

# German Antarctic Receiving Station (GARS) O'Higgins

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## Abstract

In 2009 the German Antarctic Receiving Station (GARS) in O'Higgins contributed to the IVS observing program with 10 observation sessions. General maintenance of the dewar was done. A newly installed Leica GPS receiver is now ready for Galileo. The remote control tests with the software specially developed at Wettzell were continued for VLBI sessions.

## 1. General Information

The German Antarctic Receiving Station (GARS) is jointly operated by the Federal Office of Cartography and Geodesy (BKG, where it is part of the duties of the Geodetic Observatory Wettzell (GOW)) and the German Aerospace Center (DLR). The Institute for Antarctic Research Chile (INACH) coordinates the activities and logistics. The 9-m radio telescope at O'Higgins is used for geodetic VLBI and for downloading of remote sensing images from satellites like ERS-2 and TerraSAR-X as well as commanding and monitoring spacecraft telemetry. The access to the station is still organized campaign-wise during the Antarctic spring and summer. In 2009 the station was occupied from January to March and from October to December. DLR and BKG jointly sent engineers and operators for the campaigns, together with a team for the infrastructure (e.g., the power generator).

Over recent years, special flights with "Hercules C-130" and small "Twin Otter DHC-6" aircraft were organized by INACH in close collaboration with the Chilean Army, Navy, and Airforce and with the Brazilian and Uruguayan Airforce in order to transport the staff, the technical material, and also the food for the entire campaign from Punta Arenas via Base Frei at King George Island to O'Higgins on the Antarctic Peninsula. Another route uses transportation by ship to and from O'Higgins. Due to the fact that the conditions for landing on the glacier have become unpredictable and require a lot of security precautions, the usage of a ship for transportation to O'Higgins has become more and more important. As a consequence of global warming, the glacier melts. During the summer period, transport of personnel and cargo becomes more and more difficult. Arrival and departure times are strongly dependent on the weather conditions and on the general logistics.

After the long Antarctic winter, usually the equipment at the station has to be initialized. Damages, which result from the strong winter period or strong storms, have to be identified and repaired. Shipment of spare parts or material for upgrades from Germany have to be carefully prepared in advance.

The 9-m radio telescope for VLBI is co-located with:

- two GPS receivers operated in the frame of IGS all year. The receivers worked without failure in 2009.
- plans for a new radar tide gauge went ahead. The installation was shifted to 2010. The radar sensor itself will be position-calibrated by a GPS antenna mounted on the top of the radar sensor unit.
- a meteorological station providing pressure, temperature, and humidity and wind information, as long as the extreme conditions outside did not disturb the sensors. High wind speeds

and ice uploads caused damage in 2009 so that parts of the meteorological site had to be replaced.

- a H-Maser, an atomic Cs-clock, a GPS time receiver, and a Total Accurate Clock (TAC) offer time and frequency.
- a defective underwater sea level gauge will be replaced for permanent monitoring of temperature, tide pressure, and salinity of the sea water.

The 9-m radio telescope is designed for dual purpose:

- performing geodetic VLBI and
- receiving the remote sensing data from LEO-satellites, mainly from ERS-2, TerraSAR-X.



Figure 1. GARS O'Higgins taken by a Web cam which is mounted on top of the containers



Figure 2. The penguin colony directly behind the station

## 2. Technical Staff

The staff members for operation, maintenance, and upgrade of the GARS VLBI components and the geodetic devices are summarized in Table 1.

Table 1. Staff – members

Name	Affiliation	Function	Working for
Christian Plötz	BKG	electronic engineer	O'Higgins (responsible), RTW
Reiner Wojdziak	BKG	software engineer	O'Higgins, IVS Data Center Leipzig
Richard Kilger	FESG	mechanical engineer	O'Higgins (for campaign operations)
Alexander Neidhardt	FESG	head of the RTW group and VLBI station chief	RTW, SOSW (partly O'Higgins)
Gerhard Kronschnabl	BKG	electronic engineer	RTW (maintenance in Wettzell)
Johannes Ihde	BKG	interim head of the GOW (until June 2009)	GOW
Ullrich Schreiber	BKG	head of the GOW (July to December 2009)	GOW

## 3. Observations in 2009

GARS participated in the following sessions of the IVS observing program during the Antarctic summer campaign (January-March 2009)

- IVS-T2060, February 03-04, 2009
- IVS-OHIG62, February 04-05, 2009
- IVS-OHIG63, February 10-11, 2009
- IVS-OHIG64, February 11-12, 2009
- TANAMILBA2, V252K February 23-24, 2009
- TANAMILBA3, V252L February 27-28, 2009

and during the Antarctic spring campaign (October-December 2009)

- IVS-OHIG65, November 10-11, 2009
- IVS-OHIG66, November 11-12, 2009
- IVS-T2065, November 17-18, 2009
- IYA2009SS, November 18-19, 2009

The observations were recorded with Mark 5A. The data were carried from O'Higgins to Punta Arenas by the staff when they returned home. From Punta Arenas, the disks were shipped by regular air transport to the correlator in Bonn, Germany. The TANAMI observations are correlated at Curtin University of Technology, Australia. The IYA2009 session is correlated in Haystack, USA.

## 4. Maintenance

The extreme conditions in the Antarctic require special attention to the GARS telescope and to the infrastructure. Frequently corrosion results in problems with connectors and capacitors, which need to be detected. The antenna, the S/X-band receiver, the cooling system, and the data acquisition system have to be activated properly. To continue the high quality of observations

at GARS, the cryo-system was maintained. Therefore the dewar was revised at the GOW where structural improvements could be realized in the internal setup. After this work the dewar was installed again in O'Higgins during the Antarctic spring campaign (October-December 2009).



Figure 3. The destructions caused by a strong storm: unroofed containers and a totally damaged meteorological site

Those components which were damaged during the previous campaign or because of the extreme conditions were replaced. Therefore the meteorological station had to be partly replaced. A new wind sensor was installed due to the destruction of the previous one during storm conditions between the campaigns. The satellite communication antenna and therefore the Internet and phone connection were improved. The failed up-converter, which was temporarily operative by using an external signal generator, could be brought back to full functionality after maintenance in Wettzell.

## 5. Technical Improvements

Remote control of complete VLBI sessions could be extended. With the newly developed software from Wettzell, the O'Higgins Field System can be controlled over a secure Internet connection from Wettzell. This is a key feature for extended operation periods in GARS O'Higgins.

In addition a new Leica antenna which is now able to receive Galileo was installed.

## 6. Upgrade Plans for 2010

It is planned to install the radar tide gauge directly on shore. A sea level tide gauge is planned to be re-installed. Additionally a new communication antenna setup, capable of up to 8 Mbit/s, is going to extend bandwidth for data transmission as a peer-to-peer connection between O'Higgins and Oberpfaffenhofen, Germany. The GARS station will be open continuously in 2010 for a planned period of five years, because of the Tandem-X Mission. This extends significantly also the operation period of IVS VLBI measurements. In addition, to keep the productivity, it is planned to develop a spare dewar system fitting directly into cryo-system at GARS antenna.