

**Antarctic Automatic Weather Stations
Field Report for 2006-2007**

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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 AWS electronic 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 Beardmore Glaciers, the Siple and Adelie Coast
- Mesoscale circulation and sensible and latent heat fluxes on the Ross Ice Shelf
- The Ross Ice Shelf Air Stream.
- 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
- Southern Ocean Global Ocean Ecosystems Dynamics
- Meteorological 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. Ray Smith, Long Term Ecological Research: Racer Rock, Bonaparte Point, and Santa Claus Island.
- Dr. Robert C. Beardsley, Southern Ocean GLOBEC: Marguerite Bay and the Islands in the area.
- West Antarctic Ice Sheet Initiative and International Trans Antarctic Scientific Expedition: Siple Dome and West Antarctic Divide drilling sites.
- Dr. Tom Parish and Dr. John Cassano: The Ross Ice Shelf Air Stream
- Aircraft Operation: All AWS sites in Antarctic.
- The Antarctic AWS units support many investigators outside of NSF-OPP.

AMRC/AWS collaboration:

- Climatological analysis from the AWS, and other stations (complimenting the activities in the SCAR READER project).
- Continued data collection, archival and distribution of AWS data.
- The continued generation and improvement of the Antarctic composite satellite imagery (as outlined in the above section).
- Continued educational outreach activities (as outlined in the above section and in the following outreach section).
- Utilities developed to generate climatological analyses from AWS observations.

Field work completed for 2006-2007

For the AS 2006-2007 field season, the field team consisted of George Weidner (O-283) and Jonathan Thom (O-283, I-190), and Mathew Lazzaara O-202 and O-283), with assistance from Mr Thomas Nylen of UNAVCO during the month of January. Additional assistance from the personnel at the Crary Lab at McMurdo Station, Ken Borek Twin Otter pilots, and Dr. Gordon Hamilton and Ben Parten at WAIS divide field camp and West Antarctic Sites, and finally John Gallagher and the Met Office staff at South Pole. Also, a big thank you to Rob Easter, Coordinator, 2006 Mawson's Huts Conservation Expedition 2007, for replacing the wind sensor on the AWS at Cape Denison. Fieldwork was also done through cooperative programs with personnel from the Japanese Antarctic program (JARE), the French Antarctic program **Institut Polaire Français - Paul Emile Victor (IPEV)** and the **British Antarctic Survey (BAS)**.

Summary of University of Wisconsin – Madison fieldwork follows:

A. McMurdo based operations (See full report of January Field team below)

<u>Site</u>	<u>ARGOS ID</u>	<u>Service performed at site</u>
Mullock	8907	New Site with High Wind System
Ferrell	8929	Retrieve ADG data
Willie Field	21364	Retrieve ADG data
Mary	8983	AWS software updated, ADG data
Mount Fleming	30393	New Site installation
Windless Bight	8982	AWS raised
Linda	21362	Replaced defective wind sensor
Lorne	21356	New installation near old Meeley site
Marilyn	8934	Replaced defective wind sensor
Lettau	8928	Raised Aws, replaced 8908 with 8928
Carolyn	8722	Replaced defective wind sensor
Emelia	8980	AWS 8919 replaced with CR10X ID 8980
Mt Friis	28339	AWS transferred from Andrew Fountain
Zoe	2769	Assumed AWS from Megadunes Prgram
Little Mac	2516	Assumed AWS from Megadunes Prgram

B. West Antarctic based operation

<u>Site</u>	<u>ARGOS ID</u>	<u>Service performed at site</u>
Swithinbank	21355	AWS 21355 installed by Gordon Hamilton (X)
Kominko-Slade (WAIS)	8936	AWS rebooted by Ben Parten

C. South Pole

<u>Site</u>	<u>ARGOS ID</u>	<u>Service performed at site</u>
➤ Erin	21362	John Gallagher and field team weather out.

D. Field work in Adelie Land

- Three AWS shipped to Dumont D'Urville (arrived too late for deployment in 2006-2007).
- Cape Denison serviced by Australian Antarctic Historical Society.

E. Field work by the Japanese Antarctic Research Expedition

- Two AWS shipped to Syowa Base for deployment in 2007-2008.

F. Service performed on AWS located near Palmer Station

- New wind system installed on AWS 8923 at Bonaparte Point site.

G. University of Wisconsin Automatic Weather Station Servicing by BAS

Summary of positions and height

Butler Island	S 72 12.38	W 060 10.18	205m
Sky Blu	S 74 47.53	W 071 29.31	1510m
Limbert	S 75 54.85	W 059 15.86	40m
Larsen Ice Shelf	S 67 00.70	W 061 32.97	17m
Uranus Glacier	S 71 21.67	W 068 47.83	753m - AWS was removed and relocated to Fossil Bluff in 2006.

Current status

Name	Temperature	Pressure	Wind speed	Wind direction
Larsen*	OK	OK	OK	OK
Butler*	OK	OK	OK	OK
Sky Blu*	OK	OK	OK	OK
Limbert*	OK	OK	OK	OK
Fossil Bluff*	OK	OK	OK	OK

*Stations updated to CSI CR1000 based units by BAS

- Data are sampled every 10 seconds then averaged every 10 minutes and transmitted.
- The data are downloaded from the ARGOS website every hour then decoded and error checked.

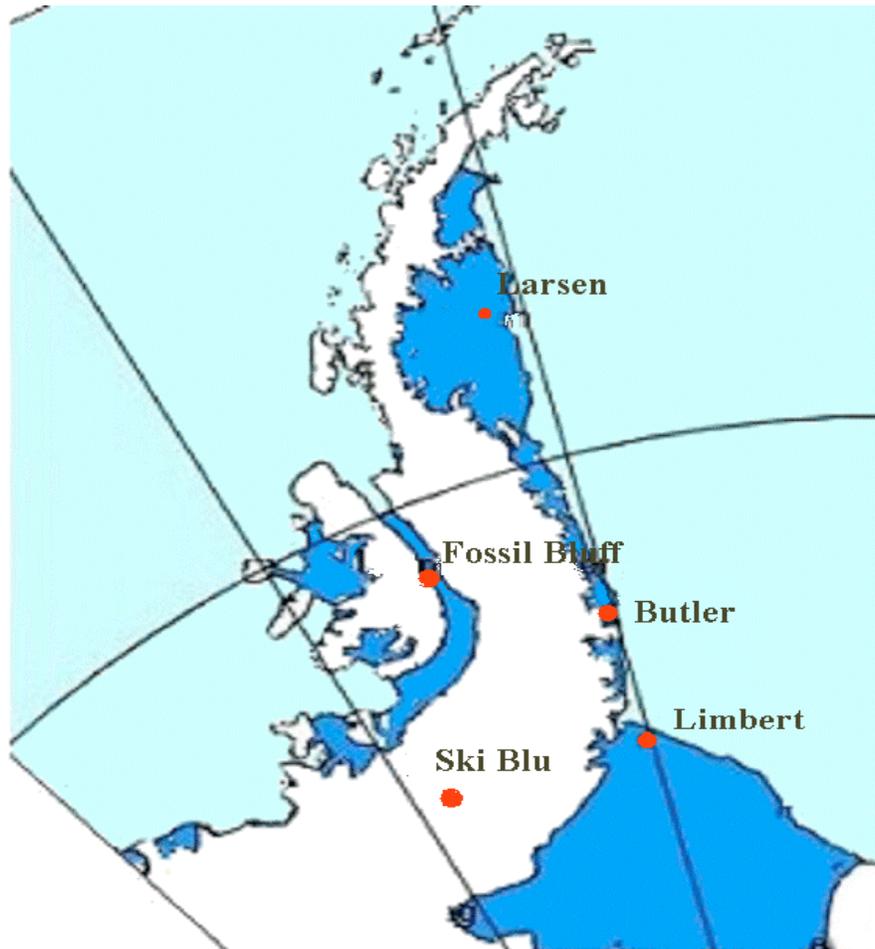


Figure 1. AWS sites maintained by the British Antarctic Survey (BAS).

October/November AWS for Icebergs (I-190) field season

October/November AWS (O-283) field season highlights

O Deployment on October 25, 2006 of AWS 8907 (AWS2B version) with a high wind speed (HWS) system on Mullock Glacier ([Mullock Glacier](#)) by Jonathan Thom and



Figure 2: Mullock AWS installed October 25, 2007 (with high wind speed system).

For the 2006-2007 field season we installed one of our AWS at the site where Mike Willis (TAMDEF) had installed an AWS (recording type) at Mount Fleming (FLM) site during the 2004-2005 field season.

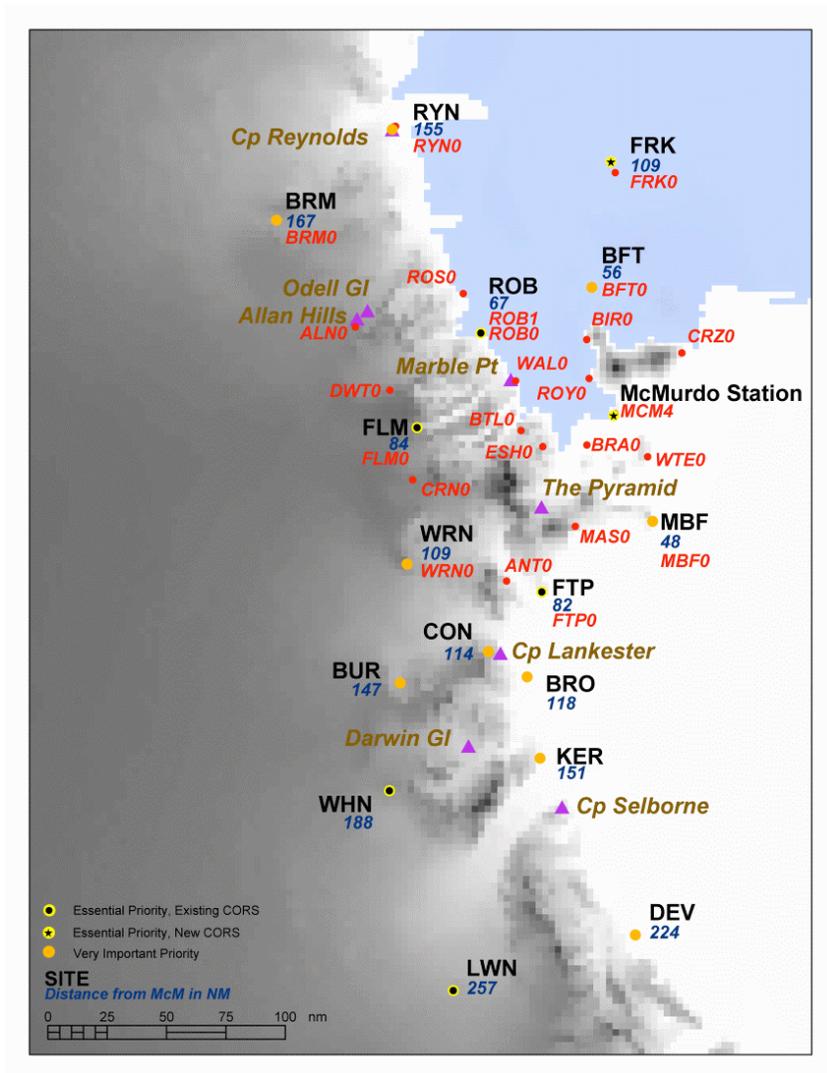


Figure 3. TAMDEF sites



Figure 4. Mount Fleming (FLM2) TAMDEF AWS after one year.

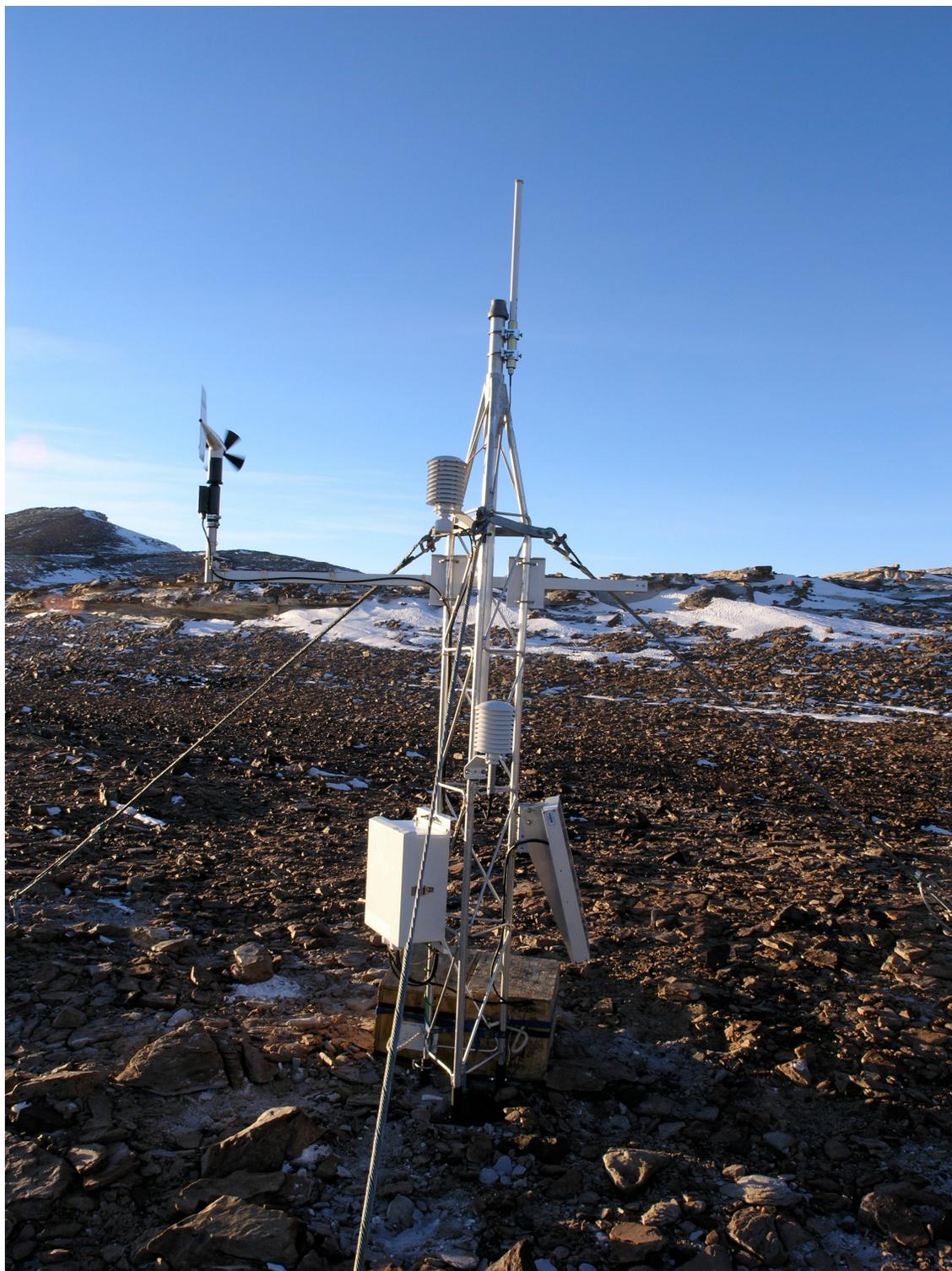


Figure 5. Mount Fleming (FLM2) UW AWS at installation

January AWS (O-283) field season

New Installations

1. Lorne AWS site.

- Establish the arc of AWS at 100 Km from McMurdo
- Install an AWS closer to the initial position of Ferrell AWS (which has moved over 20 km north since its installation in 1979).



Figure 6. Lorne AWS site

The R M Young wind direction potentiometer problem and future AWS wind systems.



- **We had three R M Young Model 05103VM wind sensors wear a gap in the potentiometer. One was an older one (5 years deployed), but the other two were only deployed for 2-3 years. Many of our AWS sites have a very high wind constancy (those in Adelie Land can be .95 or higher). So there will be a tendency to have the wiper of the sensor potentiometer “sit” on one area for most of the year. Older R M Young 05103’s have not exhibited this problem.**



- **We will be converting most of the remaining AWS with Bendix/Belfort wind sensors to R M Youngs in the next three years.**
- **Some of our sites will require a high wind speed system (see Mt Fleming [data](#)).**
- **The current cost difference is**
 - R M Young ~ \$1,000**
 - Belfort ~ \$4,000**
 - HWS ~ \$3,500**

AWS issues since the end of the field season.

*** On January 31, 2007 the Iceberg know as C25, which had AWS 30416 installed on it, broke up off of Cape Hallett. The AWS has not been received since that date and is presumed lost.**



Figure 7. Jonathan Thom at the installation of AWS 30416 on the Drygalski in November of 2005.

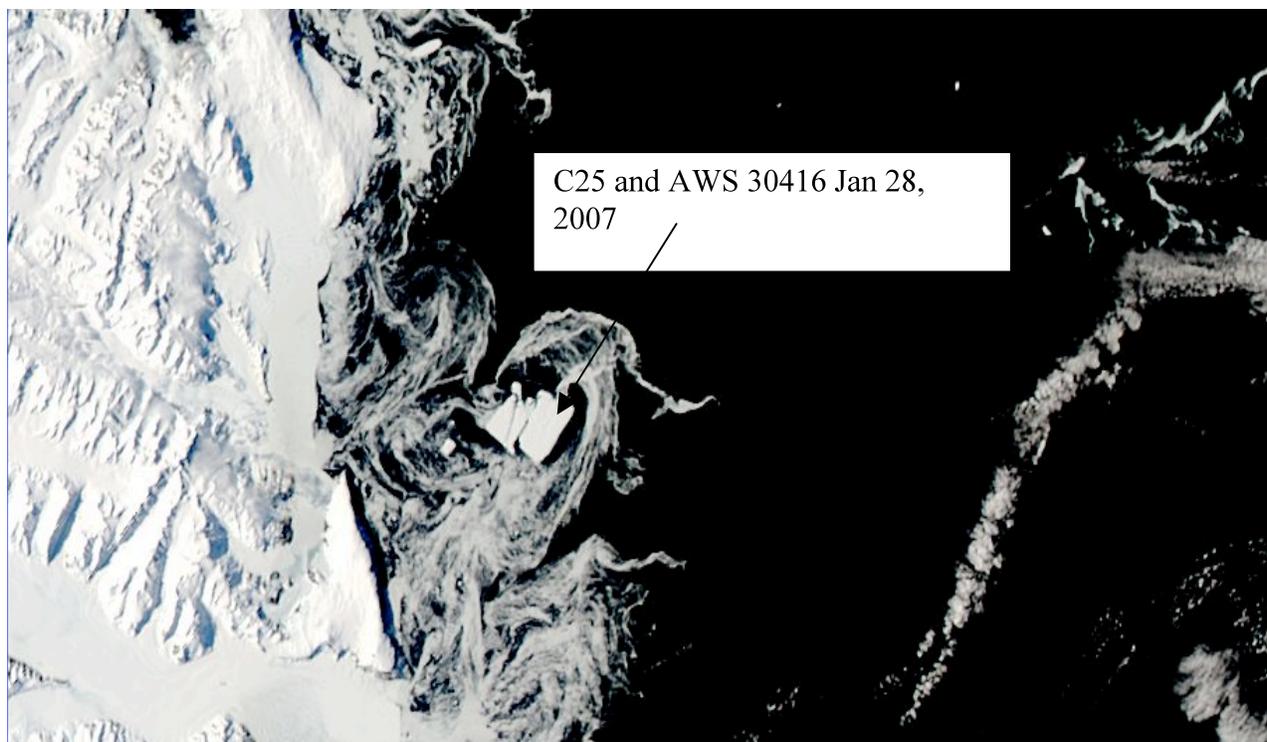


Figure 8. MODIS image Showing the C25 as it was breaking up on January 28, 2007.

Table 1: AWS for 2007. An '@' in the 'Altitude' column indicates a location obtained from UNAVCO GPS.

SITE	ARGOS ID	ARGOS ID	Lat.	Long.	Alt.(m)	Date	WMO#
	OLD/Status	NEW/Action				STARTED	
	Adelie Coast						
D-10	8986	8914 (TBI)	66.71oS	139.83oE	243	Jan-80	89832
D-47	8947		67.397oS	138.726oE	1560	Nov-82	89834
D-57	No AWS	8916 (TBI)	68.199oS	137.538oE	2105	Jan-96	
D-80	No AWS	8912 (TBI)	70.040oS	134.878oE	2500	Jan-83	89836
Dome C II	8989		75.121oS	123.374oE	3250	Dec-95	89828
Port Martin	8909	Not serviced	66.82oS	141.40oE	39	Jan-90	
Cape Denison	8988	Serviced	67.009oS	142.664oE	31	Jan-90	
Penguin Point	8910		67.617oS	146.180oE	30	Dec-93	89847
Cape Webb	N/A	Not installed	67.943oS	146.812oE	~60	Dec-94	
	West Antarctica						
Byrd Station	8903		80.007oS	119.404oW	1530	Feb-80	89324
Brianna	8931		83.889oS	134.154oW	@525	Nov-94	
Elizabeth	21361		82.607oS	137.078oW	@519	Nov-94	89332
J.C.	N/A		85.070oS	135.516oW	549	Nov-94	
Erin	21363	Not serviced	84.904oS	128.828oW	@990	Nov-94	
Harry	8900		83.003oS	121.393oW	945	Nov-94	
Theresa	21358		84.599oS	115.811oW	1463	Nov-94	89314
Doug	No AWS	Not active	82.315oS	113.240oW	1433	Nov-94	
Mount Siple	8981		73.198oS	127.052oW	230	Feb-92	89327
Siple Dome	8938		81.656oS	148.773oW	@668	Jan-97	89345
Swithinbank	21355	AWS installed	81.201oS	126.177oW	@959	Jan-97	
WAIS K-S	8936	Serviced	79.468oS	112.086oW	@1833	Jan-06	
	Ross Island Region						
Marble Point	8906		77.439oS	163.754oE	@108	Feb-80	89866
Ferrell	8929		77.865oS	170.819oE	@45	Dec-80	89872
Pegasus North	21357		77.952oS	166.500oE	@8	Jan-90	89667
Pegasus South	8937		77.990oS	166.568oE	@5	Jan-91	
Minna Bluff	8939		78.555oS	166.691oE	@47	Jan-91	89769
Mullock	8907	New install	79.018	170.819	@378	Oct-06	
Willie Field	21364	Serviced	77.866oS	166.983oE	@14	Jan-92	
Windless Bight	8982	Serviced	77.728oS	167.703oE	61	Nov-98	
Cape Bird	8901		77.224oS	166.440oE	@42	Jan-99	
Laurie II	21360		77.509oS	170.797oE	@37	Jan-00	
Linda	21362	Serviced	78.439oS	168.406oE	@43	Jan-91	89769
Lorne	21356	New Install	78.250oS	170.000oE	@45	Jan-07	
Mt Friis	28339	Acquired	77.747oS	161.516oE	@1581		
Mt Fleming	30393	New Install	77.533oS	160.276oE	@1868	Nov-06	
	Ocean Islands						
Whitlock	8935	Not serviced	76.144oS	168.392oE	(275)@206	Jan-82	89865
Scott Island	No AWS		67.37oS	179.97oW	30	Dec-87	89371

Table 2. AWS unit not deployed for 2007

AWS item	AWS ID	AWS TYPE/TX'er	Current status	2008 use ?
Madison-BAS	8902	AWS2B/PRL	Upgrade/TEL	New ID/Byrd
Madison-BAS	8917	AWS2B/PRL	Upgrade/TEL	New ID
Madison-BAS	8920	AWS2B/PRL	Upgrade/TEL	New ID
Madison-BAS	8925	AWS2B/TEL	Upgrade	Chinese/New ID
Madison-BAS	8926	AWS2B/PRL	Upgrade/TEL	New ID
Madison-Lettau	8908	AWS2B/PRL	Upgrade/TEL	ITASE
Madison-Emelia	8919	AWS2B/PRL	Upgrade/TEL	ITASE
Madison	8927	AWS2B/PRL	Upgrade/TEL	UNAVCO/Harvey
Madison-CR10X	8921	CSI CR10X/Seimac	Test	
Madison-CR10X	8922	CSI CR10X/Seimac	Test	
Madison-CR1000	*8909	CSI CR1000/ST-20	Assemble	IPEV
Madison-CR1000	*8910	CSI CR1000/ST-20	Assemble	IPEV
Madison-CR1000	*8915	CSI CR1000/ST-20	Assemble	Roosevelt Is.
Madison-CR1000	*8935	CSI CR1000/ST-20	Assemble	Franklin Is
Madison-CR1000	*8937	CSI CR1000/ST-20	Assemble	Pegasus South
Madison-CR1000*	*8934	CSI CR1000/ST-20		Marilyn
Madison-CR1000*	*8913	CSI CR1000/ST-20		Schwerdtfeger
Madison-CR1000*	*8911	CSI CR1000/ST-20		Gill
Madison-CR1000*	TBD	CSI CR1000/ST-20		
Madison-CR1000*	TBD	CSI CR1000/ST-20		
Available ID's				
Megadunes	2516	CR10X/Seimac	Megadunes	Reuse
LTER – Bonaparte Point	8923	AWS2W	LTER	Reuse
GLOBEC – Dismal Island	8930	CR10X/ST-13	GLOBEC	Reuse
GLOBEC – Kirkwood Island	8932	CR10X/ST-13	GLOBEC	Reuse
B15 K	9116	CR10X/Seimac	Iceberg	Reuse
Swithinbank	21355	AWS2B/TEL	WA	Repalcement
Not deployed	28338	CR10X/Seimac		Cape Hallett
Not deployed	30374	CR10X/Seimac		TBD
C25 Fountain AWS (gone)	30416	CR10X/Seimac	Iceberg	Reuse

Table 3: GPS data for last three years. Horizontal accuracy is +/- 10 cm and vertical accuracy +/- 20 cm. The horizontal position does not refer to the exact AWS location, but rather a position approximately 10 (~meters) paces north of the AWS.

Time (UTC)	Point Name	Latitude	Longitude	Elevation (m)
1/20/2005	MCM4	-77.838349192	166.669327881	151.384
1/5/2006		-77.838349192	166.669327881	151.384
1/21/2005	Marilyn	-79.934621417	165.378042268	64.265
1/22/2005	Schwerdtfeger	-79.866705389	170.141637633	54.111
1/22/2005	Vito	-78.500684623	177.753022227	50.438
1/29/2005	Elaine	-83.110647281	174.316209725	58.748
1/29/2005	Eric	-81.504019626	163.939784903	45.264
1/31/2005	Caroline	-79.963945053	175.841755564	52.356
1/31/2005	Mary	-79.302867615	162.968135140	58.237
1/31/2005	Emilia	-78.502159228	173.120731686	52.304
2/2/2005	Gill	-79.922360816	178.585942241	54.1
2/3/2005	Cape Bird	-77.217395796	166.439167594	38.474
2/4/2005	Ferrell	-77.871237429	170.818738812	45.807
1/5/2006	Ferrell	-77.865257305	170.818793165	45.441
1/4/2006	Linda	-78.438856017	168.406300550	42.932
1/5/2006	Lauriell	-77.509374745	170.796776506	36.998
10/24/2006	Mullock	-79.018017804	160.156465144	433.99
10/27/2006	Ferrell@	-77.860180288	170.819058853	45.697
10/30/2006	*Mary@	-79.304722957	162.985230228	58.407
11/05/2006	Windless Blight@	-77.723464484	167.692293736	39.899
01/10/2007	Linda@	-78.434615897	168.410180297	42.700
01/12/2007	Lorne@	-78.249695361	170.000239500	45.506
1/24/07	Lettau@	-82.486461167	-174.553006722	38.363
1/29/07	Carolyn#	-79.951500000	175.863830000	
1/29/07	Emelia#	-78.488000000	173.134000000	
11/1/06	Mt Fleming**@	-77.533000000	160.276000000	1868
	Mt Friis@	-77.747384067	161.516258725	1580.521
	Megadunes Zoe@	-80.775460000	124.526680000	2881

'@' is UNAVCO data

* For Mary, there was insufficient data to arrive at a fixed solution. This point is lonog free (dual frequency) float solutions. To check the position, the data was submitted to the Canadian Spatial Reference System (CSRS) Precise Point Positioning (PPP) service (http://198.103.48.76/online_data_e.php). The position from the service is Latitude (ITRF00): -79 18 17.0089 (dms) / 0.031 (m), Longitude (ITRF00): 162 59 06.8353 (dms) / 0.042 (m) and Ellipsoidal Height (ITRF00): 2.367 (m) / 0.067 (m). The EGM96 Height is 58.343m.

** Mount Fleming from UNAVCO web site for FLM2

updated lat/long only for 2007

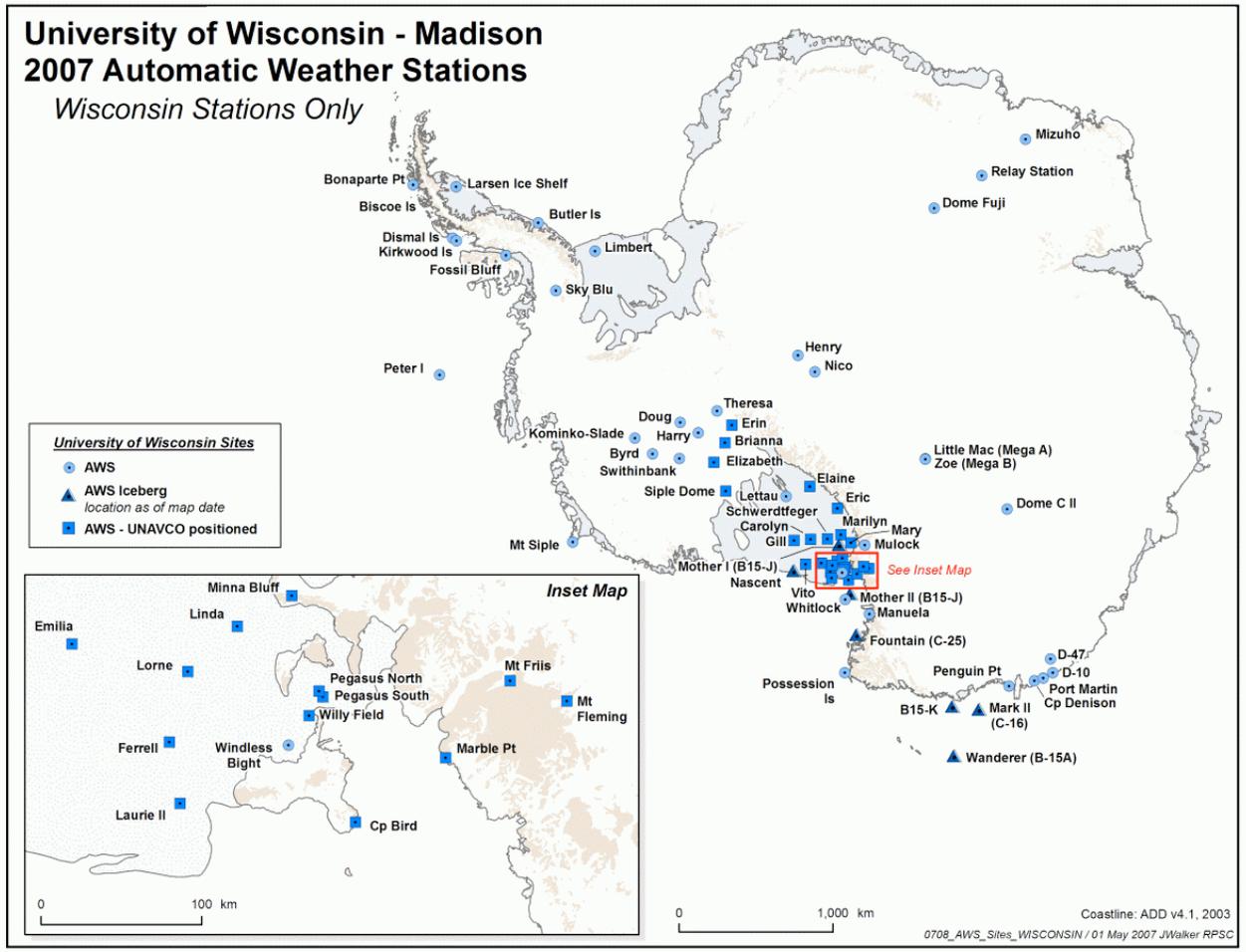


Figure 8. A map of Antarctica showing the locations of the University of Wisconsin’s automatic weather stations for 2007. Identification of the sites is by the site name

Tentative AWS Field Work 2007/2008 Austral Summer

A. AWS servicing based from Mcmurdo as of June 2007.

Ross Island Region				
Ferrell	8929	Down load ADG data	77.865oS	170.819oE
Pegasus South	8937	Replace AWS	77.990oS	166.568oE
Minna Bluff	8939	Check HWS	78.555oS	166.691oE
Mt Fleming	30393	Wind Senor upgrade	77.533 S	160.276E
Mount Friis	28339	Check wind system	77.747 S	161.516 E

Ross Ice Shelf				
Marilyn	8934	Replace Belfort,Raise AWS	79.954oS	165.130oE
Schwerdtfeger	8913	Replace Belfort	79.875oS	170.105oE
Gill	8911	Replace Belfort	79.985oS	178.611oW
Elaine	8987	Service	83.134oS	174.169oE
Lettau	8928	Replace Belfort	82.518oS	174.452oW
Carolyn	8722	Replace Belfort	79.964oS	175.842oE
Mary	8983	Raise AWS	79.303oS	162.968oE
Nascent	28336	Temp string install	78.127oS	178.497oE
Roosevelt Island	TBD	Install new AWS	TBD	TBD

B. AWS operations from the icebreaker (as a wish list).

- The following AWS sites would be visited for installing a minimal (dog house AWS on an opportunity basis from a ship, preferably an icebreaker).

Scott Island	TBD	67.37oS	179.97oW	Deploy new AWS
Young Island	TBD	66.229oS	162.275oE	Deploy new AWS
Whitlock	8935	76.144oS	168.392oE	Deploy new AWS

C. AWS operations in West Antarctica

- Service West Antarctic Sites – replacing old Bendix/Belfort wind systems and Servicing as many AWS as needed from WAIS Divide camp/ Siple Dome or ?

Byrd Station	Upgrade 8903	80.007oS	119.404oW	1530
Brianna	8931	83.889oS	134.154oW	@525
Elizabeth	21361	82.607oS	137.078oW	@519
Erin*	21363	84.904oS	128.828oW	@990
Harry	8900	83.003oS	121.393oW	945
Theresa	21358	84.599oS	115.811oW	1463
Mount Siple	8981	73.198oS	127.052oW	230
Siple Dome	8938	81.656oS	148.773oW	@668
Swithinbank	Install new AWS	81.201oS	126.177oW	@959
WAIS Divide (K-S)	8936	79.334oS	111.077oW	@1833

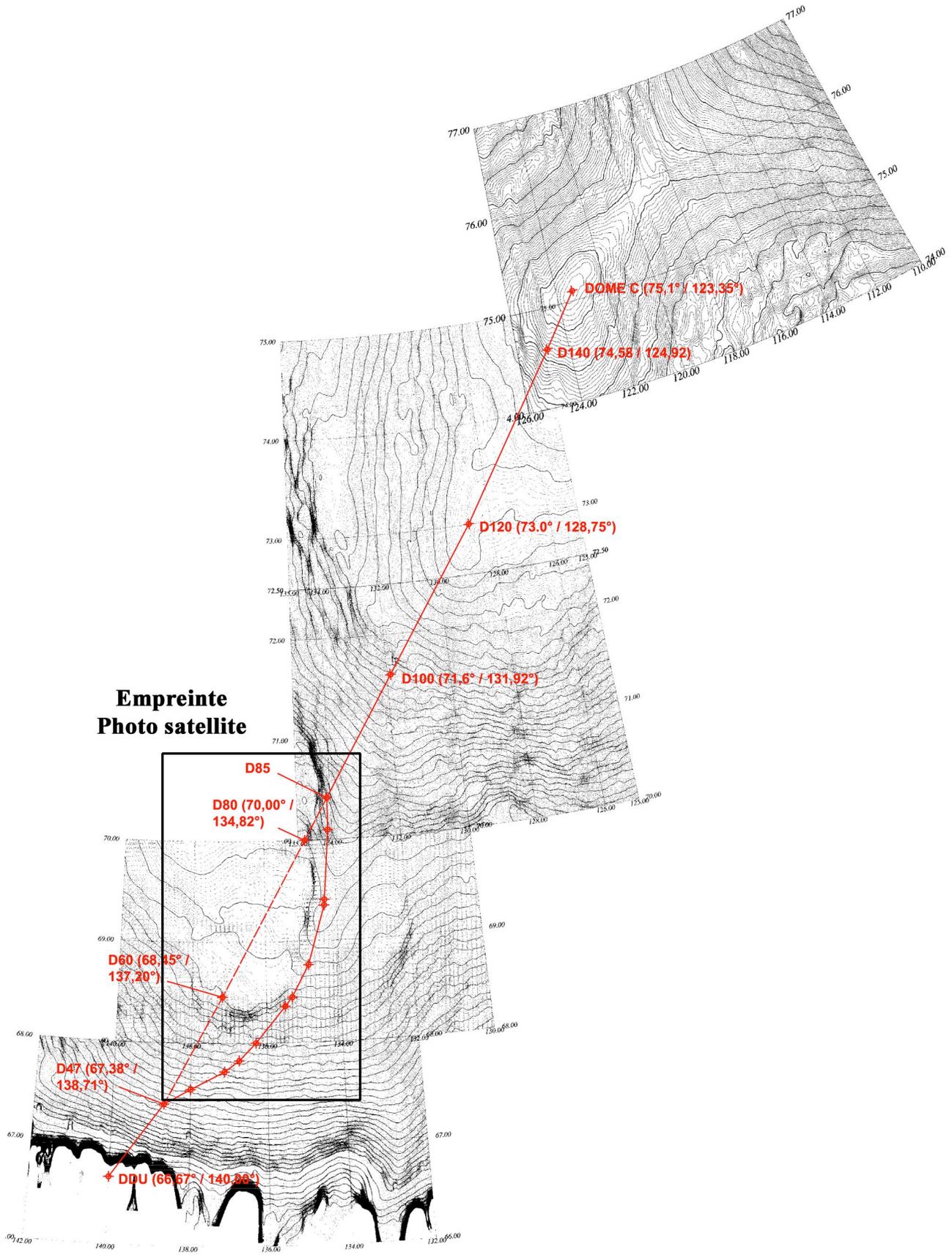
* May be serviced from South Pole

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.

D-10*	8986	66.71oS	139.83oE	243
D-47	8947	67.397oS	138.726oE	1560
D-57 reinstall	TBD	68.199oS	137.538oE	2105
D-80 reinstall	TBD	70.040oS	134.878oE	2500
Dome C II	8989	75.121oS	123.374oE	3250
Port Martin*	8909	66.82oS	141.40oE	39
Cape Denison	8988	67.009oS	142.664oE	31
Penguin Point*	8910	67.617oS	146.180oE	30

* Need to be replaced



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

- One new installation is planned at the midpoint between the Japanese Dome Fuji Station and the German Kohnen Station.
- At this time Relay Station is not transmitting and an updated AWS will be sent to replace the current AWS.

Relay Station	8918	74.017oS	43.062oE	3353
Dome Fuji	8904	77.31oS	39.70oE	3810
Mizuho	21359	70.70oS	44.29oE	2260
New installation	30305	70.00oS	20.00oE	3400



Antenna new
mount just below
R M YOUNG

AVS 30305 works with
R M YOUNG
8918 replacement
Does NOT

F. AWS Fieldwork to be done by the British Antarctic Survey based at Rothera Station.

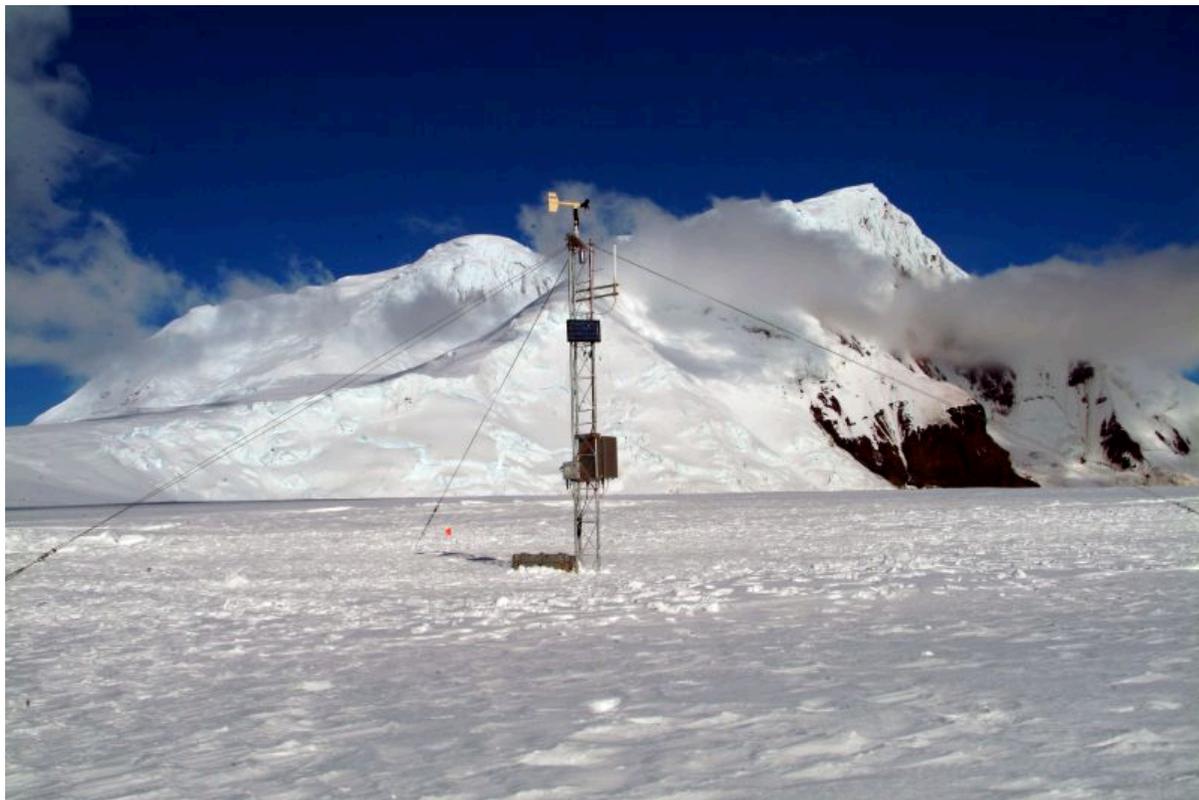
Larsen Ice	8926	Upgrade software	66.949oS	60.897oW	17
Butler Island	8902	Upgrade software	72.207oS	60.160oW	91
Fossil Bluff	8920	Upgrade software	71.33oS	68.283oW	63
Limbert	8925	Upgrade software	75.422oS	59.851oW	40
Ski-Hi	8917	Upgrade software	74.792oS	70.488oW	1395

G. AWS Fieldwork to be done for LTER/Operations based from Palmer Station.

Bonaparte Point	8921	New AWS	64.778oS	64.067oW	8
Santa Claus I	8922	New AWS	64.964oS	65.670oW	25

H. AWS servicing of Peter I Island AWS

Peter I	8933	Service /New	68.769oS	90.670oE	90
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I. WS Fieldwork in support of GLOBEC AWS.

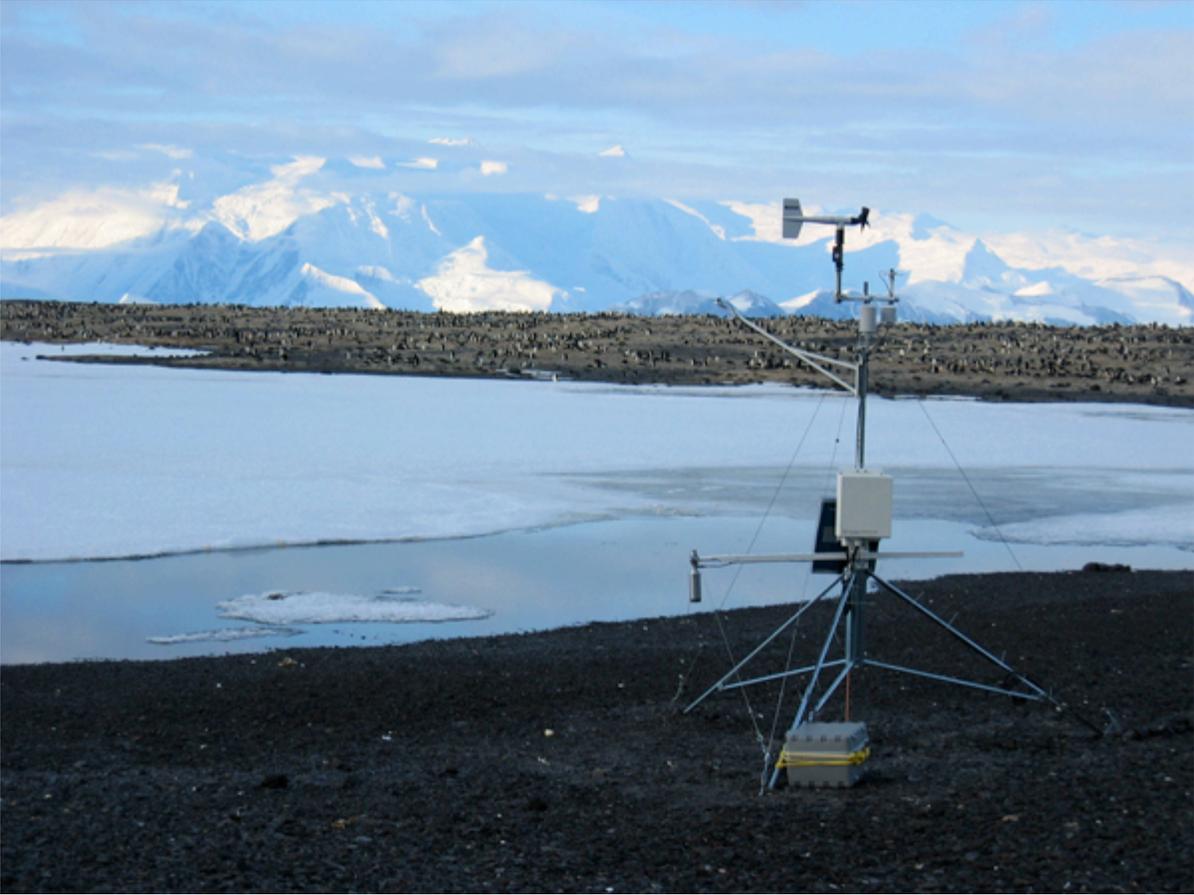
Kirkwood Island*	8930 replace	68.340oS	69.007oW	30
Dismal Island*	8932 replace	68.087oS	68.825oW	10

J. AWS servicing in support of Iceberg Research (IO-190-O)

B15J Mother 1	30504			
B15J Mother 2	30580			
B15K*	9116			
B15A Wnderer	30477			
C16	15930			

* Not received as of June 15

Ships of opportunity



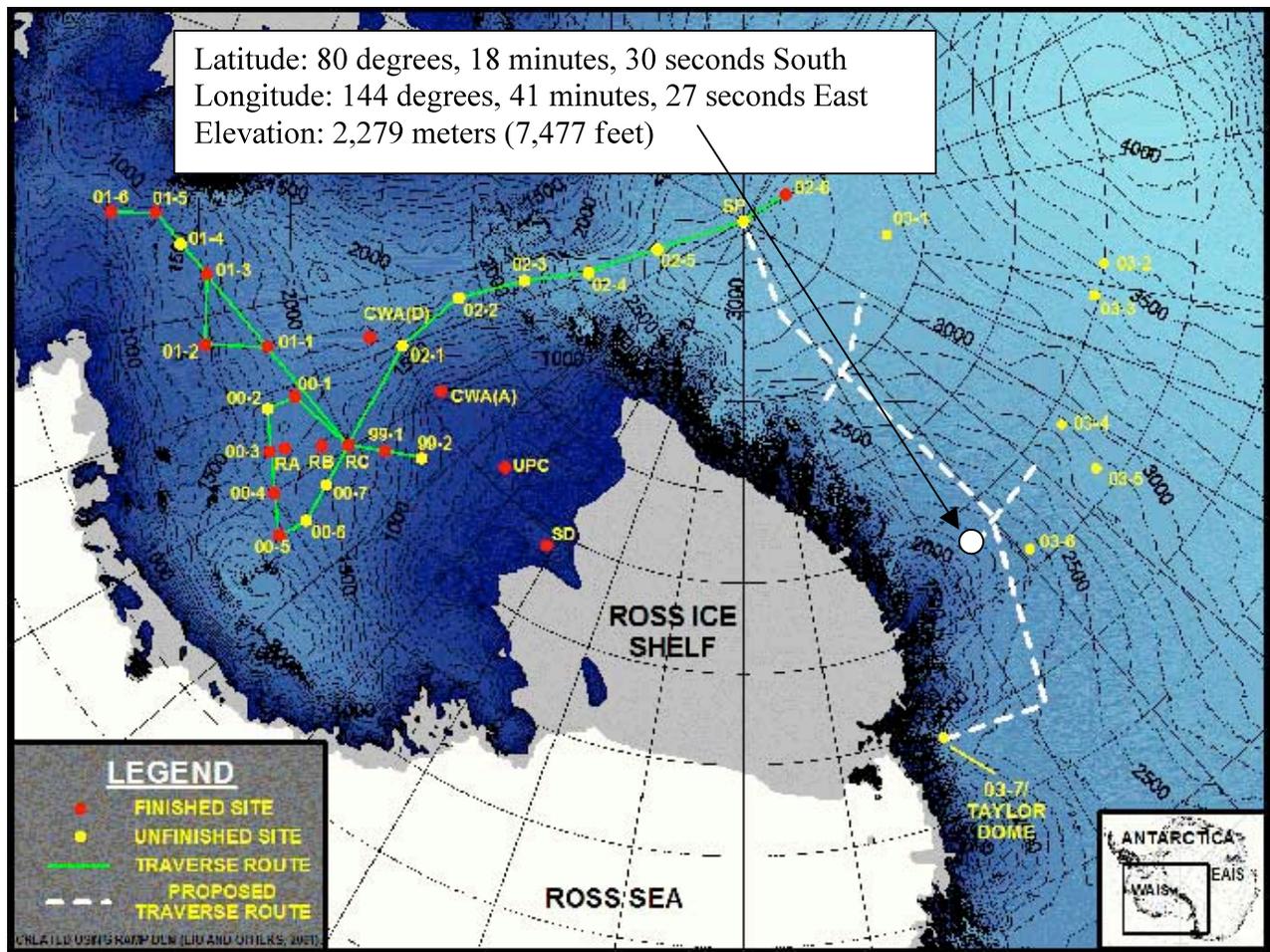


Figure showing the ITASE route for 2007/2008
 IT is proposed to take advantage of the ITASE traverse to have them install an AWS at the top of the Byrd Glacier and a possible second AWS on the way to the South Pole.

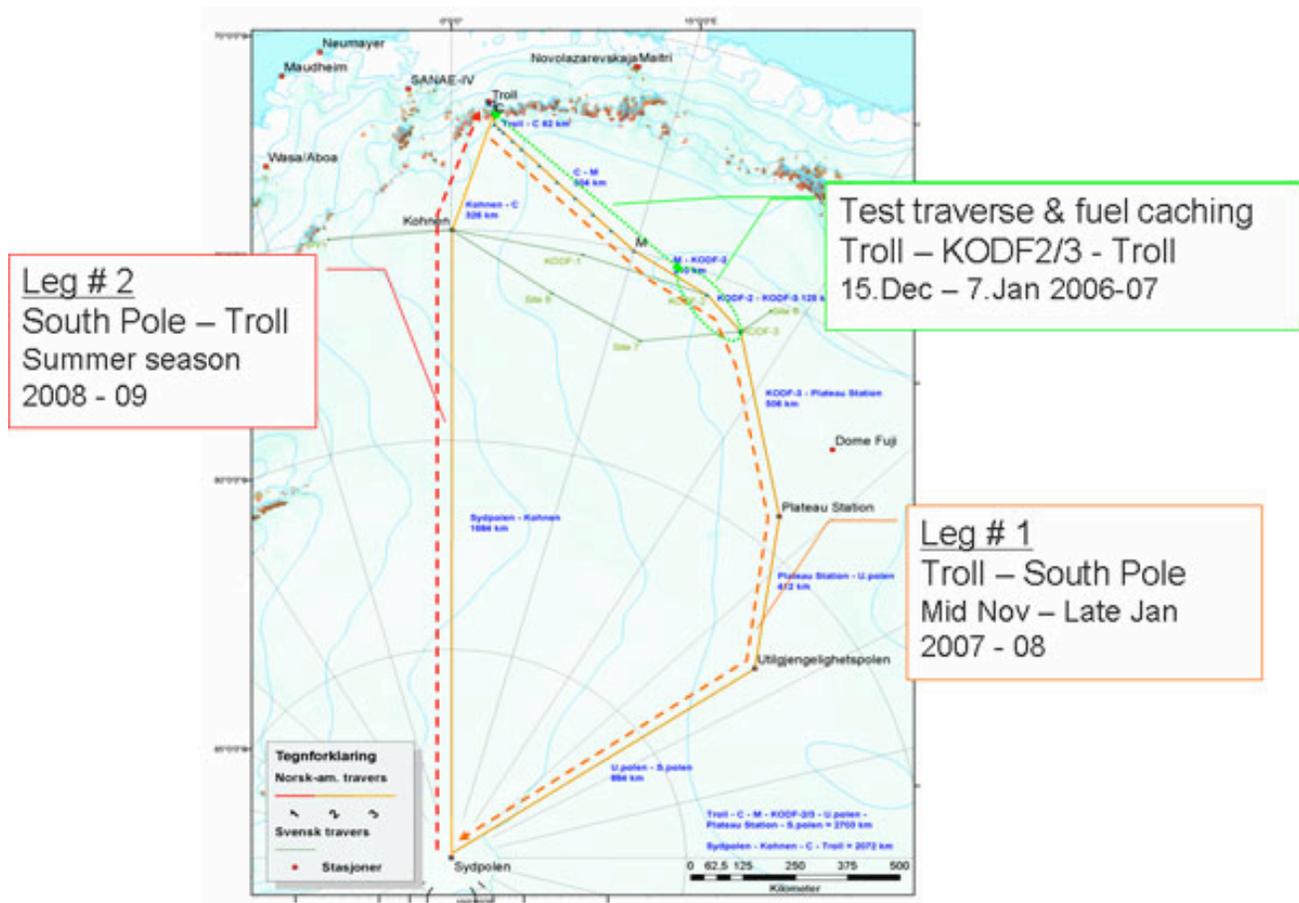


Figure showing Route by the Norwegian Troll to South Pole two-year traverse in 2007/2008 and 2008/2009.

Is there an opportunity here to deploy AWS along the route (e.g. at Plateau Station).

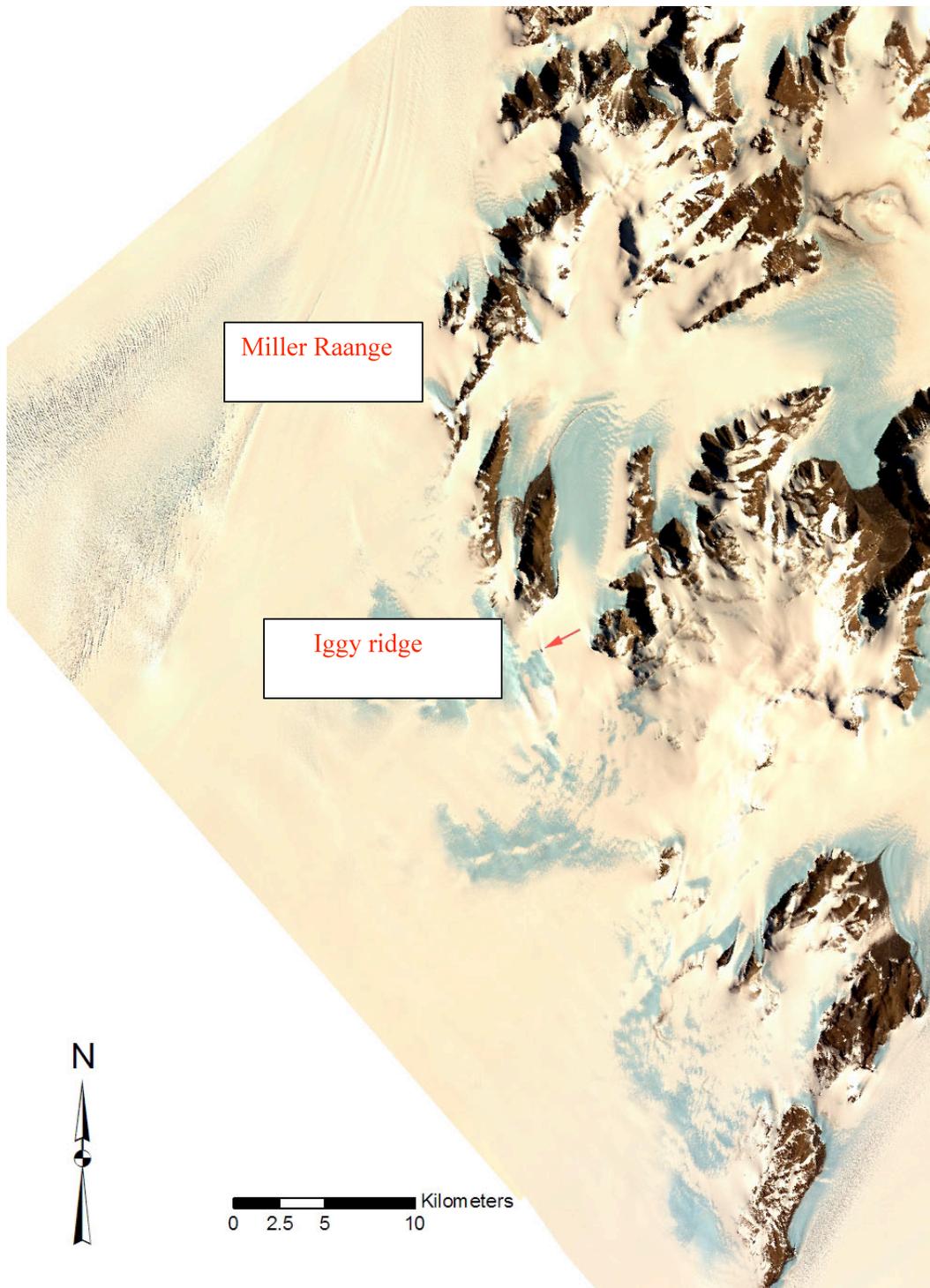


Figure showing Iggy Ridge in Miller Range where UNAVCO would like to install an AWS for 2007/2008. Ralph Harvey has asked for an AWS in the meteorite blue-ice areas. This would serve both goals as well as providing an AWS in a data sparse area.

Appendix A. Images of AWS at WAIS Divide camp

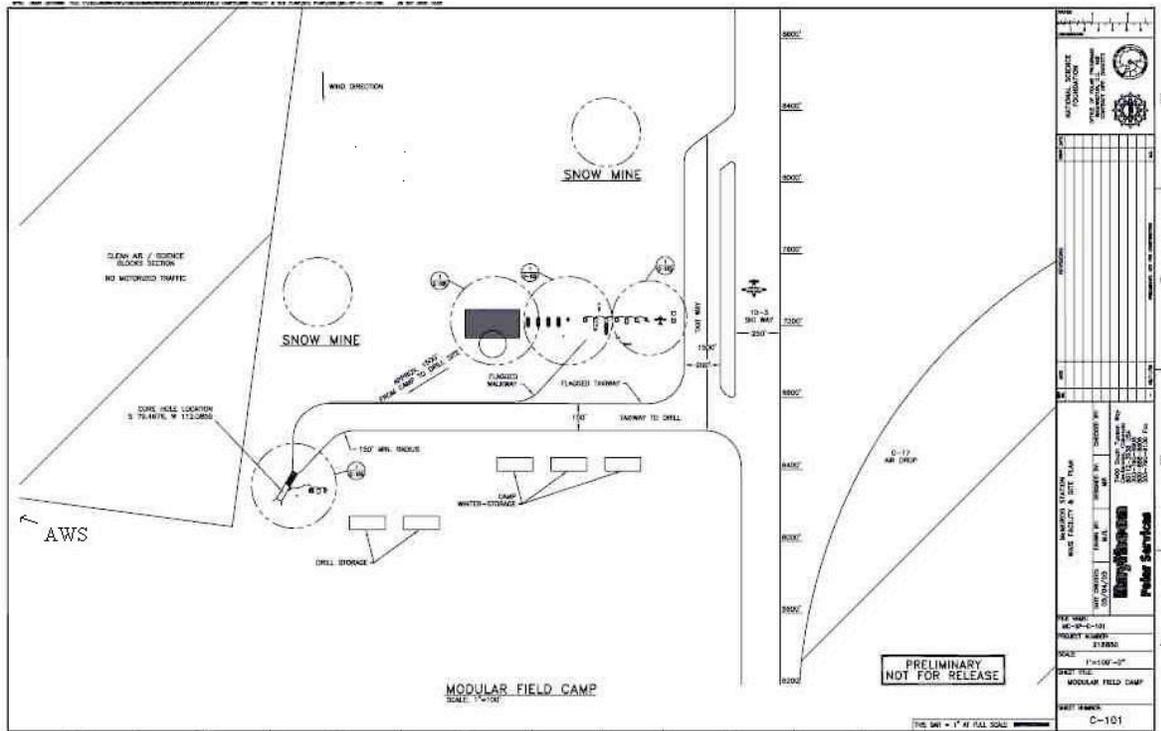


Figure A1. Layout of WAIS Divide Camp and location of AWS Kominko-Slade.

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Figure A2. View towards WAIS AWS Kominko Slade (small arrow is near top of tower).



Figure A3. AWS Kominko-Slade at WAIS Divide camp January 2006 including the snow profile sensors.



Figure A4. Swithinbank AWS after raising the tower in January 2006.