Argentinean-German Geodetic Observatory

AGGO-VLBI Network Station Report

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Abstract The Argentinean-German Geodetic Observatory (AGGO) contributed to observation programs of the IVS and of Wettzell. This report summarizes the activities of AGGO as an IVS Network Station in relation to the provision of VLBI data during 2021–2022.

1 General Information

The Argentinean-German Geodetic Observatory (AGGO) is a joint effort of the Argentinean National Scientific and Technical Research Council (CONICET) and the German Federal Agency of Cartography and Geodesy (BKG) to support the Global Geodetic Observing System (GGOS) by contributing a geodetic fundamental station located in South America [1].

The selected site is a plot of land, owned by the science department of the provincial government of the Province of Buenos Aires, about 25 km from the center of its capital town of La Plata (and about 50 km from the city of Buenos Aires). It is adjacent to the natural park Pereyra Iraola and next to the Argentinean Institute of Radio Astronomy (IAR) [2].

The project is based on the bilateral scientific-technical cooperation between Argentina and Germany. The agreement of cooperation between both partners was renewed in October 2022. It provides now a base for an at least 10-year period of further cooperation and commitment to operate AGGO jointly. Germany via BKG provides, maintains, and renews the measuring devices. CONICET provides the infrastructure. The operation is carried out jointly by staff from BKG and CONICET, complemented by operators from the Ministry of Defense of Argentina.

Fig. 1 The Argentinean-German Geodetic Observatory is a fundamental station for geodesy and, as such, a reference in the time, space, and gravity domain (Photo: 2022-12-26).

2 Component Description

Figure 2 shows a recent picture of the VLBI antenna at AGGO with characteristics and coordinates given in Table 1.

3 Staff

In 2022 two new colleagues could be hired for the VLBI activities at AGGO. The current VLBI staff situation is given in Table 2 (with new members marked

1. Bundesamt für Kartographie und Geodäsie (BKG)
2. Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET)

Fig. 2 The 6-m primary focus offset radio telescope for VLBI observations of AGGO (2021-10-16).

Table 1 Useful data about the VLBI reference point at AGGO and VLBI equipment.

Parameter	Value
DOMES No.	41596S002
CDP No.	7641 (axis intersection)
Four char code	AGGV
IVS two-letter code	Ag
approx. longitude	W 58.51398°
approx. latitude	S 34.8739°
approx. height	35.8 m
data acquisition	VLBA5
data recorder	Mark 5B+
max. e-transfer bandwidth	400 Mbps
FS version	9.13.2 (2020)
webcam: https://www.aggo-conicet.gob.ar/liveview.php	

by *). As the VLBI system is not a black box with unfailing components, training of the operators has been an ongoing process. The transition to new devices or changes in the operation processes has required a permanent training. During the last two years the technical documentation for the operations, the procedures, and the manuals have been improved and extended so that new operators can be trained more efficiently.

4 Current Status

4.1 Maintenance and Modernization

During the year 2021 some COVID-19 related restrictions still applied, and the main focus was put on keeping the observation schedules executed and monitoring the system performance. At the beginning of 2022 several modernization actions were carried out at the receiver. Replacement of aged, semirigid cables as well as the exchange of a failing local oscillator had become necessary. Some defective peltier elements at the receiver box had to be replaced. Due to the hot climate during Argentinean summer days, frequent interventions on the cryosystem were necessary in order to reestablish and maintain cryogenic temperatures. Still, it was not always possible, and some observations were lost due to high outside temperatures.

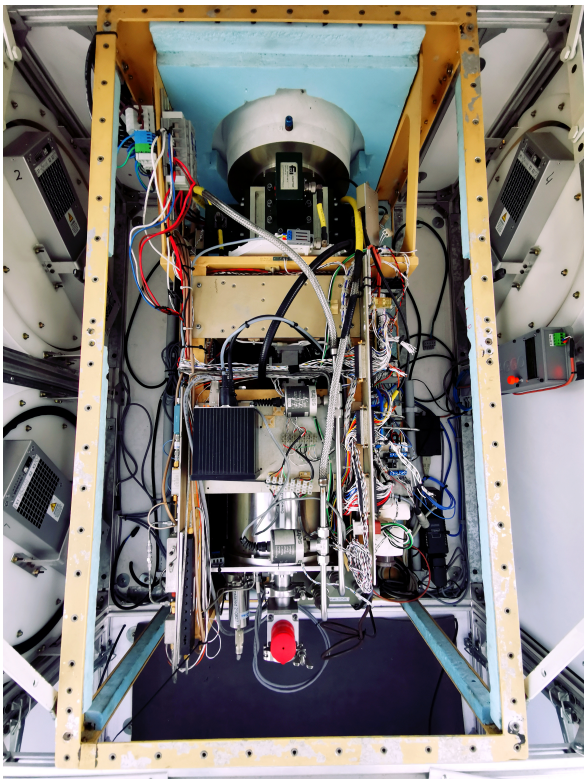

Fig. 3 The cryogenic dual band S/X receiver of the 6-m radio telescope at AGGO (2022-04-14).

Table 2 AGGO staff 2021–2022 linked with VLBI (new *members). (Name top-down corresponds to photo left-right.)

Name	Background	Tasks	Email
Federico Salguero	electronic engineer	VLBI hardware	fsalguero@aggo-conicet.gob.ar
∗Martin García	electronic engineer	VLBI hard- and software	mgarcia@aggo-conicet.gob.ar
José Vera	electronic engnieer	VLBI software and system administrator	jvera@aggo-conicet.gob.ar
Alfredo Pasquaré	electronic engineer	time and frequency lab, GNSS	apasquare@aggo-conicet.gob.ar
Augusto Cassino	electrical engineer	head of infrastructure and construction	acassino@aggo-conicet.gob.ar
Hayo Hase	geodesist	head of operations	hayo.hase@bkg.bund.de
∗Christian Kristukat	physicist	VLBI support	christian.kristukat@bkg.bund.de
Six operators	soldiers	VLBI operation	

In November 2022 the first observations using the DBBC2 and the FlexBuff recorder could successfully be performed in parallel to the analog VLBA4 system with Mk5 recorder. This was made possible by a joint effort thanks to the preparation of this upgrade by AGGO staff (Field System upgrade from 9.13 to 10.1, hardware installation, and development of an IF splitter) and the visit of Christian Plötz from BKG Wettzell, who introduced the AGGO staff to the new devices.

Although the quality of the line power supply to AGGO has improved to some extent, AGGO is still affected by unannounced power outages. The horizon mask for the radio telescope decreased slightly due to growing trees. The radio frequency interference situation at S-band is affecting most often the upper two S-band channels.

As a fundamental station for geodesy, AGGO hosts also an SLR station, the overhaul of which suffered further delays due to the COVID-19 crisis. The local survey of the important reference points at AGGO is executed on a periodical basis. Other instruments are kept working:

- time and frequency lab with two H-masers, three Cs normals (one Cs failed and will be replaced in 2023), one GNSS receiver, and one NTP server
- VLBI radio telescope
- GNSS receiver (IGS)
- absolute gravity meter and superconducting gravity meter (IGFS)
- hydrological sensors
- meteorological sensors.

Internet provision is available through a 1 Gbps optical fiber.

The construction of a new office building for the staff of AGGO has been initiated and is more than four years delayed. Once it is finished, the space of the operation building will be released to move the VLBI equipment from the containers to the operation building.

4.2 Sessions

Table 3 gives an overview about the data yield from AGGO and its performance. The loss of sessions is related mainly to technical failures during the summer months. But these failures trigger improvement projects, which will be rolled out during the coming years (see Section 5).

4.3 Outreach

Several groups of students and scientists of local universities and research institutions have been received in order to spread the knowledge about the existence of the AGGO as a fundamental station for geodesy and to demonstrate modern geodetic methods to a broader audience. In October 2022 a workshop on VLBI was held at the University of La Plata, and AGGO staff participated as speakers.

Table 3 AGGO VLBI session performance 2021–2022. The column "Correlated" contains also observed sessions which are still in backlog at the correlators. "Lost" sessions are those which had to be canceled or had been eliminated from the correlation process due to poor quantity or quality of observations. The W-series is a domestic 2-hour session of BKG on the baseline Wettzell–AGGO.

Year	Session	Duration (hours)	Scheduled	Correlated	Lost	Performance
2021	R1	24	39	27	12	0.69
	R4	24	3	2	1	0.67
	T2	24	3	1	2	0.33
	CRD	24	6	3	3	0.50
	OHG	24	4	2	2	0.50
Total (24 hour)			55	35	20	0.64
	WE	2	18	14	4	0.78
2022	R 1	24	43	29	14	0.67
	R4	24	0	0	0	0.00
	T2	24	3	1	2	0.33
	CRD	24	6	5	1	0.83
	OHG	24	5	2	3	0.40
Total (24 hour)			57	37	20	0.65
	WF	2	6	5	1	0.83

5 Future Plans

A number of important issues will take place during the coming years.

- Replacement of hybrid cables of the azimuth and elevation cable wrap. After > 27 years of operation the cables will be proactively replaced by unused hybrid cables.
- The servo cabinet of the antenna control unit will be moved from the container into the operation building of AGGO. This action requires disconnecting and reconnecting all critical signal and power lines.
- The VLBI operation will be moved to the operation room of the operation building.
- With the disappearance of CTI components for the cryogenic part at the front end, a new dewar with a different cryocooler and compressor needs to be designed, produced, and installed. This is the opportunity to employ a larger cryocooler and hence to achieve better system performance and better resistance against hot summer days.
- The technical specifications of a VGOS radio telescope for AGGO will be prepared.

Related to these VLBI-specific tasks, it should be mentioned that AGGO also received a Water Vapor Radiometer as a complementary device to VLBI and GNSS measurements. Its installation is scheduled for 2023.

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