# Antarctic Automatic Weather Station
# Field Report 1992-1993 Field Season

by
Charles R. Stearns
and
George A. Weidner
Department of Atmospheric and Oceanic Sciences
1225 West Dayton Street
Madison, Wisconsin 53706

## Introduction:

The initial plans for the 1992-1993 Antarctic field season for automatic weather station (AWS) units were outlined at the Annual Automatic Weather Station meet at Englewood, Colorado on 12 March 1992. The plans included an ice breaker cruise along the Adelie Coast and four additional AWS units around South Pole and four additional AWS units on the Siple Coast. A minimum of twelve additional AWS units would be required. Request for the ice breaker, helicopter, and Twin Otter aircraft support were made in the Support Information Request to Antarctic Support Associates and the arrangements for confirmed at the Orientation Conference on 14-16 September 1992.

Table 1 gives the site name, ARGOS identification number, latitude, longitude, elevation, site start date, and World Meteorological Organization (WMO) station number for the Global Telecommunications System (GTS) as of 15 February 1993. The British Antarctic Survey has not finished their field season in the Antarctic Peninsula region and an AWS unit may be deployed in support of the Long Term Ecosystem Research in the area of Palmer Station. Table 1 will be updated if any changes are made in the Antarctic Peninsula area.

## Polar Star Cruise:

The 1992-1993 Antarctic field season started on 12 December 1992 when C.R. Stearns and G.A. Weidner left Madison, Wisconsin for Hobart, Tasmania arriving there on 14 December 1992. The ice breaker Polar Star was at Hobart and all equipment that was shipped to the Polar Star at Seattle, Washington in November 1992 was on board the ship. Professor Gerd Wendler arrived at Hobart on 15 December 1992. The wet lab on the Polar Star was prepared for our use and the construction of the dog houses in the helo hanger was started while in port. Sand (300 kg.) was purchased for weight in the dog house AWS units. Parts for erasing AWS EPROMS were purchased. The Polar Star set sail for Dumont d'Urville on 18 December 1992. The weather was good during the crossing and we were able to prepare for the installations along the Adelie coast without difficulty.

We arrived at D-10 on 21 December 1992. In the morning a helo flight was made towards D-10. At 1200 feet altitude the helo speed was 90 kts and the ground speed was 10 kts. There was strong turbulence so the flight was aborted. At 1600 LST members of the Expedition Polaires Francaises (EPF) at D-10 reported that the wind speed had decreased so two helo flights to D-10 were made. The Rohn tower was dug out and raised one 5 foot section. A 36 inch boom with relative humidity was installed along with aerovane 90-1727.

An additional Rohn 5 foot tower section was left at the site for the EPF. The boom was about 9 feet above the snow. The Bendix aerovane that was removed had the wind speed wired to 6 and 7 on the aerovane plug instead of 1 and 2 and the wind direction potentiometer was not working properly. On the return trip to the ice breaker we stopped at Dumont d'Urville for a brief visit.

On the morning of 23 December 92 we flew to the Port Martin AWS site and replaced AWS 8934 with AWS 8930. We did not change the aerovane. In the afternoon we flew to Cape Denison and replaced the Geophysical Institute Bendix aerovane with 87-1172 and installed a new Vaisala anemometer. The bearings were destroyed on the previous Vaisala anemometer.

On 24 December 1992 we flew to Penguin Point to install the AWS unit. The tower was two 6 foot Rohn tower sections with a 36 inch boom, aerovane 89-1488, Vaisala anemometer and relative humidity. The tower was anchored by cables of 50 foot length. The north cable went to an anchor in a hole drilled in a rock and the remaining cables went to chain around rocks. The AWS unit was installed at a high spot on rock. The AWS ID is 8929.

Dog House AWS 8983 was installed on Scott Island on 28 December 92 and on 30 December 92 AWS 8984 was installed on Possession Island. Both units were installed by sling load from the helicopter without a problem.

The Polar Star reached Terra Nova Bay on 31 December 1992. A rebuilt Bendix aerovane was installed at Manuela site. Shristi site was removed. The snow at Shristi site was at the level of the first cross brace down from the top of the 10 feet Tri-Ex tower. The site had more than 8 feet of snow in five years amounting to at least 0.5 m per year. In view of the strong winds at the site, this amount of snow accumulation is unexpected.

On 1 January 93 at Whitlock site the six foot boom, aerovane, solar panel, AWS electronics, and helical antenna were removed. A 36 inch boom with relative humidity sensor, aerovane 84-447, and ground plane antenna was installed. A 10 W solar panel, junction box, and two boxes of three 40 amp hr. gel cells were installed. The ten foot tower is a Tri-Ex. AWS 8913 was removed and AWS 8925 was installed. There was about four feet of snow at the site.

On 2 January 1993 the Polar Star started to break out the channel to McMurdo. We left the ship on 3 January 1993. Rob Holmes and Paul Hamill arrived at McMurdo from Christchurch.

The Science meeting was held on 4 January. Byrd Station was to be closed on 9 January 1993. The Twin Otter was damaged and would not be flying before 15 January 1993.

On 5 January 1993 C.R. Stearns met with Erick Chiang on a possible budget for weather forecasting in Antarctica. Al Southerland will define the requirements for the ice breakers and research ships.

On the morning of 13 January 1993 a USCG helicopter flight was made to Linda site to change the AWS electronics. AWS 8915 was removed and AWS 8909

was installed. The snow was even with the top of the battery boxes. In the afternoon Ferrell site was refurbished with a 36 inch boom, relative humidity, and vertical air temperature difference. AWS 8907 was removed and AWS 8934 was installed.

Met with Rick Cambell and Henry Perkl on 15 January 1993. The Twin Otter aircraft is repaired and can fly us out to the locations on the Ross Ice Shelf when the weather is satisfactory. We could not operate out of Casertz until 26 or 27 January 1993 when the science program using the instrumented Twin Otter was completed.

On 19 January 1993 a boom and aerovane 91-2415 were sent to the Polar Star for replacement at Manuela site during the cruise to Terra Nova Bay. The wind speed was questionable at Manuela site. The aerovane was installed on 26 January and the wind speed looked okay.

Schwerdtfeger site was visited on 22 January 1993 using the Twin Otter. The tower was stripped and one five foot section of Tri-Ex tower was added raising the height to about 10 feet. AWS 8924 was removed and AWS 8913 was installed. The Bendix aerovane was reinstalled. Two boxes of three 40 amp hr gell cells were installed. The voltage on the old batteries was 12.5 when the AWS unit was connected. Bottom of the battery boxes was at the tower joint but the snow was not filled in level with the general area. The aircraft radar picked up the AWS unit from more than 5 nm. Looks like 3.35 m of snow since 1985 (8 years) or 0.42 m/year. Wires were bundled behind the AWS box which was above the tower joint.

Elaine site was reinstalled on 23 January 1993 using the Twin Otter aircraft. At the site the Twin Otter determined north using the GPS or inertial navigation system by taxiing north for a short distance then turning parallel to the track and stopping. Three poles were put into the nose ski track approximately 50 apart to lay out the station. Two 6 foot and one 3 foot Rohn tower sections were used and the boom was 4.3 m above the snow. Aerovane 91-2410 and AWS 8900 were installed. Boom lined up with sun at solar noon.

On Monday 25 January 1993 Stearns and Holmes flew to the South Pole, Weidner and Hamill started for Madison, WI, and the Twin Otter went to the South Pole. On Tuesday 26 January 1993 AWS units were installed at Henry, Nico, and Lindsay sites using the Twin Otter to determine north. On 27 January 1993 at Mount Howe site aerovane 90-1907 and AWS 8907 was installed replacing AWS 8982. The impeller blades for the aerovane at Mount Howe were broken because a 2' by 2' sheet of plywood with a hole in the middle, that was over each of the 4" x 4" x 4' ice anchors to reduce ablation, was forced up the chain and rope by the wind and against the impeller on the aerovane. The boards at each anchor to the south were tied down so this could not happen again. The anchors were solid but there had been about 10 cm of ablation at the site. The AWS at Kelly site was installed. The R.M. Young wind systems are used at Kelly, Nico, Henry, and Lindsay sites.

Stearns and Holmes left South Pole on 28 January 1993 and left for Madison, WI on 30 January 1993 after all equipment was either packed for

shipping or stored for the winter over.

AWS 8903 was reinstalled at Byrd Station on 26 January 1993 by personnel of Antarctic Support Associates using the Twin Otter based at Casertz. The instrumentation had been removed.

The weather was generally good throughout the season and everything that was possible was done. Recovered AWS units were successfully repaired and redeployed at another site. The South Pole array was done instead of the Siple Coast array because the transportation was more reliable to the South Pole after Byrd Station was closed.

Expedition Polaires Francaises (EPF) planned to make a traverse to D-80. A replacement AWS unit for D-80 was sent to Hobart, Tasmania but did not arrive in time for the traverse because of an airline strike in Australia. The traverse was not finished due to a breakdown in one of the vehicles and the EPF was unable to reach D-10.

The BAS removed the AWS 8932 at BAS-AGO and installed it at AGO-A81. AWS 8910 at Siple Station was picked up for repairs and will be returned to the University of Wisconsin. The Cape Adams AWS unit was not located and is probably buried in the snow and assumed to be lost. Larson Ice AWS was moved to away from the ice edge because the ice edge was getting closer to the AWS site.

The Long Term Ecological Research (LTER) group did not fund an AWS unit for installation during the 1992-1993 field season.

Table 2 gives relevant data on the locations of the Belfort aerovanes. The Belfort aerovanes are not giving satisfactory service. The R.M. Young wind systems are operating at the four AWS units around the South Pole.

Table 1. Antarctic automatic weather station site name, ARGOS identification number, latitude, longitude, elevation above sea level, site start date and WMO number for the global telecommunication system.

| Site Name | ARGO ID | Lat. (deg) | Long. (deg) | Elev. (m) | Date Start | WMO# |
|---|---|---|---|---|---|---|
| | | **Adelie Coast** | | | | |
| D-10 | 8914 | 66.70°S | 139.80°E | 240 | Feb 80 | 89832 |
| D-47 | 8916 | 67.38°S | 138.72°E | 1560 | Jan 83 | 89834 |
| D-80 | 8919 | 70.02°S | 134.72°E | 2500 | Nov 84 | 89836 |
| Dome C | 8904 | 74.50°S | 123.00°E | 3280 | Feb 80 | 89828 |
| Port Martin | 8930# | 66.82°S | 141.39°E | 39 | Jan 90 | |
| Cape Denison | 8933 | 67.02°S | 142.68°E | 31 | Jan 90 | |
| Penguin Point* | 8929 | 67.62°S | 146.00°E | 30 | Dec 93 | WMO |
| | | **West Antarctica** | | | | |
| Byrd Station | 8903 | 80.00°S | 120.00°W | 1530 | Feb 80 | 89324 |
| Siple Station | 8910 | 75.90°S | 83.92°W | 1054 | Jan 82 | 89284 |
| Mount Siple | 8981 | 73.20°S | 127.05°W | 30 | Feb 92 | WMO |
| | | **Ross Island Region** | | | | |
| Marble Point | 8906 | 77.43°S | 163.75°E | 120 | Feb 80 | 89866 |
| Ferrell | 8934# | 78.02°S | 170.80°E | 45 | Dec 80 | 89872 |
| Pegasus North | 8927 | 77.95°S | 166.51°E | 10 | Jan 90 | 89667 |
| Pegasus South | 8937 | 78.03°S | 166.60°E | 10 | Jan 91 | |
| Minna Bluff | 8915 | 78.50°S | 166.51°E | 900 | Jan 91 | WMO |
| Linda | 8909# | 78.50°S | 168.35°E | 50 | Jan 91 | WMO |
| Willie Field | 8901 | 77.85°S | 167.08°E | 40 | Jan 92 | |
| | | **Ocean Islands** | | | | |
| Whitlock | 8925# | 76.24°S | 168.70°E | 275 | Jan 82 | 89865 |
| Scott Island* | 8983# | 67.37°S | 179.97°W | 30 | Dec 87 | 89371 |
| Young Island | 8980 | 66.28°S | 162.33°E | 30 | Dec 90 | 89660 |
| Possession Island* | 8984 | 71.90°S | 171.13°E | 30 | Dec 92 | WMO |
| | | **Ross Ice Shelf** | | | | |
| Marilyn | 8931 | 79.98°S | 165.03°E | 75 | Jan 84 | 89869 |
| Schwerdtfeger | 8913# | 79.94°S | 169.83°EG | 60 | Jan 85 | 89868 |
| Gill | 8911 | 80.03°S | 178.63°W | 55 | Jan 85 | 89863 |
| Elaine* | 8900 | 83.15°S | 174.46°EG | 60 | Jan 86 | WMO |
| Lettau | 8908 | 82.59°S | 174.27°W | 55 | Jan 86 | 89377 |
| | | **Reeves Glacier** | | | | |
| Manuela | 8905 | 74.92°S | 163.60°E | 80 | Feb 84 | 89864 |
| Sandra | 8923 | 74.48°S | 160.48°E | 1525 | Jan 88 | 89861 |
| Lynn | 8935 | 74.21°S | 160.39°E | 1772 | Jan 88 | 89860 |
| | | **Antarctic Peninsula** | | | | |
| Larsen Ice | 8926 | 66.97°S | 60.55°W | 17 | Oct 85 | 89262 |
| Butler Island | 8902 | 72.20°S | 60.34°W | 91 | Mar 86 | 89266 |
| Uranus | 8920 | 71.43°S | 68.93°W | 780 | Mar 86 | 89264 |
| Cape Adams | 8917 | 75.01°S | 62.53°W | 25 | Jan 89 | 89268 |
| Racer Rock | 8947 | 64.16°S | 61.54°W | 17 | Nov 89 | 89261 |
| Bonaparte Point | 8912 | 64.78°S | 63.06°W | 8 | Nov 91 | |
| AGO-A81* | 8932 | 81.50°S | 3.74°E | 2410 | Jan 93 | WMO |
| | | **High Polar Plateau** | | | | |
| Clean Air | 8918 | 90.00°S | | 2835 | Jan 86 | 89208 |
| Mount Howe | 8907# | 87.32°S | 149.55°W | 2400 | Jan 92 | WMO |
| Henry* | 8985 | 89.00°S | 0.30°WG | 2877 | Jan 93 | WMO? |
| Nico* | 8924 | 89.00°S | 90.13°EG | 3065 | Jan 93 | WMO? |
| Kelly* | 8921 | 89.00°S | 179.61°WG | 3080 | Jan 93 | WMO? |
| Lindsay* | 8986 | 89.00°S | 89.85°WG | 2940 | Jan 93 | WMO? |

* New locations for 1993
\# New ARGOS ID for 1993
G Locations by Twin Otter GPS

CRS, 16 Feb 93

Table 2. Record of the Belfort aerovanes removed and installed during the 1992-1993 Antarctic field season.

| Number | Date Location |
|---|---|
| 90-1727 | 22 Dec 92 - installed at D-10. Removed the Bendix aerovane which had connections to 6 and 7 instead of 1 and 2. |
| 87-1172 | 22 Dec 92 - installed at Cape Denison replacing a destroyed Bendix aerovane with the label "Geophysical Institute" on it. |
| 89-1488 | 23 Dec 92 - installed at Penguin Point. Tachometer replaced in 1992. |
| 84-447 | 1 Jan 93 - Installed at Whitlock site. Was removed from Shristi site on 31 December 1992. |
| 85-849 | 1 Jan 93 - removed from Whitlock site |
| 91-2410 | 23 Jan 93 - Installed at Elaine site. The tachometer was replaced. |
| 90-1907 | 28 Jan 93 - Installed at Mount Howe site |
| 91-2415 | 24 Jan 93 - Installed at Manuela site |
| 91-2413 | 30 Jan 93 - To BAS via Twin Otter return flight |
| 89-1487 | Jan 93 - Returned from Racer Rock with a destroyed tachometer. |

Table 3 AWS units planned for removal, repairs, or installation during the 1993-1994 or later field season in Antarctica.

| | | | |
|---|---|---|---|
| Beaufort Island | 77.??°S | 167.??°E | Install AWS unit |
| Peter I Island | 69.8?°S | 91.??°W | Install dog house AWS unit. |
| | | **Ross Island Region** | |
| Cape Crozier | 77.55°S | 174.46°E | Install AWS unit |
| | | **West Antarctica** | |
| By Twin Otter aircraft based at Byrd Station, 80.00°S, 120.00°W. | | | |
| 500 | 85.00°S | 136.50°W | Install AWS unit |
| 500 | 83.90°S | 134.20°W | Install AWS unit |
| 500 | 82.60°S | 137.00°W | Install AWS unit |
| 1000 | 84.90°S | 128.70°W | Install AWS unit |
| 1000 | 83.00°S | 121.40°W | Install AWS unit |
| 1000 | 81.20°S | 126.10°W | Install AWS unit |
| 1500 | 84.60°S | 115.60°W | Install AWS unit |
| 1500 | 82.20°S | 113.40°W | Install AWS unit |
| | | **Ross Ice Shelf** | |
| Plunkett Point | 86.1?°S | 167.2?°E | Install AWS unit |
| Byrd Neve | 80.5?°S | 152.??°E | Install AWS unit |
| Ross Ice Edge | 78.??°S | 177.50°E | Install AWS unit |

| | | | |
|---|---|---|---|
| Martha II | 78.38°S | 173.42°W | Reinstall |
| | | High Polar Plateau | |
| Clean Air | 90.00°S | | Install snow temperature |
| | | Antarctic Peninsula | |
| | From the Polar Duke or N.B. Palmer | | |
| Joubin Island | 64.9?°S | 64.0?° | Install AWS for LTER |
| | British Antarctic Survey | | |
| Cape Adams | 75.01°S | 62.53°W | |
| Hugo Island | 64.9°S | 66.0?°W | Install AWS unit for LTER |
| | | Ross Ice Shelf | |
| | 79.0?°S | 158.0?°W | Install AWS unit |
| | 82.0?°S | 158.0?°W | Install AWS unit |
| | 85.0?°S | 158.0?°W | Install AWS unit |
| Siple Dome | 82.0?°S | 150.0?°W | Install AWS unit |
| | | | |
| Cape Colbeck | 77.2?°S | 159.0?°W | Install dog house AWS |
| Mount Vance | 76.2?°S | 140.0?°W | Install dog house AWS |
| Mizuho Station | 70.70°S | 44.33°E | 2230 m Install AWS unit |
| Biscoe Island | 66.0?°S | 63.0?°W | Install AWS unit for LTER |
| Dome F | 77.37°S | 39.61°E | 4000 m Install AWS unit |

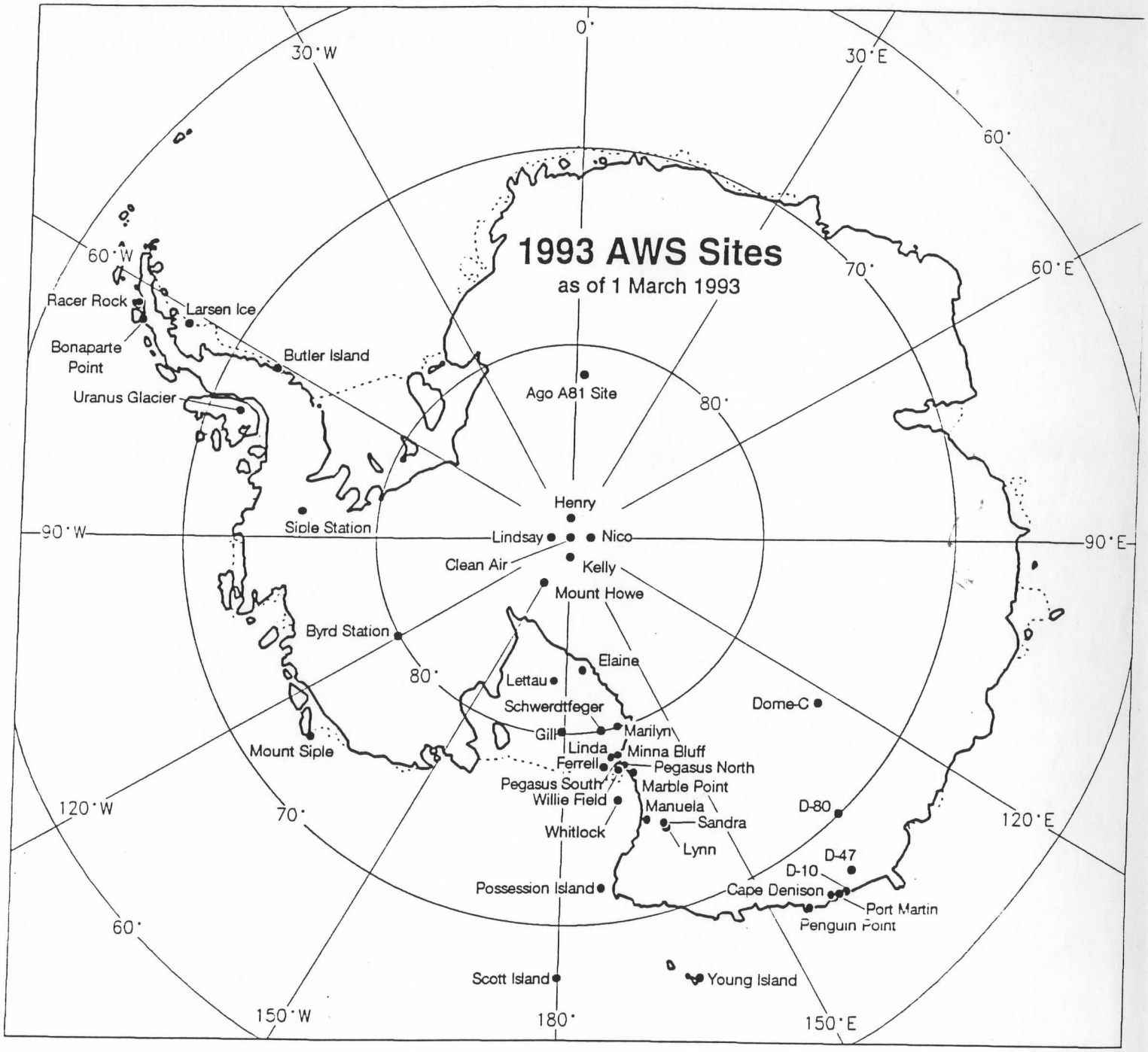


Figure 1. Map of Antarctica showing the locations of widely spaced automatic weather station units for 1993. The Cape Adams AWS site is not shown because the unit could not be found. The D-80 unit is not being received. The Siple Station unit was removed for repairs.

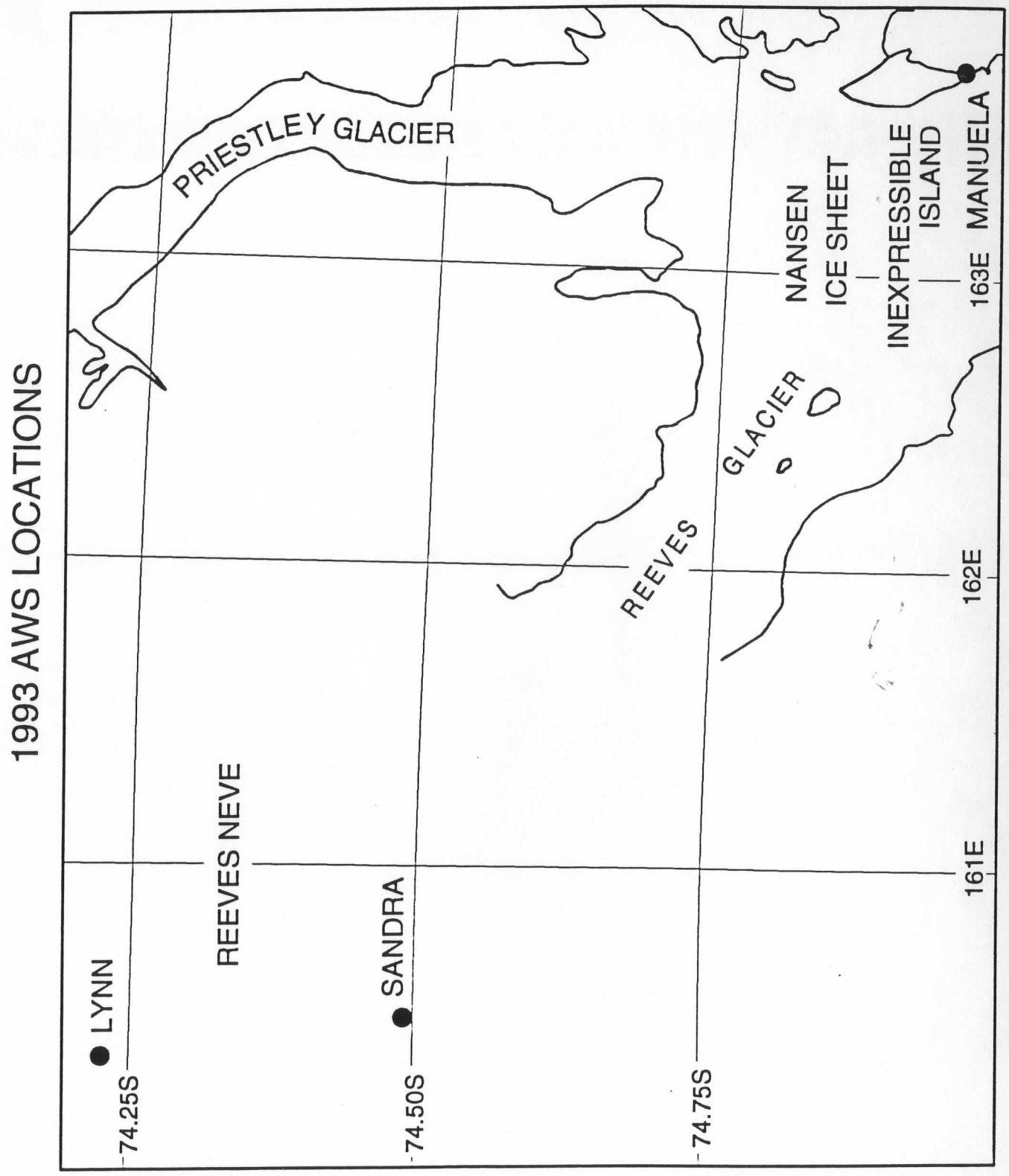


Figure 2. Map of the Reeves Glacier west of Terra Nova Bay showing the 1993 locations for Manuela, Sandra, and Lynn automatic weather station units. Shristi site was removed.

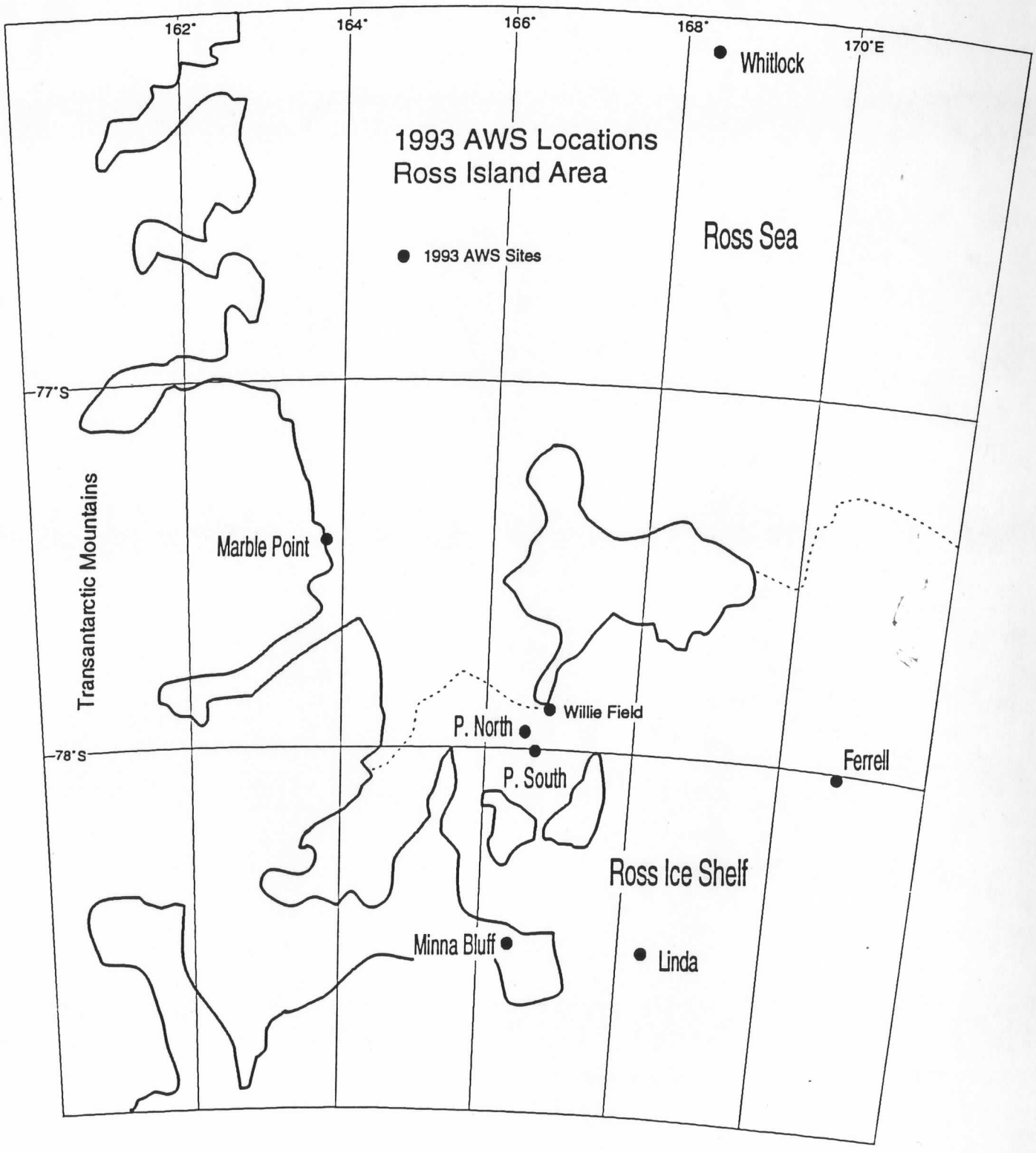


Figure 3. Map of the 1993 locations of the automatic weather stations in the vicinity of Ross Island, Antarctica.