

# German Antarctic Receiving Station (GARS) O'Higgins

*Christian Plötz, Reiner Wojdziak, Richard Kilger, Alexander Neidhardt*

## Abstract

In 2008 the German Antarctic Receiving Station (GARS) in O'Higgins contributed to the IVS observing program with 10 observation sessions. The timing system was enhanced with a rubidium clock, and the cesium clock was reinstated after repair. First VLBI sessions were completely remote-controlled by starting, attending, and finishing them from Wettzell observatory using a remote extension developed for the Field System at Wettzell.

## 1. General Information

The German Antarctic Receiving Station (GARS) is jointly operated by the Federal Office of Cartography and Geodesy (BKG) and the German Aerospace Center (DLR). The Institute for Antarctic Research Chile (INACH) coordinated the activities and the logistics that need to be done in advance. The 9-m radiotelescope at O'Higgins is used for geodetic VLBI and for downloading remote-sensing images from satellites such as ERS-2 and TerraSAR-X. The access to the station is organized campaign-wise during the Antarctic spring and summer. In 2008 the station was occupied from January to March and from September to December. DLR and BKG jointly sent engineers and operators for the campaigns together with a team which maintained the infrastructure at the station, such as the generation of power.

Over the last years, special flights with "Hercules" aircraft and small "Twin Otter" aircraft were organized by INACH in close collaboration with the Chilean Army, Navy, and Air Force and with the Brazilian Air Force in order to transport the staff, the technical material, and also the food for the entire campaign from Punta Arenas via station Frei on King George Island to the station O'Higgins on the Antarctic Peninsula. Only a few times, the staff and material were transported by ship to O'Higgins. However, due to the fact that the conditions for landing on the glacier became unpredictable, requiring a lot of security precautions, the employment of a ship for transportation to O'Higgins became more and more important. As a consequence of global warming, the glacier is melting. During the summer period, landing with Twin Otter airplanes became impossible. Arrival and departure times were strongly dependent on the weather conditions and on the general logistics. Hence more time to travel from Punta Arenas to the base O'Higgins has to be considered in the future.

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

In co-location with the 9-m radiotelescope for VLBI,

- two GPS receivers are operated in the frame of IGS over the whole year. The receivers worked without failure in 2008.
- planning for a new radar tide gauge went ahead. A new mechanical mount system was manufactured and will be installed in February 2009. The radar sensor itself will be position-calibrated by a GPS antenna mounted on top of the radar sensor unit.

- a meteorological station provides pressure, temperature, and humidity and wind information, as long as the extreme conditions outside do not disturb the sensors.
- an H-Maser, an atomic Cs-clock, a GPS time receiver, and a Total Accurate Clock (TAC) are employed for the provision of time and frequency.

The 9-m radiotelescope is designed for two main purposes:

- performing geodetic VLBI and
- receiving the remote sensing data from LEO satellites, mainly from ERS-2 and TerraSAR-X. In 2008, the commissioning phase for the new TerraSAR-X satellite was successfully attended to by GARS O'Higgins



Figure 1. A view of GARS O'Higgins



Figure 2. The 9-m VLBI telescope behind the main operation containers

## 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.



Figure 3. A Twin Otter on a supporting flight between O'Higgins and Base Frei

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	software engineer	O'Higgins (for campaign operations)
Alexander Neidhardt	FESG	group leader and VLBI station chief RTW	RTW, SOSW (partly O'Higgins)

### 3. Observations in 2008

GARS participated in the following sessions of the IVS observing program during the Antarctic summer campaign (January-March 2008)

- IVS T2053 05.-06. February 2008
- IVS OHIG55 06.-07. February 2008
- IVS OHIG56 12.-13. February 2008
- IVS OHIG57 13.-14. February 2008

and during the Antarctic spring campaign (October-December 2008)

- IVS OHIG58 05.-06. November 2008
- IVS T2058 11.-12. November 2008
- IVS OHIG59 12.-13. November 2008
- IVS OHIG60 18.-19. November 2008  
(with embedded Jupiter transition observation)
- IVS OHIG61 19.-20. November 2008
- IVS V252I 27.-28. November 2008

The observations were recorded with Mark 5A. The recording media 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 transports to the correlator in Bonn. The V252I TANAMI observation is correlated at Curtin University of Technology, Australia.

#### 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. Components that were damaged since the previous campaign usually are replaced. The H-Maser needed to be repaired as the external vacuum ion pump was broken. The satellite communication antenna frequently showed short time interruptions in communication traffic. At the end of November 2008, a complete failure occurred, and the antenna was therefore repaired. Defective components of the LNA were replaced. Also the up-converter had a failure due to an overvoltage of a defective power supply and was temporarily replaced by an external signal generator. The original up-converter then was shipped to Wettzell where it was repaired and tested for the campaigns in 2009.

#### 5. Technical Improvements

The first remote control of complete VLBI sessions was performed successfully in November 2008. The O'Higgins Field System was remotely controlled via an Internet-secure connection from Wettzell. The VLBI session was initiated, attended, and closed from Wettzell's operation room. This is a key feature for extended operation periods at GARS O'Higgins.

The timing system was updated with a new so-called reference generator produced by Timetech which supports a time distribution for 1 PPS, 5 MHz, and NTP via local network.

The local Mark 5A was upgraded with Linux version Debian Etch and the newest stream store software to support SATA drives.

#### 6. Upgrade Plans for 2009

For February 2009, maintenance work on the VLBI cryogenics system is planned. This includes an exchange of the helium compressor and the coldhead unit. The radar tide gauge will be installed directly on shore. Furthermore, a third GPS receiver for backup and reference purposes is going to be installed. Additionally a new communication antenna setup capable of up to 8 Mbit/s is going to extend the bandwidth for Internet connections. The GARS station will be open continuously from the beginning of September 2009 for a planned period of 5 years, because of the Tandem-X (TerraSAR-X add-on for Digital Elevation Measurement) mission. This will significantly extend the operation period for IVS VLBI measurements.