

National Geographic Institute of Spain Analysis Center Report

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Abstract This report gives an overview of the service and research activities of the National Geographic Institute of Spain IVS Analysis Center for the period 2021–2022.

1 General Information

The National Geographic Institute of Spain (IGN Spain, Instituto Geográfico Nacional) is the mapping agency dependent on the Ministry of Transport, Mobility and the Urban Agenda of Spain.

Among several activities such as mapping production, astronomic research or geophysical monitoring, one of the main activities of IGN Spain is the design and maintenance of the national geodetic networks, together with the exploitation of the data. The geodetic infrastructure managed by IGN Spain currently includes a network of permanent GNSS stations, tide gauges and levelling network, legacy and VGOS VLBI telescopes, and an upcoming SLR station [1].

In order to strengthen its contribution to geodetic VLBI analysis beyond the infrastructure and the technological developments of Yebes Observatory and taking advantage of the experience gained as a GNSS Analysis Center for 20 years, IGN Spain set up an analysis team in 2018 with the goal of becoming an IVS Analysis Center. As a result of this effort, IGN Spain has been submitting regular VLBI solutions since March 2020. In order to avoid confusion with

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Fig. 1 IGN headquarters in Madrid (Spain).

the National Geographic Institute of France, the IVS AC code that was selected is IGE (Instituto Geográfico Nacional de España).

2 Staff

The VLBI analysis activities are performed by staff allocated to the Geodesy department of IGN Spain. The department has approximately 20 employees, who maintain the different geodetic networks of the country (GNSS CORS, gravimetry, levelling, and tide gauges) and manage a GNSS Analysis Center and a network-RTK positioning service. During 2021 and 2022, the staff of the IGE AC consisted of three members, who are listed in Table 1 in alphabetical order. There is also a frequent exchange of information with the colleagues from the IGN Yebes Observatory Technology Development Center, and there is a line of collaboration with the staff of the VGOS Santa María Station and the University of Alicante Analysis Center (UAVAC).

Table 1 VLBI analysis group.

Name and email	Role	Dedication
Esther Azcue eazcue@mitma.es	Analyst and researcher	Part-time
Christian Palomar cpalomar@mitma.es	Analyst	Full-time
Víctor Puente vpuente@mitma.es	Analyst and researcher	Part-time

3 Service Activities

The operational processing of IVS R1 and R4 sessions is fully automatized through Linux scripts except for the visual inspection of the residuals that is normally needed in VLBI analysis to exclude outliers and to identify clock breaks.

The software package that is used for the operational analysis of the VLBI sessions is Where [2]. Rotating shifts were established between the analysts to provide the solutions in the established time. The submitted solutions can be found at the IVS Data Centers with the solution code 2020a.

Over these years, the effort of the analysis team has been also focused on the reprocessing of historical VLBI data since 1979. This activity is almost finished, and we expect to submit the solutions to the IVS servers in February 2023.

The processing environment was updated in January 2023 to be compatible with the new version of Where (v2.0.0), which supports the new VLBI naming convention. Together with this change, the switch to ITRF2020 will be carried out.

4 Research and Training Activities

The IGE VLBI group is pursuing different research lines, specifically:

- Study of inter- and intra-technique consistency in CONT campaigns [3], [4], [5].
- Assessment of the performance of VGOS sessions [6].
- Analysis of the consistency of reference frames [7].

For research activities, the VieVS software package [8] is also frequently used.

In 2022, the group hosted a traineeship of a student who also developed her final degree project within the group [9]. The work was focused on the automatic detection of clock breaks in VLBI analysis.

5 Future Plans

Quality checks on the EOP accuracy with respect to conventional series and the latency of the solution submissions are currently under development, and we expect to provide them through the IGN Spain webpage in the near future.

In addition, the automatic processing of the Intensive sessions was recently deployed in the IGE processing environment. Once the accuracy and availability of the solutions is ensured, it is foreseen to contribute to the operational analysis of this kind of sessions.

Acknowledgments

We want to thank the Norwegian Mapping Authority VLBI team for their support in the usage of the Where software package.

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