IGN Argentino Associate Analysis Center Report

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Abstract This report briefly presents a description of the IGN VLBI Analysis Center and its activities from the establishment of the center to the present. Recent results and plans for the future are mentioned. Since April 2020, IGN has been managed as an IVS Associate Analysis Center by the National Geographic Institute of Argentina (IGN-Ar) with the aim of increasing participation in the operational generation of geodetic products.

1 General Information

The IGN Analysis Center is the entity in charge of VLBI processing within the Research Center for Applied Geodesy (CIGA). It is supported and operated by the National Geographic Institute (Figure 1) in Buenos Aires, Argentina.

IGN-Ar is the institution responsible in Argentina for the determination of geodetic reference frames. In 2005, the IGN developed and began to operate the GPS Data Scientific Processing Center (CPC-Ar) with the purpose of updating the National Geodetic Reference Frame POSGAR (Argentine Geodetic Positions). The IGN is in charge of the development and maintenance of the Argentine CORS Network (RAMSAC), the National Leveling Network (RN-Ar), and the National Gravimetric Network (RG-Ar). Furthermore, CPC-Ar has been associated with the Geocentric Reference System for the Americas (SIRGAS) as an Official Processing Center, beginning its contributions to Working Group 1 in 2011.

Fig. 1 National Geographic Institute of Argentina.

The installation of the Argentine-German Geodesy Observatory (AGGO), a joint project between the National Council for Scientific and Technical Research of Argentina (CONICET) and the Federal Agency for Cartography and Geodesy of Germany (Bundesamt für Kartographie und Geodäsie, BKG), gave new impetus to the national geodetic community by being the first Argentinian co-location point of multiple geodetic techniques such as GNSS, SLR, and VLBI. In 2017, IGN developed CIGA aiming to process geodetic data obtained at AGGO and provide solutions for different international services such as IVS, ILRS, and SIRGAS.

In 2018, the VLBI AGGO antenna became part of the IVS observing program. The temporal evolution of

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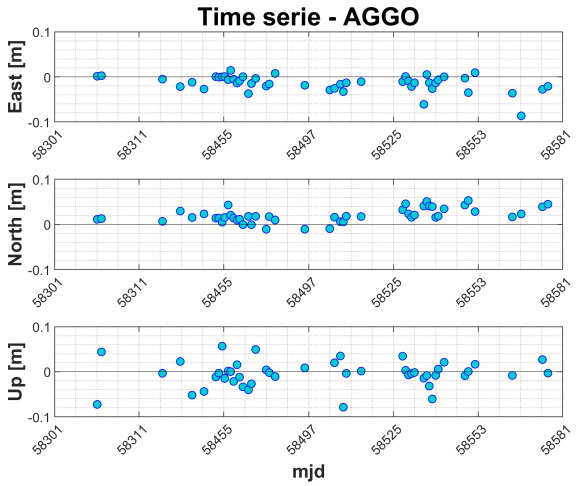

Fig. 2 Temporal evolution of the position of AGGO.

the antenna coordinates with respect to reference, a priori coordinates is shown in Figure 2 for the first two years of measurements.

The main activities of the IGN VLBI group consist of routine processing of 24-hour and one-hour observational sessions to obtain an estimation of all Earth Orientation Parameters (EOP), rapid UT1–UTC values, and station coordinates and velocities together with radio source positions. In 2020, we began submitting the results of 24-hour session processing to IVS.

2 Training Activities on VLBI Processing

In recent years, IGN promoted the development of human resources to use scientific software, through training courses and seminars with the intention of working with VLBI data.

Training began with an intensive course taught by Hayo Hase, at the facilities of the Argentine-German Geodesy Observatory. Subsequently, staff members were instructed through meetings with Dieter Ullrich, Gerald Engelhardt, and Reiner Wojdziak at the German Federal Agency for Cartography and Geodesy in Leipzig. In 2019, Robert Heinkelmann taught a course at our institution on the state-of-the-art VLBI processing techniques. Personnel of CIGA also participate in VLBI-related webinars and virtual events.

3 Staff

The National Geographic Institute has approximately 300 employees. Its responsibilities include contributing to the maintenance of international, regional, and national geodetic networks; production and dissemination of knowledge and geographic information on the Argentine Republic; and management, production, and publication of geospatial information under international standards and norms.

Members who are contributing to the VLBI Analysis Center are listed in Table 1 (in alphabetical order).

Table 1 Staff members.

Name and Email	Function
Ayelén Acosta Manschula [aacosta@ign.gob.ar]	Head of VLBI group and Operational data analyst
Daniel Fernandez [dfernandez@ign.gob.ar]	Web site and database maintenance
Facundo Nahuel Barrera [fbarrera@ign.gob.ar]	Operational data analyst
Hernán Guagni [hguagni@ign.gob.ar]	Head of Reference Frames Department
Micaela Carbonetti [mcarbonetti@ign.gob.ar]	CIGA Analyst

4 Current Status

The VLBI group at IGN generates daily solution files (DSNX) containing an estimation of 24-hour Earth orientation parameters and site positions, as well as their covariances and decomposed normal equations.

Moreover, results with a 48-hour epoch per session are generated in order to get two EOP offsets. These offsets are estimated at midnight before and after the session. Thereby, our solutions are ready to be integrated into the IVS combination effort.

Currently, IGN-Ar uses the VieVS scientific software (Vienna VLBI and Satellite Software), developed by Vienna University, Department of Geodesy and Geoinformation. We apply the following models and international standards:

- Earth Reference Frame: ITRF2014
- Celestial Reference Frame: ICRF3
- Troposphere mapping function: VMF3
- Oceanic loading model: TPX07.2
- Polar drift model: LINEAR IERS2019
- Antenna thermal deformation model: Nothnagel
- Atmospheric loading model: GSFC
- Precession/Nutation model: IAU_2006/2000
- A priori EOPs: IERS C04 14
- High Frequency EOP model (HF-EOP): Desai & Sibois (2016)

The implementation of these models and standards will allow our contribution to the realization of ITRF2020.

In April 2020, the IGN Analysis Center started to process regularly and submit daily sinex files for the IVS project "Daily EOP & station-coordinates solutions." All IVS 24-hour sessions were processed up to 2014. A comparison between IERS and IGN results for polar motion, UT1, and LOD are shown in Figures 3, 4, and 5, respectively.

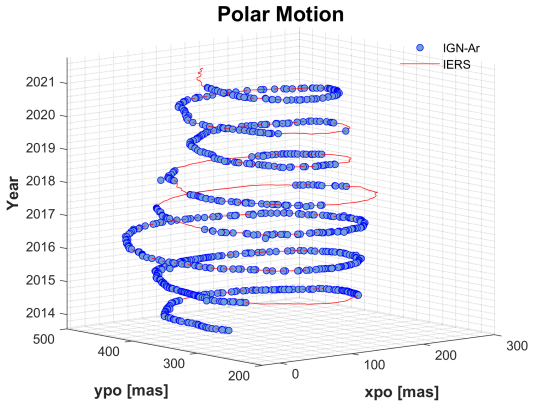

Fig. 3 Difference between polar motion XPO-YPO calculated by IGN and IERS.

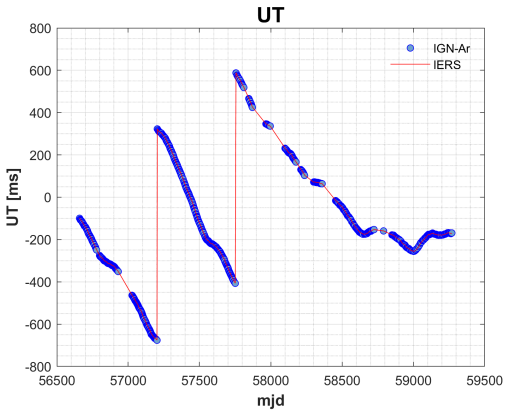

Fig. 4 Difference between UT1 calculated by IGN and IERS.

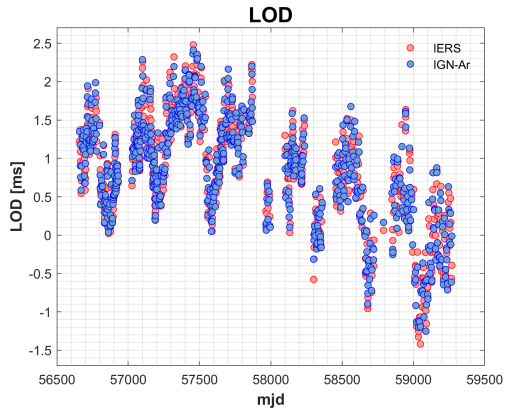

Fig. 5 Difference between LOD calculated by IGN and IERS.

5 Future Plans

As future activities, IGN-Ar plans to continue with the analysis and submission of 24-hour sessions to IVS and to extend our contribution to Intensive sessions as well. Our institution will continue its efforts to become an Operational Analysis Center, and we would like to participate in the data generation for ITRF2020.

In addition to continuing to improve our VLBI Analysis Center, we want to promote geodetic techniques and contribute to the advancement of the scientific development in our region.