

Antarctic Automatic Weather Stations: Austral Summer

1989-1990

Charles R. Stearns

and

George A. Weidner

Department of Meteorology

University of Wisconsin

1225 W. Dayton Street

Madison, Wisconsin 53706

Introduction. The National Science Foundation (NSF) Division of Polar Programs (DPP) places automatic weather station (AWS) units in remote areas of Antarctica in support of meteorological research and operations. The AWS data are collected by the ARGOS Data Collection System on board the National Oceanographic and Atmospheric Administration (NOAA) series of polar orbiting satellites. Stearns, 1988 gives the history of the AWS locations in Antarctica.

AWS System. The basic AWS units measure air temperature, wind speed, and wind direction at a nominal height of three meters above the surface, and air pressure at the electronics enclosure. Some AWS units may measure relative humidity at three meters and the temperature difference between three meters and 0.5 meters above the surface.

Table 1 gives the ARGOS identification number (ID), latitude, longitude, elevation, and the latest start date for the ID at that site for Antarctic AWS units operating during 1990. Figure 1 shows the locations for the AWS units except for those that are too close together to be clearly shown. Figure 2 shows the AWS units in the vicinity of the Reeves Glacier and Figure 3 shows the AWS units on the Ross Ice Shelf near Ross Island.

AWS Applications. Some AWS units are located in arrays for meteorological experiments and others for operational purposes. Any one AWS unit may contribute to several experiments and all contribute to operational purposes, especially the preparation of weather forecasts for aircraft flights to and from New Zealand and within Antarctica. The AWS units support the following research and operational areas:

- a. Barrier wind flow along the Antarctic Peninsula and the Transantarctic Mountains,
- b. Katabatic wind flow down the slope to the Adelie Coast, Reeves Glacier, Byrd Glacier, and Beardmore Glacier,
- c. Mesoscale circulation and the sensible and latent heat fluxes on the Ross Ice Shelf,
- d. Climatology of Byrd, Siple, and Dome C stations
- e. Oceanography in the Ross Sea,
- g. Meteorological support for air operations at McMurdo, Antarctica,

h. Monitoring for possible aircraft landing sites.

Slotten and Stearns, 1987, and Stearns and Wendler, 1988 give examples of the research carried out with the AWS units in Antarctica. Savage and Stearns, 1985, present climatological information collected by the AWS units in Antarctica.

Activities During AS 89-90. The AWS unit at Racer Rock was installed by Tony Amos, University of Texas. The AWS unit is in support of research on Antarctic coastal ecosystem rates (RACER) in the Gerlach Strait for S-44A, S-44B, S-045, and S-046. The Polar Duke transported the personnel and equipment to the area. The AWS unit was installed on a rock named "Racer Rock".

The AWS unit installed at Pegasus Site in January 1989 was removed by members of S-081 in November and installed on the highest point of Mt. Erebus. The Mt. Erebus AWS unit is in support of S-081 and should be useful to the NSFA Meteorology Office for air operations.

Three AWS units were shipped to Hobart, Tasmania and loaded on the M/S Astrolobe of Expeditions Polaires Francaises (EPF) along with Prof. Gerd Wendler, Dr. R. Flint, and Didier Simon of EPF. AWS units were installed at Port Martin and Cape Denison in support of S-277. The locations of the two sites are shown in Figure 1 and other details are given in Table 1. The third AWS unit will be installed during austral summer (AS) 1990-1991. The installation was not possible within the allotted ship time due to stormy weather. The three AWS units are equipped with a Vaisala wind speed sensor. The output is a five second average

rather than the instantaneous value measured with the Aerovane. The Vaisala anemometer is located on the south end of the extended boom. The Aerovane is downwind of the Vaisala anemometer for the prevailing wind direction at the locations along the Adelie Coast.

C.R. Stearns and George Weidner arrived in McMurdo, Antarctica on 2 January 1990. The radioactive thermal generator (RTG) used to power the AWS unit at Ferrell Site was dug out of the snow and removed by helicopter to McMurdo. The only remaining RTG used for the AWS units in Antarctica is at Dome C. The tower at Ferrell Site was raised five feet and a battery powered AWS unit was installed retaining the ARGOS ID of 8907.

The AWS unit installed at Byrd Station in January 1989 stopped shortly after the LC-130 carrying George Weidner took off for the return flight to McMurdo. The unit was returned to McMurdo in January 1990, repaired and returned to Byrd Station for installation by the Naval Support Force Antarctica (NSFA) weather observer. Marilyn Site AWS was replaced on a return flight from South Pole by an LC-130. The AWS transmitter frequency had changed enough that the unit was no longer received by the ARGOS system.

An AWS unit was installed at the north end of the experimental ice runway near the Mellor Chalet. Table 1 gives the location information for the site named Pegasus North and the location is shown in Figure 3.

The AWS unit at Pat Site fell down in November 1989. The personnel from the Italian Base at Terra Nova Bay reinstalled the tower their way. Marine science technicians from the Polar Star replaced the Aerovane and removed AWS-8929 from near the Snow Cave on Inexpressible Island and returned the unit to Byrd Polar Research Center.

AWS Data. The data are available on paper as 3 hourly values of wind speed, wind direction, air temperature, and pressure for each month including a monthly summary (Keller, et al. 1989). The three hourly data are available on 5.25 and 3.5 inch magnetic disks (high or low density) in IBM format and include any additional data that may be available such as the vertical air temperature difference and relative humidity. The complete data set is available on magnetic tape.

Acknowledgments. The AWS program is supported by National Science Foundation Division of Polar Program grants 8606385 and 8818171. The British Antarctic Survey installs and services the AWS units in the Antarctic Peninsula area. Expéditions Polaires Françaises installs and services the AWS units from D-10 to D-80 and along the Adelie Coast. Members of the Italian National Antarctic Research Programme reinstalled the AWS unit at Pat Site.

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Titles of Figures

Figure 1. Map of Antarctica showing the locations of the AWS units for 1990. The units in the rectangle about Manuela Site are shown in Figure 2 and the units in the rectangle at Ferrell Site are shown in Figure 3.

Figure 2. Map of the locations of AWS units in the Reeves Glacier area of Antarctica including Manuela Site.

Figure 3. Map of the Ross Island area of Antarctica showing the locations of Ferrell, Jimmy, and Pegasus North sites.

Table 1. AWS locations for 1990. The ID start date is the date on which the AWS unit started with the listed ARGOS ID. The site may have been in operation for a longer time with a different ID or the AWS unit may have stopped and been repaired as is the case with AWS 8903 at Byrd Station. Gill AWS unit was not received during 1989. Elaine site is planned for reinstallation in 1990 and Gill site should be repaired.

Site	ARGOS ID	Lat. (deg)	Long. (deg)	Elev. (m)	ID Start Date
<u>Adelie Coast</u>					
D-10	8912	66.70°S	139.80°E	240	15 Jan 84
D-47	8916	67.38°S	138.72°E	1560	11 Jan 89
D-80	8919	70.02°S	134.72°E	2500	11 Dec 85
Dome C	8904	74.50°S	123.00°E	3280	13 Jan 83
Port Martin	8914 U	66.82°S	141.39°E	39	19 Jan 90
Cape Denison	8933 U	67.02°S	142.68°E	31	20 Jan 90
<u>Summer Only Stations</u>					
Byrd Station	8903	80.00°S	120.00°W	1530	28 Jan 90
Siple Stat.	8910	75.92°S	83.92°W	900	10 Dec 87
<u>Ross Island Region</u>					
Marble Point	8906	77.43°S	163.75°E	120	5 Feb 80
Ferrell	8907	78.02°S	170.80°E	45	10 Dec 80
Jimmy	8925	77.87°S	166.81°E	202	25 Jan 90
Mt. Erebus	8911 U,T	77.50°S	167.15°E	3700	21 Nov 89
Pegasus North	8927 U,T	77.97°S	166.49°E	10	23 Jan 90

Table 1 continued.

<u>Ocean Islands</u>					
Whitlock	8913	76.24°S	168.70°E	275	23 Jan 82
Scott Island	8928	67.37°S	179.97°W	30	25 Dec 87
<u>Ross Ice Shelf</u>					
Marilyn	8915	79.96°S	164.96°E	75	17 Jan 90
Schwerdt.	8924 U,T	79.94°S	169.83°E	60	24 Jan 85
Gill		80.00°S	179.00°W	55	
Elaine		83.15°S	174.46°E	60	
Lettau	8908 U,T	82.59°S	174.27°W	55	29 Jan 86
Martha II	8900 U,T	78.38°S	173.42°W	18	11 Feb 87
<u>Reeves Glacier</u>					
Manuela	8905 U,T	74.92°S	163.60°E	80	15 Feb 84
Shristi	8909 U,T	74.72°S	161.58°W	1200	28 Dec 87
Sushila	8921 T	74.41°S	161.28°E	1431	20 Jan 88
Sandra	8923	74.51°S	160.42°E	1525	19 Jan 88
Lynn	8901 U,T	74.23°S	160.29°E	1772	19 Jan 88
Pat	8931 U,T	74.88°S	163.10°E	30	1 Jan 89
<u>Antarctic Peninsula</u>					
Larsen Ice	8926	66.97°S	60.55°W	17	1 Jan 86
Butler Island	8902	72.20°S	60.34°W	91	1 Mar 86
Uranus Glac.	8920	71.43°S	68.93°W	780	6 Mar 86
Cape Adams	8917	75.01°S	62.53°W	25	28 Jan 89
Racer Rock	8930 U	64.16°S	61.54°W	17	6 Nov 89
Halley Bay	8932	75.50°S	26.65°W	52	Mar 90

Table 1 continued.

South Pole Station

Clean Air 8918 90.00°S 2835 28 Jan 86

U-relative humidity

T-vertical air temperature difference

Abstract

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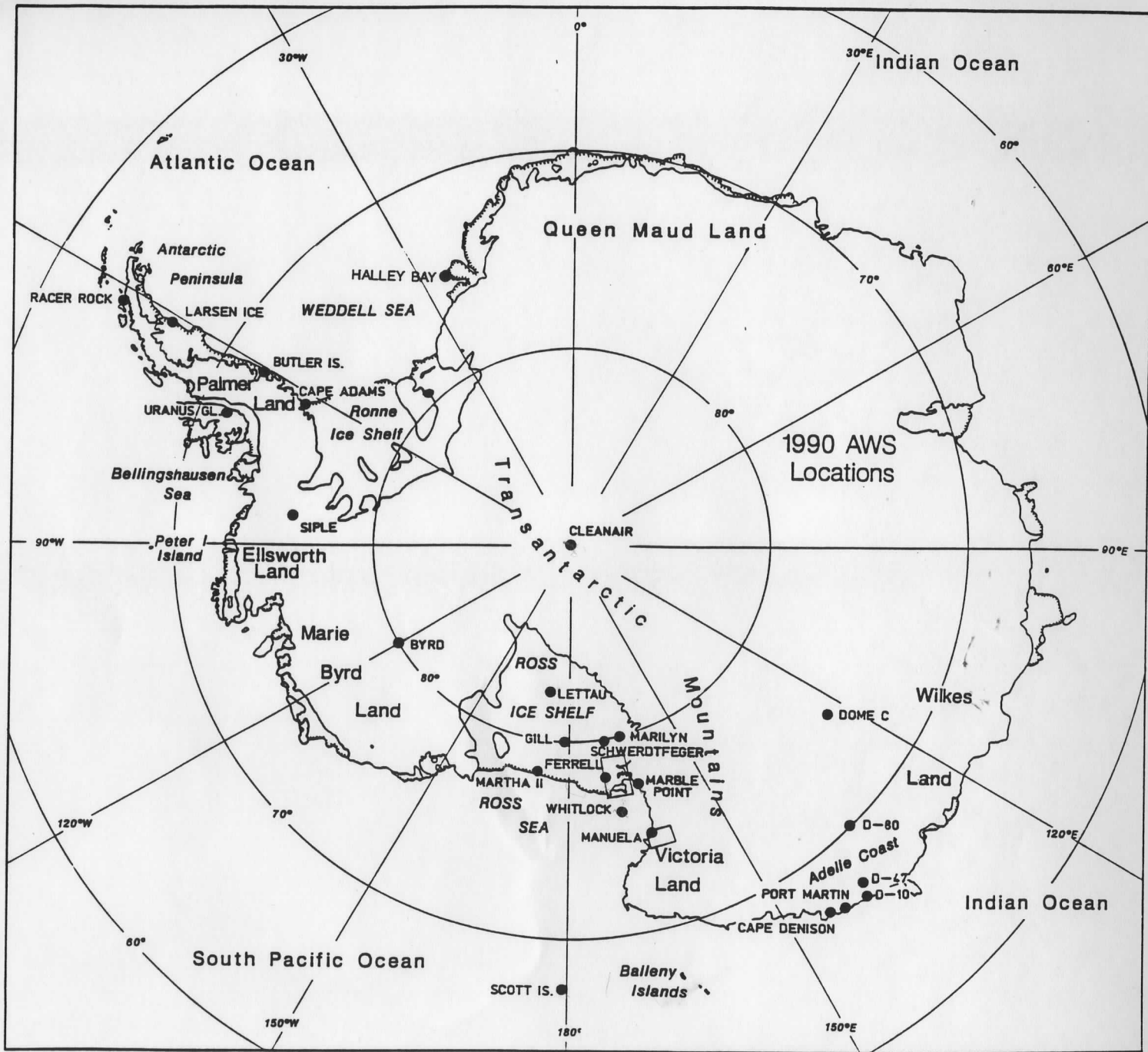
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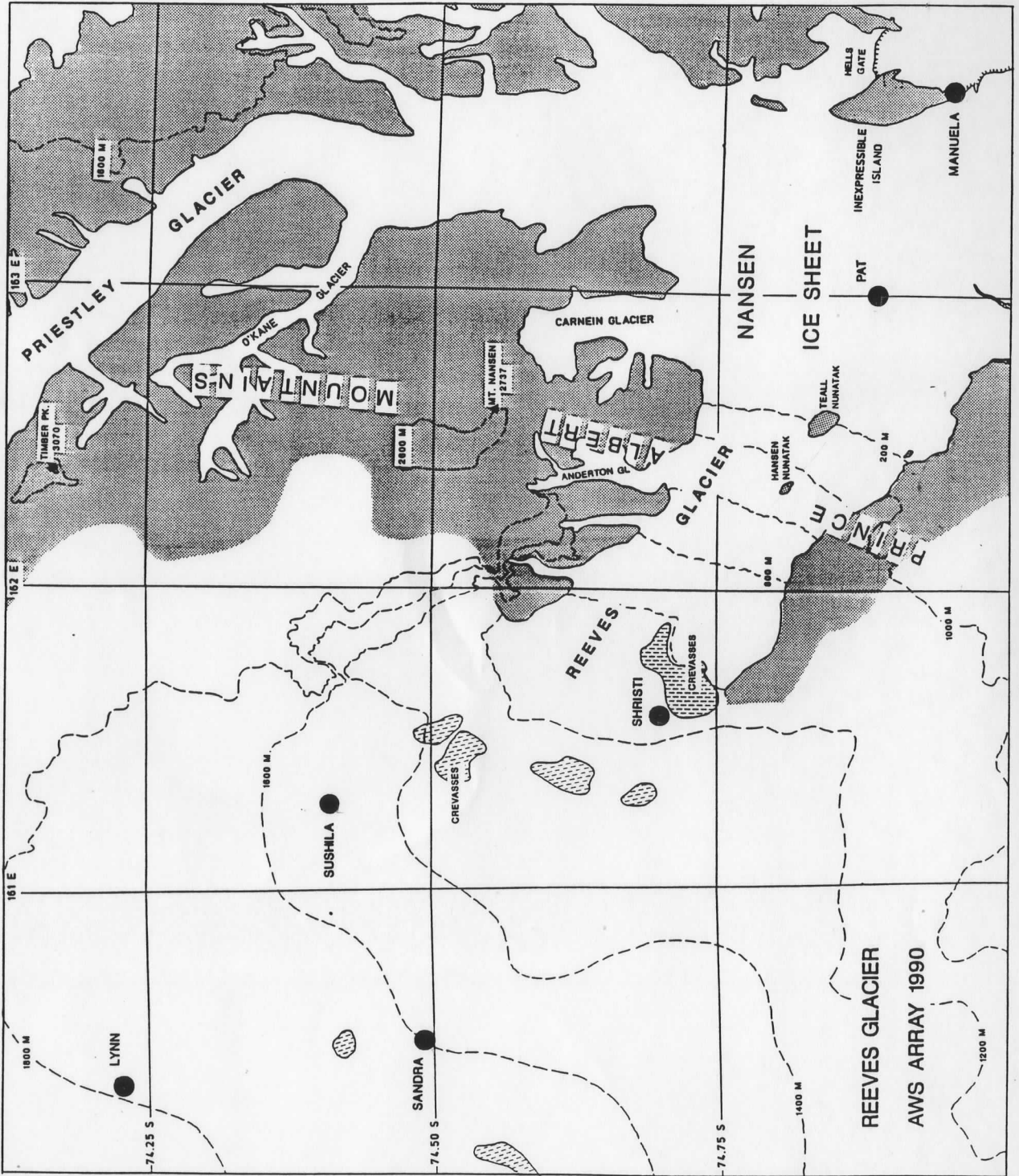
1225 W. Dayton Street

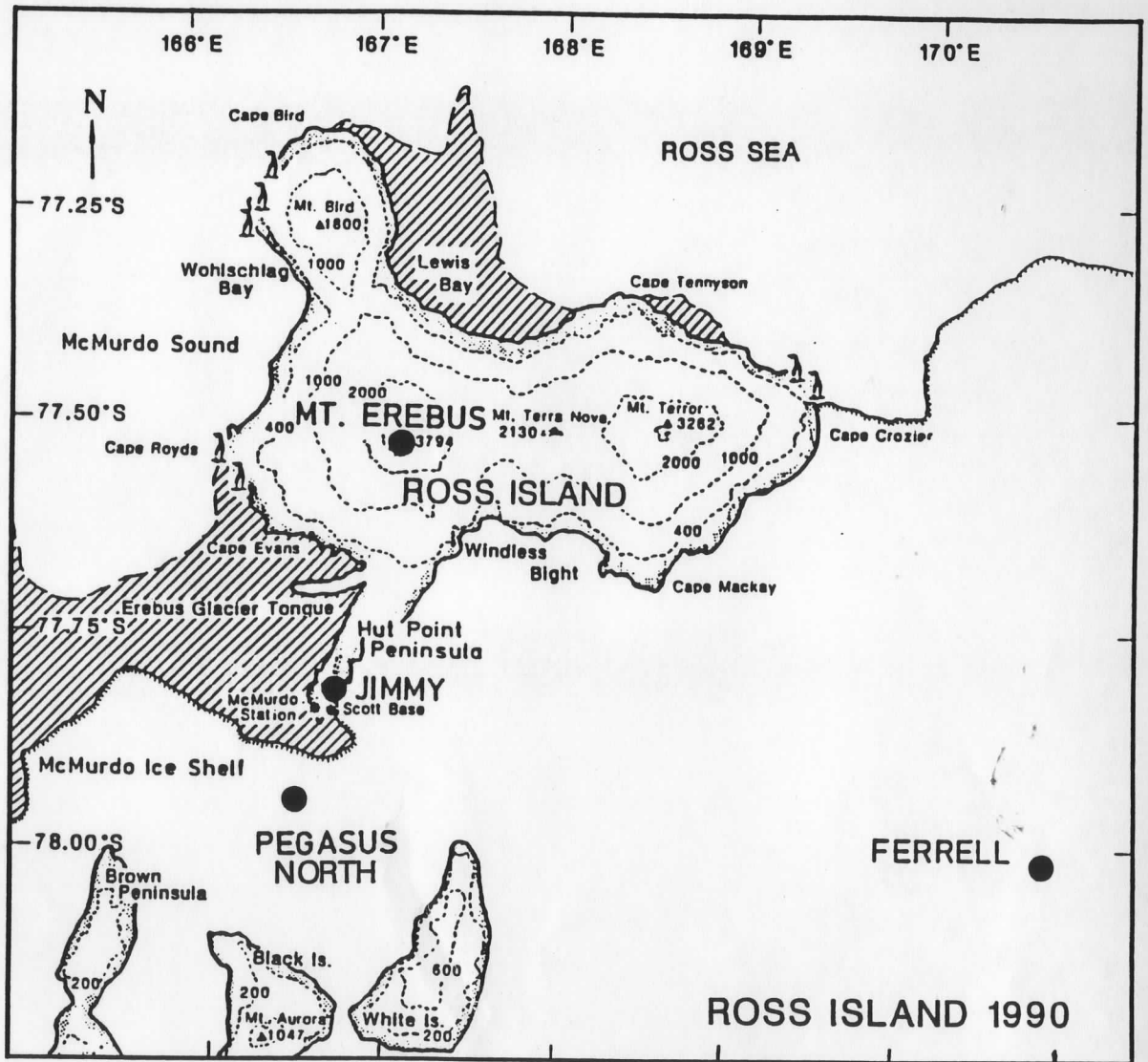
Madison, Wisconsin 53706

During AS 89-90 automatic weather station (AWS) units were installed in the Gerlach Strait, on the highest point of Mt. Erebus, and at Port Martin and Cape Denison. The radioactive thermal generator (RTG) used to power the AWS unit at Ferrell Site was dug out of the snow and removed to McMurdo. A battery powered AWS unit was installed at Ferrell site. The Byrd Stations AWS unit stopped in January 1989. The unit was repaired and returned to Byrd Station for installation by the weather observer. Marilyn Site AWS was replaced and another AWS unit was installed at the north end of the Pegasus experimental ice runway.



1990 AWS Locations





Handwritten note: Pigeon Island - no.