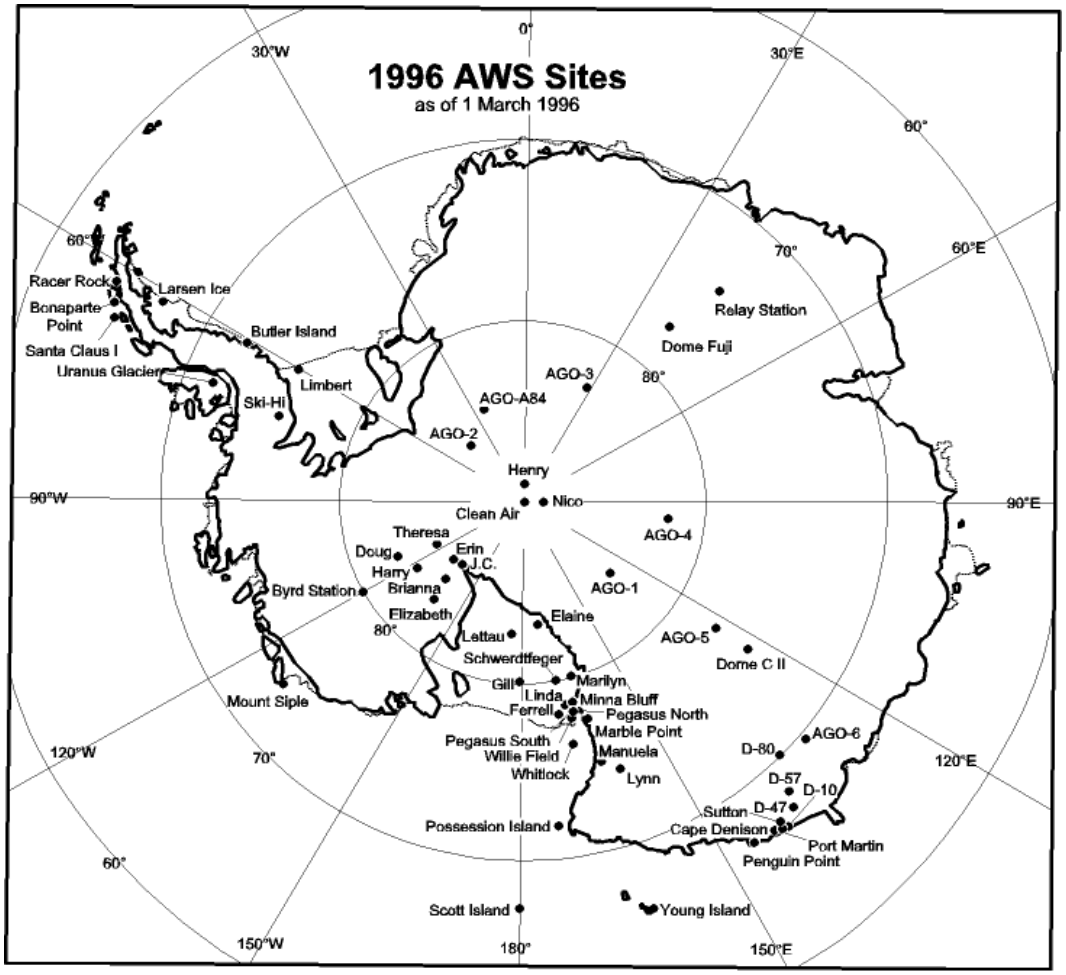

Antarctic Automatic Weather Station Data for the calendar year 1996

by

Linda M. Keller
George A. Weidner
Charles R. Stearns
Matthew T. Whittaker
Robert E. Holmes

Space Science and Engineering Center
University of Wisconsin
1225 W. Dayton St.
Madison, Wisconsin
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1. INTRODUCTION

A network of automatic weather station (AWS) units is deployed to collect Antarctic surface weather observations in support of specific meteorological research projects as well as operational activities at McMurdo. The 1996 network consisted of 51 installed AWS units providing observations on the Ross Ice Shelf, east of the Transantarctic Mountains and north of McMurdo to the Adelie Coast, along the Antarctic Peninsula and climatological locations such as the South Pole. Each unit measures air temperature, wind speed, and wind direction normally at the top of the unit's tower at a nominal height of three meters and air pressure at the electronics enclosure (Figure 1). Some AWS units also measure the relative humidity at three meters and vertical air temperature difference between 0.5 and 3 meters. Measurement heights relative to the actual surface at the site are nominal due to snow accumulation around the AWS unit.

2. DATA TRANSMISSION

The transmitted AWS data are received and stored by the ARGOS data collection system on the NOAA series of polar orbiting satellites. The data are retransmitted by the satellite for reception by a local user terminal (LUT) as at McMurdo, Antarctica. The data are processed into scientific units and are available for local use. The complete data set is received daily at Madison, Wisconsin, from Service ARGOS, Toulouse, France, for processing and distribution to the users.

3. AWS IDENTIFICATION AND LOCATION

Site location is defined by the latitude and longitude which is determined by various methods: sun shots, angles to geographical features, aircraft data, ice breaker data, the platform location system of Service ARGOS, and the Global Positioning System. AWS elevation is obtained by barometry and should be correct to within +/- 5 meters. Site names were introduced for convenience. Table 3.1 lists the site name, ARGOS identification number, latitude, longitude, elevation, start date for the site, and the World Meteorological Organization (WMO) number for the site. Figures 2, 3, 4, and 5 show the locations of the AWS units in the Antarctic for 1996.

The ARGOS identification number (ID) is used to identify the data sets distributed to the users. AWS units are sometimes moved from one location to another, and as a result, the ID at a given site may change from year to year. Table 3.2 lists the site name with the ARGOS ID, the site start date, and the ID start and stop dates.

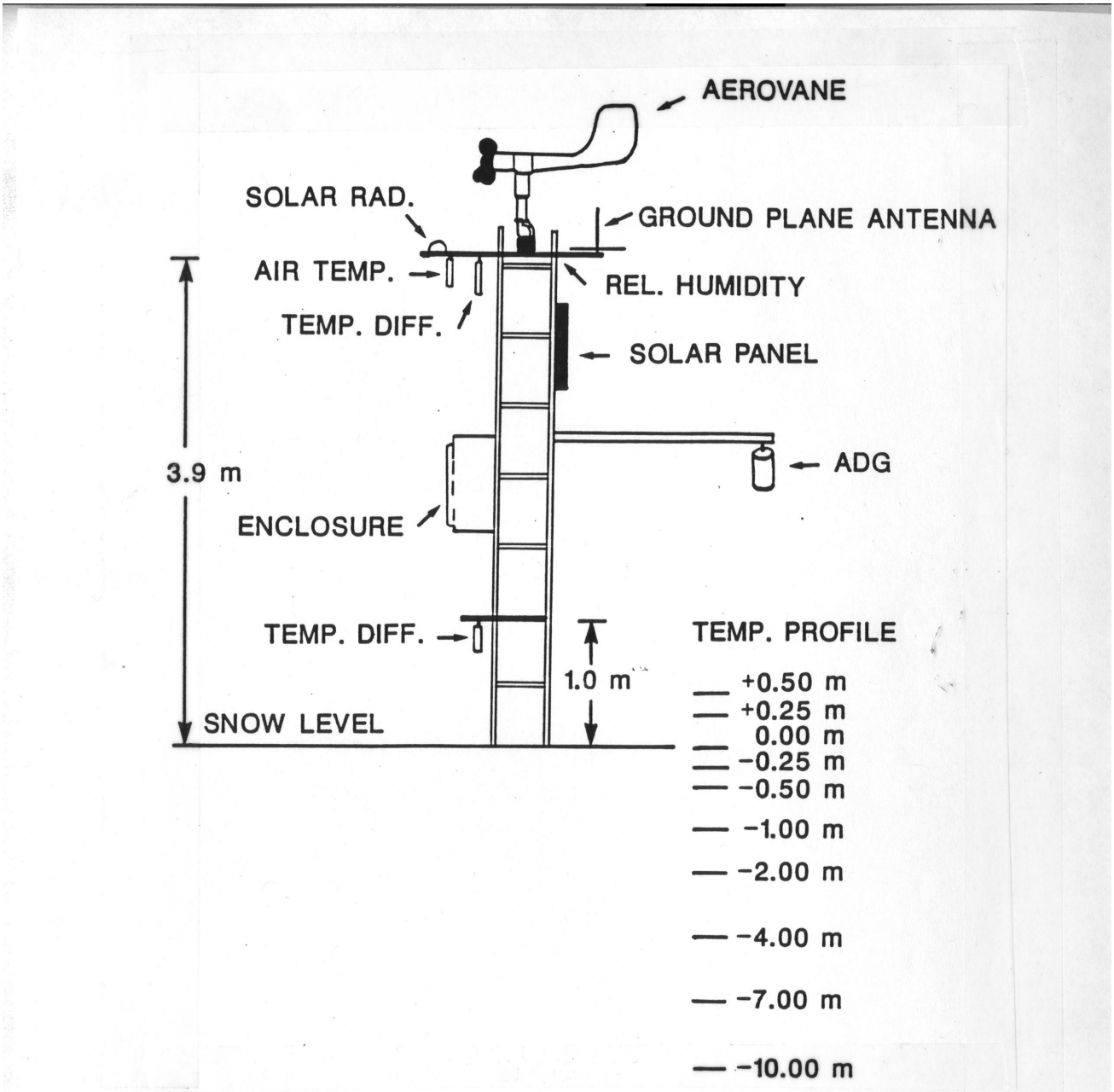

Figure 1. Layout of the AWS unit used in the Antarctic. The installed AWS unit has a 3-meter tower with a horizontal boom supporting the antenna, aerovane for measuring wind speed and direction, air temperature resistance thermometer, upper thermopile for measuring vertical air temperature difference, and the relative humidity sensor. The electronics enclosure is mounted at the mid point of the tower. The gel cell batteries are placed at the tower base. The solar panel, located near the tower top, faces north.

Table 3.1
AWS site name, geographic location and elevation, site start date, and WMO number for 1996.

Site name	ARGOS ID	Lat. (Deg)	Long. (Deg)	Elev. (m)	Site Start Date	WMO No.
			Adelie Land			
D-10	#8919	66.71°S	139.83°E	243	08 Jan 80	89832
D-47	#8986	67.40°S	138.73°E	1560	24 Jan 83	89834
D-57	#21360	68.20°S	137.54°E	2105	16 Jan 81	
D-80	#8916	70.04°S	134.88°E	2500	14 Jan 83	89836
Dome C	8904	74.50°S	123.00°E	3280	05 Feb 80	89828
Dome C II	8989	75.12°S	123.37°E	3250	12 Dec 95	89828
Port Martin	8930	66.82°S	141.40°E	39	19 Jan 90	
Cape Denison	8907	67.01°S	142.66°E	31	20 Jan 90	
Penguin Point	8929	67.62°S	146.18°E	30	24 Dec 92	89847
Sutton	8939	67.08°S	141.37°E	871	26 Dec 94	
Cape Webb	8933	67.93°S	146.82°E	37	28 Dec 94	
			West Antarctica			
Byrd Station	8903	80.00°S	119.40°W	1530	05 Feb 80	89324
Mount Siple	8981	73.20°S	127.05°W	230	20 Feb 92	89327
Harry	21355	83.00°S	121.39°W	945	29 Nov 94	
J.C.	21357	85.07°S	135.52°W	549	29 Nov 94	
Theresa	21358	84.60°S	115.81°W	1463	29 Nov 94	89314
Doug	21359	82.32°S	113.24°W	1433	29 Nov 94	
Brianna	21362	83.89°S	134.15°W	549	30 Nov 94	
Elizabeth	#21361	82.61°S	137.08°W	549	30 Nov 94	89332
Erin	#21363	84.90°S	128.81°W	1006	29 Nov 94	
			Ross Island Region			
Marble Point	8906	77.44°S	163.69°E	120	05 Feb 80	89866
Ferrell	8934	77.93°S	170.82°E	45	10 Dec 80	89872
Pegasus North	8927	77.95°S	166.51°E	10	23 Jan 90	89667
Pegasus South	8937	77.99°S	166.58°E	10	14 Jan 91	
Minna Bluff	8988	78.55°S	166.66°E	920	22 Jan 91	89768
Linda	#8909	78.48°S	168.38°E	50	21 Jan 91	89769
Willie Field	8901	77.87°S	167.02°E	20	25 Jan 92	
			Ocean Islands			
Whitlock	8921	76.14°S	168.39°E	274	23 Jan 82	89865
Scott Island	8983	67.37°S	179.97°W	30	25 Dec 87	89371
Young Island	8980	66.23°S	162.28°E	30	01 Jan 91	89660
Possession Is.	8984	71.89°S	171.21°E	30	29 Dec 92	89879
			Ross Ice Shelf			
Marilyn	8931	79.95°S	165.13°E	75	16 Jan 84	89869
Schwerdtfeger	8913	79.90°S	169.97°E	60	24 Jan 85	89868
Gill	8911	79.99°S	178.61°W	55	24 Jan 85	89376
Lettau	8908	82.52°S	174.45°W	55	29 Jan 86	89377
Elaine	8900	83.13°S	174.17°E	60	28 Jan 86	89873
			Reeves Glacier			
Manuela	8905	74.95°S	163.69°E	80	06 Feb 84	89864
Lynn	8935	74.21°S	160.41°E	1772	19 Jan 88	89860
			Antarctic Peninsula			
Larsen Ice	8926	66.95°S	60.91°W	17	21 Oct 85	89262
Butler Island	8902	72.21°S	60.17°W	91	01 Mar 86	89266
Uranus Glac.	8920	71.43°S	68.93°W	780	06 Mar 86	89264
Racer Rock	8947	64.07°S	61.61°W	17	15 Oct 89	89261
Bonaparte Pt.	8912	64.78°S	64.07°W	8	05 Jan 92	89269
Recovery Glcr.	8932	80.82°S	22.26°W	1220	18 Jan 94	
Ski-Hi	8917	74.98°S	70.77°W	1395	21 Feb 94	89272
Santa Claus Is	8910	64.96°S	65.67°W	25	10 Dec 94	
Limbert	8925	75.42°S	59.95°W	40	30 Nov 95	89257
AGO-A84*	8932	84.36°S	23.86°W	2103	09 Jan 96	
			High Polar Plateau			
Clean Air	8987	90.00°S		2835	29 Jan 86	89208
Nico	8924	89.00°S	89.67°E	2935	26 Jan 93	89799
Henry	8985	89.01°S	1.30°W	2755	26 Jan 93	89108
Relay Station	8918	74.02°S	43.06°E	3353	01 Feb 95	89744
Dome Fuji	8982	77.31°S	39.70°E	3810	08 Feb 95	89734

New ARGOS ID for 1996 at the site; *New location for 1996

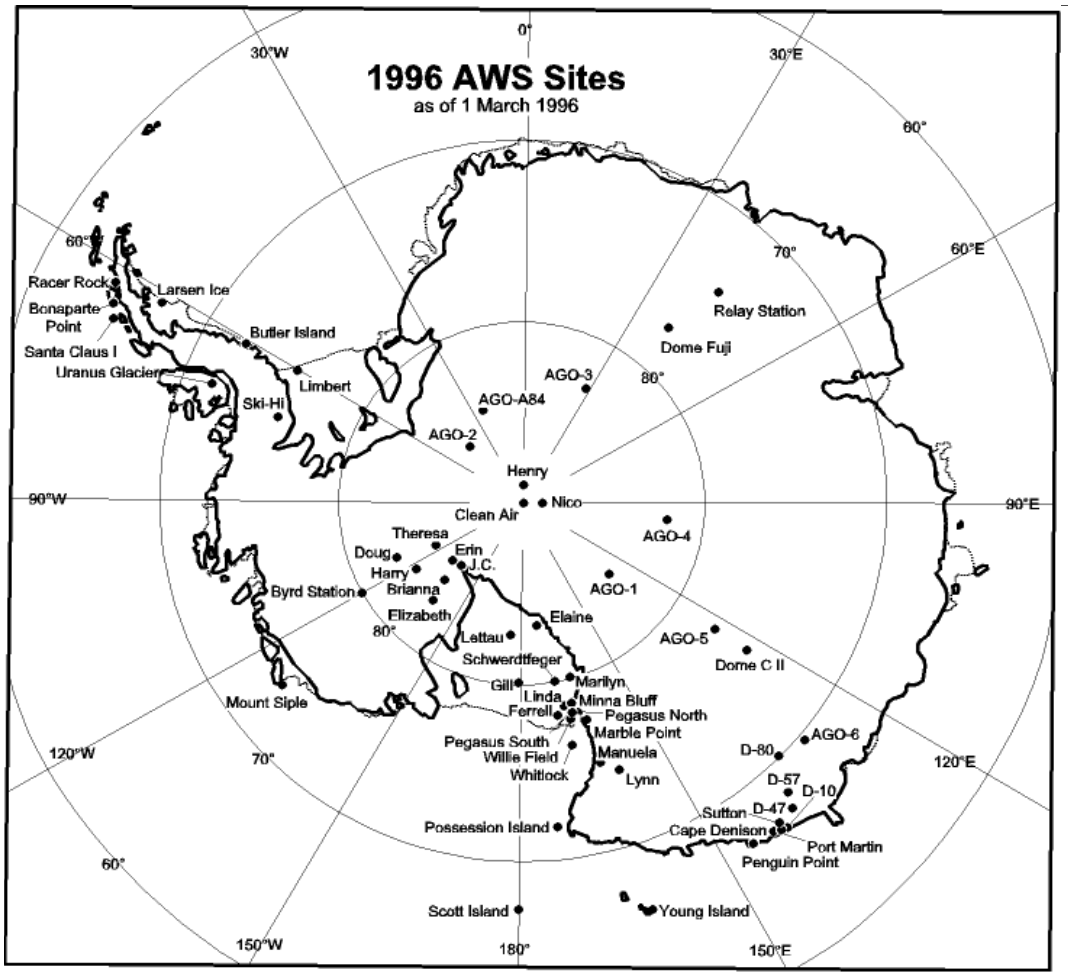

Figure 2. Antarctic automatic weather station locations during 1996 identified by the site name. Area around Ross Island is shown in Figure 3. Adelie Coast area is shown in Figure 4.

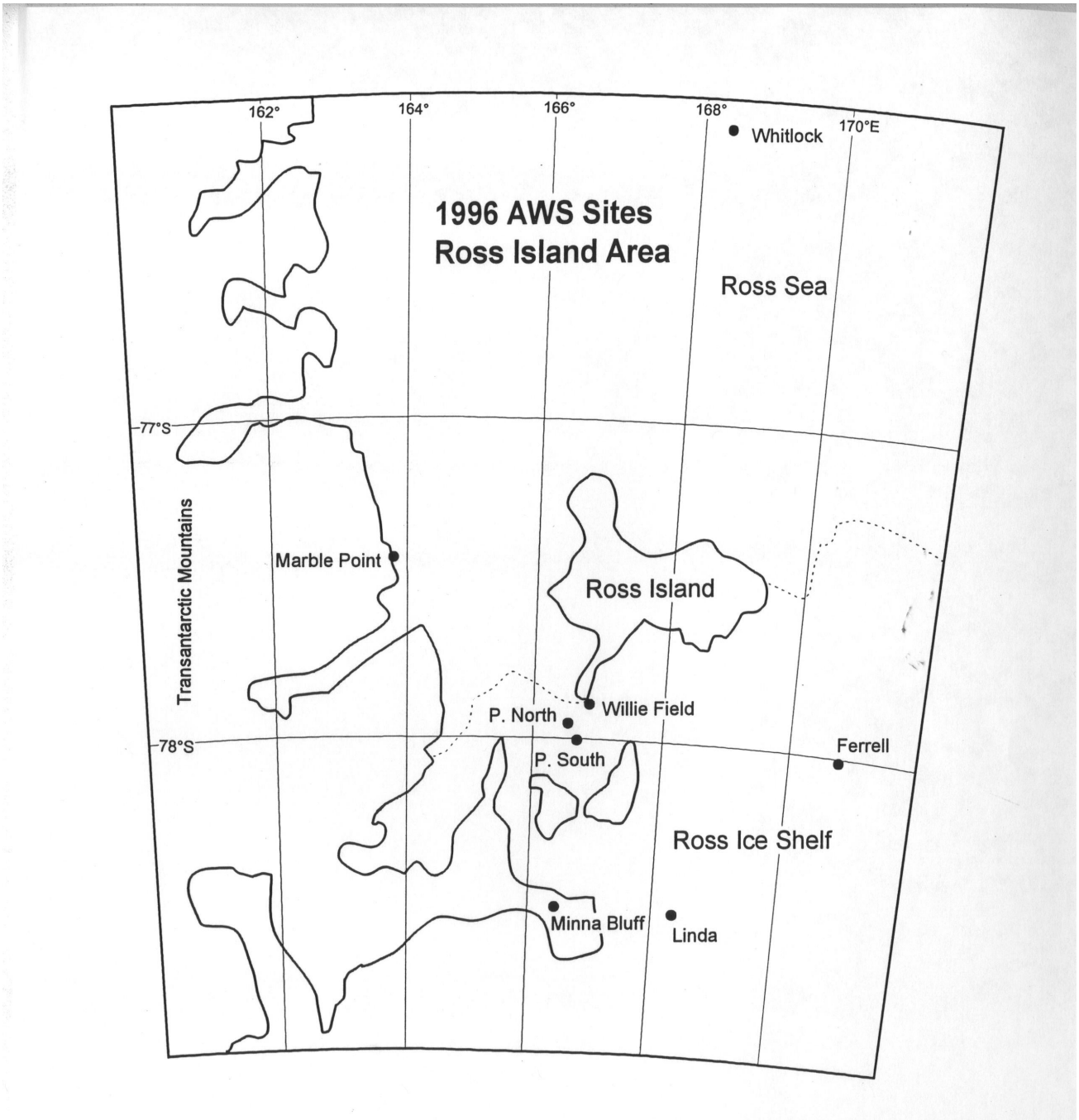

Figure 3. Location of Antarctic automatic weather stations in the vicinity of Ross Island, Antarctica during 1996.

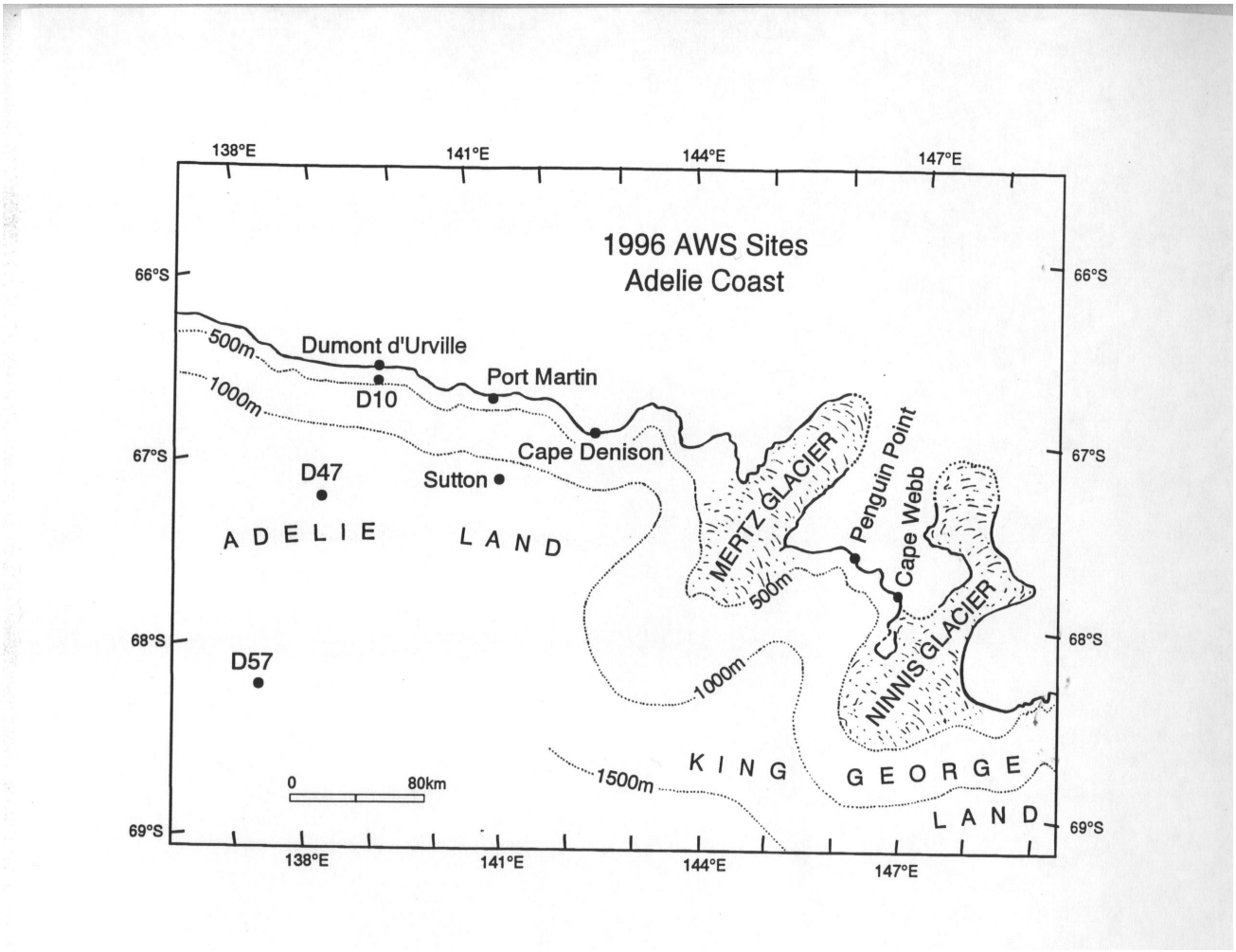

Figure 4. Location of Antarctic automatic weather stations on the Adelie Coast during 1996.

Table 3.2

1996 Antarctic AWS site name, ARGOS identification number (ID), site start date, ID start date, and ID stop date if occurring in 1995.

Site	ARGOS ID	Site Start Date	ID Start Date	ID Stop Date
D-10	21364	08 Jan 80	25 Dec 95	21 Jan 96
	8919		21 Jan 96	
D-47	8986	24 Jan 83	11 Feb 96	
D-57	21360	16 Jan 81	08 Feb 96	
D-80	8919	14 Jan 83	12 Dec 85	24 Jan 96
	8916		24 Jan 96	
Dome C	8904	05 Feb 80	05 Feb 80	02 Jan 96
Dome C II	8989	12 Dec 95	12 Dec 95	
Port Martin	8930	19 Jan 90	23 Dec 92	
Cape Denison	8907	20 Jan 90	27 Dec 94	
Penguin Point	8929	24 Dec 92	24 Dec 92	
Sutton	8939	26 Dec 94	26 Dec 94	
Cape Webb	8933	28 Dec 94	28 Dec 94	
Byrd Station	8903	05 Feb 80	05 Feb 80	
Mount Siple	8981	20 Feb 92	20 Feb 92	
Brianna	21362	30 Nov 94	30 Nov 94	
Elizabeth	21356	30 Nov 94	30 Nov 94	17 Jan 96
	21361		17 Jan 96	
J.C.	21357	29 Nov 94	29 Nov 94	
Erin	21361	29 Nov 94	29 Nov 94	18 Jan 96
	21363		18 Jan 96	
Harry	21355	29 Nov 94	29 Nov 94	
Theresa	21358	29 Nov 94	29 Nov 94	
Doug	21359	29 Nov 94	29 Nov 94	
Marble Point	8906	05 Feb 80	05 Feb 80	
Ferrell	8934	10 Dec 80	10 Dec 80	
Pegasus North	8927	23 Jan 90	23 Jan 90	
Pegasus South	8937	14 Jan 91	14 Jan 91	
Minna Bluff	8988	22 Jan 91	12 Jan 94	
Linda	8909	21 Jan 91	24 Nov 95	
Willie Field	8901	25 Jan 92	25 Jan 92	
Whitlock	8921	23 Jan 82	23 Feb 94	
Scott Island	8983	25 Dec 87	27 Dec 92	
Young Island	8980	01 Jan 91	01 Jan 91	
Possession Island	8984	29 Dec 92	29 Dec 92	
Marilyn	8931	16 Jan 84	18 Jan 91	
Schwerdtfeger	8913	24 Jan 85	22 Jan 93	
Gill	8911	24 Jan 85	25 Jan 91	
Elaine	8900	28 Jan 86	23 Jan 93	
Lettau	8908	29 Jan 86	29 Jan 86	
Manuela	8905	06 Feb 84	15 Feb 87	
Lynn	8935	19 Jan 88	23 Jan 92	
Larsen Ice Shelf	8926	21 Oct 85	01 Jan 86	
Butler Island	8902	01 Mar 86	01 Mar 86	
Uranus Glacier	8920	06 Mar 86	24 Jan 92	
Limbert	8925	30 Nov 95	30 Nov 95	
Racer Rock	8947	15 Oct 89	08 Dec 91	
Bonaparte Point	8912	05 Jan 92	05 Jan 92	
Recovery Glacier	8932	18 Jan 94	18 Jan 94	09 Jan 96
AGO-A84	8932	09 Jan 96	09Jan 96	
Ski-Hi	8917	21 Feb 94	21 Feb 94	
Santa Claus Island	8910	10 Dec 94	10 Dec 94	
Clean Air	8987	29 Jan 86	25 Jan 94	
Henry	8985	26 Jan 93	26 Jan 93	
Relay Station	8918	01 Feb 95	01 Feb 95	
Dome Fuji	8982	08 Feb 95	08 Feb 95	

4. AWS DATA SUMMARIES

The data received by the University of Wisconsin, Space Science and Engineering Center, contain all the information received by the ARGOS system including duplicate and erroneous transmissions. Invalid data are eliminated during a quality check, and the valid data are converted to scientific units producing the complete data set. Data selected at three hourly intervals, plus or minus one hour, produce a three hourly data set for each AWS unit month. Section 6.1, AWS Performance, provides some explanations for missing and invalid data.

Use of the 1996 Antarctic AWS data for publication should acknowledge the support of NSF-OPP Grant 9303569 and 9419128 or reference this publication.

4.1 Monthly Data Summaries

The monthly summaries consist of the monthly means, from the three hourly data set, and the extremes, from the complete data set. For monthly values to be included, 25% of the three hourly observations must be available. Months with 50-75% of data missing occur most often when a station is started or stopped in the middle of the month. This can cause a bias in the monthly mean, especially during seasons when parameters such as temperature change rapidly. Annual means are calculated only when twelve months of data are available. The data are presented in the same order as the sites listed in Table 3.1. Definitions of the monthly data summary headings are listed below.

Heading	Definition
Mean air temperature, °C.	Mean value for the month.
Percent of monthly data missing.	Ratio of the number of missing observations to the number of possible observations X 100.
Maximum air temperature, °C.	Maximum value for the month.
Minimum air temperature, °C.	Minimum value for the month.
Mean wind speed, m/s.	Mean value for the month.
Percent of monthly data missing.	Ratio of the number of missing observations to the number of possible observations X 100.
Resultant wind speed, dir/vv.	Resultant speed and direction for the month.
Constancy.	Ratio of the monthly resultant to the monthly mean wind speed.
Maximum wind speed, dir/vv.	Maximum wind speed and direction for the month.
Mean air pressure, mb.	Mean value for the month.
Percent of monthly data missing.	Ratio of the number of missing observations to the number of possible observations X 100.
Maximum air pressure, mb.	Maximum value for the month.
Minimum air pressure, mb.	Minimum value for the month.

4.2 Three Hourly Data Summaries

The data set for each AWS unit for the month is scanned to pick out the nearest observation within one hour of the UTC hours 00, 03, 06, 09, 12, 15, 18, and 21 to produce the three hourly data set. If valid data are not available within the three hourly time interval, then the entry is left blank to indicate missing data. The means, standard deviations, resultant wind speed and direction, the distribution of temperature, and wind speed with wind direction are determined from the three hourly observations and are presented as a monthly summary at the bottom of each page. A wind direction value of zero indicates a wind speed less than 0.50 m s^{-1}. North is indicated by a value of 360 degrees. The maximum and minimum values are taken from the complete data set, not the three hourly data set. The appropriate monthly data from the three hourly data set are used for the monthly summaries presented in 4.1. In the presence of sunlight the air temperatures are questionable if the wind speed is less than 1 m s^{-1}. These summaries are available by anonymous FTP (see Section 8). If you are unable to access the Internet, we will send the information either on diskettes or paper. Please contact us for further information (the address is at end of Section 8).

5. AWS CALIBRATION

5.1. Temperature

The external and internal temperatures are calibrated using a 1000 ohm 0.05% resistor in place of the platinum resistance thermometers which are 1000 ohms resistance at 0°C. Because the other resistances in the temperature circuit are known only to 1%, the temperature calibration will vary from one electronic unit to another. The correction factor determined from the calibration resistor is programmed into the read-only-memories for each unit. After the correction factors have been programmed into the AWS, a calibration box with 0.1% resistors is used in the field to check the temperature calibration.

5.2. Pressure

The atmospheric pressure transducer is a Parascientific model 215A digiquartz pressure gauge. The transducer frequency changes from a nominal 40 kHz at zero pressure to a nominal 36 kHz at 1000 hPa. The pressure resolution is approximately 0.05 hPa.

Paulin aneroid barometers calibrated against a mercury barometer of 10 mm bore are used to check the pressure gauge calibration. Comparisons are made between AWS units, a Parascientific Model 760-16B accurate to +/- 0.1 hPa, and with the mercury barometers at Scott Base, Antarctica. The calibrations should be within +/- 0.2 hPa. Two mercury barometers have been purchased for use at McMurdo, Antarctica but are not yet available.

The reference vacuum on the older pressure transducers can degrade with time with a maximum observed 4 hPa shift to lower pressure after ten years. Recalibration of each pressure transducer would be desirable when each unit is serviced.

5.3. Wind direction and Speed

The Belfort model 123 aerovane measures wind direction and speed. The aerovane rotates a potentiometer wiper, and the fraction of full scale of the potentiometer is measured. The wind direction is checked by positioning the aerovane to the cardinal directions relative to the boom supporting the aerovane. North or the potentiometer zero is towards the antenna on the boom and has a dead zone of 5°. During the field installation the boom is usually aligned along the north-south line as determined from the sun's azimuth, longitude, and Greenwich Mean Time. In some cases the 180° end of the boom may point in a direction other than south. At Manuela site, the 180° end of the boom points up the glacier and a correction is added to the data during processing. At Byrd site the wind is usually out of the north so the boom was rotated 120° and the correction added during the data processing. The wind speed is determined from the aerovane tachometer voltage output as 0.0472 volt per meter per second. The aerovane tachometers are spun at 1800 rpm with a load of 1071.5 ohms and the output should be 9.20 +/-0.05 vdc.

Three additional wind sensors were used with AWS units for 1996. These were the Vaisala anemometer model WAA-15, the R.M. Young wind monitor model 05103, and the Hydro-Tech WS-3 rotor anemometer. The Vaisala WAA-15 and the Hydro-Tech WS-3 were used as backup sensors for measuring wind speed in the Adelie Coast area. The WAA-15 is a 3-cup opto-electronic anemometer. When rotating, the anemometer produces a pulsed output that is proportional to the wind speed. Rated accuracy is +/- 2% up to 75 m/s. The pulsed output was input into one of the digital counter channels for 5 seconds. This resulted in a calibration value of . 293 m/s/bit. The Hydro-Tech WS-3 is a disk rotor, 3 in. high and 12 in. overall diameter, with radial cups, and the threshold sensitivity is 3 mph. The anemometer utilizes a commercial dc tachometer generator. Output is 0 to +5 vdc (and 0 to 1 ma) over the desired full scale wind speed of 85 m/s. Accuracy is +/- 2%.

The R.M. Young monitor 05103 also used a 10000 ohm potentiometer so that the wind direction was recorded identically with the Belfort/Bendix aerovanes. The wind speed was from the range of 0 to 1.0 volt full scale corresponding to 50 m/s. Thus the calibration for wind speed was a nominal . 195 m/s/bit for the R.M. Young with +/- 1% up to 50 m/s.

5.4. Relative Humidity

The Vaisala HMP-35A humidity sensor output voltage varies linearly with relative humidity (U). The sensor is calibrated by placing it over saturated salt solutions with known relative humidities at room temperature: sodium chloride (U=75%), and lithium chloride (U=12%) are used. In addition, a dry inert gas, forced past the sensor, gives a 0% U, and the sensor output can be zeroed. Then, the gain setting can be set directly using a salt solution with a high relative humidity, such as sodium chloride. The resolution of the humidity sensor is about 1% and the drift can be 2 to 3% per year in the field. The relative humidity data are not included on the summary pages but are included in the 3 hourly data sets.

5.5. Vertical Air Temperature Difference

Two junction thermocouples are used to measure the air temperature difference between 3 m and 0.5 m on the tower. The output is about 78 microvolts for 1.^{o}C temperature difference between the junctions at 0.0^{o}C, dropping to 60 microvolts at -80^{o}C. Zero output is adjusted to 0.4 volts, so that 0 to 1 volt corresponds to a -6^{o}C to +9^{o}C range of air temperature differences between 3 m and 0.5 m. The resolution is 0.05^{o}C. Calibration of the individual systems is done by applying known voltages to the amplifier input. The vertical temperature difference data are not included on the summary pages but are included in the 3 hourly data sets.

6. AWS OPERATIONS SUMMARY FOR 1996

6.1. AWS Performance

Fifty AWS units were installed at the start of 1996 and 51 were installed by the end of 1996. Based on the installation months the AWS units delivered 74% of the temperature data, 73% of the pressure data and 62% of the wind data during 1996. Complete data sets were received from 21 AWS units and 11 AWS units operated for the installed period. Eighteen AWS units were not received for one month or more during the year or stopped during the year.

The wind system has the poorest performance. If the wind speed is zero or the wind direction is constant for extended periods (days to months) then the data is considered invalid. The reason for this behavior is not known but is believed to be due to the build up of frost on the wind system. This usually occurs in the winter season and at several AWS sites. The wind speed is most frequently zero when the wind direction is constant. Another problem with the wind system involves the tachometer for measuring wind speed. The brushes on the Belfort aerovane quickly wear down and fill the gaps between the contacts with brush material, shorting out the tachometer output. As a result we do not know the calibration. The problem is in the construction of the tachometer, so we have begun to install a new wind system manufactured by R.M. Young. They are currently operating at Nico, Henry, Pegasus North, Minna Bluff, Willie Field, Ski-Hi, J.C., Theresa, Doug, Brianna, Elizabeth, Erin, D-47, D-57, and Bonaparte Point sites.

Site	Performance
D-10	Station inadvertently removed and replaced with non-functioning station on 21 January.

D-47	Station installed 11 February. Station operated intermittently and then stopped 4 August due to low battery voltage. Temperature not functioning after early April.
D-57	Station installed 8 February. Station operated until 4 August when it stopped due to low battery voltage.
D-80	Station changed 24 January. Temperature and wind speed and direction were not reporting correctly starting in mid-February, and pressure was not reporting correctly in March. Station stopped in March due to low battery voltage.
Dome C	Station stopped on 3 January due to low battery voltage.
Dome C II	OK.
Port Martin	Station transmitted sporadically from April to September due to low battery voltage. As battery recharged, more transmissions received. A Hydro-Tech anemometer was installed instead of delta-T sensor. Pressure corrected for high wind speed conditions.
Cape Denison	Intermittent transmission in May. The Belfort aerovane failed beginning in March. A Hydro-Tech anemometer was installed instead of delta-T sensor. Pressure corrected for high wind speed conditions.
Penguin Point	A Vaisala anemometer was installed instead of the delta-T sensor. Wind speed from the Vaisala anemometer was substituted for the Belfort aerovane wind speed from January through November since the aerovane wind speed was not functioning properly. Pressure corrected for high wind speed conditions.
Sutton	Station started running 10 January. Station stopped 20 February and started again 31 March. Occasionally missing several days of data for the rest of the year. Station stopped for most of October. A Hydro-Tech anemometer was installed instead of delta-T sensor.
Cape Webb	Aerovane not operating during the year. Station stopped from 17 April to 7 June and again the first half of July. A Hydro Tech anemometer was installed instead of the delta-T sensor.
Byrd	Station stopped 11 April.
Mount Siple	Pressure erratic in summer half of year. Site has a "dog house" AWS without wind speed and direction.
Harry	Pressure erratic in summer half of year. Station operated erratically in May and July and stopped 26 July. Station resumed transmission 21 October and operated erratically in December.
J.C.	Station resumed transmitting on 18 January after power was disconnected and reconnected. Wind speed and direction not functioning. Station stopped 2 May due to low battery voltage and resumed transmitting 17 October as battery recharges in the austral spring. No humidity sensor.
Theresa	Station resumed transmitting on 18 January after power supply was disconnected and reconnected. Station operated sporadically from mid-May through September. Delta-T not functioning properly mid-February to mid-November.
Doug	Pressure erratic from mid-May through November. Station stopped 26 November. Delta-T not functioning properly.
Brianna	Station transmitted erratically from the end of July to the beginning of October due to low battery voltage.
Elizabeth	Station resumed transmitting 15 February. Aerovane operated intermittently June through September. Station transmitted erratically after 14 November.
Erin	Station replaced and began transmitting 18 January. Aerovane stopped functioning 6 April. Station stopped 17 July due to low battery voltage and

	resumed transmission in late September as battery recharged in the austral spring.
Marble Point	OK.
Ferrell	OK.
Pegasus North	No pressure reports due to calibration problem. Relative humidity sensor not functioning properly.
Pegasus South	Relative humidity sensor not functioning properly.
Minna Bluff	OK.
Linda	OK.
Willie Field	OK.
Whitlock	Intermittent wind data from April to November. Intermittent transmissions in August and September due to low battery voltage.
Scott Island	Sporadic transmissions. Station stopped 7 March due to low battery voltage. Site has a "dog house" AWS without wind speed and direction.
Young Island	Another Adog house@ AWS without wind speed and direction installed 26 January. Station not functioning properly for three weeks in February.
Possession Island	Transmissions were irregular in November and December. Site has a "dog house" AWS without wind speed and direction.
Marilyn	OK.
Schwerdtfeger	Station reinstalled 27 January. Relative humidity is erratic August-October.
Gill	Aerovane operated intermittently during July-November. Delta-T not functioning properly the first part of January. Relative humidity not functioning properly the last part of January until the end of the year.
Lettau	Station transmitted sporadically February-April and stopped 12 April. The station resumed transmitting 10 November
Elaine	Aerovane did not function throughout the year. The delta-T sensor was not operating properly.
Manuela	Aerovane was replaced on 4 February. Aerovane stopped again on 29 July.
Lynn	Station stopped transmitting on 3 April and resumed on 30 April.
Larsen Ice	Aerovane did not operate after June.
Butler Island	Pressure corrected.
Uranus Glacier	Station stopped 13 February and resumed transmission 3 December with one day of transmission on 31 October.
Racer Rock	Intermittent data transmission, very sparse from last half of May through the end of the year due to low battery voltage.
Bonaparte Point	New batteries installed in January. Station resumed transmission 29 January, but the pressure was not functioning properly. Station stopped 11 July. New station electronics installed 23 December.
Recovery Glacier	Station removed.
Ski-Hi	Intermittent data transmissions.
Santa Claus Island	Water temperature probe did not function due to a defective probe. Temperature began to malfunction in May. Aerovane did not operate during June and August -September. Station stopped 28 September due to low battery voltage. New station electronics and batteries were installed 25 December. Aerovane still not functioning.
Limbert	No delta-T sensor. Aerovane “frozen” most of the time from the end of February through October.
AGO-A84	Station installed 9 January. Aerovane “frozen” most of the time from the end of April through the beginning of November. Station stopped 16 July due to low battery voltage and resumed transmission 18 September as battery recharged in the austral spring.
Clean Air	Pressure jumped erratically March-October.

Nico	Aerovane occasionally "frozen" during the winter months.
Henry	Station stopped 12 September due to low battery voltage and resumed transmission 14 October as battery recharged in the austral spring.
Relay Station	OK.
Dome Fuji	Pressure not functioning correctly.

6.2 AWS Antarctic Field Activities

Field activities for 1996 began with the arrival of Charles Stearns, Greig Thompson and Jonathan Thom at McMurdo in early January to begin repair work in the Siple Coast and Ross Ice Shelf areas. On 16 January, Stearns, Thompson, and Thom left McMurdo Station for Up Stream Bravo. On 17 January, a Twin Otter flight was made to Elizabeth site and AWS 21356 was removed and replaced with new 21361 electronics. The antenna cable did not have the shield soldered to the TNC connector. The aerovane was replaced with a Bendix aerovane, and the antenna cable was replaced with one that had the shield soldered to the TNC connector.

On 18 January, a Twin Otter flight was made to J.C. site. The power supply was disconnected and then reconnected, and the unit began to cycle normally. The malfunctioning wind direction was not checked because of the high wind speed at the time of the site visit. The flight continued on to Erin site, where the antenna cable was replaced with one that had the shield soldered to the TNC connector, but the unit still did not transmit. Because of limited resources, the electronics were not replaced at that time, and the party returned to Up Stream Bravo. A Twin Otter flight was made to Theresa site. One battery box was not connected to the junction box. The power supply was disconnected and then reconnected, and the station began to cycle normally. A second flight to Erin site was then made and AWS 21361 was replaced with 21363. A Belfort aerovane was also installed. On 19 January, Stearns, Thom, and Thompson returned to McMurdo Station.

On 23 January, a Twin Otter flight was made to Marilyn site. The site was raised by clamping two 1.8 m Rohn tower sections to the exposed 2.0 m of Triex tower using two sets of mounting bars. Three nylon rope guys were added to the tower addition. Two boxes of three gel-cell batteries were installed as well as a new power junction box and a new solar panel. The boom is now 3.8 m above the snow surface. The 1/8 in diameter antenna was replaced with a 1/4 in diameter one. On 24 January, a Twin Otter flight was made to Gill site, and the site was raised in a similar fashion as that at Marilyn.

A Twin Otter flight was made to Schwerdtfeger site on 27 January, and AWS 8913 was installed. A Bendix aerovane was installed as well as 2 boxes of three gel-cell batteries and new battery cables.

Using parts from the AWS units returned from Up Stream Bravo, AWS units 8980 and 8983 were repaired. Crew members of the USCG Polar Star installed a dog house AWS 8980 at Young Island on 26 January. Dog house AWS 8983 was not installed at Scott Island because of fog. AWS 8983 was returned to Seattle for installation during the next field season.

On the Antarctic Peninsula, members of the Long Term Ecological Research group replaced the batteries at Bonaparte Point AWS site on 14 January and installed a sea-water temperature probe at Santa Claus Island AWS site on 13 February. The sea water temperature probe did not function properly due to inadequate instrument design and manufacture.

Members of Programma Nazionale di Ricerche in Antartide at Terra Nova Bay installed a Belfort aerovane at Manuela site on 4 February. The aerovane was delivered to them by the Polar Star on the refueling trip for the base.

Members of the Institut Francais pour la Recherche et la Technologie Polaires (IFRTP) removed AWS 8919 from D-80 and installed AWS 8916 in its place on 24 January. On 8 February, AWS 21360 was installed at D-57, and AWS 8986 was installed at D-47 on 11 February. Also, AWS 21364 was inadvertently removed from D-10 on 21 January. The replacement unit, AWS 8919, did not function.

In December, 1996 Tony Amos took the place of C.R. Stearns on the Polar Duke to repair the AWS units on Bonaparte Point and Santa Claus Island. At Bonaparte Point on 23 December, Amos replaced the AWS electronics, batteries, and boom. The electronic box connectors to the boom and junction box were replaced with connectors that are supposed to be capable of withstanding corrosion by salt water. The connections between the junction box and the batteries and solar panel were wired directly and the openings were plugged with modeling clay. The water temperature sensor was installed in the sea water at Bonaparte Point. The water temperature probe that was removed was severely damaged by the salt water and the action of the sea ice. At Santa Claus Island on 26 December the pipes protecting the water temperature probe were destroyed. In addition, the AWS tower was bent at the base but left in place. The replacements were similar to those at Bonaparte Point. The water temperature probe was left on the surface and not put into the water. A stop was made at Racer Rock. The AWS unit was operating intermittently but the equipment was not available to make the necessary repairs.

7. GLOBAL TELECOMMUNICATIONS SYSTEM

The data from 35 Antarctic AWS units were entered into the Global Telecommunications System (GTS) during 1995. The data are collected by Service ARGOS. As soon as the data are received, Service ARGOS processes them and sends them on to the National Weather Service which distributes the data to the GTS. The data headers are:

SMAA14 KARS YYGGgg
SIAA14 KARS YYGGgg
SNAA14 KARS YYGGgg

where S indicates surface, M is main observations (at 00, 06, 12, and 18 UT), I is intermediate observations (at 03, 09, 15, and 21 UT), and N is any other time. AA14 is for Antarctica, and KARS stands for the Landover receiving center (backup is LFPW for the center in Toulouse, France). YY indicates the day in the month, GG is the hour, and gg is the minutes. Table 3.1 contains the WMO # used by the GTS grouped according to their purpose and proximity where possible.

The University of Wisconsin-Madison is responsible for obtaining WMO numbers for AWS sites and for providing Service ARGOS with calibration information for processing the data. The main reason for getting the AWS data into the GTS is to make sure that the data are available in near real time for all organizations operating in Antarctica. Of all the meteorological data in the GTS received by the Australian Bureau of Meteorology at Hobart, Tasmania, the AWS units provided more surface meteorological data than all the manned stations.

8. DATA AVAILABILITY

The data from our Automatic Weather Stations are available by anonymous FTP. The IP number is 144.92.108.169 (ice.ssec.wisc.edu). The login is "anonymous" (do not use the quotation marks), and the password is your email address. Once you have logged in, change to the pub subdirectory. A listing of our station locations, names, and ARGOS ID numbers is located in the file "biglist" in this subdirectory. It is meant to serve as a guide to our stations as their ID numbers

sometimes change. A complete guide for navigating the site may be found in the file Areadme.faq@.

Our three-hourly interval data for Antarctica are contained in the year subdirectories of pub/antrdr. The data have been corrected, i.e. an effort has been made to remove the bad data points. These data take longer to process, so the data for recent months are not available in this format. Within each of the year subdirectories of pub/antrdr, there are text files named "3hrlist??" (where ?? indicates the last two digits of the year). These files list what station's data are contained in which files. The file Areadme.updates@ in pub/antrdr contains information on updates and/or corrections to the data, and the file Areadme.3format@ contains file name construction information and format of the three-hourly data. The file "readme.mailinglist" contains information on joining a mailing list which distributes information on data updates and changes. To subscribe, send email to majordomo@ice.ssec.wisc.edu with the subject line left blank. In the message body, type Asubscribe three yourname@email.address@ (do no use quotation marks) and substitute your own email address for Ayourname@email.address@.

The directory pub/summary/monthly contains printable text files of the paper data summary sheets. The format of the files can be found in the file "readme.sum" while updates and corrections to the data are located in "readme.sumupdates". The data are located in year subdirectories of pub/summary/monthly.

For those users who need more current information, we have created 10 minute interval data for each station. These data are located in year subdirectories of pub/10min/rdr. The data have been calibrated for the individual station instruments, but no other corrections have been made. The data are generally available up to and including the last full month of the current year. The year subdirectories also contain a text file named "namelist??" (where ?? indicates the last two digits of the year in question). These files list what station's data are contained in which files.

Several important readme files are located in pub/10min/rdr. The file "readme.5digit" contains information on the Siple Coast stations which have a different station identification. The file "readme.format" contains information on filename construction of the data, as well as file content and is a must for those unfamiliar with the data. The file "readme.updates" contains important information on changes/additions to the data, and the file Areadme.mailinglist@ contains information on joining a mailing list to receive notification by email of data changes and updates. To subscribe, send email to majordomo@ice.ssec.wisc.edu with the subject line left blank. In the message body, type Asubscribe ant yourname@email.address@ (do no use quotation marks) and substitute your own email address for Ayourname@email.address@. If you would like to see a list of all available mailing lists, please send email to majordomo@ice.ssec.wisc.edu with the subject line blank. In the message body type Alist@.

Our site is available 24 hours a day, 7 days a week. If you have questions or problems, send email to aws@ice.ssec.wisc.edu. We can also be reached by phone at (608) 265-2209 or fax at (608) 263-6738.
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9. ACKNOWLEDGMENTS

This work is supported by the National Science Foundation, Office of Polar Programs, Grants 9303569 and 9419128 under the management of Dr. Bernhard Lettau of the National Science Foundation. Expeditions Polaires Francaises installs and maintains the AWS units from the Adelie Coast to Dome C. The British Antarctic Survey maintains the AWS units on the east side of the Antarctic Peninsula and south of Adelaide Island.