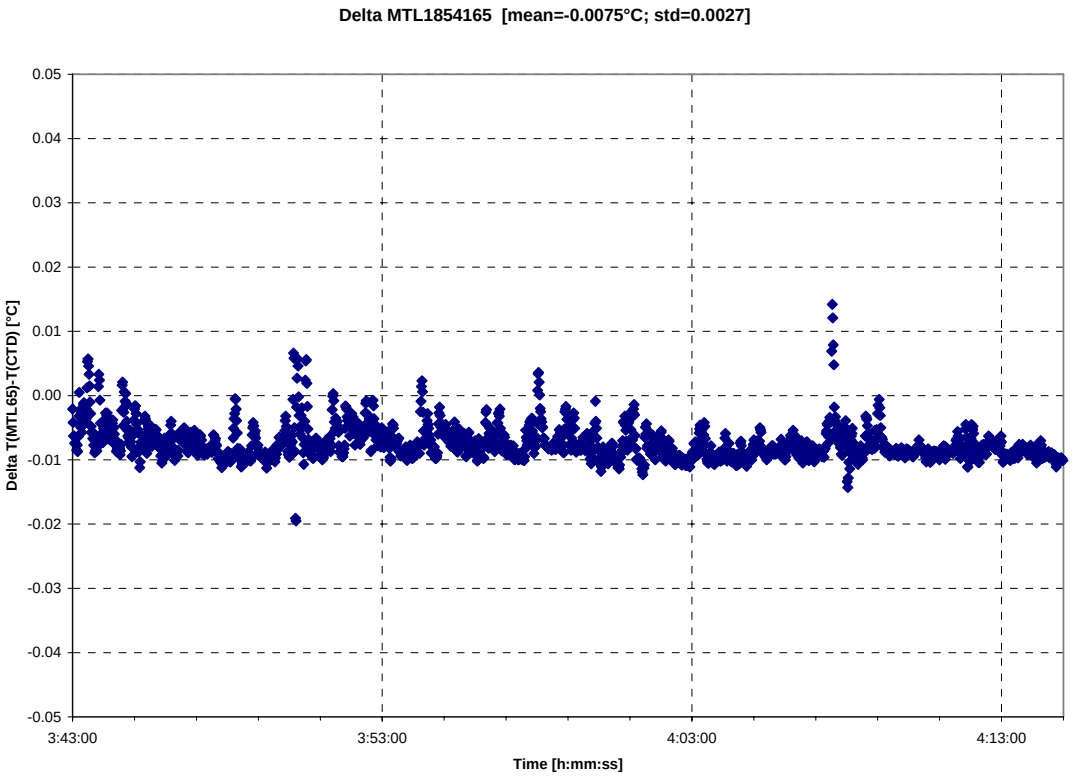

Figure 6. Temperature difference between MTL and CTD temperature vs. time.

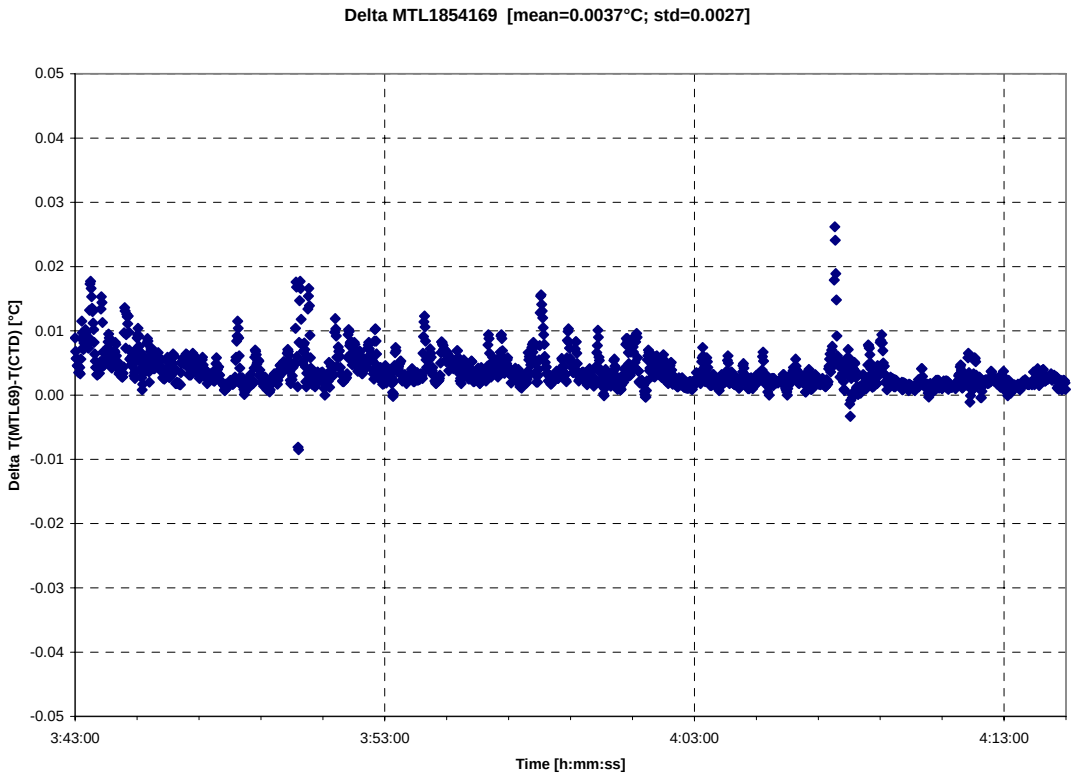

Figure 7. Temperature difference between MTL and CTD temperature vs. time.

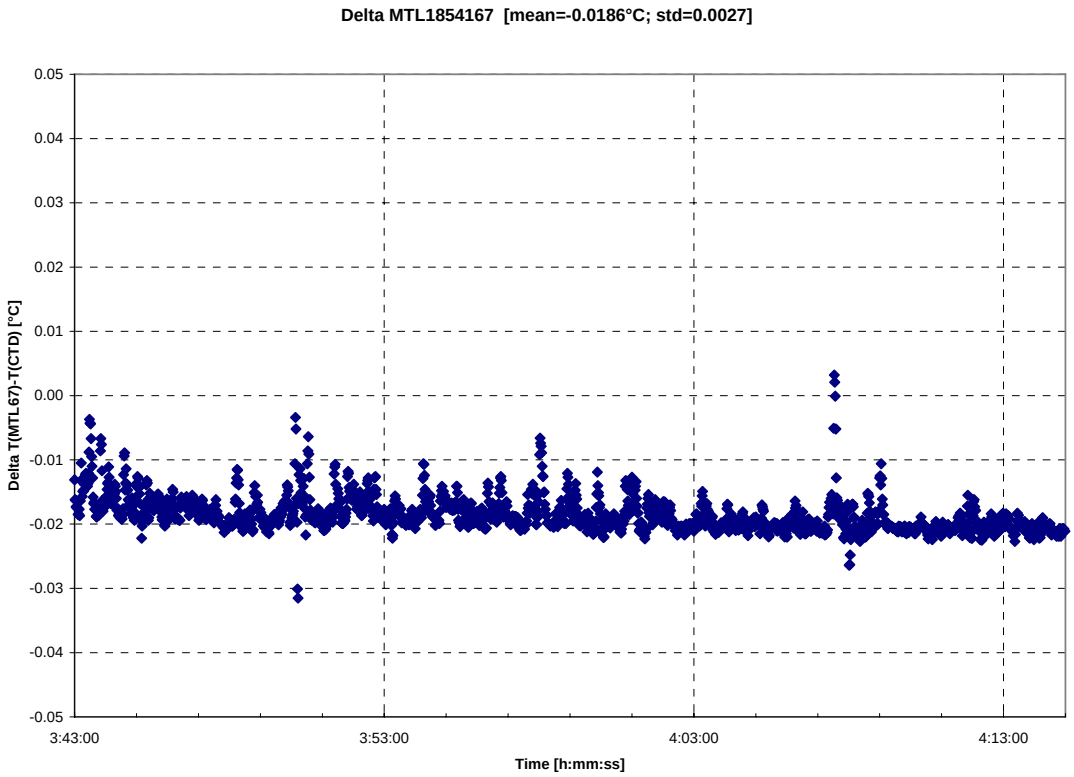

Figure 8. Temperature difference between MTL and CTD temperature vs. time.

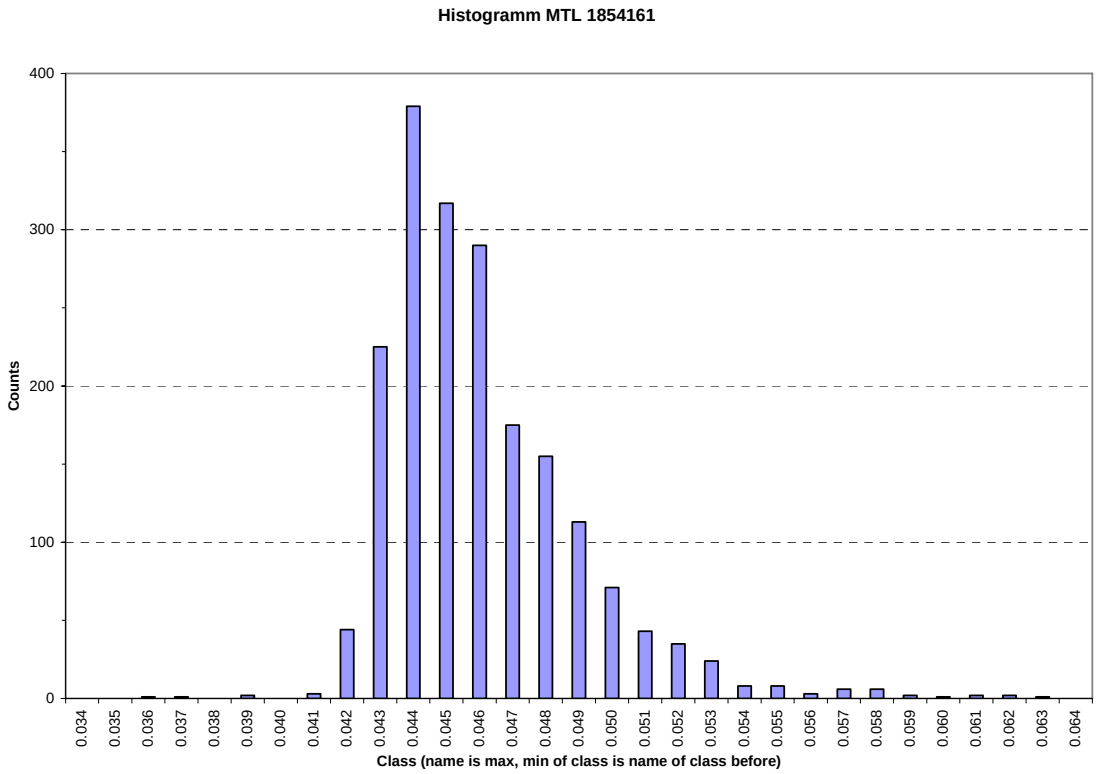

Figure 9. Histogram of temperature differences between MTL and CTD temperature.

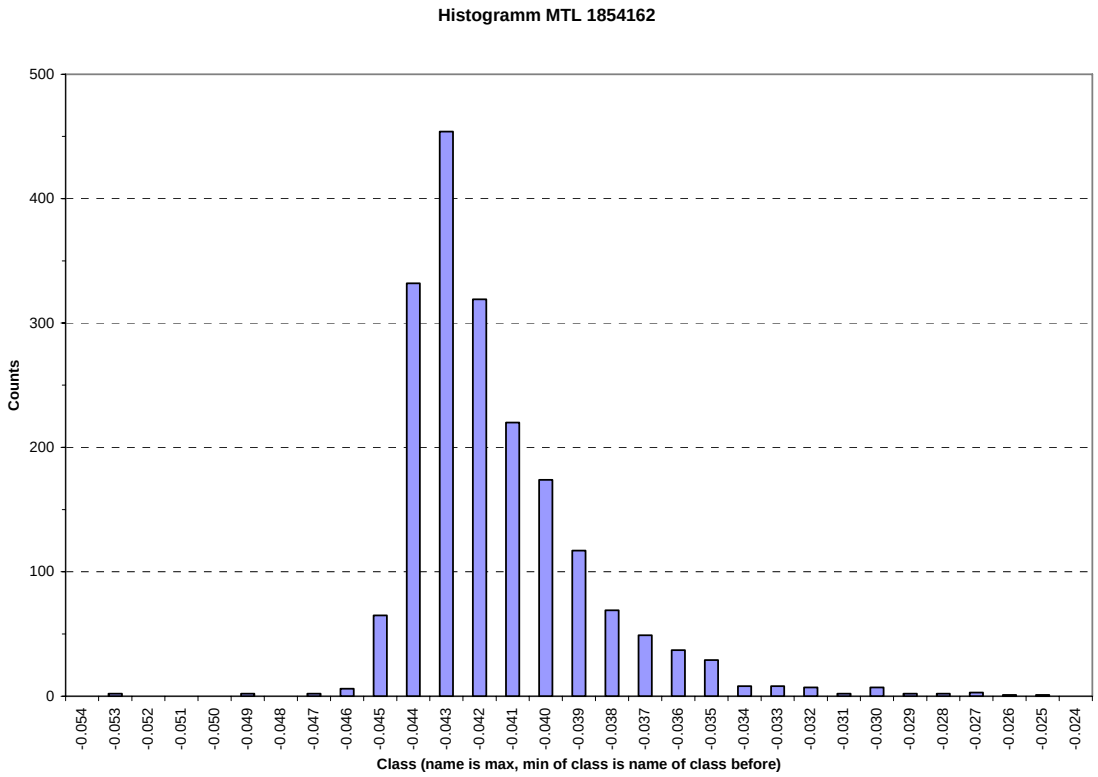

Figure 10. Histogram of temperature differences between MTL and CTD temperature.

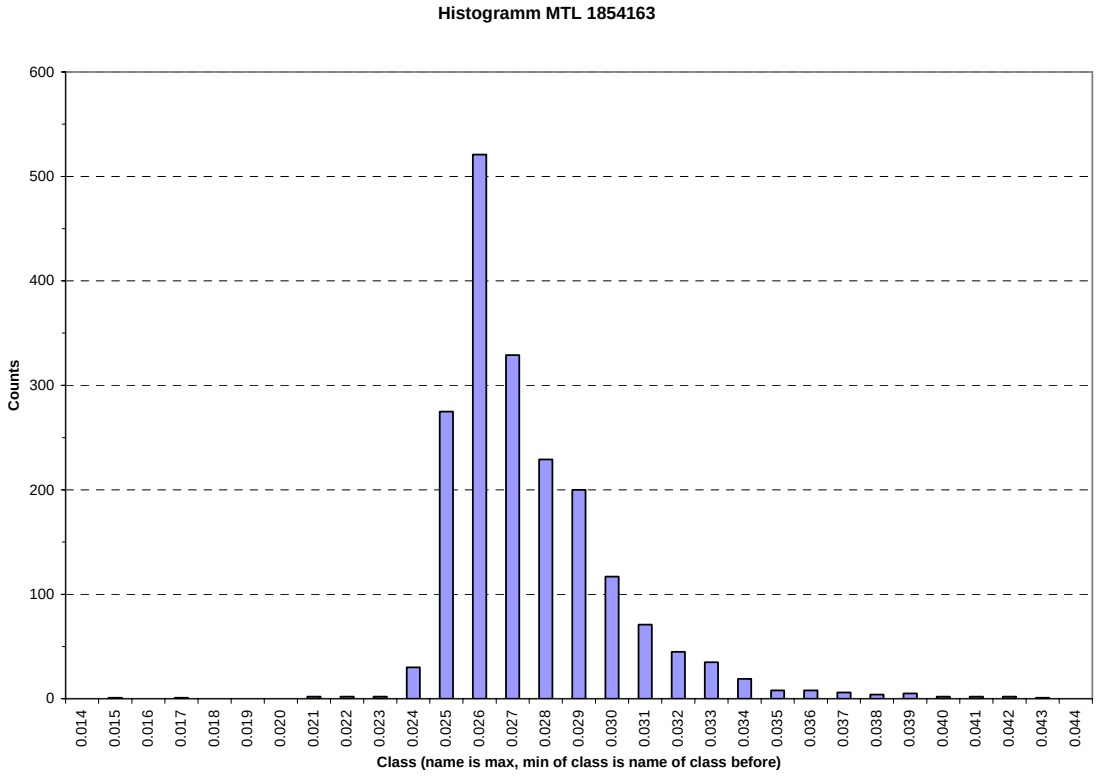

Figure 11. Histogram of temperature differences between MTL and CTD temperature.

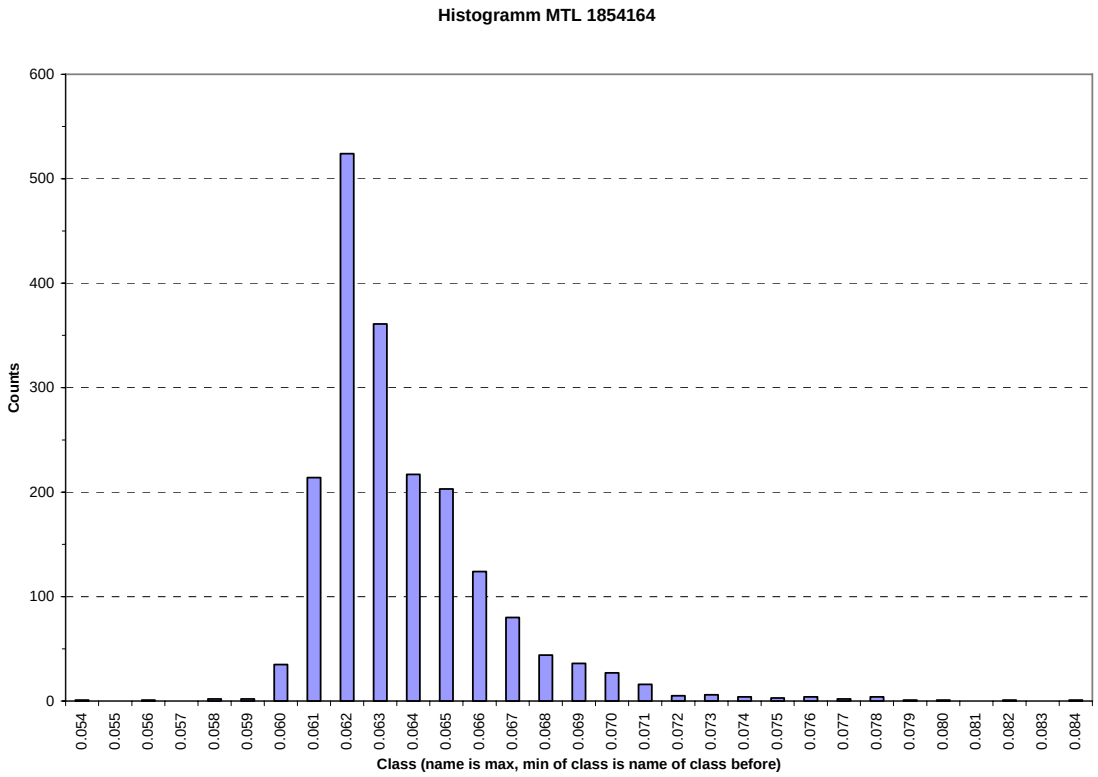

Figure 12. Histogram of temperature differences between MTL and CTD temperature.

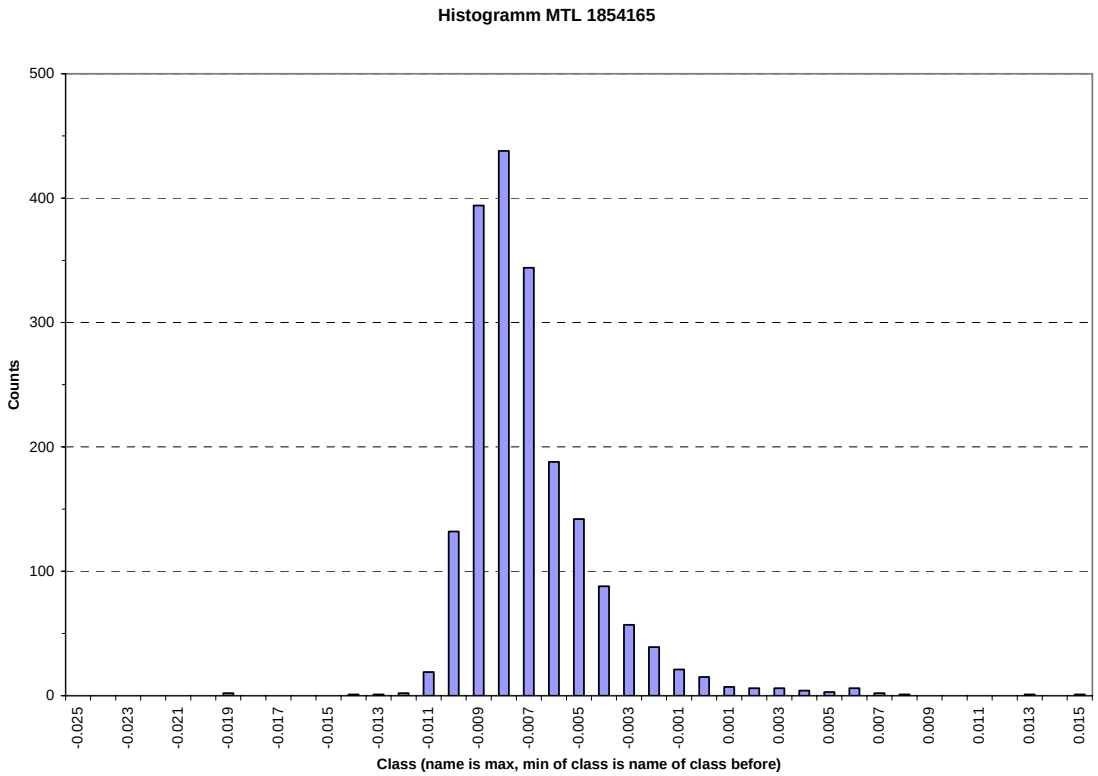

Figure 13. Histogram of temperature differences between MTL and CTD temperature.

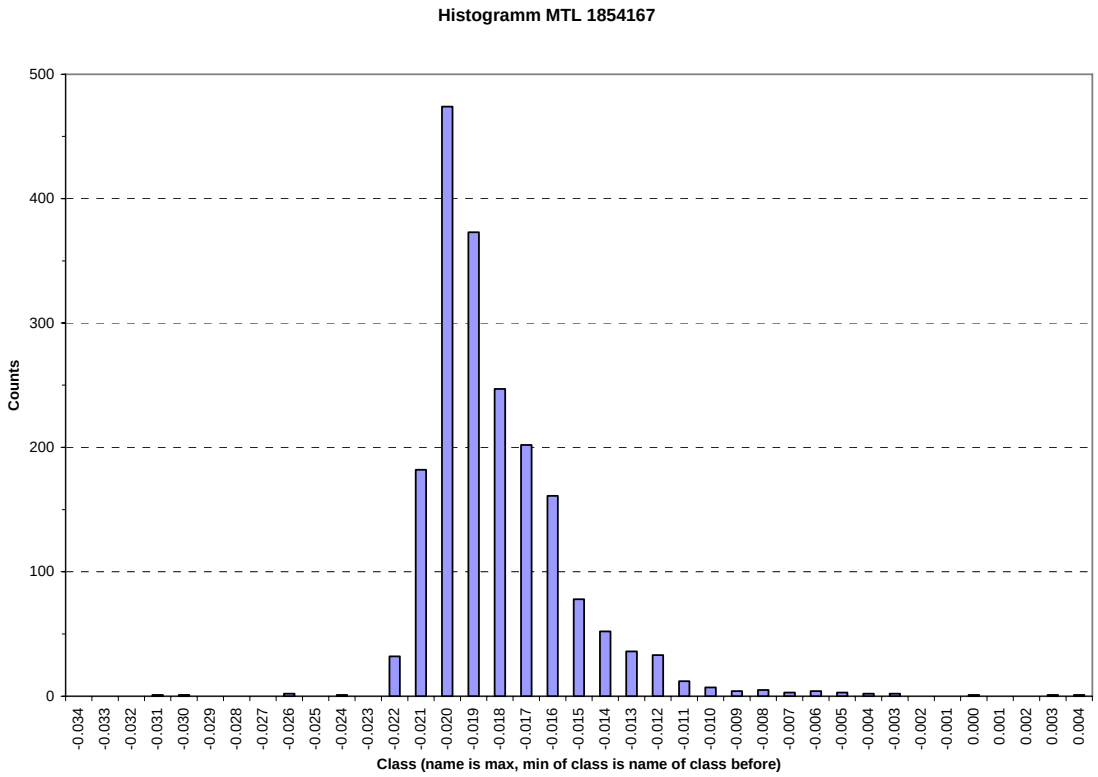

Figure 14. Histogram of temperature differences between MTL and CTD temperature.

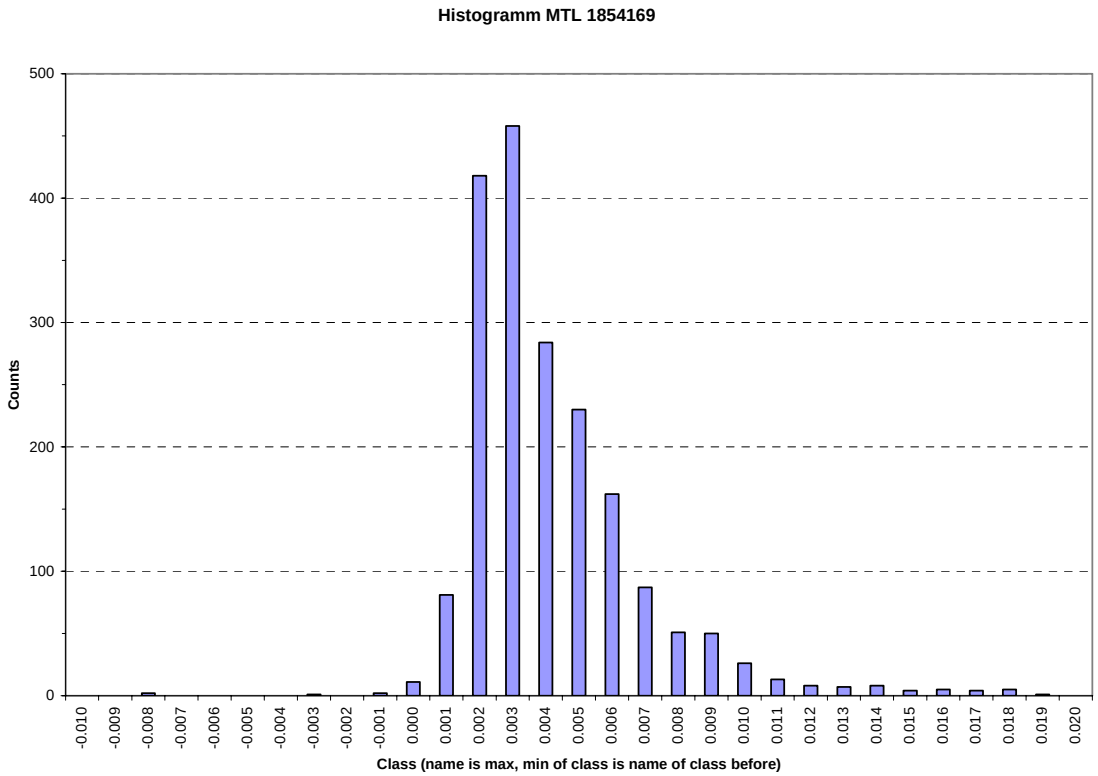

Figure 15. Histogram of temperature differences between MTL and CTD temperature.