

German Antarctic Receiving Station (GARS) O'Higgins

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Abstract

In 2011 the German Antarctic Receiving Station (GARS) O'Higgins contributed to the IVS observing program with four observation sessions. Maintenance and upgrades were made. A new replacement dewar is under construction.

1. General Information

The German Antarctic Receiving Station (GARS) is jointly operated by the German Aerospace Center (DLR) and the Federal Agency for Cartography and Geodesy (BKG, belongs to the duties of the Geodetic Observatory Wettzell (GOW)). 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 data from satellites like ERS-2 (mission ended in September 2011) and TanDEM-X as well as for commanding and monitoring of spacecraft telemetry. In 2011 the station was manned by DLR staff the entire year and by BKG staff only in January and February for the VLBI observations. The VLBI campaign in November-December 2011 had to be cancelled due to logistical circumstances. Besides engineers and operators from DLR and BKG, a team for maintaining the infrastructure (e.g., power and freshwater generation) was present all over the year.

Over the last years, special flights using "Hercules C-130" aircraft and small "Twin Otter DHC-6" aircraft as well as transportation by ship 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 staff, technical material, and food for the entire campaign from Punta Arenas via Base Frei on King George Island to O'Higgins on the Antarctic Peninsula. Due to the fact that the conditions for landing aircraft on the glacier are strongly weather dependent and involve an increasing risk, the usage of ships for transportation becomes more and more important. In general, transport of personnel and cargo is always a challenging task. Arrival and departure times strongly depend on the weather conditions and on the logistical circumstances.

After the long Antarctic winter the VLBI equipment at the station has to be initialized. Damages resulting from the winter conditions or strong storms have to be identified and repaired. Shipment of each kind of material like spare parts or upgrade kits has to be carefully prepared in advance.

Beside the 9-m radio telescope for VLBI, the following instruments are operated:

- a H-Maser, an atomic Cs-clock, a GPS time receiver and a Total Accurate Clock (TAC) offer time and frequency.
- two GNSS receivers both operating in the frame of the IGS network, while one receiver is additionally part of the Galileo CONGO network. The receivers worked without failure in 2011.
- a meteorological station providing pressure, temperature and humidity and wind information, as long as the temporarily extreme conditions did not disturb the sensors.

- a radar tide gauge which was installed in 2011. The radar sensor itself is space referenced by a GPS-antenna mounted on top and Earth referenced via the local survey network. The radar gauge is operated only during the Antarctic summer.
- an underwater sea level gauge for permanent monitoring of water pressure, temperature, and salinity, which was replaced in 2011.

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

- performing geodetic VLBI and
- receiving data from and sending commands to remote sensing satellites, mainly ERS-2 and TanDEM-X.



Figure 1. The 9-m radio telescope of GARS O'Higgins.

2. Technical Staff

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

Table 1. Staff members

Name	Affiliation	Function	Working for
Johannes Ihde	BKG	interim head of the GOW (until February 2011)	GOW
Ulrich Schreiber	BKG	head of the GOW (since March 2011)	GOW
Christian Plötz	BKG	electronic engineer	O'Higgins (responsible), RTW
Reiner Wojdziak	BKG	software engineer	O'Higgins, IVS Data Center Leipzig
Thomas Klügel	BKG	geologist	administration for O'Higgins, laser gyro and local systems Wettzell
Rudolf Stoeger	BKG	geodesist	logistics for O'Higgins
Alexander Neidhardt	FESG	head of the RTW group and VLBI station chief	RTW, TTW (partly O'Higgins, laser ranging)
Gerhard Kronschnabl	BKG	electronic engineer	RTW, TTW (partly TIGO and O'Higgins)

3. Observations in 2011

GARS participated in the following sessions of the IVS observing program during the Antarctic summer campaign (January-February 2011)

- IVS-T2074 February 01.-02., 2011
- IVS-OHIG70 February 02.-03., 2011
- IVS-OHIG71 February 08.-09., 2011
- IVS-OHIG72 February 09.-10., 2011

The observations were recorded with Mark 5A. The related data modules were carried from O'Higgins to Punta Arenas by the staff on their way back. From Punta Arenas the disk units were shipped by regular air freight back to Wettzell and then to the correlator in Bonn, Germany.

4. Maintenance

The extreme environment conditions in the Antarctic require special attention to the GARS telescope and the infrastructure. Corrosion frequently results in problems with connectors and capacitors. Defective equipment needs to be detected and replaced. The antenna, the S/X-band receiver, the cooling system, and the data acquisition system have to be activated properly.

The construction of the new dewar is in progress in order to replace the original O'Higgins dewar. This one has to be evacuated permanently by a turbo molecular pump to maintain the required vacuum due to a leakage. Besides this the IF-Distributor was shipped to Wettzell to be repaired. The board for the communication with the NASA Field System bailed out and was replaced by a new one, and all damaged components were replaced. This turned out to be a difficult task, as some components as well as technical information are barely available anymore.



Figure 2. The new radar tide gauge which was installed in 2011.

5. Technical Improvements

A new backup system was installed which allows the copying of the VLBI data to a local disk in order to keep a copy of the raw data on site. The system has a capacity to store the data

of observation campaigns from one year. Data access and administration is possible via network communication.

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

6. Upgrade Plans for 2012

The replacement dewar will be completed. A dedicated plan should offer a shared, interleaved observation of satellites (DLR) and VLBI sources (BKG) during the whole year. Some antenna motors must be replaced, and a gear needs to be inspected. There are further plans to replace the receiver with a more suitable, smaller, and more maintainable system, similar to the TWIN tri-band-receiver. This needs to be planned and designed.