Report on the 1992 Season on the Greenland Crest

by
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Six automatic weather station (AWS) units are installed on the Greenland Crest. Figure 1 shows the locations of the AWS units on Greenland and Table 1 gives additional information on the sites.

The initial field work was carried out by Charles R. Stearns and Mark Piper. Mark Piper was supported by a grant from NSF-DPP for Research Experience for Undergraduates. Piper and Stearns arrived on the Greenland Crest on 3 June 1992. The work space available to us was the carpenter shop and by 6 June 1992 we started working on the acoustic depth gauge (ADG) for measuring the distance to the surface using a sound pulse. The data are recorded on a Cambell Scientific CR-10 with a memeory storage module. The recorded data included the distance to the surface in millimeters, the air temperature, time, and date. On 8 June 1992 the ADG was installed near the carpenter shop with the data recorded every five minutes.

The AWS units at Matt and Julie sites were not operating properly so these were the first sites visited. AWS 8989 was put on the air on 9 June 1992 and AWS 8936 was put on the air on 10 June 1992. Both units were working properly and received at Madison, Wisconsin.

On 11 June 1992 at 11:30 Kevin Moran guided us to Matt site with two snowmobiles and Nansen sleds and survival gear. We covered the 100+ kilometers in 3 1/2 uneventful hours. At Matt site the AWS unit was torn down so that it could be raised another 6 feet. AWS 8929 was removed. After raising the tower 6 feet the wind picked up and we had to erect the tent for shelter. Kevin Moran demonstrated his skills at camping and we were very comfortable for the night. On the morning of 12 June 1992 we finished assembling the AWS unit and installed the electronics for AWS 8989. The data was satisfactory and we left for GISP2 at 15:30 arriving about 18:30. Before dismantling the Matt site AWS the boom was 2.75 m above the snow and the bottom delta temperature was 0.27 m above the snow. After raising the tower the boom was 4.48 m above the snow and the bottom delta temperature was 1.20 m above the snow.

Inspection of the faulty AWS 8929 showed that the CPU board was loose and several wires were broken explaining the garbled data.

The trip to Julie site was made on 15 June 1992 and the return to GISP2 was made on 16 June 1992. Jay Klinck skillfully guided us to the site and demonstrated his skill with interpersonal relationships at GRIP on each trip. The boom was 2.67 m above the snow and the lower delta temperature was 0.42 m above the snow. The unit was disassembled and raised one 6 foot tower section, assembled, and the aerovane replaced. The boom was 4.53 m and the lower delta temperature was 1.37 m above the snow. The data was received correctly.

AWS 8925 was removed from GISP2 on 7 June 1992 because the signal had not been received by the ARGOS System because the transmitter output was very low. AWS 8936 was installed at GISP2 on 17 June 1992. The AWS unit was equipped to measure 16 thermocouple channels and the snow temperature. The snow temperature profile and heat flux plates were connected and left laying on the snow to permit checking the operation of the AWS unit by receiving the transmission at the Big House. The ADG was installed using the AWS batteries for power. The height of the ADG sensor above the snow was about 1.70 m. The sampling rate was once an hour and the memory module could hold more than one year of data. Table 2 shows the ADG output from 17 to 21 June 1992 and Figure 2 is a graph of the distance to the snow surface as a function of time. The AWS boom was 3.17 m above the snow and the lower air temperature difference sensor was 0.72 m above the snow.

The snow temperature profile was installed at GISP2 on 21 June 1992. A snow pit was dug to a depth of 2 meters and a hole was drilled to a depth of 10 meters. The snow temperature and the lowest temperature difference thermocouples were installed at a depth of ten meters from the snow surface as determined by a plywood sheet put on the snow surface before digging the snow pit. The remaining temperature difference sensors were installed at −7.00 m, −4.00 m, −2.00 m, −1.00 m, −0.50 m, −0.20 m, 0.00 m, +0.25 m, +0.50 m, +0.75 m, and +1.00 m. The sensors out of the snow were suspended from a tripod made of bamboo poles in the hope that the snow will fill in around them naturally. Light string was used and I am not sure of what will be the actual level of the sensors. Three heat flux plates were installed at 0.00 m and −0.25 m, and four heat flux plates were installed at −0.50 m. The sensors in the snow from the surface to −2.00 m were pushed into the snow at the corner of the snow pit. Not enough time was allowed for the installation of the snow temperature profile and the weather conditions were poor.

On 22 June 1992 we left GISP2 for Sondestrom.

The remaining field work, consisting of raising the AWS units at Kenton, Barber, and Klinke sites, was done by Jay Klinke. The AWS unit at Barber site needed a replacement aervane which arrived in time for the trip to the site.

For the first time all of the AWS units are operating on Greenland.

George Weidner and Robert Holmes started sending weather forecasts to GISP2 on 22 June 1992 and continued sending the forecasts 5 days a week until 21 August 1992.

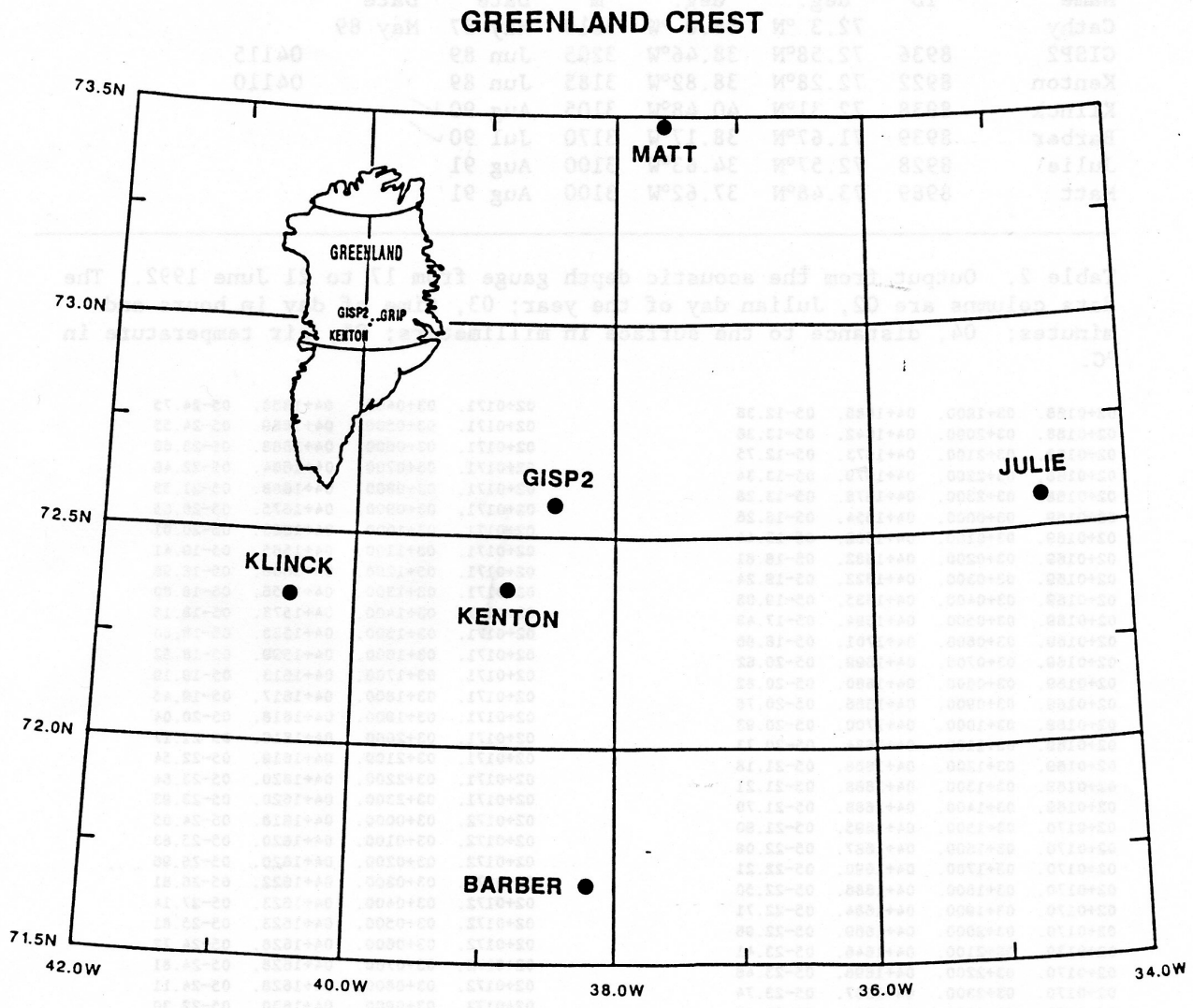

Figure 1. Map showing the locations of the AWS units on the Greenland Crest starting in August 1991.

Table 1. Site name, ARGOS identification number, latitude, longitude, elevation above sea level, start date, stop date, and Global Telecommunications System (GTS) number for operating automatic weather stations on the Greenland Crest starting 1 September 1992. GRIP and Cathy AWS units have been removed.

Site Name	ARGOS ID	Lat. deg.	Long. deg.	Elev. m	Start Date	Stop Date	GTS No.
Cathy		72.3 °N	38.0 °W	3210	May 87	May 89	
GISP2	8936	72.58°N	38.46°W	3205	Jun 89		04115
Kenton	8922	72.28°N	38.82°W	3185	Jun 89		04110
Klinck	8938	72.31°N	40.48°W	3105	Aug 90		
Barber	8939	71.67°N	38.17°W	3170	Jul 90		
Julie	8928	72.57°N	34.63°W	3100	Aug 91		
Matt	8989	73.48°N	37.62°W	3100	Aug 91		

Table 2. Output from the acoustic depth gauge from 17 to 21 June 1992. The data columns are 02, Julian day of the year; 03, time of day in hours and minutes; 04, distance to the surface in millimeters; 05, air temperature in °C.

02+0168.	03+1900.	04+1686.	05-12.36
02+0168.	03+2000.	04+1642.	05-13.36
02+0168.	03+2100.	04+1673.	05-12.75
02+0168.	03+2200.	04+1679.	05-13.34
02+0168.	03+2300.	04+1678.	05-13.28
02+0169.	03+0000.	04+1654.	05-16.26
02+0169.	03+0100.	04+1682.	05-16.44
02+0169.	03+0200.	04+1682.	05-18.81
02+0169.	03+0300.	04+1622.	05-19.24
02+0169.	03+0400.	04+1635.	05-19.03
02+0169.	03+0500.	04+1684.	05-17.43
02+0169.	03+0600.	04+1701.	05-18.86
02+0169.	03+0700.	04+1699.	05-20.62
02+0169.	03+0800.	04+1680.	05-20.82
02+0169.	03+0900.	04+1686.	05-20.76
02+0169.	03+1000.	04+1700.	05-20.93
02+0169.	03+1100.	04+1684.	05-20.73
02+0169.	03+1200.	04+1688.	05-21.18
02+0169.	03+1300.	04+1688.	05-21.21
02+0169.	03+1400.	04+1686.	05-21.70
02+0170.	03+1500.	04+1695.	05-21.90
02+0170.	03+1600.	04+1687.	05-22.08
02+0170.	03+1700.	04+1690.	05-22.21
02+0170.	03+1800.	04+1686.	05-22.50
02+0170.	03+1900.	04+1684.	05-22.71
02+0170.	03+2000.	04+1669.	05-22.96
02+0170.	03+2100.	04+1646.	05-23.41
02+0170.	03+2200.	04+1696.	05-23.48
02+0170.	03+2300.	04+1637.	05-23.74
02+0171.	03+0000.	04+1714.	05-23.99
02+0171.	03+0100.	04+1627.	05-24.35
02+0171.	03+0200.	04+1678.	05-24.51
02+0171.	03+0300.	04+1682.	05-24.43
02+0171.	03+0400.	04+1688.	05-24.75
02+0171.	03+0500.	04+1689.	05-24.55
02+0171.	03+0600.	04+1688.	05-23.66
02+0171.	03+0700.	04+1684.	05-22.46
02+0171.	03+0800.	04+1688.	05-21.55
02+0171.	03+0900.	04+1675.	05-20.65
02+0171.	03+1000.	04+1683.	05-20.01
02+0171.	03+1100.	04+1585.	05-19.41
02+0171.	03+1200.	04+1608.	05-18.96
02+0171.	03+1300.	04+1656.	05-18.80
02+0171.	03+1400.	04+1573.	05-18.15
02+0171.	03+1500.	04+1563.	05-18.60
02+0171.	03+1600.	04+1599.	05-18.52
02+0171.	03+1700.	04+1613.	05-19.19
02+0171.	03+1800.	04+1617.	05-19.45
02+0171.	03+1900.	04+1618.	05-20.04
02+0171.	03+2000.	04+1619.	05-21.17
02+0171.	03+2100.	04+1619.	05-22.54
02+0171.	03+2200.	04+1620.	05-23.84
02+0171.	03+2300.	04+1620.	05-23.93
02+0172.	03+0000.	04+1618.	05-24.05
02+0172.	03+0100.	04+1620.	05-25.63
02+0172.	03+0200.	04+1620.	05-26.96
02+0172.	03+0300.	04+1622.	05-26.81
02+0172.	03+0400.	04+1623.	05-27.14
02+0172.	03+0500.	04+1623.	05-25.81
02+0172.	03+0600.	04+1628.	05-24.72
02+0172.	03+0700.	04+1628.	05-24.81
02+0172.	03+0800.	04+1628.	05-24.11
02+0172.	03+0900.	04+1630.	05-22.30
02+0172.	03+1000.	04+1628.	05-20.46
02+0172.	03+1100.	04+1627.	05-19.61

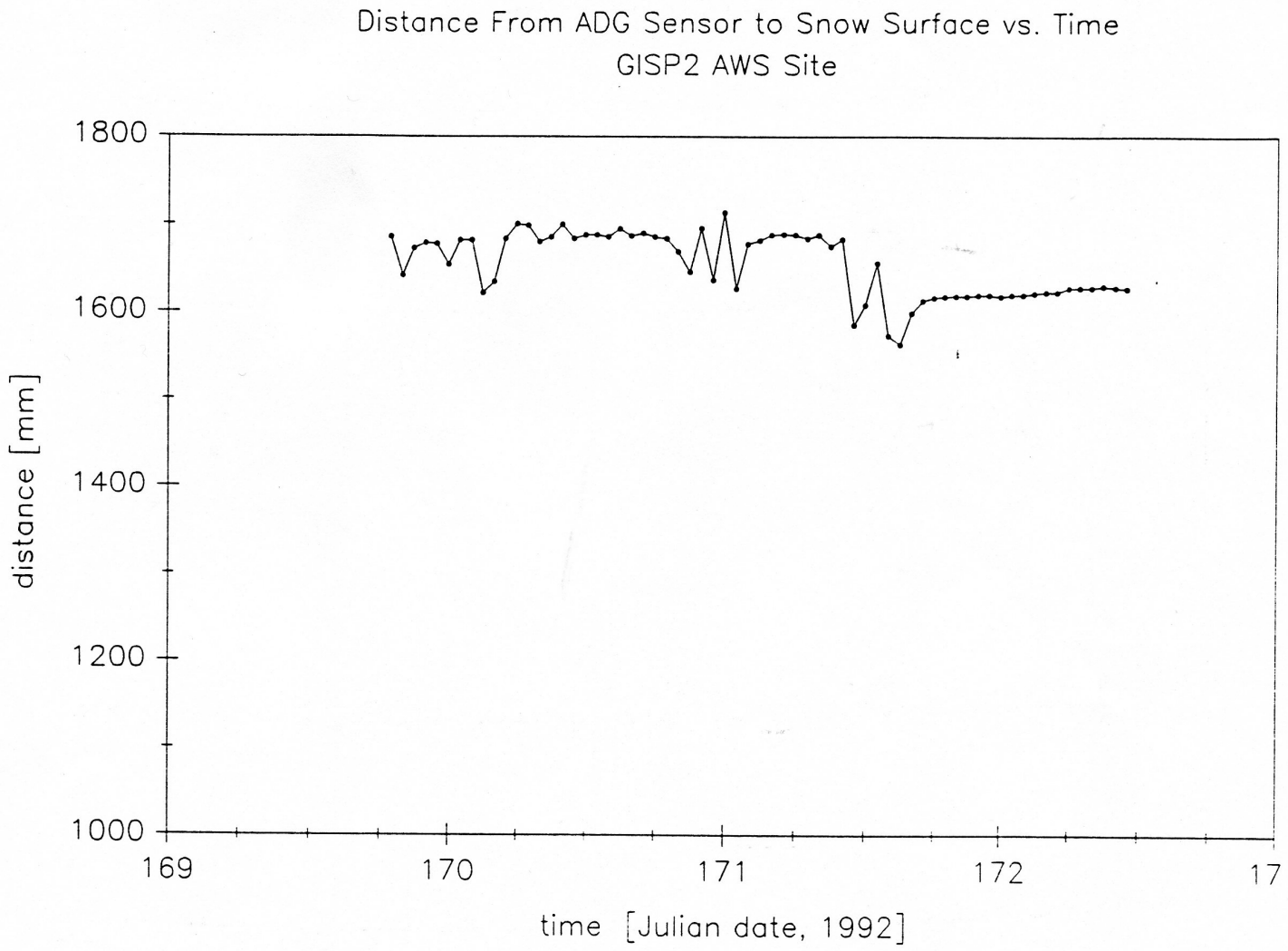

Figure 2. Graph of the acoustic depth gauge as a function of time after installation on the AWS tower at GISP2, Greenland.