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VLBI Analyses at the National Geographic Institute of Spain

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1. Introduction

Beyond its involvement on the VLBI observing network by means of the RAEGE project, the **National Geographic Institute of Spain** (IGE) is committed to expand its contribution to geodetic VLBI. For this reason an analysis team has been established. For the last two years several tests with different software packages have been performed.

In Azcue et al. (2018) first results of VLBI processing carried out at IGE were shown. Two VLBI software packages were used for experimentation activities in order to compare and validate the solution beyond the software used. These tools where VieVS 3.0 (Böhm et al. 2018) and Where v0.8.1 (Kirvirk et al. 2017).

Currently, The IGE analysis team continues with several **VLBI processing activities** such as the **routinary processing of R1 and R4 sessions** using Where (and contrasted with Vievs processing) or **diverse research activities** using both softwares.

In this poster, the estimated **Earth Orientation Parameters (EOP) for the period spanning from 2002 to 2018** obtained using Where v0.16.3 are presented. These outputs are compared to those from Analysis Centers which are consistent in terms of configuration, specifically concerning terrestrial and celestial frames and IERS models (Petit and Luzum, 2010).

2. Processing strategy

Where v0.16.3 software package has been used to process **R1 and R4 VLBI sessions** for the period spanning from 2002 to September 2018. The summary of the configuration used is shown here below:

Frames	ICRF2 and ITRF14
IERS Conventions	2010
EOP a priori	C04 series
Precession/nutation model	IAU 2006/ IAU 2000A
Troposphere	VMF1 model
Geophysical models	solid tide, tidal ocean loading (TPXO.7.2), solid and ocean pole tides, atmosphere tides, thermal antenna deformation
Estimation model	Kalman filter

The set of estimated parameters is the following:
- **Station** and **source coodinates**.
- **EOP** (polar motion and rates, UT1, LOD and celestial pole offsets)
- **Station clock** (1 h interval)
- **Zenith troposphere delay** (1 h interval) and **gradients** (6 h interval) per station.

3. Results

EOP differences for the period analysed with **Where v0.16.3** have been compared to **EOP 14 C04 series** (Bizouard et al., 2018). The same comparison has been carried out using EOP estimated by other Analysis Centers such as BKG, GSF, OPA and USN, as well as with the IVS combined solution. These solutions were retrieved from IVS ftp (Nothnagel et al., 2017). Differences shown in Figure 1 are shifted in y axis for each Analysis Center for the sake of clarity. Mean value and percentile 95th of the differences for each solution are shown in Table 1. Percentile 95th is used instead of standard deviation to avoid the influence of some outliers present in the series.
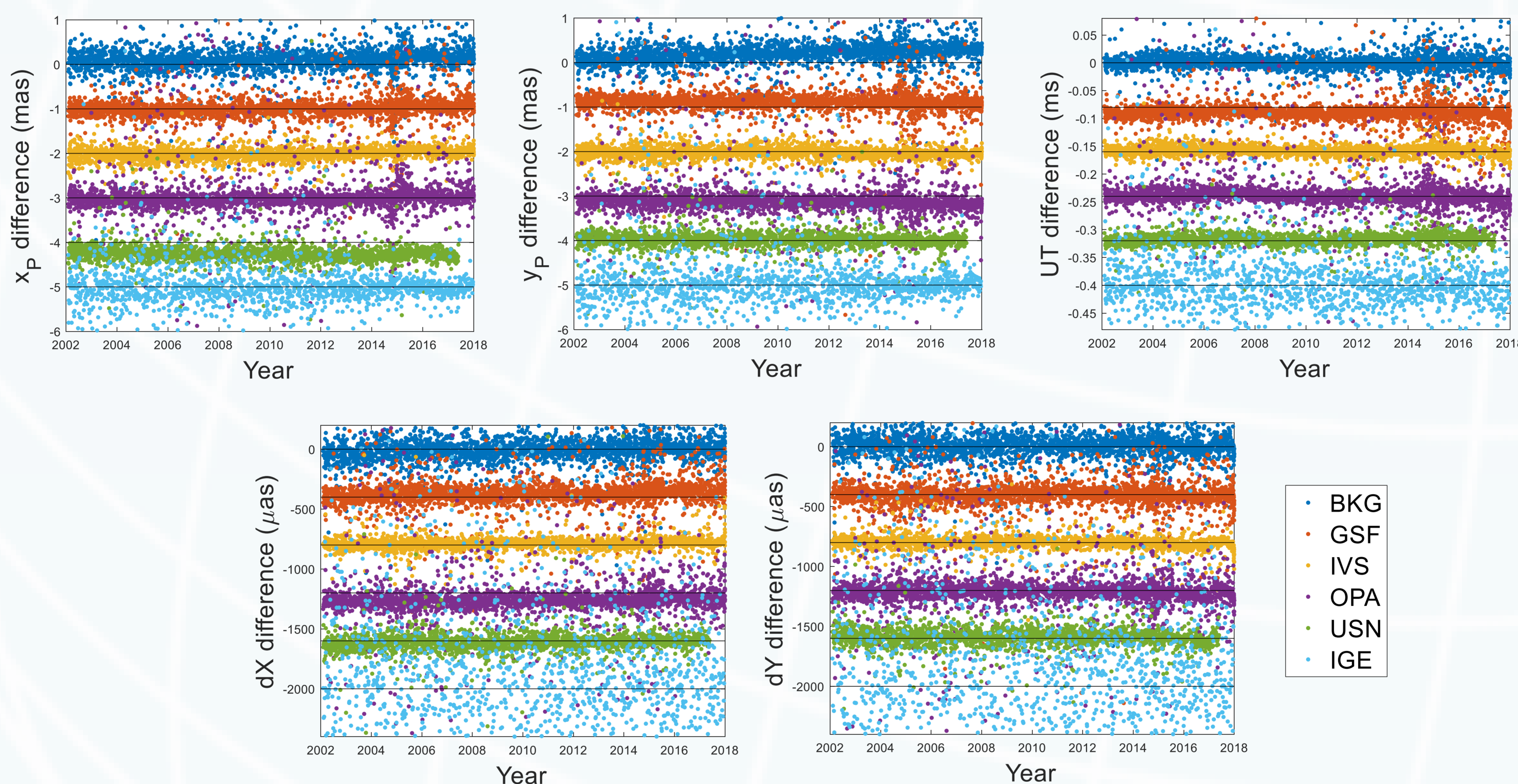

Figure 1. EOP differences with respect to EOP 14 C04 series.

EOP	Parameter	BKG	GSF	IVS	OPA	USN	IGE
Samples		2710	2889	2226	3048	2078	**1595**
xp (mas)	Mean	0.18	-0.03	-0.01	0.05	-0.25	**-0.20**
	P95	0.56	0.39	0.20	0.88	-0.02	**0.89**
yp (mas)	Mean	0.24	-3.57	-0.02	-0.01	0.02	**-0.09**
	P95	0.89	0.60	0.41	0.19	0.49	**0.24**
UT (ms)	Mean	-0.13	2.54	-0.10	-0.11	-0.15	**-0.13**
	P95	0.03	0.04	0.02	0.07	0.02	**0.12**
dX (mas)	Mean	-1.94	23.29	12.62	57.75	-9.66	**2.41**
	P95	176.99	207.66	79.69	186.99	89.62	**1599.62**
dY (mas)	Mean	8.87	-10.15	-1.21	110.65	8.59	**-26.62**
	P95	180.74	174.90	71.92	230.80	111.09	**1622.31**

Table 1. Statistical summary of the EOP differences for each solution with respect to EOP 14 C04 series (2002-2018).

4. Conclusions and future plans

The results presented in this poster lead to conclude that **the accuracy of IGE solution is,** in general, **within the same order of magnitude than other VLBI Analysis Centers**.

An odd behaviour has been detected regarding Celestial Pole Offsets. For the period processed, it would be expected to get a sinusoidal pattern due to Free Core Nutation but this is not the case. This is the reason for the worst accuracy of these EOPs. This issue requires further analysis.

Over the next months it is expected to complete the whole historical period of VLBI data processed.

In the light of these results, IGE team is driven to contribute as much as possible to IVS analysis activities. In this respect, in January 2019 a bid to become potential analysis center was submitted to the IVS Combination Center.

5. References

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