

Temperature Variability of AWS Sensors Operating at the Greenland Summit (2008–13)

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The ability to record temperatures accurately enough to derive climate trends is an area of ongoing research. Originally intended to obtain reasonably accurate meteorological data year-round in support of ice sheet field operations, automatic weather stations (AWS) at locations such as the Greenland Summit are being utilized for more challenging goals. These goals include measuring temperature over the decadal time spans necessary for assessing climate trends and to assess satellite- or model-derived parameters. This research compares two traditional, decadal+ length AWS air temperature (TA) records to more recent ‘climate quality’ data from NOAA’s instrument suite at Summit. The primary goal of the study is to quantify uncertainties in the near-surface TA measurements at typical temporal resolutions using data acquired during 2008-2013 and to explore possible reasons for observed temperature differences.

Four near-surface air temperature data sets from near Summit Station, Greenland, were investigated in this study. The availability of climate-quality TA data from a NOAA Global Monitoring Division observatory at Summit Station has enabled the study of both passive and actively-ventilated TA data. During a >5-yr period (July 2008–December 2013), data from both the Greenland Climate Network (GC-Net) AWS and the Danish Meteorological Institute (DMI) AWS were compared to averages created from the 1-minute average TA values from NOAA’s primary 2-m temperature Logan sensor. The Logan sensor was assessed through similar intercomparisons with the NOAA backup Vaisala sensor as both were enclosed in fan-ventilated shields. The principal findings of this study show 1) that the DMI data are more consistent than the GC-Net data during the study period; 2) that there is a pattern in most years of the passively-ventilated data that suggests those sensors are impacted by solar heating during the summer months; and 3) that the year by year consistency between the two NOAA sensors suggests that a high-quality temperature record can be extended at least until May 2006.

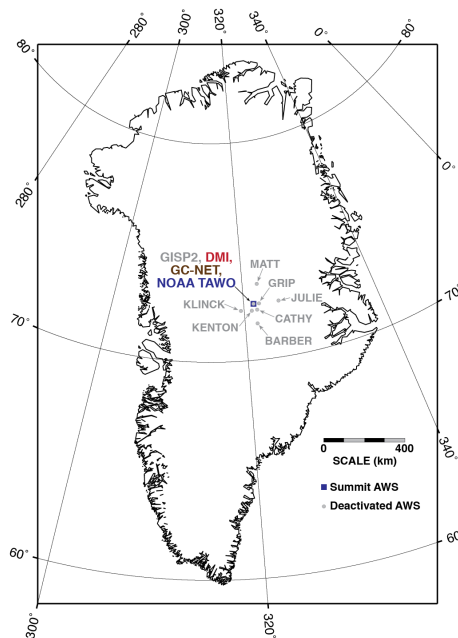


Figure 1. Location map showing past and present automatic weather stations (AWS) in the vicinity of Summit Station, Greenland. The deactivated AWS were operated by the University of Wisconsin in support of the Greenland Ice Sheet Project 2.