agreed with the secondary standard manufacturer's suggested value within 0.8 parts per million (about 0.2 percent), and were not statistically different from them. For CH_4 the SRM calculated value was higher than the suggested value for the secondary standards by 1–2 percent; however, the uncertainty in the SRM CH_4 mixing ratio value would not allow reassignment to be any more accurate. Therefore, we have not changed the secondary standard values used for generating the CH_4 and CO_2 Palmer Station data.

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Antarctic automatic weather stations, austral summer 1986–1987

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The automatic weather stations (AWS) in Antarctica measure air temperature, wind speed and wind direction at a nominal height of 3 meters above the surface, and air pressure at the electronics enclosure. Some AWS units measure relative humidity and/or the air temperature difference between 3 meters and 0.5 meters above the surface. The AWS unit is controlled by a microcomputer which updates the data at a nominal 10-minute interval and transmits three to five data points for each sensor at a nominal 200-second interval to ARGOS equipped polar orbiting satellites.

The AWS units in Antarctica support the following studies:

- Barrier wind flow along the Antarctic Peninsula and the Transantarctic Mountains.
- Katabatic flow down the Adélie Coast, Byrd Glacier, Beardmore Glacier, and Reeves Glacier.
- Mesoscale circulation on the Ross Ice Shelf.
- Climatology of Byrd Station and Dome C.
- Sensible and latent heat fluxes on the Ross Ice Shelf.
- Oceanographic support.
- Meteorological support for air operations using a local user terminal at McMurdo Station.
- Influence of Amundsen-Scott Station on the local climate.

The table gives the site name, AWS ID, location, and start date for AWS units installed austral summer 1986–1987. Stearns and Weidner (1985, 1986) present similar tables for 1984 and 1985. Figure 1 shows the locations of the AWS units in Antarctica given in the table. The open circles are units which were to be installed during austral summer 1986–1987.

Didier Simone of Expeditions Polaires Françaises replaced AWS 8901 with AWS 8912 at D-10 and repaired the sensor cable. At D-47 and D-57 the AWS electronics were replaced.

The field work for austral summer 1986–1987 included visiting Marilyn site to raise the tower and replace the AWS unit, Patrick and Allison sites to exchange AWS units, Martha site to install an AWS unit, Manuela site to replace the entire station, and Buckle Island in the Balleny Islands to install an AWS unit.

Marilyn site was visited on 10 January 1987 using an LC-130 airplane. The inertial navigation system located the site, and the unit was detected on radar. The aircraft ADF detected the solar-powered beacon. The tower top was approximately 3 feet (0.9 meter) above the snow. The tower was raised 3 meters, and AWS 8915 and a radar reflector were installed. The AWS 8921 had not been received because the Synergetics antenna was broken internally.

On 16 January 1987 Patrick site near South Pole was visited to remove AWS 8905 and install AWS 8901 for testing. A pressure gauge was not installed. The tower was raised and the boom reoriented so that the vane zero was not in the direction of the most frequent wind.

Allison site was visited on 17 January 1987 to replace AWS 8905 with AWS 8921. Two boxes of three gel-cell batteries and a regulator were installed. The tower was reinstalled and the boom was oriented so that zero was not in the most frequent wind direction. The old batteries were returned to McMurdo Station to determine their condition after 1 year at the South Pole.

Ferrell site was visited on 23 January 1987 to replace the aerovane. The bearings had failed on the wind speed ta-

AWS locations for 1987

Location or name	AWS ID	Latitude	Longitude	Elevation (in meters)	Start date
Purpose: Katabatic wind flow; G. Wendler, University of Alaska					
D-10	8912	66.70°S	139.80°E	240	15 Jan 84
D-47	8914	67.38°S	138.72°E	1,560	13 Nov 85
D-57	8916	68.18°S	137.52°E	2,105	17 Nov 85
D-80	8919	70.02°S	134.72°E	2,500	11 Dec 85
Dome C	8904	74.50°S	123.00°E	3,280	13 Jan 83
Purpose: Climatic record; C. Stearns, University of Wisconsin					
Byrd Station	8903	80.00°S	120.00°W	1,530	05 Feb 80
Purpose: NSFA Support network					
Marble Point	8906	77.43°S	163.75°E	120	05 Feb 80
Ferrell	8907	78.02°S	170.80°E	45	10 Dec 80
Whitlock	8913	76.24°S	168.70°E	275	23 Jan 82
Buckle Island	8928	66.87°S	163.24°E	335?	20 Feb 87
Purpose: Ross Ice Shelf network; C. Stearns, University of Wisconsin					
Marilyn	8915	79.98°S	165.03°E	75	16 Jan 84
Schwerdtfeger	8924	79.57°S	169.45°E	60	24 Jan 85
Gill	8925	80.00°S	179.00°W	55	24 Jan 85
Elaine	8911	83.15°S	174.46°E	60	28 Jan 86
Lettau	8908	82.59°S	174.27°W	55	29 Jan 86
Martha II	8900	78.38°S	173.42°W	18	11 Feb 87
Purpose: Katabatic flows; Bromwich and Parish, Ohio and Wyoming					
Manuela	8905	74.92°S	163.60°E	80	06 Feb 84
Purpose: Barrier wind, Antarctic Peninsula; C. Stearns, U. of Wisconsin					
Larsen Ice	8926	66.97°S	60.55°W	17	01 Jan 86
Dollman Island	8917	70.58°S	60.92°W	396	18 Feb 86
Butler Island	8902	72.20°S	60.34°W	91	01 Mar 86
Uranus Glacier	8920	71.43°S	68.93°W	780	06 Mar 86
Purpose: South Pole Station influence, A. Hogan, State Univ. of NY					
Clean-air fac.	8918	90.00°S	—	2,835	19 Jan 86
Patrick	8921	89.88°S	45.00°E	2,835	28 Jan 86
Allison	8901	89.88°S	60.00°W	2,835	28 Jan 86
Purpose: Testing					
Jimmy	8927	77.87°S	166.81°E	200	01 Feb 87

chometer. This was the first confirmed failure of a Belfort aerovane and the first failure of the tachometer on any aerovane. A solar powered beacon transmitting at 235.8 millihertz was installed.

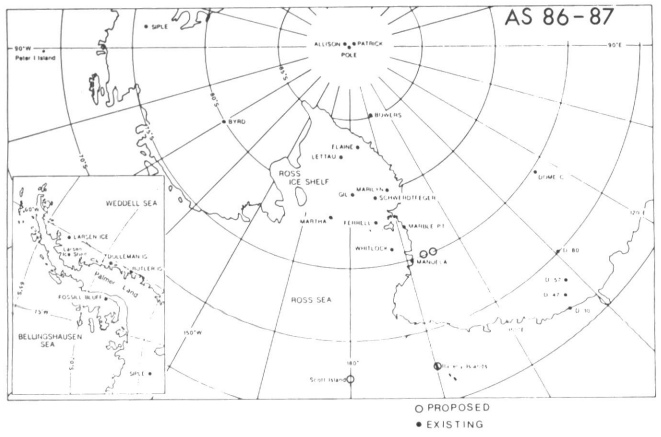

Figure 1. Map of Antarctica showing the locations of automatic weather station units for 1987. Bowers and Martha I are not operating properly and are not listed in the table.

On 28 January 1987 a second trip was made to Ferrell site to install the AWS 8907 and a second beacon transmitting at 235.05 millihertz.

Tom Parish and Ken Waight arrived to help with the planned installations on the Reeves Glacier. The trip was cancelled because of changes in the *Polar Sea* schedule. Instead, AWS 8927 was installed near McMurdo Station at Jimmy site on Star Glacier for testing of a Belfort aerovane. On 2 February 1987 Weidner, Parish, and Waight returned to Christchurch. C. Stearns boarded the *Polar Sea* for Science Cruise II.

A helicopter search was made for Martha site but due to scattered clouds and the resulting poor visibility the site was not found, so AWS 8900 was installed nearby and named Martha II.

After the *Polar Sea* cruise along the Ross Ice Shelf, sufficient time remained to visit Manuela site at Inexpressible Island. The tower was down and the second Belfort aerovane with failed wind speed tachmoter bearings was found. The tower was installed at a height of 1.5 meters. The boom's 180° end was pointed up the Reeves Glacier and AWS 8905 was installed. Another anchor to the north was put on the tower. The aerovane wind speed failed 30 April 1987.

On the *Polar Sea* return trip to Sydney, Australia, AWS 8928 was installed on Buckle Island in the Ballenys. The islands were

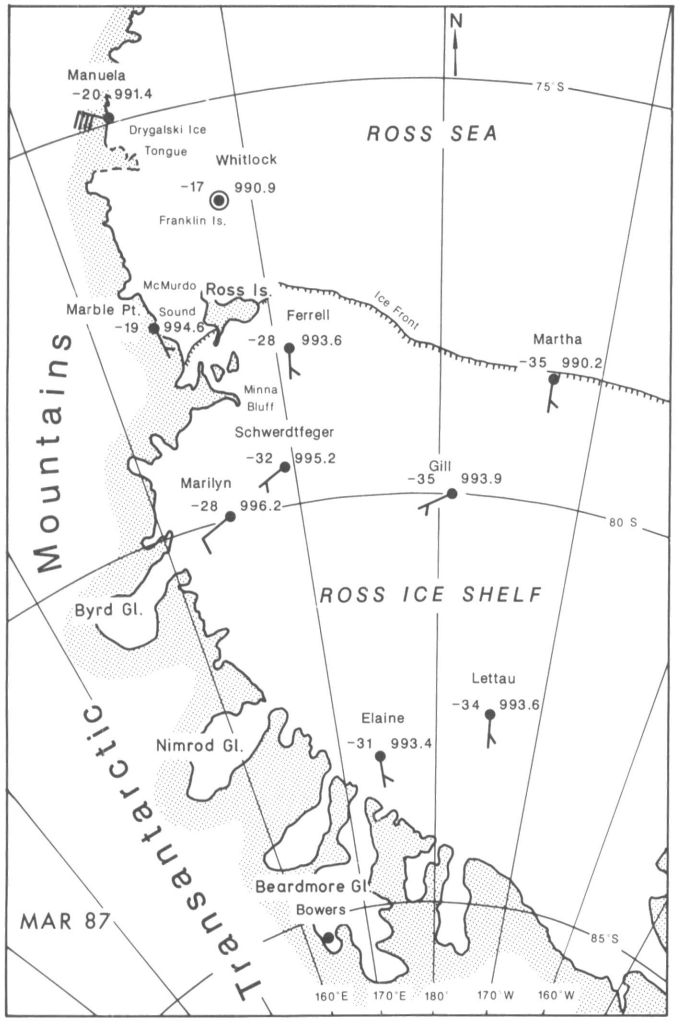

Figure 2. Mean temperature, pressure, and resultant winds on the Ross Ice Shelf for March 1987.

shrouded by clouds. Fortunately, the south end of Buckle Island had sufficient ceiling so that a helicopter landing could be made. AWS 8928 was installed with a boom height of 1.5 meters. The aerovane wind speed and direction had stopped working as of 1 May 1987 and were operating again on 30 June 1987. The aerovane may have been covered with ice. It may be a mistake to install any wind instrument on the Balleny Islands.

Figure 2 represents the climate summary for March 1987 for the Ross Ice Shelf. The temperatures and sea-level pressures are the monthly means while the wind data is the resultant wind for the month. The outflow from the Byrd Glacier is clearly evident at Marilyn and Schwerdtfeger sites. The higher sea-level pressures near the Transantarctic Mountains support a barrier wind flow. Initial analysis indicates that March 1987 was on the order of 7°–10°C colder over the central Ross Ice Shelf than March 1986.

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