

German Antarctic Receiving Station (GARS) O'Higgins

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Abstract

In 2010 the German Antarctic Receiving Station (GARS) O'Higgins contributed to the IVS observing program with four observation sessions. The remote control tests with the software developed at Wettzell were continued for VLBI sessions. The antenna of the Global Navigation Satellite Systems (GNSS) reference point "OHI3" was replaced by a calibrated one for GALILEO satellites.

1. General Information

The German Antarctic Receiving Station (GARS) is jointly operated by the Federal Agency for Cartography and Geodesy (BKG; as 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 such as ERS-2 and the TanDEM-X as well as for commanding and monitoring spacecraft telemetry. In 2010 the station was manned in January and February from BKG and the colleagues of DLR. DLR and BKG jointly sent engineers and operators for the campaigns together with a team for the infrastructure (e.g., power generator). In 2010 the DLR kept the station operational during the year.

Over the last years, special flights with "Hercules C-130" aircrafts and small "Twin Otter DHC-6" aircrafts 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 on 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 are absolutely weather dependent and require a lot of security precautions, the usage of a ship for transportation to O'Higgins becomes more and more important. In general, transport of personnel and cargo is quite challenging. Arrival time and departure time depend strongly 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 winter period or strong storms, have to be identified and repaired. Shipment of spare parts or material for upgrades from Germany has to be carefully prepared in advance.

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

- an H-Maser, an atomic Cs-clock, a GPS time receiver, and a Total Accurate Clock (TAC) offer time and frequency.
- two GNSS receivers were operational, while the permanent site "OHI3" was used in the frame of IGS all over the year. The receivers worked without failure in 2010.
- a meteorological station provided pressure, temperature, and humidity and wind information, as long as the temporarily extreme conditions outside did not disturb the sensors.

- the installation of a new radar tide gauge was shifted to 2011. The radar sensor itself will be position-calibrated by a GPS antenna mounted on top of the radar sensor unit.
- 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 and TanDEM-X.



Figure 1. Photo of GARS O'Higgins taken during transport from the landing zone to the station (on the right side is the rope bridge which connects the peninsula to O'Higgins).



Figure 2. Sunset behind the penguin colony.

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
Johannes Ihde	BKG	interim head of the GOW (until September 2010)	GOW
Ullrich Schreiber	BKG	head of the GOW (since October 2010)	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 (mainly 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 2010

GARS participated in the following sessions of the IVS observing program during the Antarctic summer campaign (January-February 2010)

- IVS-T2067 February 02-03, 2010
- IVS-OHIG67 February 03-04, 2010
- IVS-OHIG68 February 09-10, 2010
- IVS-OHIG69 February 10-11, 2010

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



Figure 3. Mostly used for transportation to and from O'Higgins is the FACH "Twin Otter DHC-6".

4. Maintenance

The extreme environmental conditions in the Antarctic require special attention to the GARS telescope and to the infrastructure. Corrosion frequently results in problems with connectors and capacitors. Therefore defective equipment needs to be detected. The antenna, the S/X-band receiver, the cooling system, and the data acquisition system have to be activated properly. In 2010 a replacement dewar was planned in Wettzell, but the unit will have to be finished in 2011 in order to replace the original O'Higgins dewar. The current dewar has to be pumped permanently by a turbo molecular pump to maintain the required vacuum due to air leakage at the chamber.

Those components, which were damaged during the previous campaign or because of the extreme conditions, were replaced. The meteorological station failed partly during the Antarctic winter. Therefore a new system will be installed to fulfill again the reliability requirements for collecting weather data. The intermediate frequency distributor module "ifdcd" failed in February due to problems on the Monitor and Control Bus (MCB) board, which realizes the communication to the NASA Field System. The module was transported to Wettzell, repaired, and sent back to the O'Higgins station. Nevertheless, it is very difficult to maintain and repair this kind of equipment. Some components as well as technical information are close to unavailable.

5. Technical Improvements

Remote control of complete VLBI sessions was 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 at GARS O'Higgins.

O'Higgins is represented in the GNSS network with the reference point "OHI3". With the GALILEO capability upgrade of the GNSS system, the station participates in the COoperative Network for GIOVE Observation (CONGO) network, by establishing a GALILEO reference station at O'Higgins.

6. Upgrade Plans for 2011

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 peer-to-peer connection between O'Higgins and Oberpfaffenhofen, Germany. The GARS station will be manned by DLR continuously in 2011 for a planned period of three years, because of the TanDEM-X-Mission. This may lead to an extended operation period of IVS VLBI measurements. A new S/X-band dewar will replace the original dewar of the O'Higgins VLBI system. Furthermore it is planned to realize a second gravimeter measurement. The first one took place in 1997.