GOP AC report

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Recent GOP activities (1)

- **Routine processing**
  - *Processed data until end of 2017*
  - *New standards coming soon (Satellite CoM, possibly changes in orbit parametrization)*

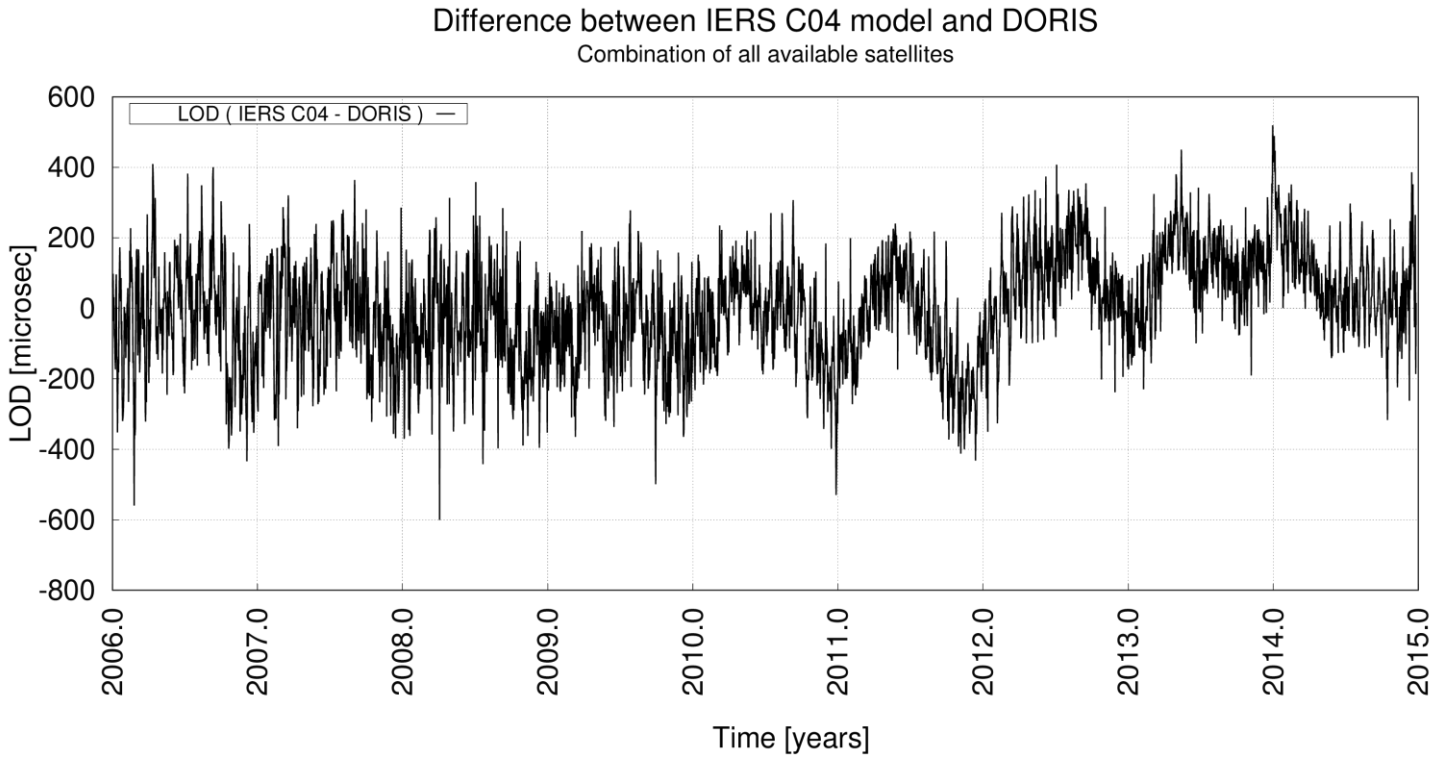
- **RINEX implementation**
  - *Implemented, but not yet properly working*
  - *Higher residuals than for DORIS Doppler*
  - *Systematic behavior of residuals during satellite passes*
  - *For Hy-2A the residuals are significantly higher than for the other satellites.*
  - *It is necessary completely revise our logic of the RINEX processing*

Recent GOP activities (2)

- **LOD estimation**
  - *following slides*
- **Scale (in)consistency**
  - *see separate presentation in the afternoon*
- **Systematic effect in pole estimation**
  - *following slides*
- ***Czech Ministry of Education grant (cooperation with IDS)***
  - *Essential financial support of GOP IDS AC.*
  - *70% of salary refundment, all travel costs*
  - *2018-2022*
  - *Modeling improvements, POD, next ITRF reprocessing, etc.*

LOD estimation (1)

- 2006.0 – 2015.0
- multi-satellite and single-satelite solutions
- Cross track harmonics not adjusted
- For detailed information see Štěpánek et al. (in press)



LOD estimation (2)

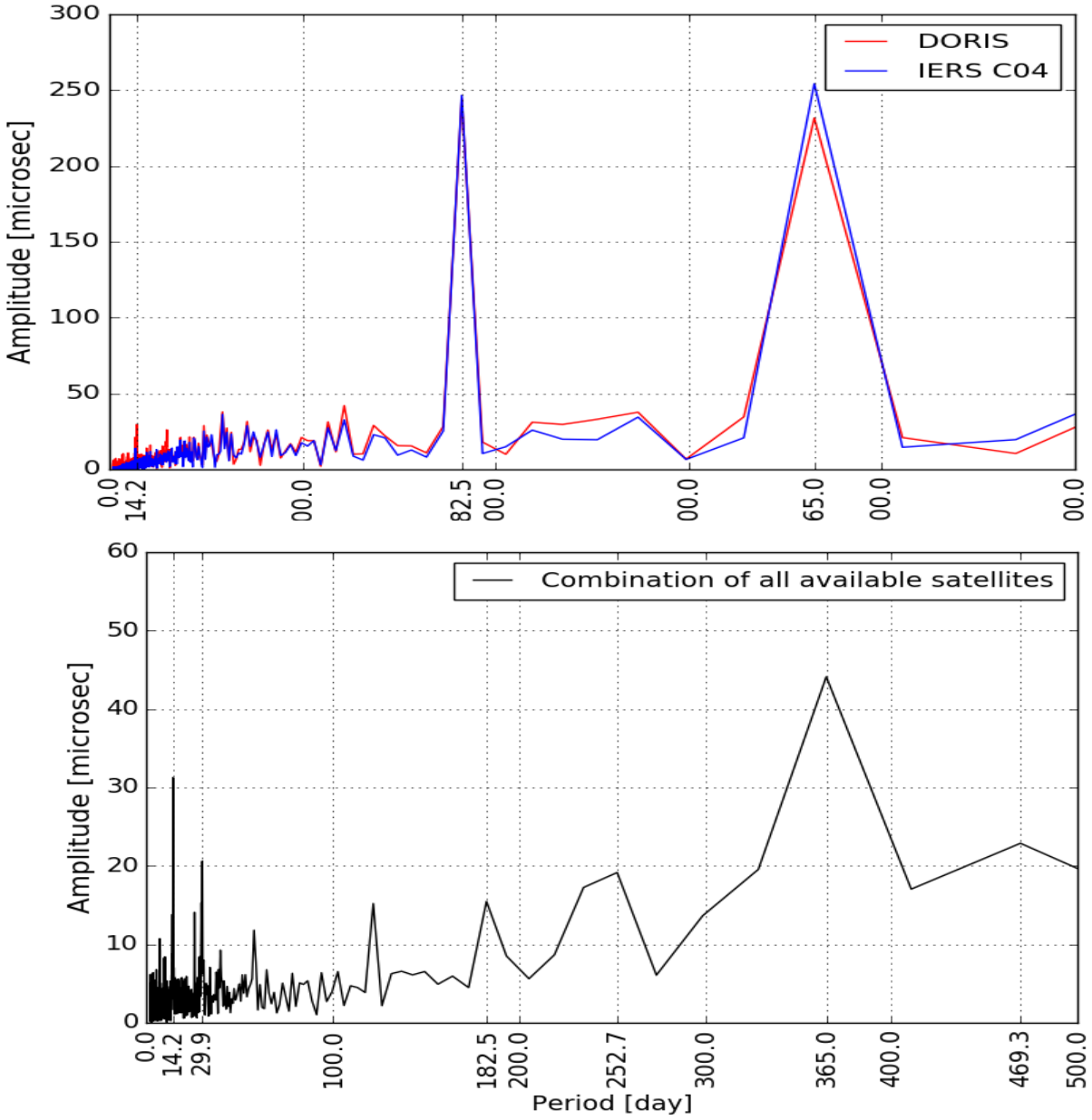
- For 2006.0 – 2015.0 WMean -31 μs, WRMS 153 μs, formal error 49 μs

- Mean is not stable during the time (dependent on satellite constallation, possibly also on solar activity cycle

- (W)RMS comparable to RMS derived from SLR-derived LOD (LEOs) and twice higher than for SLR Lageos solutions (Sośnica (2014))

Year	Weighted mean [μs]	Weighted standard deviation [μs]	Formal error [μs]
2006	-32	160	54
2007	-16	144	76
2008	-61	168	70
2009	-64	127	68
2010	-30	126	48
2011	-65	147	44
2012	82	130	42
2013	118	113	41
2014	78	125	38

LOD estimation (3)



- Annual signal (sun-synchronous satellites)
- Short periodic signal 14.2 days and 29. days (subdaily tidal model imperfection?)
- Draconitic period (Cryosat-2, Jason-2)

LOD estimation (4)

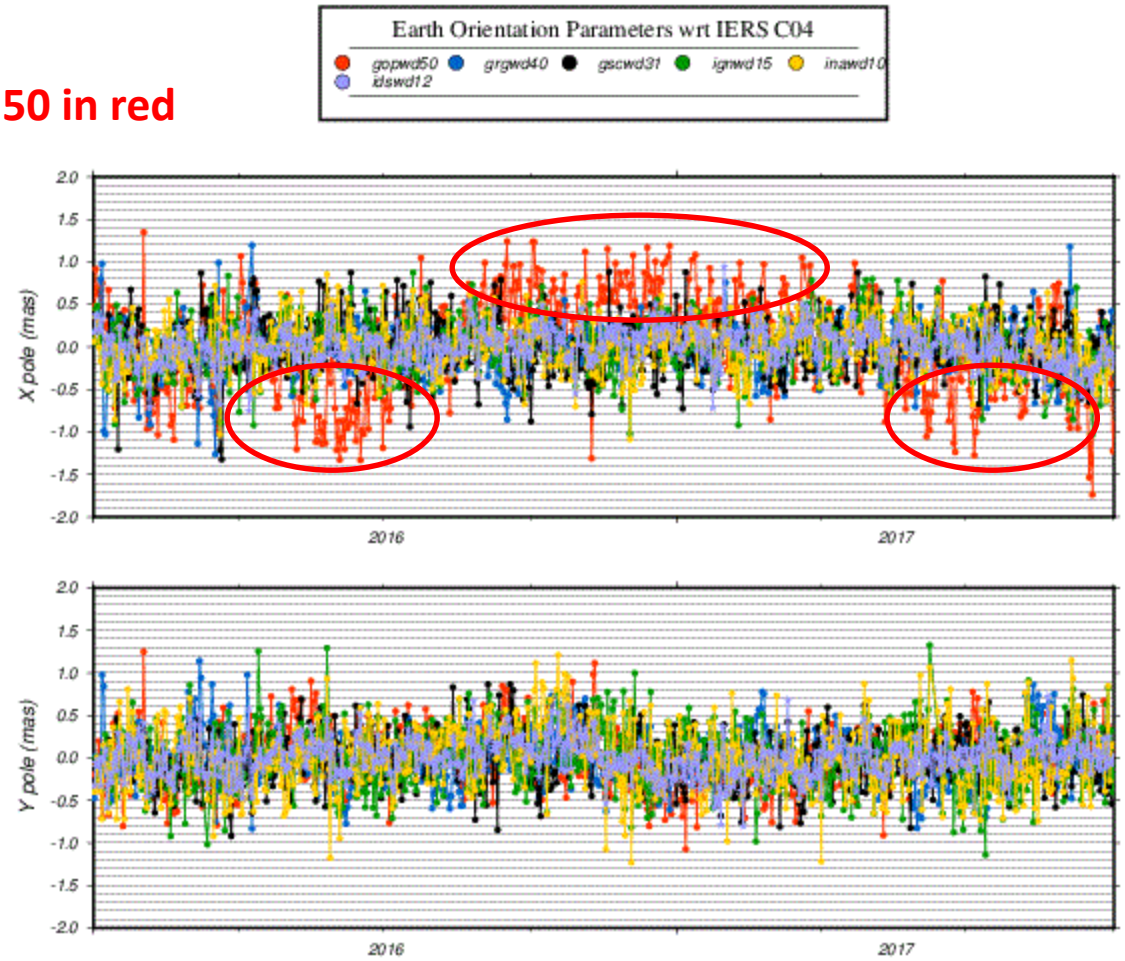
- **Cross track harmonics – Bloßfeld et al. (2014) was able to adjust LOD, C_{20} and cross track simultaneously**
  - in Lageos 1/2 SLR solutions (inclination 53 and 110 deg), 7 days arcs
  - DORIS satellite combination enabled C_{20} and LOD, but not cross track
  - In GOP DORIS solutions 1 day arc, inclination 66 and 92-98 deg.
  - In GOP DORIS solutions, correlation of LOD and Sin cross track amplitude ~ 0.96

- **Future testing**
  - DORIS long arcs
  - Adjusted Cos cross track amplitude
  - Longer time span (full Solar cycle)
  - Other AC(s) ?

Systematic effects in pole estimation (1)

Systematics in Xp, present only in GOP solutions, pointed out by IDS CC (Guilhem)

GOP wd50 in red



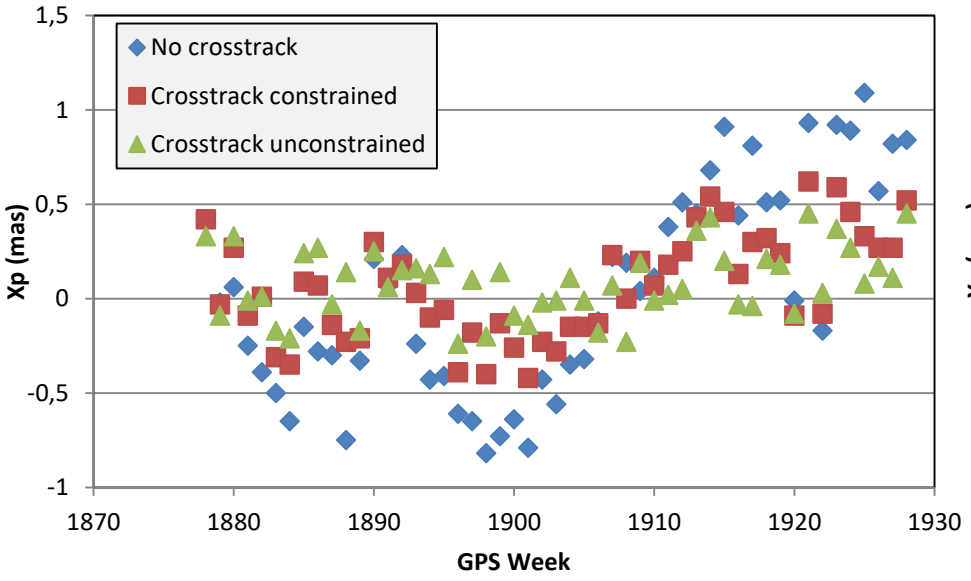
Systematic effects in pole estimation (2)

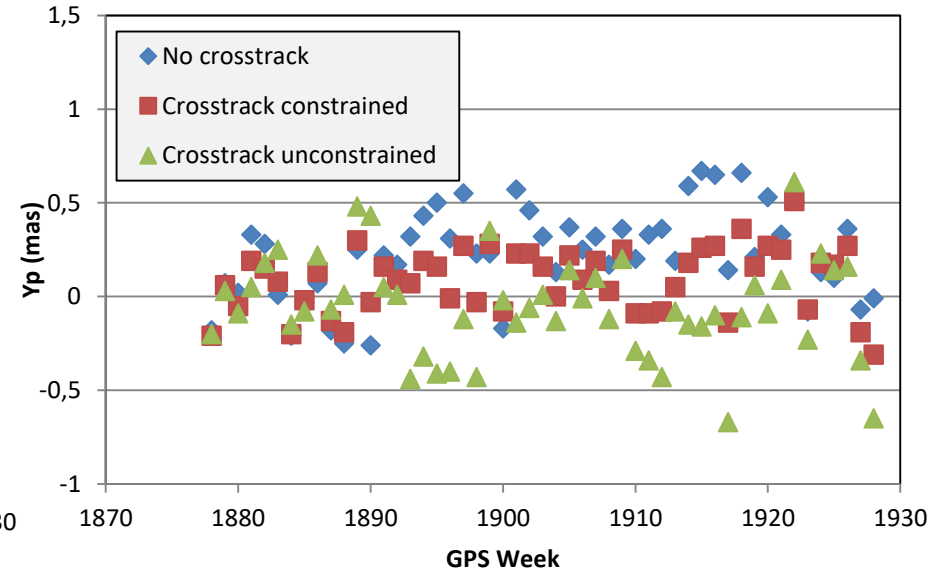
- Problem in not adjusting cross track harmonics ?
- 3 testing Solutions for 2016
- IERS C04 as reference

Cross	Mean (µas)		RMS (µas)	
	Xp	Yp	Xp	Yp
No	37	224	648	359
Constrained $5x10^{-9}$	68	89	418	328
Unconstrained	85	-59	394	503

Systematic effects in pole estimation (3)

- adjusted cross track with constraints (5×10^{-9}) optimal
- not expected result
  - not consistent with our older results (Štěpánek et al. 2014)
  - in correlation analysis from 2012 data, only very low correlation of cross track amplitudes and Xp,Yp
  - in a single-satellite solutions, the highest effect observed for Saral
- This results should rather be considered as preliminary and confirmed/validated by additional testing
- Ask other ACs about cross track amplitude constraints





References

Bloßfeld M., Gerstl M., Hugentobler U., Angermann D., Müller H. (2014): Systematic effects in LOD from SLR observations. Advances in Space Research 54(6):1049-1063, DOI: 10.1016/j.asr.2014.06.009.

Sośnica, K. (2014): Determination of Precise Satellite Orbits and Geodetic Parameters using Satellite Laser Ranging, Astronomical Institute, University of Bern, Switzerland, pp 253, ISBN 978-83-938898-0-8.

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Štěpánek, P.; Hugentobler, U.; Buday, M.; Filler, V., in press. Estimation of the Length of Day (LOD) from DORIS observations, *ADVANCES IN SPACE RESEARCH*, DOI: 10.1016/j.asr.2018.04.038

Thanks for the attention ….