

# Support and services

## Antarctic Marine Geology Research Facility, 1995–1996 and 1996–1997

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For over 35 years, Florida State University has been involved in the collection and study of antarctic marine sediments. During this interval, over 6,300 cores and dredge samples have been collected and stored at the Antarctic Marine Geology Research Facility (AMGRF) and over 215,000 samples have been distributed from the collection to geoscientists around the world. This article provides a brief summary of the activities of the AMGRF at Florida State University for the project periods 1 June 1995 to 31 May 1996 and 1 June 1996 to 31 May 1997. In addition to the normal facility activities of sample distribution and sediment description, the AMGRF has received several new core shipments, produced and published five new sediment description volumes, established a searchable core and sample database, and held two antarctic-related workshops. The activities of the facility for the past 2 years are outlined below.

### Sample requests

Thirty-seven sample requests were received by the curator during the period from 1 June 1995 to 31 May 1996, and 2,384 samples were distributed to 21 investigators from 18 institutions of five nations (Australia, Canada, Israel, Italy, and the United States). In total, 3,802 samples were distributed to 41 investigators (67 separate sample requests) representing 31 institutions of 10 nations (Australia, France, Germany, Italy, the Netherlands, New Zealand, Sweden, Switzerland, the United Kingdom, and the United States) during the period from 1 June 1996 to 31 May 1997. The distribution of samples by cruise/drilling project for the past 2 years is shown in the table.

### Core shipments

Several new core shipments were received at the facility during the 1995–1996 project year. These shipments include, three large-diameter gravity cores from R/V *Polar Duke* cruise PD95-X to the Palmer Deep (received 12 January 1996), five Kasten cores from R/V *Nathaniel B. Palmer* cruise NBP95-07 to the Bransfield Strait (received 30 January 1996), and cores from four holes drilled as part of the Mount Feather drilling project (received 22 March 1996). In addition to this new material, the archive halves of cores from R/V *Nathaniel B. Palmer* cruise NBP94-07 to the Ross Sea, on a temporary loan to the University of Alabama, were returned to the facility

on 23 May 1996. The work halves remain at the University of Alabama. Nine Kasten cores and miscellaneous bag samples from R/V *Polar Duke* cruise PD92-II to the Antarctic Peninsula, which were previously stored at Hamilton College, arrived at the facility on 30 January 1996.

One new core shipment was received at the facility during the 1996–1997 project year. Sixteen large-diameter piston cores and 13 large-diameter trigger cores from R/V *Nathaniel B. Palmer* cruise NBP96-01 to the Ross Sea arrived at the facility on 26 June 1996.

### Publications

Three sediment description volumes were completed and published during the 1995–1996 project year. These volumes include the R/V *Polar Duke* cruise PD88-VI to the Antarctic Peninsula, L. Lawver, chief scientist (Janecek 1995a); R/V *Nathaniel B. Palmer* cruise NBP93-01 to the Antarctic Peninsula/Larsen Ice Shelf region, B. Sloan and L. Lawver, chief scientists (Janecek 1995b); R/V *Nathaniel B. Palmer* cruise NBP93-08 to the Ross Sea, L. Bartek, chief scientist (Janecek 1995c). The AMGRF also produced sediment description volumes during the following year (1996–1997) for R/V *Polar Duke* cruise PD92-II to the Antarctic Peninsula, C. McClennen and J. Bernhard, chief scientists (Janecek 1996), and the R/V *Nathaniel B. Palmer* cruise NBP94-01 to the Ross Sea, J. Anderson, chief scientist (Janecek 1997). These volumes are available upon request to all interested geoscientists, prospective users of the AMGRF, and libraries. Sediment descriptions for R/V *Nathaniel B. Palmer* cruises NBP94-07, NBP95-01, and NBP96-01 to the Ross Sea are nearing completion and will be available within the next year.

### Miscellanea

*Visitors.* Thirty-three geoscientists visited the facility to describe, sample, and x ray cores, and facility personnel gave 22 tours and lectures to over 300 grade-school to college-level students during the 1995–1996 project year. The AMGRF hosted 12 geoscientists during the 1996–1997 project year and over 155 grade-school to college-level students toured the facility on 16 occasions.

*Workshops and conferences.* A workshop to discuss the Mount Feather Sirius Group Coring Project and to open, describe, and sample cores recovered during the previous

year's field season at Mount Feather was held at the AMGRF on 19–22 June 1996. Seven visiting investigators, along with all AMGRF personnel, participated in the workshop, which was coordinated by Gary Wilson (Byrd Polar Research Institute) and John Barron (U.S. Geological Survey).

The 6th Polar Diatom Conference was hosted by the AMGRF from 17–22 August 1996. Eighteen visiting investigators, along with all AMGRF personnel, participated in the conference, which was coordinated by David Harwood (University of Nebraska). The conference consisted of three to four lectures each morning followed by microscope workshop sessions each afternoon.

*WWW access.* The Antarctic Research Facility now has a World Wide Web page (URL = <http://www.arf.fsu.edu>) that provides the antarctic research community with information about facility cores and samples, personnel, publications, and related polar links. The Web page has a searchable database (see *Core and sample database*, below) that provides information about core locations and samples taken from cores. Sample request forms also can be accessed via the Web page.

*Core and sample database.* The Antarctic Research Facility database is now accessible through the AMGRF's World Wide Web site. At present, the database contains basic information (latitude, longitude, water depth, core length, and so forth) about all the cores stored at the facility, as well as information about samples taken from the cores (core, interval, size, investigator, and so forth) between 1970 to the present. Future additions to the database will include

- text and graphic core descriptions for all cores,
- bibliographic listings for research done on AMGRF cores,
- core-plotting capabilities, and
- continued input of sample information (pre-1970 samples).

Funding in support of the curatorship of the antarctic collections at the AMGRF is in accordance with National Science Foundation contract OPP 93-22647 to Florida State University.

## References

- Janecek, T.R. (Ed.). 1995a. *Descriptions of sediment recovered by the R/V Polar Duke, cruise VI, 1988. United States Antarctic Program* (Antarctic Marine Geology Research Facility contribution number 1). Tallahassee: Department of Geology, Florida State University.
- Janecek, T.R. (Ed.). 1995b. *Descriptions of sediment recovered by the R/V Nathaniel B. Palmer, cruise I, 1993. United States Antarctic Program* (Antarctic Marine Geology Research Facility contribution number 2). Tallahassee: Department of Geology, Florida State University.
- Janecek, T.R. (Ed.). 1995c. *Descriptions of sediment recovered by the R/V Nathaniel B. Palmer, cruise 8, 1993. United States Antarctic Program* (Antarctic Marine Geology Research Facility contribution number 3). Tallahassee: Department of Geology, Florida State University.
- Janecek, T.R. (Ed.). 1996. *Descriptions of sediment recovered by the R/V Polar Duke, cruise II, 1992. United States Antarctic Program* (Antarctic Marine Geology Research Facility contribution number 4). Tallahassee: Department of Geology, Florida State University.
- Janecek, T.R. (Ed.). 1997. *Descriptions of sediment recovered by the R/V Nathaniel B. Palmer, cruise I, 1994. United States Antarctic Program* (Antarctic Marine Geology Research Facility contribution number 5). Tallahassee: Department of Geology, Florida State University.

### ***Sample distribution from the Antarctic Marine Geology Research Facility by cruise/drilling project during the 1995–1996 and 1996–1997 project years***

<b>Cruise/drilling project</b>	<b>1995–1996</b>	<b>1996–1997</b>
USNS <i>Eltanin</i>	677	2,447
ARA <i>Islas Orcadas</i>	119	232
USCGC <i>Glacier</i>	35	256
R/V <i>Polar Duke</i>	483	192
R/V <i>Nathaniel B. Palmer</i>	627	279
Dry Valley Drilling Project	20	93
Cenozoic Investigations of the Ross Sea	381	172
Mount Feather	42	131

# The Antarctic Meteorological Research Center: 1997

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The Antarctic Meteorological Research Center (AMRC) was founded in 1992 at the University of Wisconsin Space Science and Engineering Center (SSEC). The first stages of the AMRC are described by Stearns and Young (1993, 1994). The goals of the AMRC are

- to collect, process, archive, and display all possible meteorological data related to Antarctica for research, weather forecasting, and engineering applications;
- to foster interdisciplinary research in Antarctica by making meteorological data and products readily available to the entire scientific community; and
- to establish a reliable, long-term meteorological data record covering Antarctica for use in global climate change research.

Many of the data requests are from people and organizations in other disciplines, such as glaciology.

The Antarctic Meteorological Research Center has two centers: one located at the SSEC and designated as UWAMRC

and the second located at the Crary Laboratory, McMurdo, Antarctica, and designated as MCMAMRC. Figure 1 shows the AMRC hardware configuration for 1997 and 1998 at McMurdo, Antarctica, and Madison, Wisconsin. The Terascan system at McMurdo Meteorology Office collects all the data from the National Oceanic and Atmospheric Administration (NOAA) polar-orbiting satellites. The AMRC collects the data from the Terascan system and stores the data on tape for shipment to the UWAMRC for archiving and distribution to others. The NOAA High Resolution Picture Transmission (HRPT) data can be transferred to the UWAMRC in real time, but this practice is not desirable as a rule because the large data volume would clog the Internet link.

The AMRC data flow for 1997 and 1998 is shown in figure 2. Data from four geostationary satellites and two NOAA polar-orbiting satellites are collected at the SSEC of the University of Wisconsin. The satellite data cover the entire Earth and allow the construction of infrared images every 3 hours over Antarc-

tica. In addition, water vapor winds constructed from the satellite data received from the Australian Bureau of Meteorology are transmitted twice daily to the McMurdo Meteorology Office. The water vapor winds cover the flight path from Christchurch, New Zealand, to 70°S on the way to McMurdo, Antarctica, and the altitude region where the aircraft fly.

The AMRC provides support for forecasting at McMurdo, Antarctica, by sending the 3-hourly composite infrared images of Antarctica, the Global Gridded Analysis and Forecasts for the Southern Hemisphere from the United States National Center for Environmental Prediction (NCEP), water vapor winds between Christchurch, New Zealand, and McMurdo, and synoptic and upper air reports to the McMurdo Meteorology Office. These data can be overlaid on the NOAA satellite passes and the antarctic

## AMRC 1997 Hardware Configuration

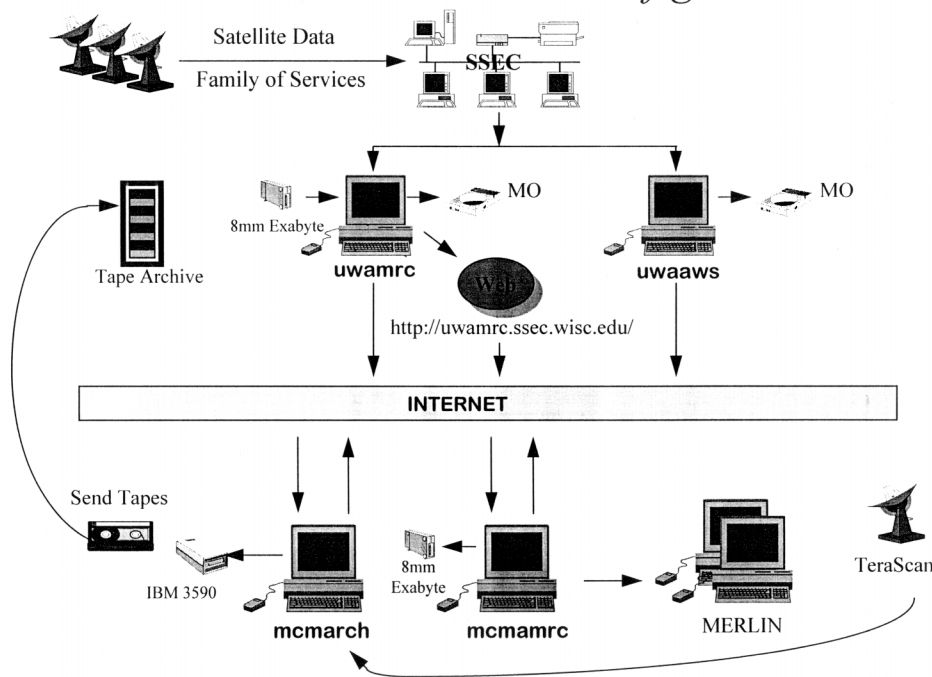


Figure 1. The hardware configuration at the SSEC, University of Wisconsin–Madison, Wisconsin, and at the Crary Laboratory, McMurdo, Antarctica. The UWAMRC is a Sparc 10 and UWAAWS is a Sparc 2, each with 4 gigabytes of hard disk space. MO is a magneto-optical read-write system primarily used for archiving the composite infrared images. At the Crary Laboratory, McMurdo, Antarctica, the MCMARCH is a Sparc 5, MCMAMRC is a Sparc Ultra, and MERLIN is a Sparc 2 used for display. The IBM 3590 tape system is the primary recording system with an 8-millimeter Exabyte tape system for backup. The data tapes are shipped to the University of Wisconsin during the field season.

composite infrared images. The Global Area Coverage (GAC) infrared NOAA HRPT data returned from Antarctica by the NOAA series of polar-orbiting satellites are archived at the UWAMRC. The archive backs up the collection of NOAA HRPT data at McMurdo and can be used to provide data to McMurdo in case of the failure to obtain the Local Area Coverage (LAC) NOAA HRPT data at McMurdo. The GAC infrared data have a resolution of 4 kilometers and a time delay of 2–3 hours compared to the real time LAC HRPT data collected at McMurdo. During the 1996–1997 field season, GAC data were sent to the AMRC at McMurdo so that Robert Holmes could make forecasts for a flight across the continent. The landing site was not covered by the satellite data received at the McMurdo Meteorology Office.

In addition to forecasts from McMurdo, daily forecasts are issued to the research vessel *Nathaniel B. Palmer* using meteorological information available in near real time from the UWAMRC.

The forecasts are a side benefit of an ongoing investigation into the atmospheric circulation around Antarctica. The impetus for making the forecasts is that the *Nathaniel B. Palmer* encountered extreme weather without warning causing some damage. The observations of these extreme events by the *Palmer* provide additional information on the structure of small-scale features, information that would be difficult to obtain otherwise. Although these events can be dangerous for a ship and its personnel, they also can affect research activities on the continent and/or flight conditions at McMurdo and outlying camps.

The table shows the data transfers from the UWAMRC for each of the last 2 years. The data transfers from the University of Wisconsin antarctic automatic weather station (UWAAWS) are primarily 3-hourly, 10-minute, and monthly summary data

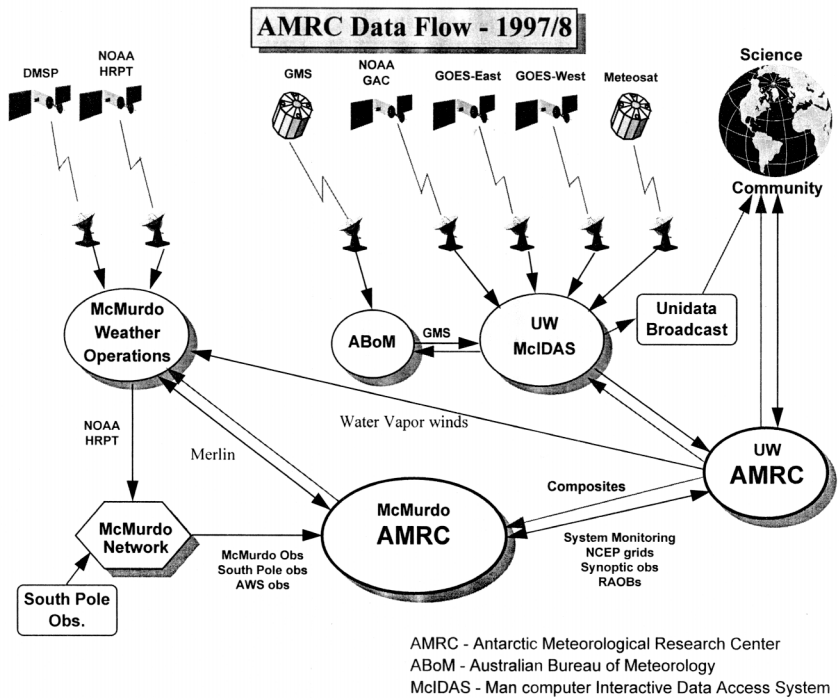


Figure 2. The AMRC data flow for 1997 and 1998. The geostationary meteorological satellite data from ABoM are used to construct the composite infrared images and the water vapor vector winds currently available to the McMurdo Meteorology Office, Antarctica. Near real-time antarctic meteorological data are made available to the World community through the UWAMRC. The United States National Center for Environmental Prediction (NCEP) provides gridded medium-range forecasts to the AMRC.

from the AWS sites, radiosonde, AGO, and snow temperature data. The data transfers from the UWAMRC are the composite infrared images, ship observations, and radiosonde soundings. The UWAMRC Web site contains the composite infrared images, latest AWS data, the medium-range forecast loop, antarctic synoptic data, and more. Additional data requests are sent out on 8-millimeter tape and amount to about 1 gigabyte per year. The AVHRR requests for the Man-computer Interactive Data Access System (McIDAS) areas are down, but the GIF requests are up, cutting the data transfers by a factor of 10. The 4 gigabytes transferred during 1996 were primarily one request for AVHRR McIDAS areas. Automatic transfers to UNIDATA (400 gigabytes/year), McMurdo Meteorology Office, special requests, and the GOPHER server for SSEC are not included in the table.

**The UWAMRC data transfers for 2 years starting with November 1995 and November 1996**

NOTE: The column headings are start date of the year, the number of files collected in the year, the estimated number of hosts, and the gigabytes (GB) of data collected for the UWAAWS, UWAMRC, and the UWAMRC Web site. The most important data are for the UWAAWS, primarily representing the AWS data, and the UWAMRC, primarily representing the GIF images, synoptic data, and ship reports.

Start date	UWAAWS			UWAMRC			UWAMRC Web site		
	Files	Hosts	GB	Files	Hosts	GB	Files	Hosts	GB
November 1995	32K	616	1.64	1.3K	88	4.42	59K	6K	0.8
November 1996	34K	419	1.75	2.2K	158	1.00	141K	16K	2.9

The antarctic meteorological community of the United States and other countries, such as the United Kingdom, Argentina, Belgium, Australia, Canada, France, Germany, Italy, Japan, Netherlands, New Zealand, Philippines, and Poland, are regular collectors of data from the UWAMRC. An increasing number of requests for meteorological data come from people and organizations in astronomy, biology, human health, geology, glaciology, oceanography, physics, and zoology.

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## References

- Stearns, C.R., and J.T. Young. 1993. Antarctic meteorological research center: 1992–1993. *Antarctic Journal of the U.S.*, 28(5), 335–336.
- Stearns, C.R., and J.T. Young. 1994. Antarctic Meteorological Research Center: 1993. *Antarctic Journal of the U.S.*, 29(5), 288–289.

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# Antarctic geodesy and mapping

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The National Science Foundation (NSF), through the U.S. Geological Survey (USGS), supports geodesy and mapping in Antarctica. During the 1996–1997 season, the USGS's National Mapping Division directed its antarctic geodesy and mapping activities toward global positioning system (GPS) geodetic mapping control, topographic and satellite image mapping, and management of the Scientific Committee on Antarctic Research (SCAR) map library.

Antarctic geodetic field programs support national and international research in defining the Earth's geoid and to provide the basis for spatial reliability in mapping. Recently, the SCAR Geodesy and Geographic Information working group recommended increasing the effort to use GPS technology to tie previously obtained conventional surveys to a common Earth-centered datum. The results of this effort will provide more accurate cartographic materials better suited to the current and future satellite data-collection systems, geographic information systems, and thematic mapping programs.

In 1996, the USGS began a geodetic program to determine the relative motions of bedrock in southern Victoria Land of the Transantarctic Mountains to validate models for predicting tectonism and for improving the accuracy of models for establishing relationships to changes in global sea level and ice-sheet mass balance. Although the primary objective is monitoring vertical changes, horizontal motion will also be an important parameter. Geodetic scientists and surveyors from USGS, in cooperation with geophysicists and geologists from Byrd Polar Research Institute, Ohio State University, have established specialized monuments at up to 20 bedrock sites. Most of the sites are located between Allan Hills and an area about 150 kilometers south of the McMurdo Dry Valleys along the Transantarctic Mountains. The project is the first in a

series to be performed by various investigators in future years. Accuracies at the millimeter level are the goal for the relative positions between the bedrock points. These measurements are being determined by use of late-model dual-frequency high-quality GPS receiver systems. Combined with the “precise” ephemerides provided by the International GPS for Geodynamics System (IGS), the data are being processed with the latest version(s) of appropriate software. To establish a high-level of confidence in the “base reference” measurements, a second series of measurements in the long-term project are being performed during the 1997–1998 field program. After “base reference” measurements are established within acceptable tolerances and depending on predicted magnitude of motion or initial results for possible detection of motion, repeat measurements may be at longer intervals (2 to 4 years) between GPS observing campaigns.

USGS Geodetic survey personnel, in cooperation with the University Navstar Consortium (UNAVCO), served as a focal point at McMurdo Station and vicinity and the South Pole to provide information on GPS technologies. In addition, they coordinated the establishment of a backup Continuous Operating Reference station at McMurdo, and in cooperation with Land Information New Zealand at Cape Roberts.

In April 1997, a permanent GPS continuously operating reference station (CORS) was established at Palmer Station. The system was set up to operate and collect highly accurate geodetic data similar to the operational system for the IGS station located near the RADARSAT site at McMurdo and South Pole Stations.

The United States and New Zealand undertook a joint program to combine U.S. and New Zealand geodetic networks in the McMurdo Dry Valleys area. The geodetic surveys were conducted to support U.S. and New Zealand geodetic and

mapping programs. The surveys were conducted by Larry Hothem, Bill Smith, Michael Starbuck, and Vincent Belgrave using dual-frequency GPS receivers. Bedrock benchmarks were established to tie the GPS observations into the continuous-tracking GPS base station at McMurdo Station.

In January 1997, the USGS team of Bill Smith and Michael Starbuck conducted a geodetic survey using GPS receivers to establish the position of the true South Pole geodetic marker at Amundsen–Scott South Pole Station. Based on this season's observations and data from previous surveys, the team determined that the ice sheet at the South Pole continues to move to the northwest approximately 10 meters per year. The team installed a permanent brass geodetic marker identifying the 1996–1997 austral summer position.

The USGS's mapping program includes 1:50,000-scale topographic maps for areas in the McMurdo Dry Valleys. The mapping is being conducted in cooperation with the Land Information New Zealand. Under this cooperative program, the USGS obtains the aerial photographs, establishes the geodetic control, and performs the aerotriangulation. New Zealand performs the stereocompilation, collects digital cartographic data, prepares shaded relief, and provides color separates. The USGS will print the maps. The maps cover the Taylor and Wright Valleys, the Convoy Range, and Royal Society Range in the McMurdo Dry Valleys area. These 1:50,000-scale, 15-minute topographic maps have 50-meter contour intervals and 25-meter supplemental contours. The maps will be published using the World Geodetic System–84 geodetic datum. The maps will include existing and new place names approved by the U.S. Board on Geographic Names. Five maps covering part of the Royal Society Range were published in August 1993, and seven additional maps are planned for publication in 1998.

The USGS continues the USAP mapping program in Antarctica. Maps at scales ranging from 1:5,000,000 to 1:10,000, have been published as a result of this program, and many of the maps are also in digital form. Through the support of NSF, the USGS is providing access to these digital databases and assistance in their application to antarctic research projects.

The USGS has recently produced a Landsat thematic mapper (TM) satellite image map for the McMurdo Dry Valleys at 1:100,000-scale and has three combined Landsat TM and Systeme Probatoire d'Observation de la Terra (SPOT) image maps at 1:25,000-scale in the final stages of production. The maps are scheduled for publication in 1998. Four additional maps in this series are in compilation and are scheduled for publication in late 1998 or early 1999. The maps will contain U.S. Board on Geographic Names place names.

The USGS manages the SCAR library for the NSF and the U.S. Antarctic Program. The library is the official depository and distribution point for antarctic aerial photographic and cartographic products produced by the United States. The library has approximately 450,000 black-and-white and color aerial photographs of the Antarctic dating from Operation Highjump (1946–1947) through the 1989 field season. The library also houses geodetic control records, satellite images, maps, charts, and publications. Maps, charts, and publications are exchanged with nations under the provisions of the Antarctic Treaty.

The USGS continues to manage antarctic geographic names using the computer-based geographic names information system and has recently made the names available through the USGS geographic names World Wide Web site.

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