

# German Antarctic Receiving Station (GARS) O’Higgins

Theo Bachem<sup>1</sup>, Michael Seegerer<sup>1</sup>, Robert Wildenauer<sup>1</sup>, Thomas Klügel<sup>1</sup>, Alexander Neidhardt<sup>2</sup>, Christian Plötz<sup>1</sup>, Torben Schüler<sup>1</sup>

**Abstract** The German Antarctic Receiving Station (GARS) O’Higgins successfully contributed to the IVS observing program in 2023. At the end of 2023, a major upgrade of the 9-meter antenna was initiated. The goal was to renew the outdated analog servo drive system, for which no further spare parts were available. In addition, all cables for the power supply and signal connections were replaced with new cables. The old system was no longer reliable for operations. Hence, this upgrade was well overdue and required to ensure operations at O’Higgins. However, after antenna maintenance, the hydrogen maser and the cryogenic receiver failed. Maintenance in particular for the hydrogen masers with an external service provider is still pending. Therefore, VLBI observations were not possible until the end of 2024.

## 1 General Information

The Antarctic station GARS O’Higgins is jointly operated by the German Aerospace Center (DLR) and the Federal Agency for Cartography and Geodesy (BKG, it is under the service of the Geodetic Observatory Wettzell (GOW)). The Institute for Antarctic Research Chile (INACH) coordinates the logistics. The 9-meter radio telescope at GARS O’Higgins is mainly used for downloading of remote sensing data from satellites such as TanDEM-X and for the commanding and moni-

1. Bundesamt für Kartographie und Geodäsie (BKG)

2. Forschungseinrichtung Satellitengeodäsie (FESG), Technische Universität München

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toring of spacecraft telemetry. The DLR operating staff and a Chilean team for maintaining the infrastructure (e.g., power and freshwater generation, technical support) attend the station throughout the year.

The transportation of passengers and cargo by air and by ship was organized by the Chilean Antarctic Institute (INACH) in close collaboration with the Chilean Army, Navy, and Air Force. All technical material and food for the entire stay were delivered from Punta Arenas via Base Frei on King George Island to O’Higgins on the Antarctic Peninsula. The conditions for landing on the glacier or accessing the base via ship are strongly weather dependent. In general, transport of personnel and cargo is always a challenging task. Arrival and departure times strongly depend on the current meteorological conditions and logistic circumstances.

The VLBI system is continuously operational. However, maintenance and potential repair work is only possible when BKG staff is present. Frequent damages resulting from rough climate conditions and strong storms have to be identified and repaired, e.g., wind sensors. The shipment of each kind of material, such as special tools, spare parts, or upgrade kits, has to be carefully prepared in advance. The most important station and system parameters are permanently monitored remotely.

## 2 Activities During the Years 2023–2024

The planning of all related work packages related to the major antenna upgrade for the VLBI system had to be done beforehand at the beginning of 2023. The main power distribution units and the new VLBI signal coax-



**Fig. 1** View of 9-meter radio telescope at GARS.

ial cables were installed. The new cables provide better performance for the signal connection from the cryogenic receiver in the elevation cabin to the back end, where the VLBI sampler is located (ADS3000+). Finally, the backup hydrogen maser EFOS-11 failed and had to be examined. The main unit, EFOS-50, was previously out of order. Maintenance of both units with an external service provider is mandatory, and until this is performed, it prevents VLBI operations. In addition, the cryogenic VLBI receiver failed, and maintenance of the cold head section was needed.

### 3 Current Status

Besides the 9-meter VLBI radio telescope, which is used for the dual purposes of performing geodetic VLBI and receiving data from and sending commands to remote sensing satellites, other geodetic-relevant instruments are also operated on site:

- Two H-masers (EFOS-11 and EFOS-50), an atomic cesium clock, and a GPS time receiver, which realize the time and frequency basis. (However, currently both hydrogen masers are not operational.)

- Two GNSS receivers OHI2 and OHI3, both Galileo enabled, which operate within the IGS network. Both receivers worked without failure.
- A meteorological station that provides pressure, temperature, humidity, and wind information, as long as the temporarily extreme conditions do not disturb the sensors.
- Two SAR corner reflectors, which were installed in March 2013 as part of a network to evaluate the localization accuracy of the TerraSAR-X mission.

### 4 Future Plans

The most important task is to repair the frequency reference of the VLBI station, the EFOS-50/11 hydrogen masers. Furthermore, the cryogenic receiver needs a cold head maintenance service. The upgrade of technical equipment must continue to maintain a reliable infrastructure and operations on site. The concrete pylons and the basement of the GNSS antennas are exposed to rough climate conditions, and their concrete foundations need some reinforcements.