3.5 Product Centres

3.5.1 Earth Orientation Centre

This section presents over the year 2019 the activities and main results of the Earth Orientation Centre located at Paris Observatory.

According to the IERS Terms of Reference, this component is responsible for monitoring Earth Rotation Parameters (ERPs) including long term consistency, publications for time dissemination (DUT1) and leap second announcements. The ERPs: Pole coordinates (x,y), Difference UT1–UTC, Length of Day variation (LOD) and Celestial pole offsets (dX, dY) are available to a broad community of users in various domains such as astronomy, geodesy, geophysics, space sciences and time. Firstly, the ERPs are collected in the form of combined solutions derived by the Technique Centres (IGS, IVS, ILRS and IDS). Two main solutions are computed: a long-term solution (IERS C01) since 1846 until the end of the previous year and the Bulletin B / C04 given at one-day intervals, which is published monthly with a 30 day delay (Bizouard et al., 2018).

Monitoring of the geophysical fluid excitation of the polar motion and length-of-day

In this regard, our service maintain and improve since years an interactive tool (http://iers.obspm.fr/eop-pc/index.php?index=excitactive&lang=en) completing the products of the Global Geophysical Fluid Centre (GGFC) of the IERS. It allows to know, with a delay of at most 24 hours, to what extent the hydro-atmospheric excitation accounts for polar motion and length of days. This analysis can be made since the 1950's. As it gives the equatorial geodetic excitation corresponding to C04 pole coordinates, it has been the support of many published papers.

C04 series updates

- For UT1, the C04 solution was recalculated over the whole year 2018 and for the first months of 2019 due to the presence of a spurious bias over this period (MJD 58119–MJD 58560). The previous version, updated until 2019/12/27, has been put in the sub-directory /eopc04.2018.
- For deriving the last 30 days of the C04 solution (non-official IERS values, only for national use), we have introduced underweighted Ultra-rapid IGS values (x, y, LOD) at 0hUTC. This allows us to reduce the instability of the x pole coordinate for the last day of the solution.

Web site upgrade

In the web page devoted to numerical analysis of the combined and intra-technique ERP time series http://iers.obspm.fr/eop-pc/index.php?index=excitactive&lang=en, we offer now the possibility to derive the parameter TT – UT1.

Statistics

Statistics of 14 C04 for the year 2019 are provided in Table 1 (standard deviations of C04 – intra-techniques solutions), Table 2 (mean and standard deviations of C04 – intra-technique combined solutions) and Table 3 (mean and standard deviations of C04 – multi-technique combined solutions). Those results can be reproduced on line from http://iers.obspm.fr/eop-pc/index.php?index=operational&lang=en, and extented to any other time interval covered by the ERPs series.

Table 1: *Intra-techniques solutions: averaged time sampling and standard deviation with respect to the combined solutions Bulletin B / C04 over the year 2019. Solutions contributing to Bulletin B / C04 are flagged by stars (*).*

Intra-techniques solutions	Estimated uncertainties				
	Time sampling	Terrestrial Pole	UT1	LOD	Celestial Pole
		μas	μs		μas
VLBI - 24h					
EOP(AUS)	~-365 d	111	111		111
EOP(BKG)	~7 d	155	10.4		90
EOP(GSFC)	~2 d	189	8.4		151
EOP(IAA)	~4 d	114	8.5		70
EOP(USNO)	~3 d	59	6.8		53
EOP(IVS Comb*)	~3 d	77.5	6.5		64
VLBI - Intensive					
EOP(BKG)	~1 d		23.4		
EOP(GSFC)	~1 d		26.8		
EOP(IAA*)	~1 d		75.7		
EOP(PUL)	~1 d		14.0		

EOP(USNO*)	~1 d		7.7		
SLR					
EOP(MCC)	~1 d	212		208	
EOP(IAA)	~1 d	189		27	
EOP(ASI)	~1 d	197		54	
EOP(ILRS Comb*)	~1 d	134		23	
GPS					
EOP(CODE)	~1 d	34		12	
EOP(JPL)	~1 d	37		20	
EOP(GFZ)	~1 d	42.5		13	
EOP(ESOC)	~1 d	37		14	
EOP(NOAA)	~7 d	53		12	
EOP(SIO)	~1 d	71		26	
EOP(EMR)	~1 d	48		14	
EOP(GRGS)	~1 d	37.5		11	
EOP(CGS)	~1 d	48.5			
EOP(IGS-R Comb*)	~1 d	31.5		10	
EOP(IGS-F Comb*)	~1 d	32		12	
DORIS					
EOP(INASAN)	~-365 d	12			
EOP(IDS Comb*)	~-365 d	12			

Table 2: *Mean and standard deviation (STD) in microarcsecond of the differences between intra-techniques combined solutions entering the combination and Bulletin B / C04 over 2019.*

EOP	IGS Comb – IERS 14C04		ILRS Comb – IERS 14C04		IVS Comb – IERS 14C04		IDS Comb – IERS 14C04	
	Mean	Std	Mean	Std	Mean	Std	Mean	Std
X(μas)	25	34	40	128	-29	73	-29	73
Y(μas)	-10	30	37	140	-117	95	-117	95
UT1(μs)					1.8	7.8		
LOD(μs)	0	30	-1	23				
dX(μas)					29	46		
dY(μas)					42	82		

Table 3: *Mean and standard deviation for Pole coordinates (x,y) and UT1 of the differences between combined solutions derived by both the Rapid Service/Prediction Centre at USNO, the JPL and Bulletin B / C04 over 2019.*

EOP	Unit	Bul A – Bul B		Comb JPL – Bul B	
		Mean	Std	Mean	Std
X	μas	26	48	-11	58
Y	μas	2.2	18.0	13	43
UT1	μs	2.2	18.0	-1.6	15.1

Earth Orientation Centre staff

Christian Bizouard, Astronomer, head
Olivier Becker, Engineer, operational work and automation
Teddy Carlucci, Engineer, system
Jean Yves Richard, Engineer, EOP consistency with ITRF
Pascale Baudoin, Secretary
Sébastien Lambert, Assistant-Astronomer, Consultant, representative of the IERS EOC

References

http://iers.obspm.fr/eop-pc/

Bizouard C, Lambert S, Gattano C, Becker O and J Y Richard (2018), The IERS EOP 14C04 solution for Earth orientation parameters consistent with ITRF 2014, J Geod (2018), https://doi.org/10.1007/s00190-018-1186-3

Bizouard C and D. Gambis (2009), The combined solution C04 for Earth Orientation Parameters, recent improvements, Springer Verlag series, Series International Association of Geodesy Symposia, Vol. 134, Drewes, Hermann (Ed.), pp. 265–270, DOI 10.1007/978-3-642-00860-3

Gambis D (2004), Monitoring Earth Orientation at the IERS using space-geodetic observations. J. of Geodesy 78, pp. 295–303

Gambis D and Luzum B (2011), Earth rotation monitoring, UT1 determination and prediction, Metrologia 48 (2011) S165–S170

Christian Bizouard