Antarctic Automatic Weather Stations
Field Report for 2000-2001

Jonothan Thom
Rob Flint
David Otani
George Weidner
Charles R. Stearns

Space Science and Engineering Center
University of Wisconsin - Madison
Madison, Wisconsin 53706

The National Science Foundation's Office of Polar Programs funds the placement of automatic weather station (AWS) units in remote areas in Antarctica in support of meteorological research, applications and operations. The basic AWS units measure air temperature, wind speed and direction at a nominal height of 3 meters above the surface. Air pressure is measured at the height of the electronic's enclosure. Some units measure relative humidity at 3 meters above the surface and the air temperature difference between .5 and 3 meters above the surface at the time of installation. The data are collected by the ARGOS Data Collection System (DCS) on board the National Oceanic and Atmospheric Administration (NOAA) series of polar-orbiting satellites.

The AWS units are located in arrays for specific proposals and at other sites for operational purposes. Any one AWS may support several experiments and all support operational meteorological services - especially support for weather forecasts for aircraft flights.

Research areas supported include

- Barrier wind flow along the Antarctic Peninsula and the Transantarctic Mountains
- Katabatic wind flow down the Reeves, Byrd and Beardmor Glaciers, the Siple and Adelie Coast
- Mesoscale circulation and sensible and latent heat fluxes on the Ross Ice Shelf
- Climatology of Byrd and Dome C sites
- Meteorological support around the South Pole
- Meteorological support for the West Antarctic Ice Sheet Initiative and the International Trans-Antarctic Scientific Expedition
- Long Term Ecological Research (LTER) along the Antarctic Peninsula
- Meteorlogical support for United States Antarctic Program flight operations

The following are supported principal investigators funded by NSF-OPP.

Dr. Douglas R. MacAyeal: Iceberg Drift in the Near-Shelf Environment, Ross Ice Shelf, Antarctica.
Dr. Gerd Wendler, Katabatic Winds: D-10, D-47, D-57, D-80, Dome C II, Port Martin, Cape Denison, Penguin Point, Sutton, and Cape Webb.
Dr. David Bromwich, Siple Coast Katabatic Winds: Byrd Station, Brianna, Elizabeth, J.C., Erin, Harry, Theresa, Doug, and Swithinbank.
Dr. Ray Smith, Long Term Ecological Research: Racer Rock, Bonaparte Point, and Santa Claus Island.
Dr. David Bromwich, Research on Ocean-Atmosphere Variability and Ecosystem Response in the Ross Sea: Marble Point, Whitlock, Manuela, Scott Island, Young Island, Possession Island.
West Antarctic Ice Sheet Initiative and International Trans Antarctic Scientific Expedition: Siple Dome and Noel, installed in 1999/2000 field season. Siple Dome site is equipped with snow temperature profiles .
Aircraft Operation: All AWS sites in Antarctic.

The Antarctic AWS units support many investigators outside of NSF-OPP.

Field work completed for 2001-2002

For the 2001-2002 field season, our field team consisted of Dr. Chris Shuman, George Weidner Doug MacAyeal, Andrew Bliss and Jonothan Thom who serviced AWS in West Antarctica, Mcmurdo area and on the Icebergs B-15A.

A. McMurdo based operations

Site	ARGOS ID	Service performed at site
Pegasus North	21357	SPAWAW serviced AWS
Windless Bight	8927	AWS tower raised
Minna Bluff	8935	New AWS antenna installed
Williams Field	21364	New batteries installed
Cape Spencer	8695	New AWS installed
B-15A	30305	Update AWS software
B-15A	30504	Update AWS software
B-15A	30580	Update AWS software
B-16	15930	Install AWS

B. West Antarctic based operaiton

Site	ARGOS ID	Service performed at site
Byrd Station	8903	Restarted AWS
Noel	8936	Removed AWS unit
Swithinbank	21355	Replaced AWS
Brianna	8931	Replaced AWS
Doug	8922	AWS not found

C. Field work in Adelie Land
No field work

D. Field work by the Japanese Antarctic Research Expedition

Site	ARGOS ID	Service performed at site
Dome Fuji	8904	Installed new AWS

E. Service performed by Long Term Ecological Research group

F. AWS operations by British Antarctic Survey

G. AWS operations by GLOBEC group

Site	ARGOS ID	Service performed at site
Kirkwood	8930	Install AWS
Dismal Island	8932	Install AWS

The current list of AWS (not including AWS currently deployed on B-15Aand C-16) is given in the Table 1, by geographic area, Table 2, by Argos ID, and Table 3, by GTS umber. Figures 1-5 at the end of this report show the AWS locaitons by region. Sites with three digits after the decimal point in the latitude and longitude were located using the ARGOS positions for a three day period, aircraft GPS, or hand held GPS.

Table 1. The 2001 Antarctic automatic weather station site name, ARGOS identification number, latitude, longitude, altitude above sea level, site start date and WMO number for the Global Telecommunications System.

Site	ARGOS ID	Lat. (deg)	Long. (deg)	Alt. (m)	Date Start	WMO#
Adelie Coast						
D-10	8914	66.71°S	139.83°E	243	Jan 80	89832
D-47	8986	67.397°S	138.726°E	1560	Nov 82	89834
D-57		68.199°S	137.538°E	2105	Jan 96	
D-80		70.040°S	134.878°E	2500	Jan 83	89836
Dome C II	8989	75.121°S	123.374°E	3250	Dec 95	89828
Port Martin	8909	66.82°S	141.40°E	39	Jan 90	
Cape Denison	8988	67.009°S	142.664°E	31	Jan 90	
Penguin Point	8910	67.617°S	146.180°E	30	Dec 93	89847
Cape Webb		67.943°S	146.812°E	60?	Dec 94	
West Antarctica						
Byrd Station	8903	80.007°S	119.404°W	1530	Feb 80	89324
Brianna	#8931	83.889°S	134.154°W	@+525	Nov 94	
Elizabeth	21361	82.607°S	137.078°W	@519	Nov 94	89332
J.C.		85.070°S	135.516°W	549	Nov 94	
Erin	21363	84.904°S	128.828°W	@990	Nov 94	
Harry	8900	83.003°S	121.393°W	945	Nov 94	
Theresa	21358	84.599°S	115.811°W	1463	Nov 94	89314
Doug	8922	82.315°S	113.240°W	1433	Nov 94	
Mount Siple	8981	73.198°S	127.052°W	230	Feb 92	89327
Siple Dome	8938	81.656°S	148.773°W	@668	Jan 97	89345
Swithinbank*	#21355	81.201°S	126.177°W	@+959	Jan 97	
Noel/ITASE		79.334°S	111.077°W	@+1833	Jan 00	
Ross Island Region						
Marble Point	8906	77.439°S	163.754°E	@108	Feb 80	89866
Ferrell	8929	77.910°S	170.817°E	45	Dec 80	89872
Pegasus North	21357	77.952°S	166.500°E	@8	Jan 90	89667
Pegasus South	8937	77.990°S	166.576°E	10	Jan 91	
Minna Bluff	8935	78.555°S	166.691°E	@+895	Jan 91	89768
Linda	8919	78.464°S	168.382°E	@47	Jan 91	89769
Willie Field	21364	77.865°S	167.017°E	40	Jan 92	
Windless Bight	8927	77.728°S	167.703°E	61	Nov 98	
Cape Spencer*	#8695	77.97°S	167.55°E	30?	Jan 99	
Herbie Alley*	8697	78.10°S	166.67°E	30?	Jan 99	
Cape Bird	8901	77.224°S	166.440°E	@42	Jan 99	
Laurie II*	21360	77.549 °S	170.817 °E	30	Jan 00	
Ocean Islands						
Whitlock	#8907	76.144°S	168.392°E	274	Jan 82	89865
Scott Island		67.37°S	179.97°W	30	Dec 87	89371
Young Island		66.229°S	162.275°E	30	Jan 91	89660
Possession Is.	8984	71.891°S	171.210°E	30	Dec 92	89879
Manuela	8905	74.946°S	163.687°E	80	Feb 84	89864
Ross Ice Shelf						
Marilyn	#8934	79.954°S	165.130°E	75	Jan 84	89869
Schwerdtfeger	8913	79.904°S	169.973°E	60	Jan 85	89868
Gill	8911	79.985°S	178.611°W	55	Jan 85	89376
Elaine	8915	83.134°S	174.169°E	60	Jan 86	89873
Lettau	8908	82.518°S	174.452°W	55	Jan 86	89377
Antarctic Peninsula						
Larsen Ice	8926	66.949°S	60.897°W	17	Oct 85	89262
Butler Island	8902	72.207°S	60.160°W	91	Mar 86	89266
Uranus	8920	71.43°S	68.93°W	780	Mar 86	89264
Limbert	8925	75.422°S	59.851°W	40	Dec 95	89257
Racer Rock	8947	64.067°S	61.613°W	17	Nov 89	89261
Bonaparte Point	8923	64.778°S	64.067°W	8	Jan 92	89269
Ski-Hi	8917	74.792°S	70.488°W	1395	Feb 94	89272
Santa Claus I	8933	64.964°S	65.670°W	25	Dec 94	
High Polar Plateau						
Clean Air	8987	90.00°S		2835	Jan 86	89208
Henry	8985	89.011°S	1.025°W	2755	Jan 93	89108
Nico	8924	89.000°S	89.669°E	2935	Jan 93	89799
Relay Station	8918	74.017°S	43.062°E	3353	Feb 95	89744
Dome Fuji	#8904	77.31°S	39.70°E	3810	Feb 95	89734
Mizuho	21359	70.70 °S	44.29°E	2260	Oct 00	

New ARGOS ID at the site for 2002: @UNAVCO GPS Location: and Elevation. ,@+updated this year

Table 2. The 2000 Antarctic automatic weather station site name, ARGOS identification number, latitude, longitude, altitude above sea level, site start date and WMO number for the Global Telecommunications System.

Site	ARGOS ID	Lat. (deg)	Long. (deg)	Alt. (m)	Date Start	WMO#
	8695					
Cape Spencer*	8697	77.971°S	167.160°E	30?	Jan 99	
Herbie Alley*	8722	78.10°S	166.67°E	30?	Jan 99	
Harry	8900	83.003°S	121.393°W	945	Nov 94	
Cape Bird	8901	77.224°S	166.440°E	@42	Jan 99	
Butler Island	8902	72.207°S	60.160°W	91	Mar 86	89266
Byrd Station	8903	80.007°S	119.404°W	1530	Feb 80	89324
Dome Fuji	#8904	77.31°S	39.70°E	3810	Feb 95	89734
Manuela	8905	74.946°S	163.687°E	80	Feb 84	89864
Marble Point	8906	77.439°S	163.759°E	@120	Feb 80	89866
Whitlock	#8907	76.144°S	168.392°E	274	Jan 82	89865
Lettau	8908	82.518°S	174.452°W	55	Jan 86	89377
Port Martin	8909	66.82°S	141.40°E	39	Jan 90	
Penguin Point	8910	67.617°S	146.180°E	30	Dec 93	89847
Gill	8911	79.985°S	178.611°W	55	Jan 85	89376
	8912					
Schwerdtfeger	8913	79.904°S	169.973°E	60	Jan 85	89868
D-10	8914	66.71°S	139.83°E	243	Jan 80	89832
Elaine	8915	83.134°S	174.169°E	60	Jan 86	89873
	8916					
Ski-Hi	8917	74.972°S	70.488°W	1395	Feb 94	89272
Relay Station	8918	74.017°S	43.062°E	3353	Feb 95	89744
Linda	8919	78.480°S	168.375°E	50	Jan 91	89769
Uranus	8920	71.43°S	68.93°W	780	Mar 86	89264
	8921					
Doug	8922	82.315°S	113.240°W	1433	Nov 94	
Bonaparte Point	8923	64.778°S	64.067°W	8	Jan 92	89269
Nico	8924	89.000°S	89.669°E	2935	Jan 93	89799
Limbert	8925	75.422°S	59.948°W	40	Dec 95	89257
Larsen Ice	8926	66.949°S	60.897°W	17	Oct 85	89262
Windless Bight	8927	77.728°S	167.703°E	61	Nov 98	
	8928					
GLOBEC	8930					
	8931					
GLOBEC	8932					
Santa Claus I	8933	64.964°S	65.670°W	25	Dec 94	
Marilyn	#8934	79.954°S	165.130°E	75	Jan 84	89869
Minna Bluff	8935	78.554°S	166.656°E	920	Jan 91	89768
Noel/ITASE*	8936	79.334°S	111.077°W	@1833	Jan 00	
Pegasus South	8937	77.990°S	166.576°E	10	Jan 91	
Siple Dome	8938	81.656°S	148.773°W	620	Jan 97	89345
Sutton	8939	67.08°S	141.37°E	871	Dec 94	
Racer Rock	8947	64.067°S	61.613°W	17	Nov 89	89261
Young Island	8980	66.229°S	162.275°E	30	Jan 91	89660
Mount Siple	8981	73.198°S	127.052°W	230	Feb 92	89327
	8982					
Scott Island	8983	67.37°S	179.97°W	30	Dec 87	89371
Possession Is.	8984	71.891°S	171.210°E	30	Dec 92	89879
Henry	8985	89.011°S	1.025°W	2755	Jan 93	89108
D-47	8986	67.397°S	138.726°E	1560	Nov 82	89834
Clean Air	8987	90.00°S		2835	Jan 86	89208
Cape Denison	8988	67.009°S	142.664°E	31	Jan 90	
Dome C II	8989	75.121°S	123.374°E	3250	Dec 95	89828
Test USA	9116					
	21355					
Swithinbank	21356	81.200°S	126.174°W	945	Jan 97	
Pegasus North	21357	77.952°S	166.500°E	@8	Jan 90	89667
Theresa	21358	84.599°S	115.811°W	1463	Nov 94	89314
Mizuho	#21359	70.70°S	44.29°E	2260	Oct 00	
Laurie II*	#21360	77.549°S	170.817°E	30	Jan 00	
Elizabeth	21361	82.606°S	137.082°W	549	Nov 94	89332
Brianna	21362	83.887°S	134.145°W	549	Nov 94	
Erin	21363	84.901°S	128.810°W	1006	Nov 94	
Willie Field	#21364	77.865°S	167.017°E	40	Jan 92	

New ARGOS ID at the site for 2001: @UNAVCO GPS Location: and Elevation:

Table 3. The 2000 Antarctic automatic weather station site name, ARGOS identification number, latitude, longitude, altitude above sea level, site start date and WMO number for the Global Telecommunications System in the order of the WMO number. Sites with three digits after the decimal point in the latitude and longitude were located using the ARGOS positions for a three day period, aircraft GPS, or hand held GPS.

Site	ARGOS ID	Lat. (deg)	Long. (deg)	Alt. (m)	Date Start	WMO#
Henry	8985	89.011°S	1.025°W	2755	Jan 93	89108
Clean Air	8987	90.00°S		2835	Jan 86	89208
Limbert	8925	75.422°S	59.948°W	40	Dec 95	89257
Racer Rock	8947	64.067°S	61.613°W	17	Nov 89	89261
Larsen Ice	8926	66.949°S	60.897°W	17	Oct 85	89262
Uranus	8920	71.43°S	68.93°W	780	Mar 86	89264
Butler Island	8902	72.207°S	60.160°W	91	Mar 86	89266
Bonaparte Point	8923	64.778°S	64.067°W	8	Jan 92	89269
Ski-Hi	8917	74.972°S	70.488°W	1395	Feb 94	89272
Theresa	21358	84.599°S	115.811°W	1463	Nov 94	89314
Byrd Station	8903	80.007°S	119.404°W	1530	Feb 80	89324
Mount Siple	8981	73.198°S	127.052°W	230	Feb 92	89327
Elizabeth	21361	82.607°S	137.078°W	@519	Nov 94	89332
Siple Dome	8938	81.656°S	148.773°W	@608	Jan 97	89345
Scott Island	8983	67.37°S	179.97°W	30	Dec 87	89371
Gill	8911	79.985°S	178.611°W	55	Jan 85	89376
Lettau	8908	82.518°S	174.452°W	55	Jan 86	89377
Young Island	8980	66.229°S	162.275°E	30	Jan 91	89660
Pegasus North	21357	77.952°S	166.505°E	@8	Jan 90	89667
Dome Fuji	#8904	77.31°S	39.70°E	3810	Feb 95	89734
Relay Station	8918	74.017°S	43.062°E	3353	Feb 95	89744
Minna Bluff	8935	78.554°S	166.656°E	920	Jan 91	89768
Linda	8919	78.480°S	168.375°E	50	Jan 91	89769
Nico	8924	89.000°S	89.669°E	2935	Jan 93	89799
Dome C II	8989	75.121°S	123.374°E	3250	Dec 95	89828
D-10	8914	66.71°S	139.83°E	243	Jan 80	89832
D-47	8986	67.397°S	138.726°E	1560	Nov 82	89834
D-80		70.040°S	134.878°E	2500	Jan 83	89836
Penguin Point	8910	67.617°S	146.180°E	30	Dec 93	89847
Manuela	8905	74.946°S	163.687°E	80	Feb 84	89864
Whitlock	#8907	76.144°S	168.392°E	274	Jan 82	89865
Marble Point	8906	77.439°S	163.759°E	08	Feb 80	89866
Schwerdtfeger	8913	79.904°S	169.973°E	60	Jan 85	89868
Marilyn	#8934	79.954°S	165.130°E	75	Jan 84	89869
Ferrell	#8929	77.910°S	170.817°E	45	Dec 80	89872
Elaine	8915	83.134°S	174.169°E	60	Jan 86	89873
Possession Is.	8984	71.891°S	171.210°E	30	Dec 92	89879

New ARGOS ID at the site for 2001: @UNAVCO GPS Location: and Elevation:

Plans for June 1, 2002 through July 31, 2003

A. AWS Operations based from McMurdo

1. Installations
   No new installations are planned at this time.

2. AWS servicing
   AWS sites will be serviced as needed

B. AWS operations from the icebreaker.

1. The following AWS sites will be visited for instaling an AWS with high wind speed and direction units from HydroTech Inc.

Site	ARGOS ID	Lat.	Long	Elev (M)
Cape Webb		67.934°S	146.824°E	37

C. AWS operations in West Antarctica

1. The following AWS sites will be serviced as necessary. Some sites may be moved.

Site	ARGOS ID	LAT	LONG	ELEV (M)
Byrd Station	8903	80.007°S	119.404°W	1530
Brianna	21362	83.887°S	134.145°W	549
Elizabeth	21361	82.606°S	137.082°W	549
Erin	21363	84.901°S	128.810°W	1005
Harry	21355	83.003°S	121.393°W	945
Theresa	21358	84.599°S	115.811°W	1460
Doug	8922	82.315°S	113.240°W	1433
Mount Siple	8981	73.198°S	127.052°W	230
Siple Dome	8900	81.656°S	148.773°W	620
Swithinbank	21356	81.200°S	126.174°W	945
Noel	8936	79.334 °S	111.077 °W	1833

D. Tentative field work supported by the Institut Francais Pour la Recherche et la Technologie Polaires (IFRTP) at Dumont D'Urville.

1. Two installations are planned with other sites to be serviced as necessary.

AWS Site		ARGOS ID	Lat. (deg)	Long. (deg)	Alt (m)
D-57	Install	AWS 8912	68.199°S	137.538°E	2105
D-80	Install	AWS 8916	70.040°S	134.878°E	2500

E. Tentative Field work by the Japanese Antarctic Expedition from Dome Fuji

1. Install AWS 8904 at Dome Fuji Site

F. AWS field work to be done by the British Antarctic Survey at Rothera Station.

1. Service AWS sites as necessary

G. AWS operations based at Palmer Station for LTER support

1. Provide replacemnt RM Young 05103 AWS for 8923 .
2. Provide replacement AWS for Hugo Island AWS 8933

H. AWS operaitons in support of Iceberg studies

1. Install 2 GPS-AWS units on an iceberg

2. AWS Operations over the next grant cycle from 1 July 2001 to 1 July 2004.

Deployment of Next-Generation AWS

The current National Science Foundation (NSF) funded Antarctic Automatic Weather Station Program relies on an AWS that was designed 20 years ago. This design has proven to be very reliable, however, critical components are no longer available. The proposed project is intended to deploya replacement AWS designated AWS3A. A separate proposal has been submitted entitled ***Design and Fabrication of a Prototype Next-Generation Polar Automatic Weather Station.*** Specific objectives of the proposal are the design of a new generation automatic weather station (AWS) that will (1) be capable of operating in the harsh polar environment, (2) be capable of transmitting data as an Argos-certified platform terminal transmitter (PTT) to the various polar-orbiting satellites that have the Argos receiver onboard, (3) consume much less power than the current AWS and (4) be highly flexible in its ability to interface with many different sensors and (5) be competitive econimically with the commercial data loggers currently available.

The new design will take advantage of the many advances in microprocessors and integrated circuits that have occurred since the current AWS was designed in the 1970's. Major advances include (1) much lower power requirements, (2) greatly reduced component size, (3) more processing power, and (4) many more functions on a single integrated circuit. The new AWS will also anticipate the Argos 3 satellite platform (**Argos newsletter No. 54, 1999**) that will allow for two-way communication between the satellite and the AWS.

The new AWS design will be compatible with all atmospheric sensors used by the current AWS. Additional sensor configurations (including smart sensors) will be possible with the use of additional input/output (I/O) circuits. Flexible data sampling intervals will be selected by the AWS3A's system software as is presently the case for current AWS2B. The first year request is for three of the new AWS3A units to be constructed. The unit costs are significantly reduced from that of the current AWS since we will reuse some major components (e.g. the pressure gauge) in the new AWS. If the above proposal isn't funded then we would use a commercially available data logging system that has a proven record of operating in polar regions. We would loose some flexibility in selecting other sensors and components and in having control of the data processing sofware.

Proposed AWS Operations

1. West Antarctica sector

The region of the Earth from the South Pole to 30^{o}S along 85^{o}W then to 175^{o}W then to the South Pole remains the largest meteorological void for surface observations by manned stations. A dog house AWS unit should be installed on Peter I island (69^{o}S, 91^{o}E) to provide pressure and temperature data. Past experience has shown that wind systems on islands like Peter I will last only a few weeks. The dog house AWS has the batteries, AWS electronics and pressure guage, and antenna located inside a small dog house that weighs about 300 kg. The dog house can be carried as a sling load by the Coast Guard helicopters and deposited at locations where the helicopter cannot land. Dog house AWS units are currently installed at Young, Possession, and Scott Islands and at Mt. Siple. The batteries will operate the unit for several years and a solar panel is installed to charge the batteries. The installation at Peter I island is dependent on the availability of the Coast Guard helicopter to make the installation. The dog house AWS box is at McMurdo, Antarctica waiting for the opportunity.

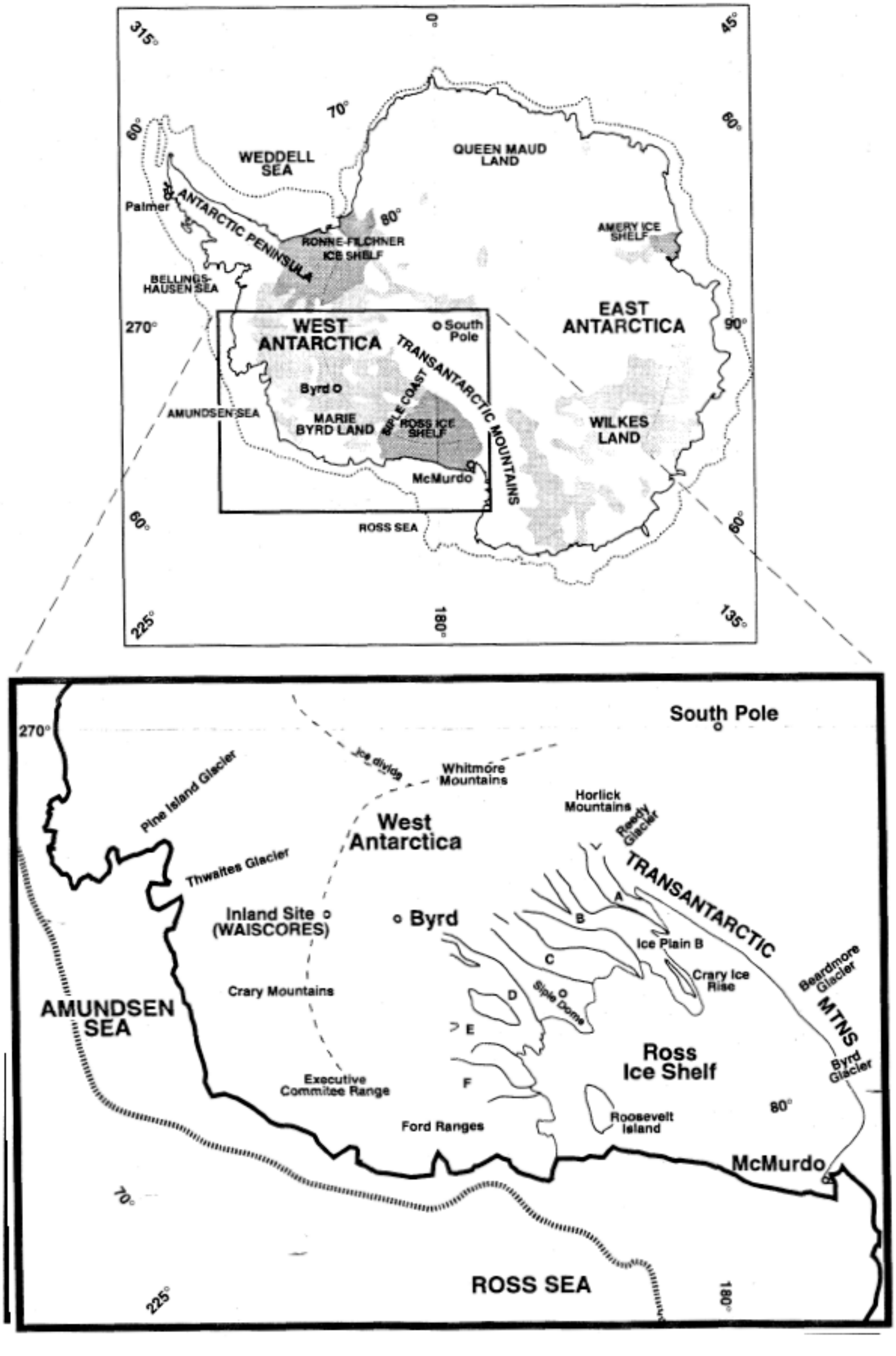
WAIS/ITASE Meteorological Support

The ongoing WAIS/ITASE programs seek to obtain high resolution ice core glaciochemical records from sites in West Antarctica. These records can provide indirect information on past atmospheric circulation patterns over West Antarctica (Mayewski et al., 1997). We propose to make use of the ITASE as an opportunity to place AWS at locations in West Antarctica in order to provide a more complete picture of the current atmospheric circulation over West Antarctica. Previous work (Bromwich, 1990) has show that approximately 40% of the moisture flux to Antarctica is through West Antacrtica. This is observed in the video of three-hourly composites of satellite imagery generated by the AMRC (Stearns et al., 1999) and in the records from AWS already deployed in West Antarcitca. Thus, understanding the atmospheric cirulation over West Antarctica is essential to understanding the masss balance of the Antarctic ice sheets. It is anticipated that two AWS will be needed each year, to be placed at selected sites along the traverse route.

Meteorological support for WAIS (Bindschadler, 1996) and ITASE (Mayewski, 1996) in West Antarctica has already begun with the installation of an AWS unit at a possible ice core drilling site at West Antarctic Dome (Noel site Table 1, Figure 2). Additional sites will be selected partly based on observed accumulation differences around the dome. The differences in annual snow accumulation may reflect differences in the wind fields and associated moisture advection at each site. The Greenland Crest showed significant differences in the wind field around the crest (Stearns et al., 1997b). The monthly resultant wind direction on the west side of the Greenland Crest was from the south and along the contours while on the east side of the crest the monthly resultant wind direction was from the northwest and across the contours downslope. The annual resultant wind direction at Byrd Station is from the north while the Siple Station annual resultant wind direction is from the south. The three AWS sites around South Pole show annual resultant wind directions along 120^oW to 150^oW essentially towards Byrd Station. There are significant differences in the annual resultant wind direction over distance of approximately 1000 km. Sufficient AWS units need to be installed in West Antarctica to resolve the surface wind fields . The traverses planned by ITASE for subsequent years will help determine the location and timing of additional AWS units.

Additional AWS sites in West Antarctica that would provide valuable data for real time analysis and for initializing models used in operational weather forecasting for Antarctcia are at Peter I Island and sites along the coasts of Ellsworth Land and Marie Byrd Land. Recent work (Bromwich, et al., 2000) has indicated that the mosisture flux convergence as determined by operational numerical analyses from the European Centre for Medium-Range Weather Forecasts (ECMWF) in the sector west of 105^oW to the Ross Sea demonstates a significant relation to the SOI.

Installation of AWS at these sites would depend on future icebreaker cruises or a cooperative agreement with another country's antarctic program. An AWS unit proposed for Thurston Island (or Pine Island Bay) could be either a dog house AWS (pressure and temperature) or a conventional AWS unit. The choice will depend upon conditions at Pine Island Bay such as the annual snow accumulation and the build up of ice or hoar frost on sensors.


315°
0°
45°
70°
60°
WEDDELL SEA
QUEEN MAUD LAND
Palmer
ANTARCTIC PENINSULA
80°
RONNE-FILCHNER ICE SHELF
AMERY ICE SHELF
BELLINGS-HAUSEN SEA
EAST ANTARCTICA
270°
WEST ANTARCTICA
South Pole
90°
TRANSANTARCTIC MOUNTAINS
Byrd
SIPLE COAST
AMUNDSEN SEA
MARIE BYRD LAND
ROSS ICE SHELF
WILKES LAND
McMurdo
ROSS SEA
225°
180°
135°
South Pole
Ice divide
Whitmore Mountains
Pine Island Glacier
Horlick Mountains
West Antarctica
Reedy Glacier
Thwaites Glacier
TRANSANTARCTIC
Inland Site (WAISCORES)
Byrd
A
B
Ice Plain B
C
Crary Ice Rise
Beardmore Glacier
Crary Mountains
D
Siple Dome
MTNS
AMUNDSEN SEA
E
Ross Ice Shelf
Byrd Glacier
Executive Commitee Range
F
80°
Roosevelt Island
Ford Ranges
McMurdo
70°
ROSS SEA
225°
180°

2. East Antarctic Sector

AWS in support of Katabatic wind study

The proposed porgram will continue to support OPP funded studies of the katabatic winds along the Adelie Coast, by deploying AWS that make use of special wind sensors that are capable of withstanding the extremely high winds observed there (Wendler et al., 1997). The AWS deployed from Dumont D'Urville to Dome C will be maintainde via a cooperative program with the French polar program,
(IFTRP). Since, this proposal reduces the number of personnel from previous years, it is proposed that any NSF-funded project provide personnel to service the AWS along the Adelie Coast. Such personnel could receive traning at the Space Science and Engineering Center prior to the annual icebreaker cruise along the Adelie Coast.

JARE meteorological suppor

The proposed program will continue to deploy AWS in east Dronning Maud Land, Antarctica through a cooperative arrangement with Japanese Antarctic Research Expedition (JARE). These AWS are in support of a Deep Ice Coring Project at Demo Fuji (Kameda et al., 1997) and provide data in an area of Antarctica with few routine observations. As in West Antarctica, knowledge of the current atmospheric circulation around Dome Fuji will help interpret the glaciochemical record of the ice cores. It is porposed to set up an array of AWS around Dome Fuji similar to the array set up around the Greenland Ice Sheet Project (GISP) ice coring site at the summit of Greenland (Stearns et al. 1997). AWS data from the Dome Fuji AWS shows similar warming events during the winter months that were observed at the AWS site on the summit of Greenland (Takahashi et al., 1998).

AWS in support of LTER at Palmer Station

The proposed program will continue to support the Long Term Ecological Research (LTER) program at Palmer Station by supplying AWS capable of measuring water temperature along with the standard meteorological variables. These AWS ar located at Bonaparte Point and on Santa Claus Island and an additional site on Racer Rock (Table 1 and Figure 1). Special enclosures were constrcted to withstand the marine environment. However, it is proposed to further modify the sensor array in order to improve its ability to function in the marine environment. This project would submit a SIP for ship time to service the AWS , but due to the recuction in personnel from previous funded proposals, it is porposed that personnel from Palmer Station or a NSF-funded LTER programs service the AWS. If necessary, they could be trained at SSEC prior to the field season.

AWS for East Antarctic Plateau

There remain some significant meteorological data void areas on the high plateau of East Antarctica. It is proposed to take advantage of a planned ITASE traverse from Dome Concordia station to Dome Fuji through Dome A (Dome A has the highest elevation in Antarctica) by a joint French and Italian team in the near future. This traverse is tentatively planned to begin in the 2002/2003 field season and take up to four years to complete. The AWS will again support the ice coring operations as well as provide valuable surface meteorological data that can provide more data for meteorological analysis and enable better initializations for models used for operational weather forecasting. As noted previously, theseAWS will also serve as"ground truth" for the coming generation of satellite sounders. . It is proposed that if adequate resources are availabel, independent AWS be placed at the AGO sites (Figure) .The AGO platform has not proven reliable enough to ensure the availability of meteorological data. At the recent Antarctic Weather Forecasting workshop, it was noted that the interior of East Antarctica shows much variability in temperature trends and that it is likely that the climate has more local variability than is supposed (Wendler, 2000). Recent work (Neff, 1999) has documented the relation of the ozone hole to the delay in the transistion fro winter to spring (e.g. formation of the tropopause)at the South Pole and other changes in the atmospheric circulation over East Antarctica. A better understanding of the local variablility of the climate of East Antarcitc is necessary before any speculations with resepect to the impact of global climate change on Antarctica are possible.

AWS sites for monitoring climate change

The AWS sites that serve to maintain long term surface meteorological records will continue. In particular are the AWS at Byrd Surface Camp, Dome C, and at Marble Point. In addition, AWS sites located in conjuction with ice coring sites will be maintained in order to document the local climate. The AWS data will serve as a refernce point for possible future ice coring operations.

AWS used to monitor interannual atmoispheric variablility found in meteorological data in Antarctica

It is now well documented that there are significant interannual variabilities observed in the Antarctic atmosphere. There are El Nino-Southern Oscillation (ENSO) signals observed in the instrumented record (Smith and Stearns, 1993) as well an observed ENSO modulation of West Antarctic precipitation (Bromwich et al., 2000). The ENSO siganl is particularlysignificant on the Ross Ice Shelf. This is shwon in the temperature record from the AWS located at Ferrell site (Figure 1) plotted along with the SOI . In addition, a two-wave pattern that propagates around Antarctica with a 4-5 year periiod (referred to as the Antarctic Circompolar wave) has been observed in meteorological date and sea ice extent (White and Peterson, 1996). The temperature record at Dome C plotted along with the SOI indicates a periodicty different from the SOI but more closely related to the ACW. The AWS data from sites that support ice coring work, will serve to provide "calibration" data to relate current atmospheric variablility to that deduced from the glaciochemical data found in the ice cores. Recent work has found evidence of ENSO teleconnections over West Antarcitca in the glaciochemical record of the ice core obtained at Siple Dome (Kreutz et al. 2000).

Anarctic Weather Forecasting Support

Currently the Space and Naval Warfare Systems Center (SPAWAR), is responsible for operational weather support to the United States Antarctic Program (USAP). This work is carried out through Mac Weather (Mcmurdo Station, Antarctica). This proposal will continue to support operational forecasting by providing current location and calibration data for all deployed AWS to Mac Weather and the Antarctic Meteorological Research Center. Since November of 1998, an Argos uplink receiver was installed to receive AWS-to-satellite transmissions at Mcmurdo Station. This allows for the real-time reception of AWS data without relying on a polar-orbiting satellite with an Argos system retransmission to be in view at Mcmurdo Station.

In addition, SPAWAR deployed additional commercial AWS's that used HF transmitters in November of 199. These additional AWS allow for direct transmission of data from the AWS to Mac Weather, again allowing real-time data acquisition for AWS located near Mcmurdo Station. It is proposed to enable the next-generation AWS to have the HF transmitter as an option (in addition to the Argos transmitter).

AWS supporting model initialization

Perhaps as equally important is support for operational forecasting obtained by the placement of AWS in meteorologically data void areas of Antarcica . Besides directly providing data for real-time analysis, placemnet of the AWS data on the Global Telecommunication System (GTS), allows for the AWS data to be incorporated in the initialization of atmospheric models used by Mac Weather. The AWS version (obtaining pressure and temperature data only) placed on islands (e.g. Scott Island) has shown to provide critical data for model initializaton (ref ?). As the ability to make use of real-time forecasts based on the output from mesoscale numerical weather prediction models (ref ?) improves the AWS data from thses locations will become increasingly important - both directlyand as surface reference points for satellite sounder data.

AWS to simulate rawindsonde data at Mcmurdo

The complex topography around Mcmurdo Staion coupled with the seaonal change from sea ice to open water contribute to the challenging operaitonal weather forecasting problem for USAP operations. At the current time, there are only twice-daily rawindsonde launches. It is prpposed to place AWS at various elevations in the vicintiy of Mcmurdo Station to provide moe frequent "upper air" data. There has in the past been an AWS place near the rim of the Erebus lava lake (3800 meters).The topography of the area around Mcmurdo provides an ooportunity to place AWS at appropriate elevations to obtain meteorological data. Currently, in addtition to AWS's at Williams Field and the Pegasus Runway, there is an AWS located on Minna Bluff (920 meters). Potential sites are White Island (up to 750 m) , Brown Peninsula (up to 700 m), and sites up to Erebus's peak.

AWS for ground verification of satellite sounders

The number of polar-orbiting satellites is increasing dramatically in the next several years. An important function of the AWS will be to provide data for calibrating the new atmospheric sounders that will be onboard the new polar-orbiting satellites. This "ground truth" capability will be most important for areas currently lacking surface meteorological data (in particlular the interior of East Antarctica). [In here with MODIS/AERI "cold" point reference - Chris Moller] Shuman (1997) compared the calulated surface temperature using SSM/I sounder data over Greenalnd with the temperature record of an AWS located at the crest of Greenland and found excellent agreement.

On of the more promising methods of obtaining upper air data is the use of radio occultation soundings(Ware et al, 1996). The proposed Constellation Observing System for Meteorology, Ionospherer and Climate (COSMIC) will provide 3000 radio occultation soundins daily uniformly distributed around the globe. By using AWS data and applying the method developed by Philpott to extrapolate the surface meterological data to estimate the 500 mb data, it should be possible to independently tune the soundings constructed from the COSMIC system.

References

Argos newsletter (April 1999 issue), Service Argos, 1801 McCormick Drive, Suite 10, Largo, MD, 20774 (http://www.argosinc.com/)

Bindschadler, R., Editor, Agenda and Abstracts, Third Annual Workshop, West Antarctic Ice Sheet Initiative, September 25-17, 1996, Algonkian Meeting Center, Sterling, Virginia.

Bromwich, D. H., 1990: Estimates of Antarctic precipitation, Nature, 343, 627-629.

Bromwich, D.H., A.N. Rogers, P. Kallberg, R.I. Cullather, J.W.C. White, and K.J. Kreutz, 2000: ECMWF analyses and reanalyses depiction of ENSO signal in Antarctic precipitation. J. Climate, 13, 1406-1420. http://polarmet.mps.ohio-state.edu/PolarMet/PMGAbstracts/abs.ENSO.99.html

Cassano, John J., Lin Li, and David H. Bromwich, 2000: Byrd Polar Research Center Mesoscale Numerical Weather Prediction during the 1999/2000 Antarctic field season, Antarctic Weather Forecasting Workshop, May 17-19, 2000, Preprint vol. , 54-57. Byrd Polar Reearch Center, The Ohio State University, Columbus, Ohio, 43210. http://www-bprc.mps.ohio-state.edu/WFWS/index.php3

Hamill, Paul , 1994: On the Relationship Between Antarctic Meterological Variables and ENSO, M. S. Thesis, Department of Atmospheric and Oceanic Sciences, University of Wisconsin - Madison, Madison, 53706, 123p.

Kameda, T. and 9 others. 1997: Meteorological Observations along a traverse route from coast to Dome Fuji Station, Antarctica recorded by automatic weather stations in 1995. Proc. NIPR Symp Poalr Meteorol. Glaciol. 11, 35-50.

Kreutz, K.J., P.A. Mayewski, I.I. Pittalwala, L.D. Meeker, M.S. Twickler, and S.I. Whitlow, 2000: Sea level pressure variability in the Amundsen Sea region inferred from a West Antarctic glaciochemical record. J. Geophys. Res., 105, D3, 4047-4059.

Mayewski, P. a. and I. D. Goodwin, 1996: International Trans-Antarcic Scientific Expedition(ITASE), PAGES Workshop Rep. Ser. 97-1, University of New Hampshire, Durham, 48pp

Mayewski, P. A., L. D. Meeker, M. S.Twickler, S. I. Whitlow, Q. Yang, W. B. Lyons, and M. Prentice, 1997: Major features and forcing of High-latitude Northern Hemisphere atmospheric circulation over the last 110,000 year. J. Geophys. Res., 102, 26345-26366.

Neff, W.D., 1999: Decadal time scale trends and variability in the tropospheric circulation over the South Pole. J. Geophys. Res., 104, D22, 27217-27251.

Phillpot, H.R., 1991: The derivation of 500 hPa height from automatic weather station surface observations in the Antarctic continental interior. Aust. Met. Mag., 39, 79-86.

Schwalb, A. , 1978: The TIROS-N,NOAA A-G satellites series, NOAA Tech. Memo. 95 NESS., U. S. Department of Commerce, Washington , D. C., 95pp

Shuman, C.A., R.B. Alley, S. Anandakrishnan, and C.R. Stearns, 1995: An empirical technique for estimating near-surface air temperature trends in central Greenland from SSM/I brightness temperatures. Remote Sens. Environ., 51, 245-252.

Smith, Shawn R. and Charles R. Stearns, 1993.: Antarctic pressure and temperature anomalies surrounding the minimum in the souther oscillation index, J. Geophys. Res., 98, 13, 071-13,083,

Stearns, Charles, Bruce Sinkula, and J. T. Young, 1999 : Six years of Composite Infra-red Images South of Forty Degrees South at Three-Hour Intervals, Video Tape, Space Science and Engineering Center, University of Wisconsin, Madison.

Stearns, Charles R., George A. Weidner and Linda M. Keller, 1997: " Atmospheric Circulation around the Greenland Crest", J. Geophys. Res., 102, (D12), 13,801-13,812,.

Takahashi, S., T. Kameda, H. Enomoto, T. Shiraiwa, Y. Kodama, S. Fujita, H. Motoyama, O. Watanabe, G.A. Weidner, C.R. Stearns, 1998: Automatic weather station program during Dome Fuji Project by JARE in east Dronning Maud Land, Antarctica. Annals of Glaciol., 27, 528-534.

Taylor, Kendirck , Editor, WAISCORES, 2000: A Science and Implementation Plan for Ice Dynamics, Climate, and Cryobiology Studies in West Antarctica - a draft for review by the Ice Core Working Group in June 2000. http://www.dri.edu/Projects/waiscores/wais17.pdf

Thom, Jonathan, 1997: Snow Properites of the Greenland Crest Derived from Data Obtained by the GISP2 Automatic Weather Station During 1992-1996. M. S. Thesis, Department of Atmospheric and Oceanic Sciences, University of Wisconsin - Madison, Madison, 53706, 101pp.

Turner, J., S. Pendlebury, L. Cowled, K. Jacka, M. Jones, and P. Targett, 2000: Report on the First International Symposium on Operational Weather Forecasting in Antarctica. Bull. Amer. Meteor. Soc., 81, 75-94.

Ware, R. M. Exner, D. Feng, M. Gorbunov, K. Hardy, B. Herman, Y. Kuo, T. Meehan, W. Melbourne, C. Rocken, W. Schreiner, S. Skolovskiy, F. Solheim, X. Zou, R. Anthes, S. Businger, and K. Trenberth, 1996: GPS sounding of the atmosphere from low Earth orbit: Preliminary results. Bull. Amer. Met. Soc., 77, 19-40.

Weidner, G. A., 1985: Automatic Weather Station Technical Manual, Department of Atmsopheric and Oceanic Sciences, University of Wisconsin – Madison, Madison, WI 53706,

Weidner, G.A., R.E. Holmes, and C.R. Stearns, 2000: Antarctic automatic weather stations field report for 1999-2000, Space Science and Engineering Center, University of Wisconsin, Madison, WI 53706, 19pp.

Wendler, G., C. Stearns, G. Weidner, G. Dargaud, and T. Parish, 1997: On the extraordinary katabatic winds of Adelie Land. J. Geophys. Res., 102, D4, 4463-4474.

White, W. B. and R. G. Peterson, 1996: An Antarctic circumpolar wave in surface pressure, wind, temperature, and sea ice extent, Nature, 380, 699-702.

Figure 1. Map of Antarctica showing the locations of widely spaced automatic weather stations for 2000. Identification of the sites is by the site name. The locations of the AGO sites are included but are not a part of the AAWS program.

Figure 2 . AWS Locations from the Ross Ice Self to Antarctic Peninsula

Figure 3. Location of AWS near the Antarctic Peninsula

Figure 4. Location of AWS along the Adelie Coast

Figure 5. AWS locations near Mcmurdo

AWS Data Services

The AWS data are distributed over the Internet through the Antarctic Meteorological Research Center. The data can be accessed by anonymous ftp or via the World Wide Web. For 1999 the monthly average number of hosts obtaining data was 52 , the number of files collected was 7098 per month, and the amount of data was 297 megabytes per month. The total data sent out in 1999 are 3.5 gigabytes. These data are the equivalent of 2477 high density disks. The transfer of data over the Internet is operating smoothly and accounts for 99% of the data transferred to others. Data requests are received from people and organizations which do not have access to the Internet. Data are sent to them on magnetic media or paper.

Prior to 1994 a data book was prepared that contained all of the monthly three hourly data sheets. Last year a monthly data summary was sent out to approximately 300 organizations and individuals which included the description of the AWS units and the sensors, the field report summary at the start of the year, and the monthly means and extremes for each of the sites. The three hourly data are available over the Internet and will be mailed to those who cannot use the Internet and would like the three hourly observations for the year.

We are now able to process the DCS data at Mcmurdo using the same progrm that is used to process the data here in Madison. This will enable data to be processed for any Argos based platform to be processed real time in Mcmurdo once the data format is known.

2001 Field Season Report

Charles Stearns, George Weidner, Matthew Lazzara, Linda Keller, Jonathan Thom

Introduction

The 2001 Antarctic Automatic Weather Station (AAWS) field season had some successes and some unsuccessful events. The major successes of the season were the installation of the iceberg Automatic Weather/Global Positioning System (AW/GPS) stations on iceberg B-15A. The average results were caused by not being able to repair many of the current AWS stations that need repair, and the lack of spare parts for repairs. There was also some difficulty with having only one inexperienced person there for the duration of the season. The assistance of Rob Flint during the beginning of the season was invaluable. In addition, during the transport to Byrd station my camera was broken because of careless baggage handlers. Therefore, making it impossible to get photographic records of the stations that were visited subsequently. I believe that the season went as well as could be expected considering the circumstances and commitments related to the iceberg project.

Automatic Weather Station Repairs

Ferrell (ARGOS Id 21355)

GPS Location: 77° 53' 49.87387" S
170° 49' 02.66258" E

Station Characteristics:

Lower ΔT probe: 53 cm
AWS enclosure: 79 cm
Junction Box: 53 cm
Solar Panel: 183 cm
Boom: 226 cm
Battery Voltage: 13.5 Volts

Field Group: Rob Flint, Jonathan Thom

Ferrell Site was not being received via the ARGOS system. Transport to the AWS site was provided by Petroleum Helicopters, Inc. (PHI). After arriving at the site the Telonics up-link receiver was used to determine if the station was transmitting off frequency; no signal was received. The battery voltage measured to be sufficient without the solar panel. Therefore no new battery boxes were required. The power was disconnected and reconnected after a short period. This did not generate a transmission from the station. The enclosure was opened and the power connections were checked and found to be okay. The antenna cable was also checked and found to be okay. Since no obvious problems were evident we removed the station and boom and replaced it with AWS 8929. This station had been removed earlier from Willie Field. Ferrell site will probably require a new tower section within the next two years. The initial AWS 8929 transmissions were received bye the up-link receiver before departing.

Laurie II (ARGOS Id 21364 replaced with ARGOS Id 21360)

GPS Location: 77° 32' 31.89360" S
170° 48' 50.59399" E

Station Characteristics:

Lower ΔT probe: 55 cm

AWS enclosure: 91 cm
Junction Box: 62 cm
Solar Panel: 183 cm
Boom: 86 cm
Battery Voltage: 12.7 Volts

Field Group: Jonathan Thom

Laurie II site had not been received since 16 December. This station had been installed in 2000. Transportation was provided by the U.S. Coast Guard Helicopter. Using the Telonics up-link receiver no transmission was received. The power cable was then disconnected and reconnected after a period of time. The system was reset and began transmitting. The AWS enclosure was opened and power and antenna connections were checked. There were no obvious problems within the box or connections to the antenna. Since there was no obvious problem with 21364 the station was replaced with 21360. The wind monitor did not need to be replaced because the R.M. Young present had a serial number below 32xxx. The lower ΔT probe was left disconnected and the plug was taped. An AWS 21360 transmission was received by the Telonics up-link receiver before leaving the site. This station will need to have an additional tower section within the next two years.

Marilyn (ARGOS Id 8931 replaced with ARGOS Id 8934)

GPS Location: 79° 56' 38.72082" S
165° 16' 40.17371" E

Station Characteristics:

Lower ΔT probe: below the snow (disconnected)
AWS enclosure: 249 cm
Junction Box: 203 cm
Solar Panel: 382 cm
Boom: 439 cm
Battery Voltage: 12.7 Volts

Field Group: Ben Kerman, Andy Bliss, Jonathan Thom

Marilyn site was not transmitting. Kenn Borek Air, Ltd provided transport to the site. Some searching was required to find the site because the GPS location was off by about 2 km. When we arrived at the station the power was disconnected and reconnected in an attempt to reset the station; this was unsuccessful. The station needed to be raised so everything was removed from the tower and a seven-foot tower section was added to the top. The instrument boom, solar panel, and junction box were re-installed on the tower and a new AWS enclosure was installed (8934), and two fresh boxes of batteries were left. The original battery boxes and the lower ΔT boom were probed for with an ice axe, and preliminary digging, but were determined to be too deep within the snow to allow extraction in a timely manner. It was necessary to cut the thermocouple wire for the lower boom and leave the old battery boxes buried. It should be noted that the boom is pointed 60 degrees off of north in the counter-clockwise direction. Before leaving the site, transmissions from AWS 8934 were received by the Telonics up-link receiver. In addition, the next time this station is serviced it is necessary to bring correct station mounting bars.

Pegasus North (ARGOS Id 8927)

GPS Location: 77° 57' 23.44120" S
166° 31' 34.26953" E
Station Characteristics:
Lower ΔT probe: 85 cm
AWS enclosure: 142 cm
Junction Box: 100 cm
Solar Panel: 216 cm
Boom: 333 cm
Battery Voltage: 13.5 Volts with solar panel
Field Group: Rob Flint, Ernie Mastroianni, Jonathan Thom

Pegasus North was operating in a nominally. The RPSC airfield manager requested that the station be relocated. The stations old location was located directly in the middle of the approach apron for the runway. Although we were in that location first, we thought that it would be a good idea to move the station. We removed the AWS enclosure and instrument booms and began to extract the station with ice axes from the blue ice. This turned out to be a fruitless venture. I think were able to remove one battery box and the rest were frozen. The airfield manager had access to a front-end loader with a fork mounted on it. The front-end loader removed the station tower, deadmen, and old battery boxes from their icy tomb. Unsuspecting that the station would need to be extracted in this manner we did not have all of the necessary equipment to reinstall the station the same day. The following day we reinstalled the station using two seven-foot tower sections to the south-east of the original location about one-mile away. The boom was oriented using geographic landmarks, and should be verified in subsequent field seasons. The Telonics up-link receiver's batteries were dead; therefore, it was impossible to determine if the station was transmitting. The station was confirmed to be transmitting by checking the ARGOS system.

Willie Field (ARGOS Id 8929 replaced with ARGOS Id 21364)

GPS Location: 77° 51' 57.68668" S
166° 59' 31.63699" E
Station Characteristics:
Lower ΔT probe: 83 cm
AWS enclosure: 99 cm
Junction Box: 137 cm
Solar Panel: 191 cm
Boom: 333 cm
Battery Voltage: 12.85 Volts
Field Group: Andy Bliss, Doug MacAyeal, Jonathan Thom

Willie Field AWS was removed early in the season to provide an AWS for Ferrell site. The station was replaced by 21364 at the end of the season, although 21364 is possibly a defective station it will be easy to pull the station next season for repair in McMurdo. The station was raised with a six-foot tower section and an R.M. Young wind monitor was installed to match with the AWS station. The station did not transmit before leaving, so this whole venture may have been fruitless. It was not a total loss because the station did need to be raised and it will be easy to return the AWS for repair next season. In addition, the R.M. Young prop should be replaced because the keys that lock the prop to the shaft were missing.

Coast Guard Repair Projects for their return voyage

I provided the U. S. Coast Guard with AWS parts for repairs at Whitlock on Franklin Island and Manuella on Inexpressible Island for their voyage north. AWS 8907 was provided to replace the AWS station at Franklin Island. A high wind speed boom with the wind vane, anemometer, and antenna were provided for Manuella site. If it is not possible to replace the boom because of severe weather conditions a Belfort aerovane was also provided. In addition to the above items I provided a tower section for Franklin Island and two battery boxes and cables, one for each site. I emphasized that if conditions or time would not allow them to visit the sites it was okay not to do the work.

Projects that didn't get done, but should have . . .

The project that should have gotten done was Byrd AWS. This trip took an entire day out of my schedule without any results, and also resulted in a broken camera. The problem was with miscommunication. Between whom, I'm not sure. The station manager at Byrd did not realize what AWS needed to be repaired. I had made a request to Robbie Score to have someone at Byrd unplug and plug back in our station. The request was performed, but on the wrong station. Byrd station was in the process of closing for the season and this allowed for only 45-60 minutes of ground time. This would not have been sufficient to traverse to the AWS, repair it, and traverse back to Byrd. Next year it will be necessary to spend some time in west Antarctica in order to repair the stations that did not get attended to this year. Another station in west Antarctica that needs attention next year is Noel.

Another project that didn't get done is Minna Bluff. I ran out of time and resources to get to and repair this station. The main problem was the uncertainty of when the iceberg AW/GPS Station installations would occur. It did not allow me to commit to times when I could go out to the station. The resource issue could also be blamed. Many problems were encountered with shipping equipment out of Madison. Hopefully, some of the logistical problems will be cleared up next year and more of our resources can be devoted to the AWS project.

There probably were additional projects that should have been done and mistakes that were made, but these two were the bigger missteps this field season. They were lessons learned and should help make next season better.

Iceberg B-15A Automatic Weather/GPS Station Installations

The highlight of the AAWS 2001 Field Season was the deployment of three GPS stations on the iceberg B15-A. US Coast Guard icebreaker Polar Sea and the USCG helicopters provided transport for the iceberg station deployment. Of the three stations that were deployed, two were Campbell-Scientific automatic weather stations with global position system receivers and the third was a Telonics Gen-II global positioning receiver system. All three stations transmit data via the ARGOS data communication system. The AW/GPS stations record meteorological and GPS data every half-hour and the GPS station records GPS data hourly. The meteorological data that is observed is temperature at the top of the tower, temperature near the surface, relative humidity, wind speed, wind direction, and atmospheric pressure. The GPS data for all stations has significant figures out to thousandths of a minute.

Mother 1 (ARGOS Id 30504)

Station Characteristics:

HMP Boom: 77 cm
PRT Boom: 231 cm
Wind Boom: 240 cm to the bottom of the vane mount
Battery Voltage: 12.5 Volts

Tower GPS Location: 77° 07.365' S 169° 58.947' E (at time of setup)
Campbell CR10X Time: 6:16:40 on CR10X at 13:08:30 UTC 25 January 2001
Field Group: Andy Bliss, Doug MacAyeal, Jonathan Thom, Forrest McCarthy

Mother 2 (ARGOS Id 30580) — installed first

Station Characteristics:

HMP Boom: 85 cm
PRT Boom: 238 cm
Wind Boom: 250 cm to the bottom of the vane mount
Battery Voltage: 12.78 Volts

Tower GPS Location: 77° 06.925' S 170° 00.889' E (at time of setup)
Campbell CR10X Time: 2:50 at 9:41:44 UTC 25 January 2001
Field Group: Doug MacAyeal, Jonathan Thom, Forrest McCarthy

The installation of the GPS stations Mother 1 and Mother 2 occurred on 25-26 January 2001. Forrest McCarthy, an FSTOP mountaineer, and Andy Bliss surveyed the site for crevasses and staked out a safe working region for the Mother 2 site. This was done in the morning on the 25 January. The weather the morning of 25 January was 30 knot winds, blowing snow, and low visibility. Further operations were suspended until the weather calmed down. We resumed operations after dinner on the 25 January. Doug MacAyeal and Jonathan Thom were flown to the Mother 2 site and began construction of the station. The tower base and the deadmen were dug in to a depth of approximately 3 feet. The tower consisted of a seven-foot section and a three-foot section. The Campbell-Scientific station assembly went smoothly and the station powered-up and began taking data as expected. The first ARGOS transmissions were received by the Telonics uplink-receiver and it was confirmed that the GPS had obtained an initial position.

The direction of Mother 2's wind system was configured so that the R.M. Young box was pointed toward the sun. After we completed installing Mother 2 the location of

Mother 1 was established. The angle between the boom and the direction to Mother 1 was approximately 18° in the counter-clockwise direction.

During the install of Mother 2 Forrest McCarthy and Andy Bliss made the safety survey for Mother 1. Mother 1 is located approximately 1 kilometer away from Mother 2. Mother 1 is a duplicate station to Mother 2 and installation characteristics were the same. Mother 1 began collecting data as expected. The first ARGOS transmissions were received by the Telonics uplink-receiver and the GPS had obtained an initial position.

Mother 1's wind system was configured so that the R.M. Young box on the wind monitor was pointed towards Mother 2.

After finishing the install of Mother 1, we were given a preliminary pick-up time 2 hours later. This was due to one of the USCG helicopters having mechanical problems and the other helicopter was doing other necessary tasking. As we approached our pick-up time the weather became less favorable. A low cloud ceiling had developed and scattered fog was present. The ship was able to move out of the fog and allow a helicopter launch and we were picked up off of the iceberg at approximately 5:30 am on 26 January. To pass the time we dug holes and built snow cairns. The snow cairns were leveled before leaving to ensure that our surface meteorological observations would not be affected.

Daughter (ARGOS Id 30305)
Station Characteristics:
Battery Voltage: 8-9 Volts
Field Group: Ben Kerman, Doug MacAyeal

The installation of the Daughter site occurred on the morning of 25 January. The Daughter site consisted of a Telonics integrated GPS/ARGOS transmitter. This station will provide a hourly GPS location. Forrest McCarthy and Andy Bliss did the safety survey of the site before Doug and Ben arrived. By the time Doug and Ben arrived at the site the weather had worsened, low visibility and high winds. The captain of the USCG Polar Sea gave them 45 minutes of ground time. Three battery boxes were installed at this location with a total of 27 four-volt battery pairs. The station was installed within an hour and the ARGOS transmission had a good initialization. Doug indicated that the tower installation was, "not as pretty," as it could have been if more time was allowed. As it turned out the ground crew and helicopter crew were out of contact for a period longer than 45 minutes which caused some concern from the captain.

Daughter 2 (ARGOS Id 30477)
Originally, two Telonics GPS stations were going to be available and installed. There was a technical problem with station 30477. The station had been tested in Madison in December before being brought down to Antarctica. When the station was tested in Antarctica we could not get the station to initialize. The problems were relayed to Telonics for suggestions and the suggestions were performed with no positive results. A decision was made to only deploy three stations. In addition, it was determined that the best possibility to get a good data set was to install all three stations on one iceberg, B15-A. The revised plan also would make the logistics of the mission a little bit easier, and provide more station redundancy in case of a failure. In the end, the station 30477

was cut open and we were able to get the station to initialize and provide good data. This station was crudely repackaged and brought along on the mission as a backup for station 30305.

Southern Ocean GLOBEC Automatic Weather Station Report 1
October 9, 2001; Bob Beardsley

Introduction

The following two automatic weather stations (AWSs) were deployed in Marguerite Bay in May 2001 as part of the Southern Ocean GLOBEC program:

AWS # 8930 (Kirkwood Island)
Latitude: -68 20.397 S
Longitude: -69 00.444 W
Height of site above sea level: ~ 75 ft (crude estimate) (25 m)
Station orientation: 77 N
Installation: May 25, 2001; reprogrammed May 30, 2001

AWS # 8932 (Dismal Island)
Latitude: -68 05.243 S
Longitude: -68 49.480 W
Height of site above sea level: ~ 35 ft (crude estimate) (12 m)
Station orientation: 124 N
Installation: May 27, 2001

Each station is equipped with a R. M. Young wind monitor, air temperature, relative humidity, and barometric pressure sensors, an electronics controller, and ARGOS telemetry link to the Antarctic Weather Research Center (AWRC), U. Wisconsin. This group provided the AWSs, and has been collecting the data and placing processed data on an AWRC ftp site for use by this program.

Each AWSs started producing useful data within an hour of deployment. Monitoring of the raw ARGOS data by AWRC indicated that a software error prevented the 8930 controller to record wind speeds in excess of 5 m/s (wind direction and other scalar variables were unaffected). This AWS was revisited on May 30 and the software error fixed. The AWS data from deployment through August 30 have been processed and placed online by AWRC. This note concerns further processing done at WHOI and an initial comparison of data from these two stations, located roughly 28.8 km apart within the mouth of Marguerite Bay, over the 95-day period of initial data. A brief comparison of the AWS data with data measured on NBP01-3 is also given.

WHOI Data Processing

The basic data obtained from AWMC had the following steps done to produce final 1-hr time series of air temperature (AT), relative humidity (RH), barometric pressure (BP), east and north components of wind (u, v) and wind stress (Tx, Ty). First, pad values were replaced with NaNs, then, additional outliers were identified using a median detector (wildm) and replaced with NaNs. Linear interpolation was used to create a uniform 1-hr time series of the scale variables AT, BP, RH, u, and v, then, gaps containing NaNs filled by linear interpolation. High frequency noise was then removed from the wind components u and v using the low-pass filter pl66tn with a half-amplitude period of 8 hrs. The resulting filtered u and v were then converted into wind speed (SP) and direction (DR), measured here counter-clockwise from East. The wind stress amplitude (TAU) was computed using the Large and Pond (1981) quadratic expression for neutral conditions with an anemometer height of 25 m (8930) and 12 m (8932), and the east and north components of the stress computed using TAU and DR. (The use of land-based winds to estimate wind stress is problematic, but this approach should provide at least a qualitative description of the wind stress and its variability.) For the initial period when the 8930 wind speed was pegged at 5 m/s before the software fix, wind speed was set to NaN. In this initial description, the wind direction

Description of AWS Data

Time series of wind stress, wind direction, air temperature, relative humidity and barometric pressure are plotted in Figure 1, with 8930 in blue and 8932 in red. The overall agreement in all variables is encouraging. Both records show a series of strong wind events passing over the study area, with periods of extreme cold air (below –15 °C). Peak wind speeds exceed 20 m/s, and the wind stress exceeds 0.5 N/m^2 frequently.

The scalar variables are highly correlated and exhibit differences that may be mostly instrumental noise and/or resulting from different station heights above sea level. Results of nonlinear regression follow in Table 1. Roughly, 8932 reads higher than 8930 in all scalar variables, by about 1 °C, 5 mb, and 6% on average. This could be consistent with 8932 being located at an approximate height of 12 m, closer to the sea surface than 8930, at a height of 25 m.

Air Temperature:	AT32 = a + b AT30 a = 0.97 +/- 0.15 °C; b = 1.01 +/- 0.01 corr coef = 0.973
Barometric Pressure:	BP32 = a + b BP30 a = 4.83 +/- 3.57 mb; b = 0.998 +/- 0.002 corr coef = 0.998
Relative Humidity:	RH32 = a + b RH30 a = 5.6 +/- 2.5 percent; b = 0.961 +/- 0.022 corr coef = 0.880

Table 1. Results of regression analysis for 95-day comparison period.

The wind and wind stress time series exhibit larger differences that reflect real differences between wind speeds and directions at the two stations. A comparison of wind speed is shown in Figure 2. The regression results are SP32 = a + b SP30, with a = 1.0 +/- 0.3 m/s, b = 0.938 +/- 0.024, and the correlation coefficient = 0.857, meaning roughly 74% of the variance is explained by this linear model. A scatter plot of 8930 and 8932 wind direction is shown in Figure 3 for the case when the wind speed at both stations is above 5 m/s (this restriction eliminates the large differences in directions during low winds). There is clearly some systematic difference in wind directions for winds from certain directions. The difference is roughly – 20° for winds towards

0^o (E), while the difference is roughly $+20^o$ for winds towards -90^o (S). This tendency is less clear for winds towards N, presumably because of the locations of the stations on the western ends of their islands respectively.

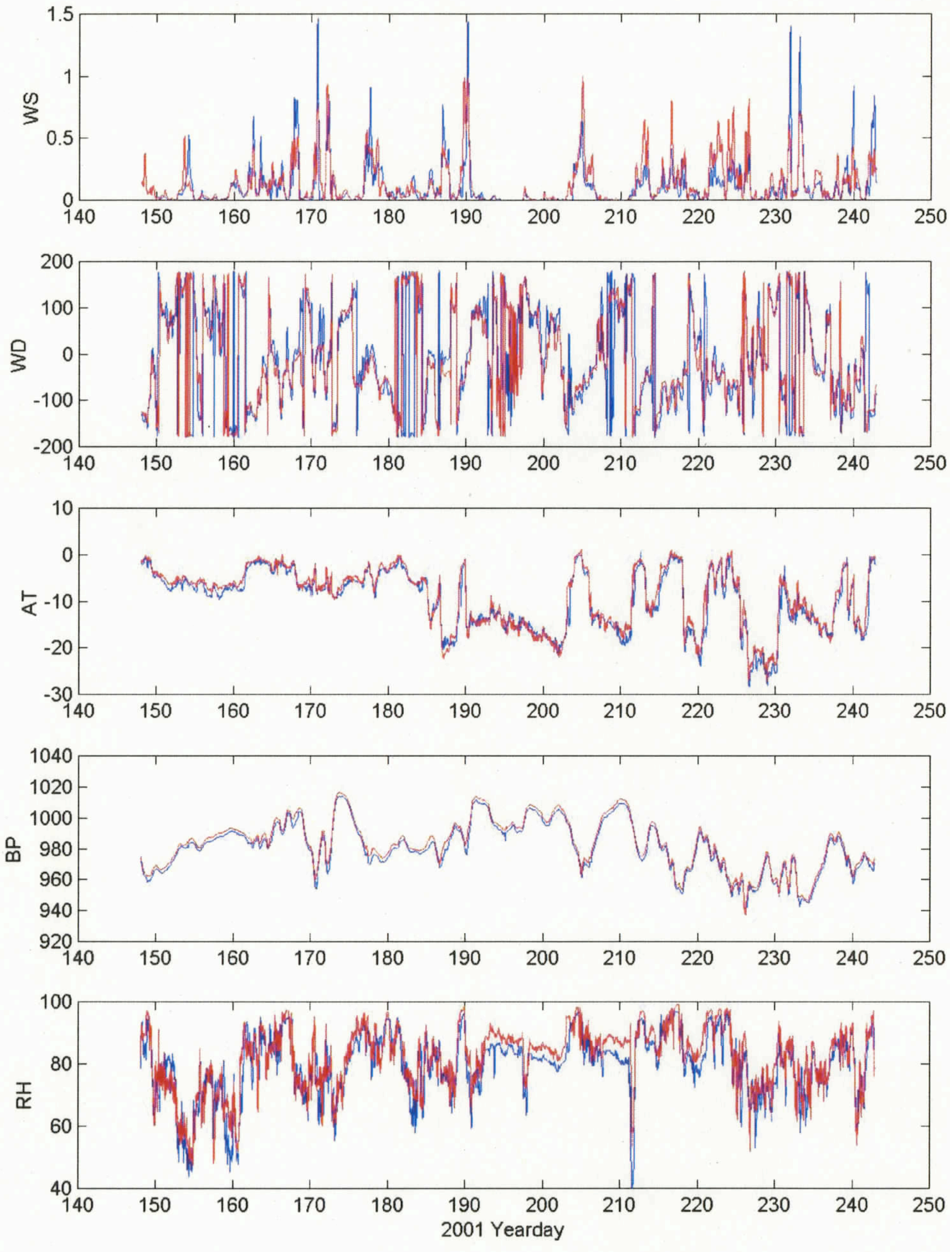


Figure 1. Time series of wind stress amplitude (top panel), wind direction (met convention) (second), air temperature (third), barometric pressure (fourth), and relative humidity (bottom) for AWS 8930 (blue) and 8932 (red). Units: N/m^2, degrees CCW respect to E, ^oC, mb, and percent.

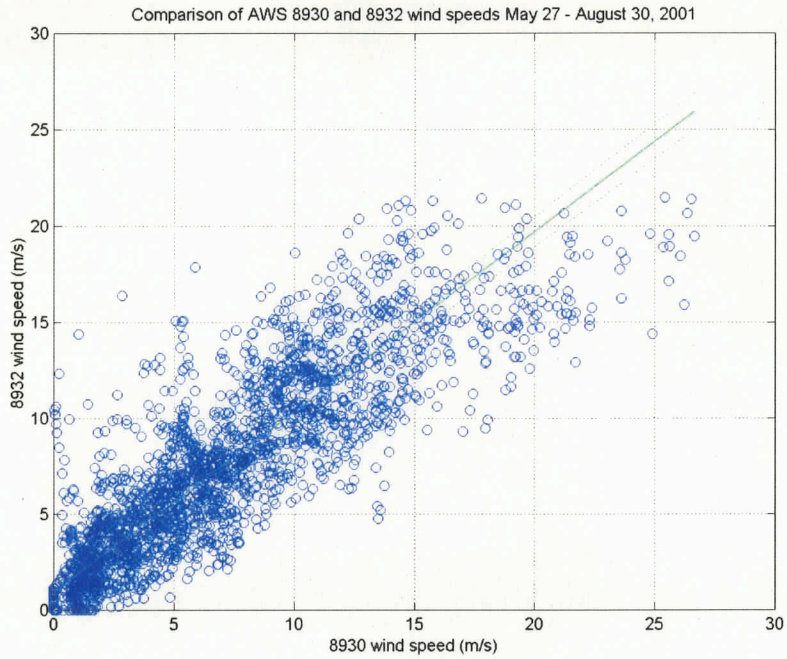


Figure 2. Comparison of wind speed.

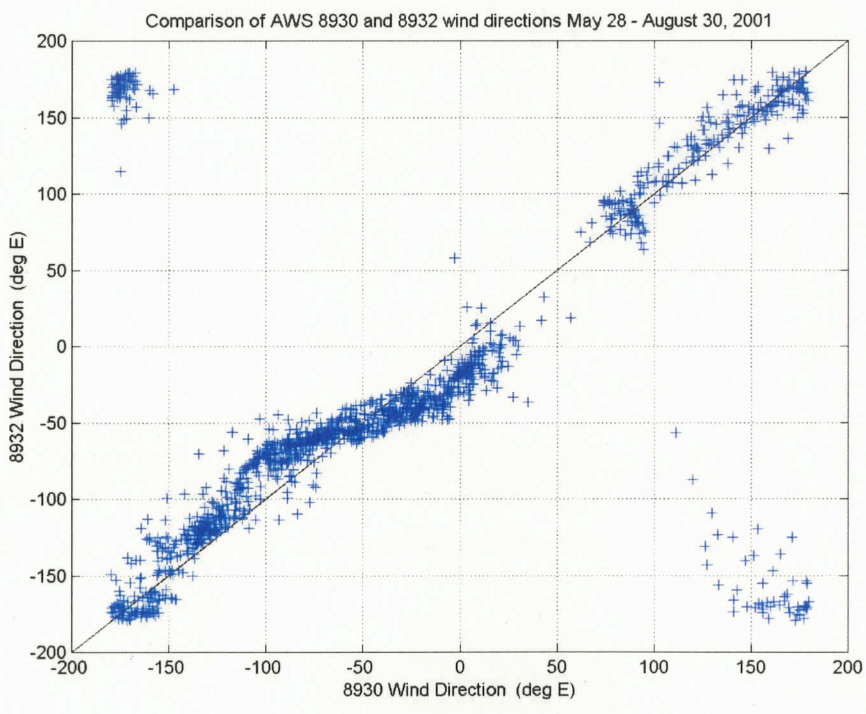


Figure 3. Plot of 8930 wind direction (x) versus 8932 direction (y). Here wind direction is the direction the wind is pointing, i.e., a direction of 90 degrees means the wind is northward.

Comparison of AWS and NBP01-03 Data

Meteorological data collected on NBP01-03 following the deployment of the two AWSs are shown here over-plotted on the AWS data for the period May 28 through June 2. The cruise track shown in Figure 4 indicates the position of the ship relative to the two AWSs. Plots of wind speed, wind direction, air temperature, barometric pressure, and relative humidity are shown in Figures 5-9, with the NBP data shown in black, 8930 in blue, and 8932 in red. The overall agreement is reasonably good until about yd 153, as the NBP departs the study area and heads rapidly for Punta Arenas. This agreement provides independent confirmation that the AWSs are working correctly.

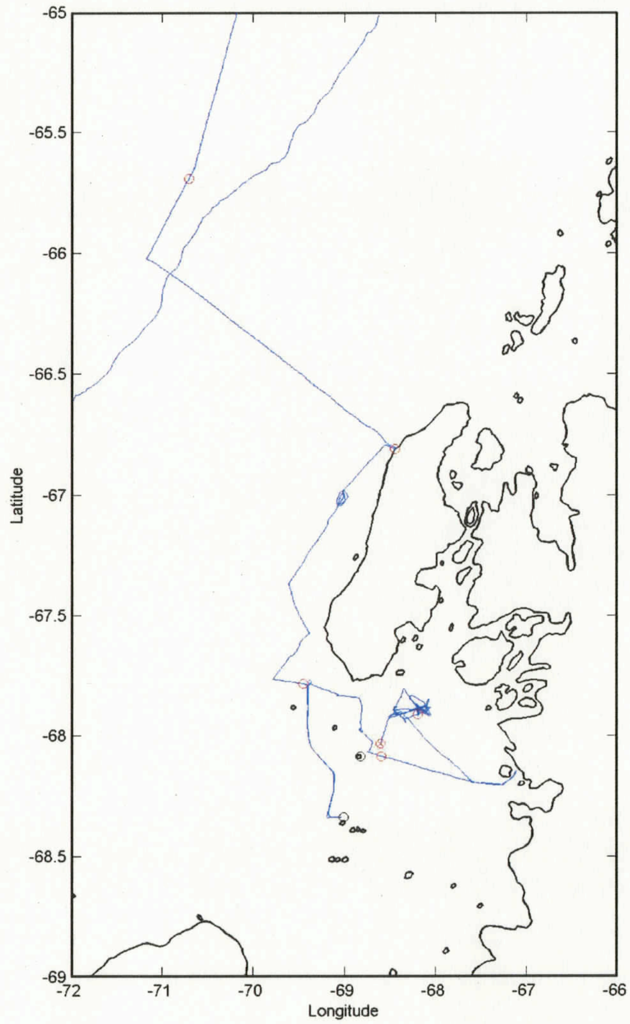


Figure 4. Cruise track of NBP01-03 following the deployment of 8932, starting on May 28 (yd 148). The wind speed problem on 8932 was repaired on yd 150. The NBP left Marguerite Bay on yd 151.

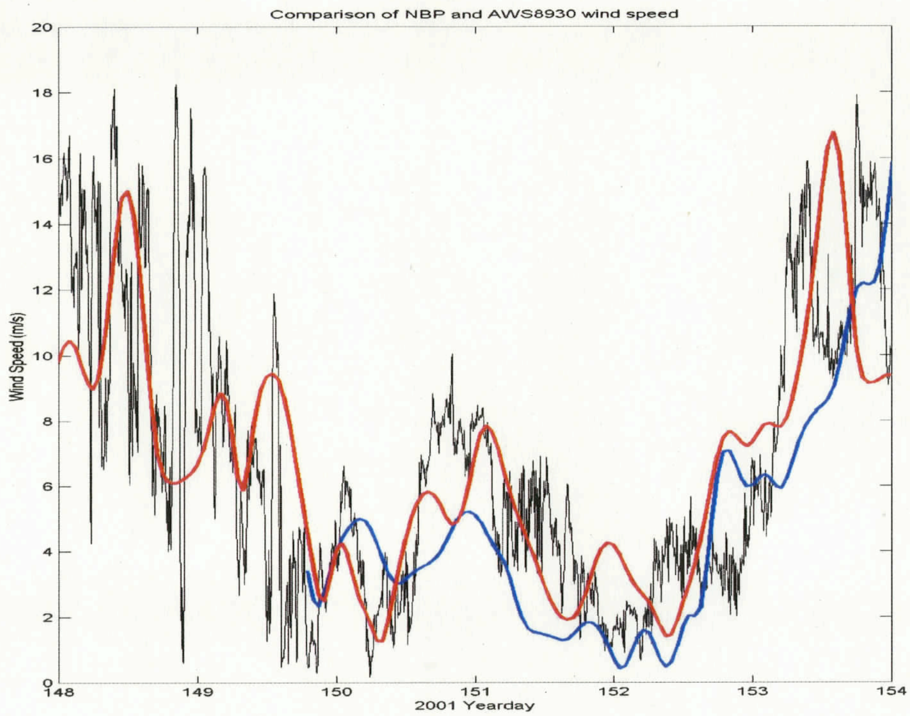


Figure 5. Comparison of NBP (black), 8930 (blue) and 8932 (red) wind speed.

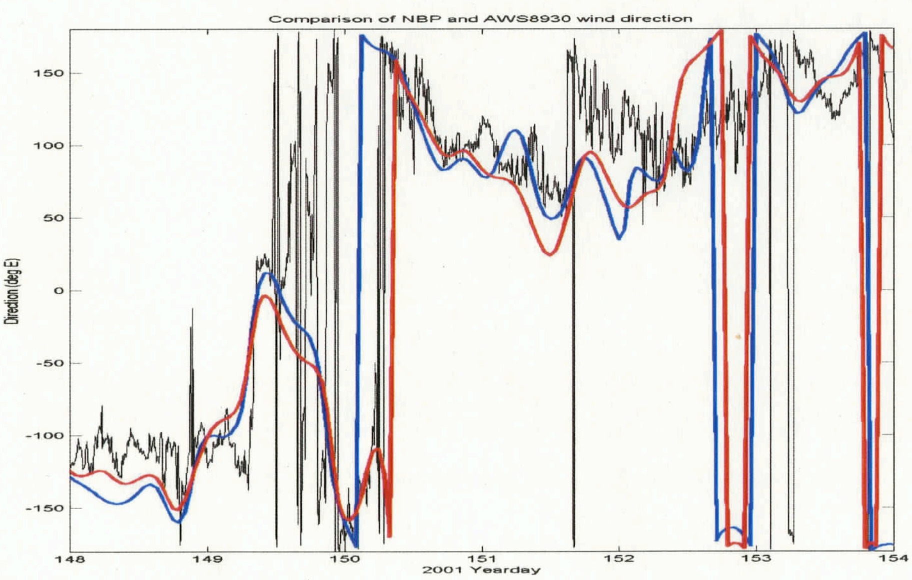


Figure 6. Comparison of NBP (black), 8930 (blue), and 8932 (red) wind direction.

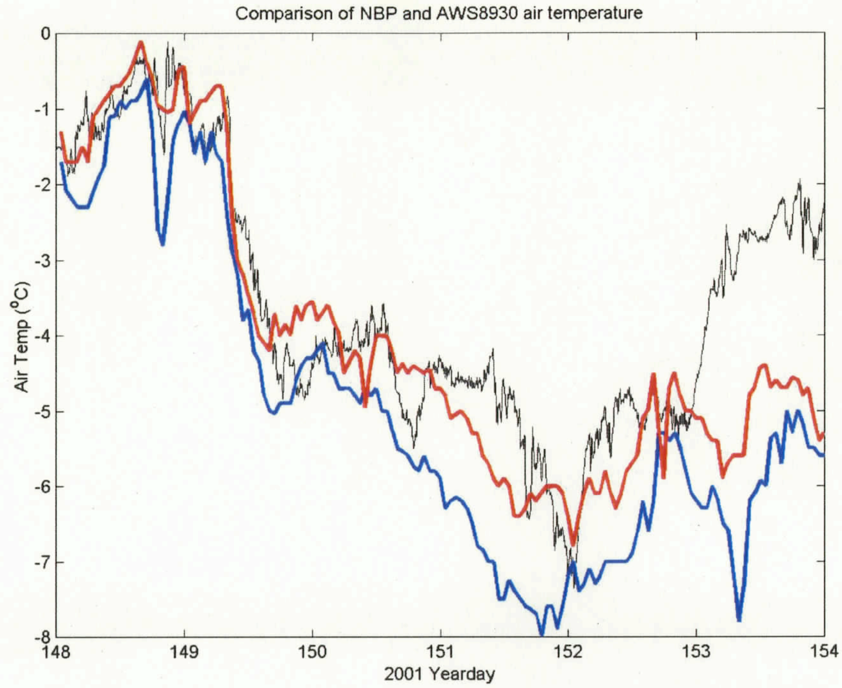


Figure 7. Comparison of NBP (black), 8930 (blue), and 8932 (red) air temperature.

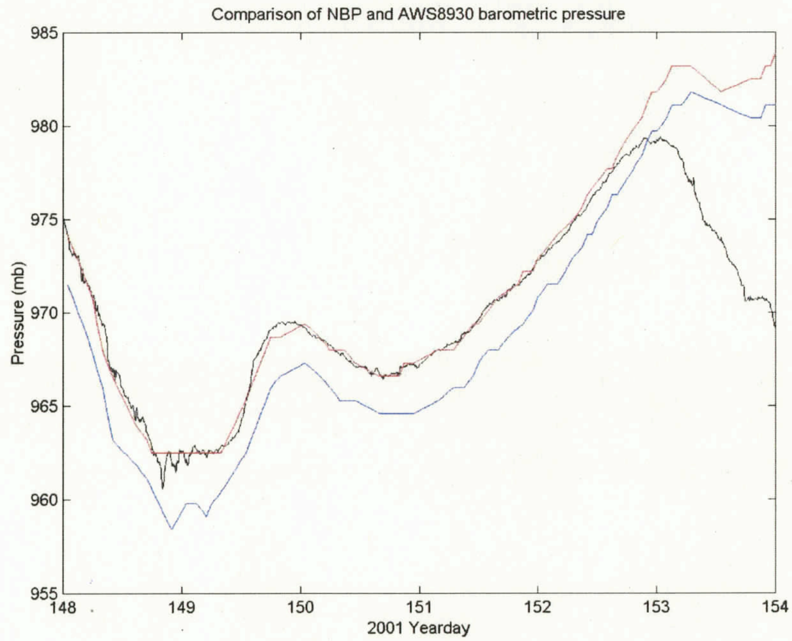


Figure 8. Comparison of NBP (black), 8930 (blue) and 8932 (red) barometric pressure.

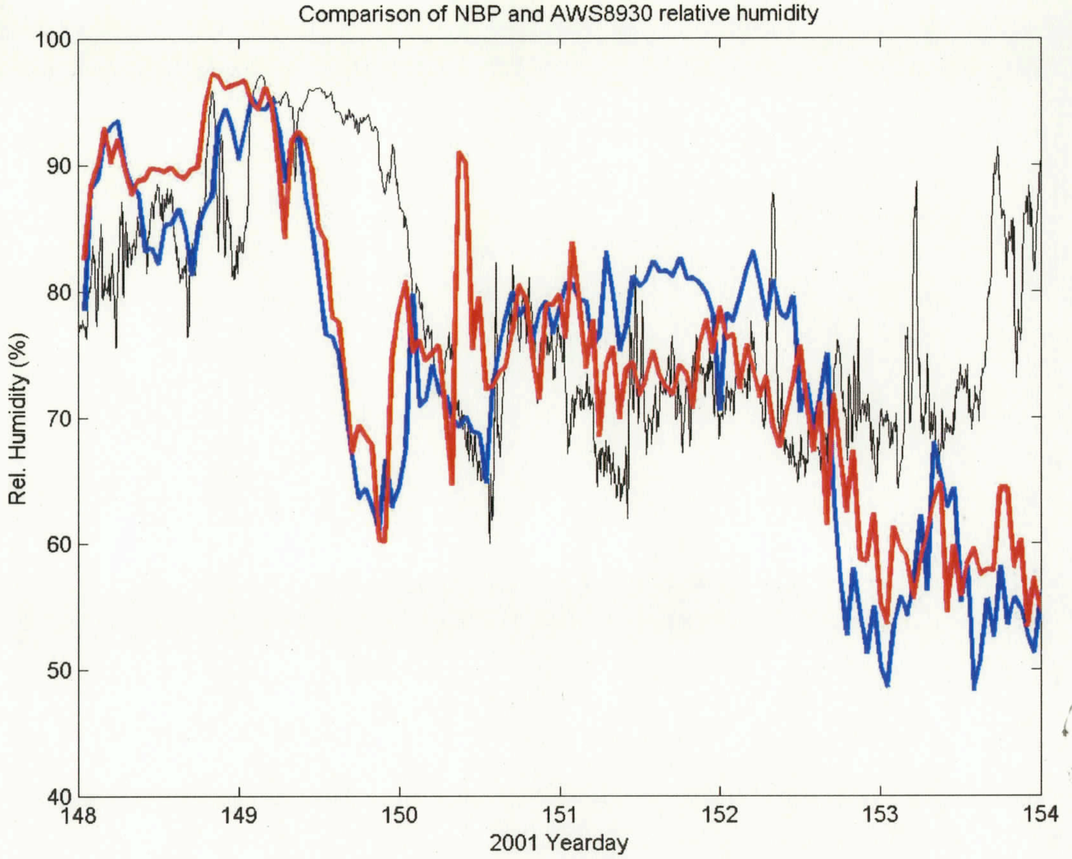


Figure 9. Comparison of NBP (black), 8930 (blue), and 8932 (red) relative humidity.

Report on AWS operations from *Polar Sea*
Hobart to McMurdo Station
Dec. 2000
Rob Flint

I boarded the Polar Sea in Hobart first on December 10, 2000, and moved my personal gear aboard on December 13 for a departure on the morning of December 14. On board were 10 civilians: Gerd Wendler, Principal Investigator in meteorology and primary user of the Adelie Coast Automatic Weather Station data, Gerd's assistant, Blake Moore, three New Zealanders headed to Cape Adare for penguin related studies, a New Zealand lichen expert, and another New Zealand penguin expert to look at the Balleny Islands and other rookeries along the way, an Australian glaciologist and his assistant, a film crew of two (also New Zealanders) for National Geographic, and myself.

The AWS materials which had been air shipped from the University of Wisconsin never arrived in Hobart. I had asked for copies of the shipping documents well before I left home, in case the AWS shipments did not arrive in Hobart (as happened on my first AWS installation in 1979 – in that case, we were able to track the missing material to Melbourne in time to have it forwarded). For some reason, the shipper in Madison was unable to provide George Weidner (and therefore, me) with copies of the shipping documents.

The shipping agent in Hobart, Mr. Stephen Parodi of Beaufort Shipping and his assistants were very solicitous in trying to locate the missing three boxes and spent several hours over the course of two days in the search, but without shipping numbers, they were unsuccessful.

Batteries, battery boxes, and guy wires had already been sent aboard the Polar Sea from Seattle, and were in fine shape upon my arrival. Before we left Hobart, I wired six battery boxes (was short one diode board, but that was easily replaced using one from an old battery box retrieved in the field). As throughout the voyage, the MST's (Marine Science Technicians) assigned to help us were extremely solicitous and helpful.

Because we did not have parts for the new station planned for installation at Cape Webb and because the success of the AWS program on the Adelie Coast has always been in part dependent on the French, Gerd Wendler and I first flew to Dumont D'Urville Station on December 18, 2000. The French have been an intergral part of the AWS network from the very beginning – I installed the first stations at D-10 and D-17 just inland from Dumont D'Urville Station in early 1980. Despite repeated attempts, we were not able to reach the station by telephone, fax, or HF radio before our arrival. The radio operators on the ship did not have the correct sequence to use the INMARSAT telephone to Dumont D'Urville, nor did they have the correct frequencies nor schedules for HF communication with the station. (It would seem to me that this information <u>should</u> be available on board Coast Guard icebreakers working in this area as a matter of course, whether or not any visit is planned.). Therefore, we arrived unannounced. The French leader, Didier Drouet, the previous winter-over leader, Michel Galliot, and the head of technical department, Patrice Godon (whom I had first met aboard the Thala Dan in 1979) all made it clear that they would have preferred that we warn them of our arrival. Gerd and I have since tried to send them a letters of apology (in my best French) for the unannounced visit and of thanks for their hospitality and their help with the AWS program. However, the radio operators on the ship again were unable to make the INMARSAT fax number work. The station leaders did welcome us, and we were able to talk about common interests in the AWS program. M. Galliot (who is also a meteorologist), told us that they have done a couple of repairs to the station at D-10: it tends to work loose in the wind, and they have had to tie it down a couple of times. They have already done a round trip to Dome C in the Caterpillar Challenger vehicle that is borrowed from the Australians. With the yearly traffic along the route to Dome C, there may be opportunities to revive the stations at D-47, D-59, and/or D-80 should there be future scientific interest in such data. M. Godon told us that temperatures this season along the route to D-80 had been a whopping fifteen degrees centigrade warmer than usual! It may be of interest to investigate this phenomenon further.

On the evening of the 18th, Blake Moore and I attempted to service the station at Port Martin. Although the ship was under an overcast, Port Martin was in bright evening sun. There is a very good helicopter landing site just to the west of the AWS - access is easy. We discovered that the glazing on the solar panel had been smashed by an impact - it is not clear what hit it - perhaps a skua?. We did have the spare solar panel with us, but discovered that the connector to the junction box was so corroded with salt that it was not possible to unscrew it. In fact, the connector disintegrated in the attempt. Forgetting that the voltage regulation Zener is in the junction box, I proposed to bypass the junction box and wire the new solar panel directly into the battery box.. I realized my mistake after having taken the connector off the end of the new solar panel (it was later replaced). The junction box was corroded closed, and I could not get into it with any of the tools that we had. (I am not sure what I would have done if I had been able to get the box open - would still have had to bypass the shattered connector). So we reluctantly concluded that we could not connect the solar panel, but decided to leave the station with new batteries in order to get at least a few months data before the new batteries would be depleted. We also tightened the guy wires and made a visual inspection of the station. The wind instruments appeared to be in good shape, and there was no perceptible wobble in the bearings of either of the high speed wind instruments. There were salt crystals on the transmitting antenna and the sensor boom and essentially all over the station.

We were able to return to Port Martin on December 20, and I shall report on that visit out of chronological order in order to complete the story on Port Martin. Blake Moore and I returned late afternoon. It was warm and totally calm: the wind speed sensor was motionless. We installed a new junction box and connected the new solar panel. We had some difficulty in removing the connector from the old junction box into the AWS, Eventually it did release: we used a pair of channel locks and some WD-40. (The cable-end connector broke, but fortunately the connector mounted on the AWS remained in fine shape.) We were unable to remove the battery cable from the junction box; but we did have a spare battery to junction box cable. Therefore, the station is complete with a new battery box, new solar panel, and new junction box. The old junction box and old battery cable are abandoned on site: the mounting hardware for the old junction box is frozen on by salt corrosion, and while we did carry a bolt cutter to remove it; we ran out of time. It probably would have been a good idea to cover ALL cable connectors with electrical tape: I am not sure that this was done. I know that the battery connector was covered, which may ease the next battery change. I did check to see if the transmitter cable and sensor cables could be removed from the AWS, and both of these connectors COULD be removed as of this year.

While Blake and I were servicing Port Martin on the 18th, Gerd and an MST, Drew Egressey , were searching for Sutton Station. They were able to find it without too much trouble at the new co-ordinates which George Weidner read to me on the phone on the 14th. The sensor boom, junction box, and AWS were returned to the ship. In the process of transport (I think), two elements of the ground plane were broken off the transmitting antenna. These were later replaced on board the ship using copper rod. I investigated the lack of wind direction registered by the Bendix aerovane. I found that the 10K potentiometer, which is used to indicate direction, is open, and the vane does not turn smoothly: clearly the potentiometer has failed. This aerovane is also missing some hardware internally and looks quite battered: it should be completely re-conditioned or scrapped for parts. I looked inside the AWS itself. The oscillator case shows some signs of corrosion, but otherwise, everything looked fine.

On December 19 I went to the Penguin Point AWS site with an MST, Rachel Smith. We landed on snow at about the same level as the station. We replaced a battery box, tightened the guys, and made a visual inspection of the station. Both high speed wind direction indicator and high speed anemometer turned easily and smoothly. The anemometer bearing has a very slight wobble in it: This bearing should be replaced in the course of next service. There was no evidence of any corrosion on the station. It was overcast and windy, but was not especially cold and was easy to work.

On the morning of December 20, LCDR Jackson accompanied me to Cape Denison. It was overcast and breezy. We were also accompanied by Catherine Beard, a biologist, who collected lichens while we were replacing a battery box. At Cape Denison, the helicopter landing spot is just above Mawson's hut and at the foot of a rocky outcrop on which the AWS stands. It is a little more work to haul batteries up this hill than at the other mentioned sites. The battery replacement went without incident. The guys remained tight. Visual inspection of the station revealed no flaws. The bearings in both the high speed wind sensor and in the direction sensor appeared to be in good shape - both instruments rotated freely and had no perceptible wobble. There was no evidence of salt deposited on this station. Upon return from Cape Denison, I went out again with Blake Moore to Point Martin as noted above.

Because of mechanical problems with the helicopters, we had only one operational helicopter on December 20. Therefore, it was decided to omit the installation of Cape Webb. While we theoretically had a working station (minus wind direction) using the materiels found at Sutton, it would have taken essentially a full day to put in the new station.

Our next proposed service was at Manuela. At that station, wind direction is reporting, but wind speed is not. Therefore, we had hoped on December 27 to put in the aerovane from Sutton which registers wind speed, but not direction. However, ice conditions prevented us from approaching close enough to make the helicopter flight. At the same time, Gerd Wendler proposed to deliver the rest of the Sutton Station to Terra Nova Bay, in the hope that it could be taken to Dome C and delivered to the French for emplacement along the Dome C- Dumont D'Urville route. This station would be complete except for wind direction, because it already has a functioning high speed wind sensor. However, the same ice conditions that prevented us from getting to Manuela likewise prevented him from visiting Terra Nova Bay.

Our final objective was to remove the station at Franklin Island, which has a faulty AWS. While we took off from the ship on the evening of December 27 in sunshine, there was a cloud cap over the center of the island. The co-ordinates that we had for Franklin Island put the AWS on the snow cap on the north end of the island. One of our helicopter pilots, Lieutenant McDevitt, had been to the site before, and his memory confirmed that we were in about the right place. We did four or five passes over the cloud-free part of the north end of the island without finding the station. However, the edge of the cloud was very near (perhaps a quarter mile) to the area that we were searching, and I believe that the station must have been just inside the cloud cap, because I feel that the search outside of the cloud was good and thorough. George Weidner confirms that a tower section was added last year; so the top should be above the snow. It would have been helpful to have a radar reflector on this station.

Bad whether prevented flights to McMurdo on December 28, but I arrived on the morning of December 29. I brought with me the Sutton station components - AWS, sensor boom, Bendix aerovane, high speed wind sensor, and repaired transmitting antenna. In McMurdo I had a chance to talk with Commander Richard Kermond, who is the Executive Officer of the Polar Star. He was here to see the work that the Polar Sea is doing this year and that the Polar Star will do next. He seems personable and supportive of the scientific program.

As of this writing, the captain of the Polar Sea is hopeful of having the opportunity to service Franklin Island and Manuela on his return trip.

General observations and recommendations:
Clearly, the program was hampered by the failure to receive the materials airshipped from Madison. With a complete station, we would not have felt the need to look for materials at Dumont D'Urville. Such shipments must be made early and tracked carefully until they are aboard the ship.

I was unprepared for the salt problems at Point Martin. In talking to some of the Coast Guard crew aboard the Polar Sea, I understand that this has been a problem before. At this site (and other similar ones where marine corrosion is a problem), it is recommended to have a complete station in reserve, new cables, new junction box, new solar panel, and strong tools to deal with corrosion. It would also be well to have a written check off list of tools and materials for the helicopter flights to be SURE that all possibly useful tools and materials were on board.

While the MST's are very generous with their tools and there are lots of tools on board, it would be well to have the basic tool set as part of the AWS materials. Tools taken to each site should include hacksaw, bolt cutter, channel-locks, pipe wrench, tape, WD-40, socket wrench set, tape, multimeter, cable ties, pliers, wire cutters, screw drivers both small and large, Phillips and slotted, Swiss army knife, a selection of spare bolts and nuts (5/16"), and a 1/8" allen wrench for the high speed wind indicators. Also recommend some bailing wire and camera for documentation.

It would be useful to have as precise co-ordinates as possible for each station and photos and information on helo landing sites.

The bird experts asked us to recommend streamers on the guy wires of any stations that might be near bird sites (Port Martin). Such streamers might be six inch lengths of nylon cord.

I want to express my sincere thanks to Captain Keith Johnson and the crew of the Polar Sea. The entire crew were very supportive of all the science projects aboard the ship, and Captain Johnson went out of his way to be personally friendly and supportive, as did Executive Officer Stephen M. Wheeler. Ensign April A. Isley , the Marine Science Officer, and Chief Sean McPhilamy, were especially helpful. Marine Science Technicians, Chris James, Drew Egressey David Otani, Ryan Moraros and Rachael Smith gave the programs a great deal of friendly help. The helicopter crews went out of their way to be supportive, and worked hard with us on the ground, moving batteries, tightening guy wires, and offering a great deal of personal help. The Polar Sea is a remarkable platform for science projects, and it would be my hope that the partnership between the Coast Guard and the scientific community will continue in the Antarctic.

Polar Sea crew gave the program a great deal of friendly help. The helicopter crews went out of their way to be supportive, and worked hard with us on the ground, moving batteries, tightening guy wires, and offering a great deal of personal help. The Polar Sea is a remarkable platform for science projects, and it would be my hope that the partnership between the Coast Guard and the scientific community will continue in the Antarctic.

Report of MST3 David Otani
USCGC Poalr Sea
Northbound AWS field work

To: "'georgew@ssec.wisc.edu'" <georgew@ssec.wisc.edu>
Cc: "Casler, Eric R. LTJG" <ECasler@polarsea.uscg.mil>,
"Isley, April A. LTJG" <AIsley@polarsea.uscg.mil>,
"McPhilamy, Sean M. MSTC" <SMcPhilamy@polarsea.uscg.mil>
Subject: Franklin Island AWS

Mr. G. Weidner

Original plans were to take down and retrograde the entire system at Franklin-Whitlock unless another AWS system was found. Jonathon Thom previewed with me the option of the "found AWS" and its exchange.

At 1:30pm, 07 Feb 2001 - Wisconsin time (7:30pm, 07 Feb 2001 - GMT), we changed out the AWS at Franklin Island. There was no problem spotting the weather station, unlike last month where we could not find it because of the low ceiling. The USCG helicopter GPS determined its location to be 76.08.6 S 168.23.5 E. The altitude, also according to the helo is approx 790 ft or 241 M.

When we arrived it was buried about 2'6"deep in snow. (see photos) The hights of the anatomical features are:

Anemometer and vane	6'8"
Boom	6'0"
Solar panel	4'10"
Junction box	1'6"
AWS enclosure	0'9"

The AWS enclosure change out went smoothly. No significant problems were evident. The solar panel, boom, sensors, and antenna all seem healthy. The batteries registered at 13 volts, so we made no change of them. We also uncovered, through the snow, a small portion of the battery boxes (interestingly they read Polar Sea-Deep Freeze 98)

We now have in our possession the old Franklin-Whitlock AWS which has no number (however its serial number is 856695. I wonder if it is 8905 in your directions). AWS 8907 is now currently running at Franklin-Whitlock.
It may have been optimal to add on the 3' tower extension. We did not for two reasons:

1) We could not tell if we could get 3 ' worth of slack in all the cables as they were perfectly protected in the snow. Didn't want to accidentally and unknowingly pull anything out on the other end.

2) 10 minutes after we landed, we were invaded by low clouds that pushed up the windward side of the island. We were then in fog, and icing conditions were to unfavorable for the helo. Time, not suprisingly, became a critical factor. If we had started our venture
10 minutes later, we probably wouldn't have found the sight at all.
Respectfully,

MST3 David Otani

At 05:48 AM 2/18/01 -0800, you wrote:
>Hello again.

Sorry, my last email bounced back and unfortunately my home email is out due to hard disk problems so I didn't realize your previous message was not answered.

>
>Have some news. We tried to go find Manuela AWS again but the helo had some
>problems. We were all ready to go, rotors turning and everything. I was
>sitting in the co-pilot seat like a dog ready to go for a car ride. Still
>may be a very slim slim slim chance. Any pointers on finding it? We still
>couldn't find it.
\TO FIND MANUELA

1. Manuela site is located on southern end of Inexpressible Island.
   at

   As one approaches the site via helo the two Nunataks (Teall and Hansen) should be kept in a line. Once landing at the site The Teall Nunatak is just to the left of the Hansen Nunataks highest point.
   The location as given by ARGOS

   74 deg 56.4 min South
   163 deg 41.4 min East

   Last GPS was

   74 deg 56.76 South
   163 deg 41.22 East

   estimate of 80 meters (which may be too high)

   This is at south end of Island. ope this helps

>Is Franklin / Whitlock working? I hope so. Please let us know. You can
>just reply to this address if you like.

This unit is working well. thanks
Regards, George Weidner