

# German Antarctic Receiving Station (GARS) O'Higgins

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## Abstract

In 2003 the German Antarctic Receiving Station (GARS) in O'Higgins contributed to the IVS observing program by dedicated observation sessions. Mark 5 system has been integrated. Steps have been undertaken to conduct remote control operations in the next future.

## 1. General Information

The German Antarctic Receiving Station is jointly operated by the Federal Office of Cartography and Geodesy (BKG), the German Aerospace Center (DLR) and the Institute for Antarctic Research Chile (INACH).

The 9m radiotelescope at O'Higgins is used for geodetic VLBI and for remote sensing purposes. Access to the station is organized only campaign-wise during the Antarctic spring and summer from November to March. DLR and BKG jointly send engineers and operators for the campaign together with a team which maintains the infrastructure such as the provision of power etc: Special flights with small Twin Otter aircrafts were organized by INACH in close collaboration with the Chilean Army, Navy and Airforce in order to transport the staff, the technical material and also the food for the entire campaign from Punta Arenas via Island Frey to the station O'Higgins on the Antarctic Peninsula. Conditions and time schedule are unpredictable and require a lot of security precautions. Arrival time and departure time is strongly dependent on the weather conditions and the general logistics.

After the long Antarctic winter usually the equipment has to be initialised and damages have to be identified and repaired. Shipping of spare parts or upgrade material from Germany needs careful preparation in advance, but nevertheless the arrival of material in O'Higgins is mostly delayed. The station is ready for operation usually just at the last minute before a session is planned to start. This requires flexibility not only from the staff but also from those colleagues who prepare the schedule and from the staff of the collaborating stations.

Beside the 9m radiotelescope for VLBI, the site has:

- two GPS receivers, a TURBO Rogue (OHIG), which has a long and stable history and one Ashtech Z18 receiver, capable for GPS and GLONASS tracking. The Ashtech will be replaced by a JAVAD receiver during the summer campaign 2004.
- a PRARE station for the ERS2 tracking, which unfortunately failed due to lack of spare parts, in particular due to cable problems. The cable could not be repaired successfully nor replaced during the October-December campaign 2003.
- a tide gauge, which has operated several years with some interruptions caused by destroyed cables from ice scratching on the rocks,
- a meteorological station providing pressure, temperature and humidity and wind information, as long as the extreme conditions outside did not disturb the sensors.

For the provision of time and frequency, a H-Maser, an atomic Cs-clock, a GPS time receiver and a Total Accurate Clock (TAC) are employed.



Figure 1. GARS O'Higgins

The 9m radiotelescope is designed for dual purposes: for performing geodetic VLBI and for receiving the remote sensing data from ERS 2, JERS and ENVISAT. Different antenna tracking modes and different receivers have to be activated dependent on the application.

## 2. Technical Staff

The staff members for operating, maintaining and improving the GARS VLBI component and the geodetic devices are summarized in the table 1.

## 3. Observations in 2003

During the Antarctic summer campaign (January/February 2003) and during the Antarctic spring campaign (November-December 2003) GARS participated in the following sessions of the IVS observing program:

- 5 sessions during the period January - February (OHIG 23, OHIG24, OHIG25, T2013 and T2014)
- 5 sessions during the period November- December (OHIG26, OHIG27, O'HIG 28, T2023 and T2024),
- the Vienna Students Project, which was carried out November 27, 2003.

Due to logistic requirements the observers were forced to leave O'Higgins one week earlier in December than planned, right after the last VLBI session. The tapes were packed in a container which should be shipped from O'Higgins to Punta Arenas immediately after they left. Unfortunately problems to load the container onto a Navy ship caused a delay of shipping the tapes from O'Higgins to Punta Arenas, from where they usually were sent via courier to Wettzell.

Table 1. Staff - members

<b>Name</b>	<b>Affiliation</b>	<b>Function</b>	<b>Working for</b>
Christian Plötz	BKG/FESG	electronic engineer	O'Higgins (responsible), RTW
Reiner Wojdiak	BKG	software engineer	O'Higgins, Data Center Leipzig
Walter Schwarz	BKG	electronic engineer	RTW, O'Higgins
Gerhard Kronschnabl	BKG	electronic engineer	RTW, O'Higgins (partly)

#### 4. Maintenance

The extreme conditions in the Antarctic requires maintenance and repair of the GARS telescope and of the infrastructure. We have to consider the effect of corrosion; problems with connectors and capacitors need to be detected; H-Maser has to set up into operation mode; antenna, S/X-band receiver and the data acquisition system has to set up properly. Conditions outside the containers are sometimes very extreme due to the temperature and in particular the speed of wind, which reached 160 km/h in December 2003. Up to 250 km/h has been observed during previous campaigns.

Those components which were damaged during the previous campaign usually have to be replaced. During this period the device to measure the speed of wind was completely replaced.

#### 5. Technical Improvements

The transition from the Mark IV to the Mark 5A has been successfully performed. Two Mark 5A system were available. Both have been prepared for use in Antarctica ahead of time at the Fundamentalstation Wettzell, in order not to be faced with severe problems in O'Higgins. One system has been shipped to GARS and is already installed. The second system still remains in Wettzell for further development.

A new computer has been prepared and modified to implement the new Field System version. Due to interface problems with a board the Field System and the new PC could not be finally integrated in GARS. The problem will be solved by a replacement of the board during the campaign at the beginning of 2004.

For the planned remote control of GARS, more power and a more reliable power system is required. A new power generator including UPS is on the way to O'Higgins. The system will arrive in O'Higgins in February 2004 and will be set up also in the first campaign 2004.

All computers for operating the geodetic devices and all servers need a replacement with the new PC generation, as they were worn out and caused failures. An Internet link via satellite to Santiago with 128 kbps has been established. The link allows regular data transfers and telephone communication. The link will be the basis for the remote control.



Figure 2. View from the telescope to the Ashtech GPS antenna and to the radome for the Turbo Rogue antenna.

## 6. Upgrade Plans for 2004

During 2004 it is planned to replace the Field System computer, to test the Mark 5, to replace the worn out power station by a stronger one which will be capable to provide enough power during unmanned periods. All these steps are required for the establishment of remote control capabilities, which will be prepared and tested for geodetic VLBI as well as for the acquisition of remote sensing data in 2004.

Some restoration work will be done, in order to maintain the antenna as corrosion has to be prevented.