Moving from TIGO to AGGO

Argentinean-German Geodetic Observatory (AGGO) Report

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Abstract The former Transportable Integrated Geodetic Observatory (TIGO) in Concepción, Chile, was moved to the vicinity of the town of La Plata, Argentina, constituting the new Argentinean-German Geodetic Observatory (AGGO). The period of 2015–2016 covers the move of eleven standard containers across the Andes mountain chain and setting up a new geodetic observatory near the La Plata river. Several overhaul measures were realized to begin operation with a refurbished instrumentation.

1 General Information

The successful VLBI operation of TIGO in Concepción came to an end in 2014 when the local partner, the Universidad de Concepción, was unable to continue its financial support of TIGO due to the losses and damages related to the M8.8 earthquake on February 27, 2010. However, the German government understood the need for a continued production of observing data obtained in the Southern hemisphere for the benefit of global geodesy. Consequently, the German administration was searching for a new project partner. In November 2013 a contract was signed between BKG and CONICET, Argentina.

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3. Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET)

AGGO Network Station

IVS 2015+2016 Biennial Report

Since then a site near the capital town of the Province of Buenos Aires, La Plata, was investigated to become the home for a geodetic observatory. While in Chile the disassembling of TIGO progressed, the new platform had to be built in Argentina. The AGGO project was agreed to have three periods:

1. **[until the end of 2016]** termination of the construction of infrastructure and start of operation from the containers;
2. **[2017–2019]** transfer measuring and controlling equipment from containers to an operations building, while the operation for services is ongoing;
3. **[by 2020]** operation from operations building as a permanent observatory, abandoning the containers.

2 Activities during the Past Years 2015–2016

The year 2015 started with the last packings at the TIGO platform in Concepción. The documentation of the planned move was processed by Chilean authorities for exportation and by Argentinean authorities for importation. In parallel, two shipping companies had to provide trucks and air-suspended trailers for the move on land (as the age of the containers did not allow for a seaborne transport option). Finally, on April 11, 2015, the caravan consisting of eleven trucks and two accompanying cars left the town of Concepción in the early morning hours (Figure 1).

Nine days and about 3,600 km later, the final destination of AGGO was reached in the Pereyra Iraola Park at the urban limit of the town of La Plata, and the trucks were unloaded (Figure 2). At this time the foun-

Fig. 1 The caravan of eleven trucks while awaiting customs clearance at the *Paso Pino Hachado* border station in Argentina (April 11–13, 2015).

Fig. 3 The re-installation of the former TIGO radio telescope as AGGO radio telescope above a specially constructed platform was performed with the support of the company MT-Mecatronica from Chile (May 6, 2015).

dation for the containers and the radio telescope had already been prepared to set up the containers at their final position (Figure 3). However, there was still a lot of construction work to be done (operation building with kitchen, bathrooms, laboratories, electricity supply and Internet access). While the infrastructure work progressed step by step, the equipment and instruments had been unwrapped and reassembled also one after the other with new staff provided by CONICET.

Fig. 2 Downloading the 23-t container with the radio telescope inside at the AGGO platform (April 20, 2015).

The task is to set up AGGO as a fully functional fundamental station for geodesy, including:

Fig. 4 The geodetic reference marker of the radio telescope is part of the platform. The radio telescope is centered above the marker, which is conical and self-centers the radio telescope during the setup (May 6, 2015). The acronyms used for this radio telescope reference marker are listed in Table 1.

- 6-m offset radio telescope for VLBI observation within the IVS;
- 50-cm optical telescope with two-color 100-Hz laser system for SLR within the ILRS;
- GNSS stations supporting GPS, Glonass, and Galileo within the IGS, but also SIRGAS and the national geodetic reference frame POSGAR;
- time & frequency laboratory contributing to Universal Time as administrated by the Time Section of BIPM;

Table 1 Useful data about the VLBI reference point at AGGO (Figure 4).

Parameter	Value
DOMES No.	41596S002
CDP No.	7641 (axis intersection)
4-char code	AGGV
IVS 2-char id	Ag
approx. longitude	W 58.51398°
approx. latitude	S 34.8739°
approx. height	35.8 m

- super-conducting gravimeter for the ultra-precise observation of gravity variations within IGFS;
- local geodetic network for the local survey linking the local reference points;
- complementary sensors for meteorology, tilt, and seismicity;
- hydrological sensors in cooperation with GFZ Potsdam;
- data depository and local computer infrastructure;
- electricity supply robust against frequent power outages or instabilities;
- infrastructure for the well-being of staff working at AGGO.

On the occasion of the erection of the future operation building, the official inauguration of the AGGO project with the presence of the Argentinean Minister of Science, Technology and Innovation, Dr. Barañao, and the German Federal State Secretary, Mrs. Rogall-Grothe, took place on July 23, 2015 (Figure 5).

In order to make progress with this many-sided task, administrative support and special expertise were necessary. The supply with overhauled and new spare parts and materials for the installation from the Geodetic Observatory Wettzell was and is crucial. Supplies for AGGO coming from abroad require usually quite a long processing time for customs documents in order to enter into Argentina. This limits the speed of advance of the project.

In chronological order we received in situ help by:

- Hartmut Wziontek, Ilona Nowak (BKG) for the installation and operation of the superconducting gravity meter;
- Andreas Günthner, Stephan Schröder (GFZ) for the installation of hydrological sensors;
- Virginia Mackern, Laura Matteo (UNCuyo) with the local survey;

Fig. 5 The official inauguration of the AGGO project on July 23, 2015. Argentinean and German authorities cutting the inauguration tape of the operation building. From left to right: Prof. Dr. Brunini (AGGO), President Ing. Rodriguez (CIC), President Prof. Dr. Salvarezza (CONICET), Minister Dr. Barañao (MINCYT), State Secretary Mrs. Rogall-Grothe (BMI), President Prof. Dr. Kutterer (BKG), Ambassador Graf von Waldersee (AA).

- José Manuel Serna Puente (IGN, Spain) for the installation of the overhauled Dewar for the VLBI receiving system;
- Armin Böer (BKG) for the installation of the time&frequency laboratory;
- Ronald Guyot (T4Science, Switzerland) for modernizing and restarting the hydrogen masers.

3 Current Status

The status reached by end of the year 2016 is such that most of the construction work was completed and the instruments were set. Already in operation are:

- super-conducting gravity meter,
- hydrological sensors,
- frequency standards,
- GNSS receiver,
- part of the meteorological sensors.

Severe problems with the stability and continuity of the electric power supply and temporal floodings of the underground cabling system required adjustments in the construction and delayed rapid progress with the setup. The Internet access via optical fiber from/to the AGGO site is unfortunately also delayed, but should be done

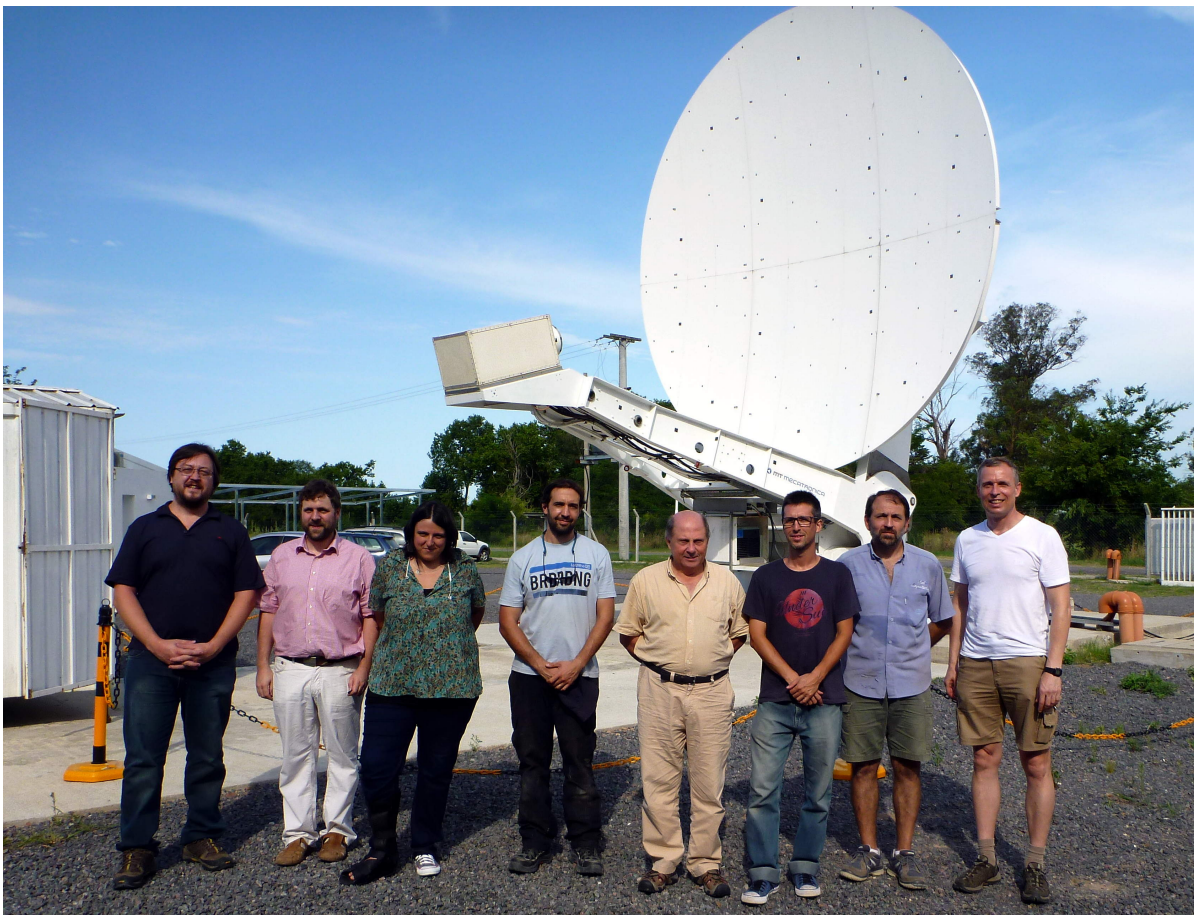

Fig. 6 AGGO staff in front of the 6-m offset radio telescope. From left to right: José Vera, Michael Häfner, Florencia Toledo, Augusto Cassino, Claudio Brunini, Federico Salguero, Alfredo Pasquaré, and Hayo Hase.

Table 2 AGGO staff in 2016.

Name	Background	Tasks	Email
Claudio Brunini	astronomer	scientific director	cbrunini@aggo-conicet.gob.ar
Hayo Hase	geodesist	head of operations	hayo.hase@bkg.bund.de
Augusto Cassino	electrical engineer	head of infrastructure and construction	acassino@aggo-conicet.gob.ar
Federico Salguero	electronic engineer	VLBI hardware	fsalguero@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
Michael Häfner	physicist, engineer	SLR system	michael.haefner@bkg.bund.de
Florencia Toledo	optical engineer	SLR hardware	ftoledo@aggo-conicet.gob.ar
Romina Ronchi	administrator	administration	rronchi@aggo-conicet.gob.ar

during 2017. Consequently VLBI and SLR operations should resume in 2017.

The current staff situation is given in Table 2.

4 Future Plans

The plan for AGGO is to take part as an active network station for VLBI and SLR as well as for the other international services. This will require the training of staff

in operations and the familiarization of operators with the instruments and equipment. Once some routine operations are established again, modernization projects will become more important.

Concerning future VLBI operation, a new VGOS radio telescope is considered to be important, and we have to see how we can manage this challenge.

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