German Antarctic Receiving Station (GARS) O'Higgins

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Abstract In 2013, the German Antarctic Receiving Station (GARS) O'Higgins contributed to the IVS observing program with four observation sessions in February. Maintenance and upgrades were made and are in progress; e.g. the complete receiver was dismounted and shipped to Wettzell. A new replacement dewar was finished in the labs of the observatory in Yebes, Spain.

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, belonging 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 mainly used for downloading of remote sensing data from satellites such as TanDEM-X and for the commanding and monitoring of spacecraft telemetry. During dedicated campaigns in the Antarctic summer it is also used for geodetic VLBI. In 2013, the station was again manned by DLR staff and by a team for the maintenance of the infrastructure (e.g. power and freshwater generation) the entire year. BKG staff was there from January to the beginning of March. The VLBI campaign in November—December 2013 had to be canceled again, as the VLBI receiver is currently in Wettzell for maintenance.

Over the last few years, special flights using "Hercules C-130"-aircrafts and small "Twin Otter DHC-6"-aircrafts 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 stay from Punta Arenas via Base Frei on King George Island to O'Higgins on the Antarctic Peninsula. The conditions for landing on the glacier are strongly weather dependent and involve an increasing risk; in general, transport of personnel and cargo is always a challenging task. Arrival and departure times strongly depend on the climate conditions and on the logistic circumstances.

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

Besides the 9-m VLBI antenna, which is used for the dual purposes of receiving data from and sending commands to remote sensing satellites and performing geodetic VLBI, other geodetically relevant instruments are also operated upon on location:

- an 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.

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Fig. 1 The Web cam image of the VLBI antenna and some real-time penguin cams from the O'Higgins Web page.

- 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 2012. 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.

2 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 of RTW.

Name	Affiliation	Function	Mainly working for
Torben Schüler	BKG	head of the GOW (since January 2013)	GOW
Christian Plötz	BKG	electronic engineer (chief engineer RTW)	O'Higgins, RTW, TTW
Christian Schade	BKG	geodesist	O'Higgins operator, SLR
Reiner Wojdziak	BKG	software engineer	O'Higgins, IVS Data Center Leipzig
Andreas Reinhold	BKG	geodesist	O'Higgins operator
Thomas Klügel	BKG	geologist	administration laser gyro/ local systems Wettzell
Rudolf Stoeger	BKG	geodesist	logistics for O'Higgins, GNSS
Alexander Neidhardt	FESG	head of the VLBI group and VLBI station chief	RTW, TTW
Gerhard Kronschnabl	BKG	electronic engineer (chief engineer TTW)	TTW, RTW, TIGO

3 Observations in 2013

GARS participated in the following sessions of the IVS observing program during the Antarctic summer campaign (January-March 2013):

- IVS-OHIG82 February 11 - 12, 2013
- IVS-OHIG83 February 13 - 14, 2013
- IVS-T2088 February 19 - 20, 2013
- IVS-OHIG84 February 20 - 21, 2013

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

4 Technical Improvements and 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. A prob-

lem is the low transfer rates (often with only 50 kbps) on the communication connection, so the Internet and phone access were reduced. Also, the Web cams are regularly maintained.

Special maintenance tasks focused on the stabilization of the timing system, where the NTP-server is now connected to the external PPS-signal of the Cesium standard. The GNSS-antennas had to be cleaned from salt debris, and the acquisition PC of the GNSS point OHI2 was replaced by a low maintenance PC box.

The meteorological data are now directly available on the Web pages with an update interval of one minute. Because of some defective connectors, the radar gauge had to be dismounted and repaired.

The construction of the new dewar is finished now in order to replace the original O'Higgins dewar. The current one must be evacuated permanently by a turbo molecular pump to maintain the required vacuum due to leakage. The new one is currently at the observatory at Wettzell to be tested.

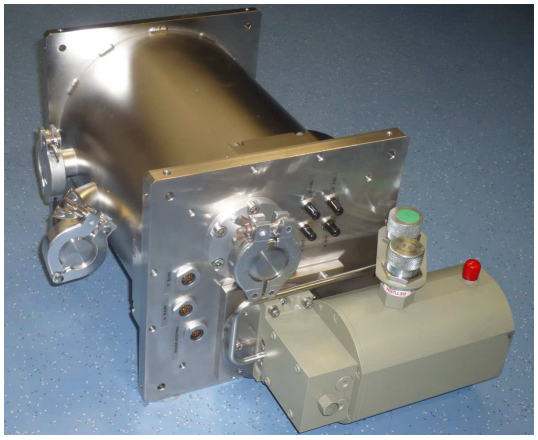

Fig. 2 The new dewar for the VLBI system at O'Higgins.

The dismounted receiver is currently at the observatory at Wettzell for maintenance. The idea is to fix overaged parts and to integrate a new control equipment.

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. Another technique, using the download and commanding gaps for geodetic VLBI, was discussed with the DLR and is planned to be realized. But it requires a suitable communication with the scheduling and control programs of the DLR.

A complete geodetic survey was performed with equipment from Wettzell (total station TCA 2003) in addition to the VLBI observations, to determine the local ties. Additional leveling surveys were included, using the equipment DNA 03.

5 Future Plans

The replacement dewar must be installed again after the tests at Wettzell. The maintained receiver must also be installed again. A dedicated plan should offer a shared, interleaved observation of satellites (DLR) and VLBI sources (BKG) during the whole year. In order to optimize the operating procedure and the disposition of staff, a common control room for DLR and BKG staff is in preparation. Some antenna motors must be replaced, and a gear needs to be inspected.