GOP AC report

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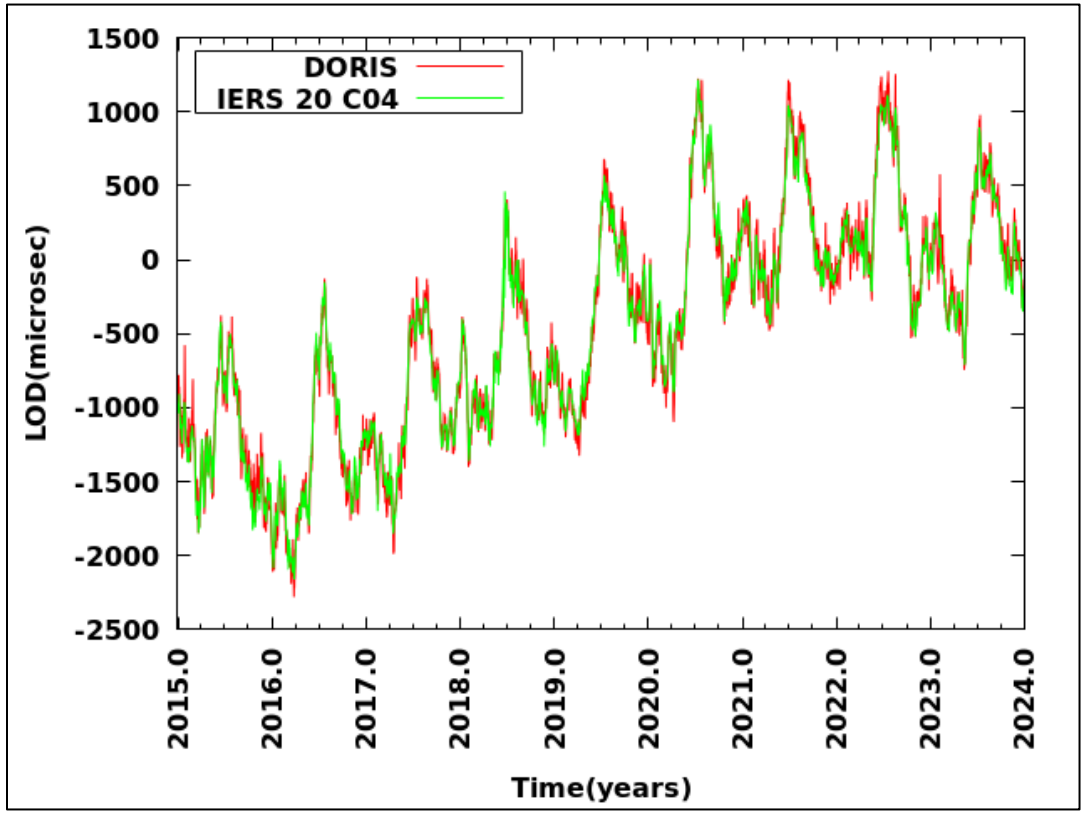
Solutions - current status

- **Operational GOPwd69 and GOPwd70**
  - Differs from GOPwd68 in gravity field model
    - GOPwd68 EIGEN RL04
    - GOPwd69/70 GRGS RL05
  - Differences of GOPwd69 and GOPwd70
    - GOPwd69 all the satellites contribute to the scale
    - GOPwd70 Sentinel-6, Hy-2C and Hy-2D do not contribute to the scale
  - Delivered up to 2025.0
  - Recently LOD included

- **New solution planned**
  - 12 plate macromodel for Sentinel-6
  - SWOT processing

LOD estimation (1)

- **LOD estimation 2015.0-2024.0 from DORIS**
- **Multi-satellite and single satellite solutions**
- **All satellites equipped with DGXX receiver except SWOT**
- **RINEX data only**
- **Solutions with different cross-track harmonic constraints**
- **LOD correlates with cross track, experiments with different cross track constraints**
- **For detailed results, see Vikash Kumar presentation from the IDS Workshop 2024**
- **Peer reviewed paper in progress**



LOD (2)

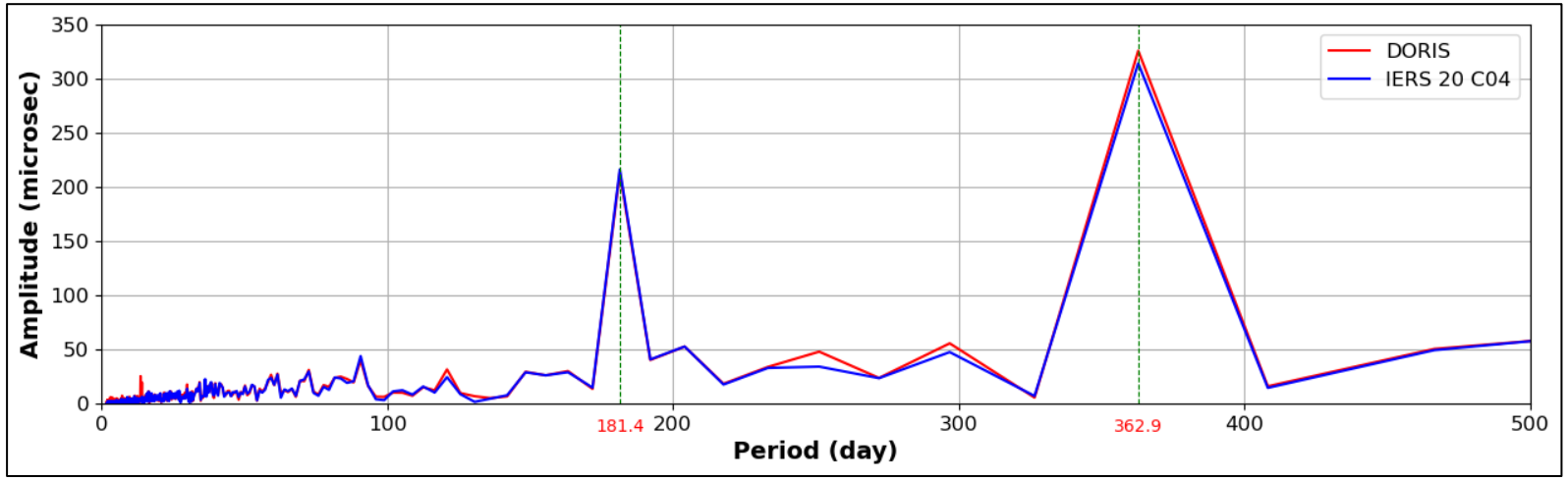
- **The solution with the cross-track OPR amplitude constraint of 5×10^{-9} m/s² performs much better than the solution with 5×10^{-8} m/s²**

- **The LOD annual weighted mean varies for the years between -22 µs to 39 µs. The weighted std. dev. reaches values around 83 microseconds in the average (cross track OPR amplitudes constraints 5×10^{-9} m/s²)**

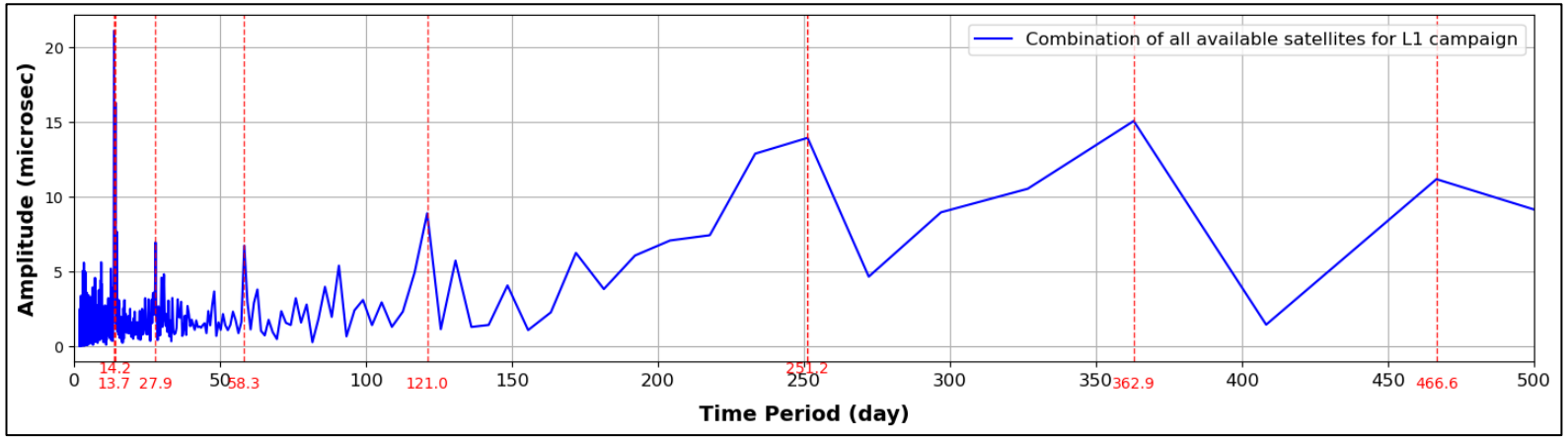
Year	Weighted mean [µs]	Weighted standard deviation [µs]
2015	-2.9	298.3
2016	-200.8	353.5
2017	-146.5	323.8
2018	-90.3	362.9
2019	36.5	302.6
2020	58.2	371.8
2021	459.6	495.8
2022	108.9	270.5
2023	457.1	364.7

Year	Weighted mean [µs]	Weighted standard deviation [µs]
2015	39.1	91.2
2016	-20.8	66.4
2017	-0.8	84.0
2018	21.4	88.6
2019	4.4	86.5
2020	-22.4	85.1
2021	38.7	83.8
2022	35.6	85.3
2023	11.9	69.7

LOD -Spectral Analysis



The periodogram of the LOD time series obtained from the DORIS solution and from the IERS 20 C04

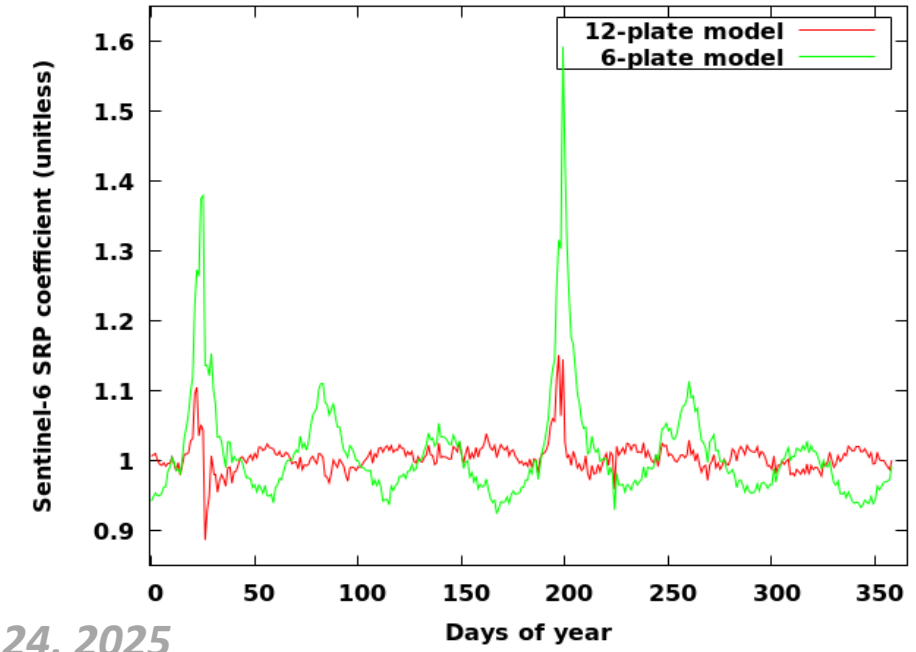


Periodogram of the difference between LOD from IERS 20 C04 and from DORIS

Testing of Sentinel-6 12 plates model

- **POD tests**
- **6 plates vs 12 plates**
- **12 plates much stable SRP coefficient series**
- **But with 6 plates model we got a bit lower OPR amplitudes**

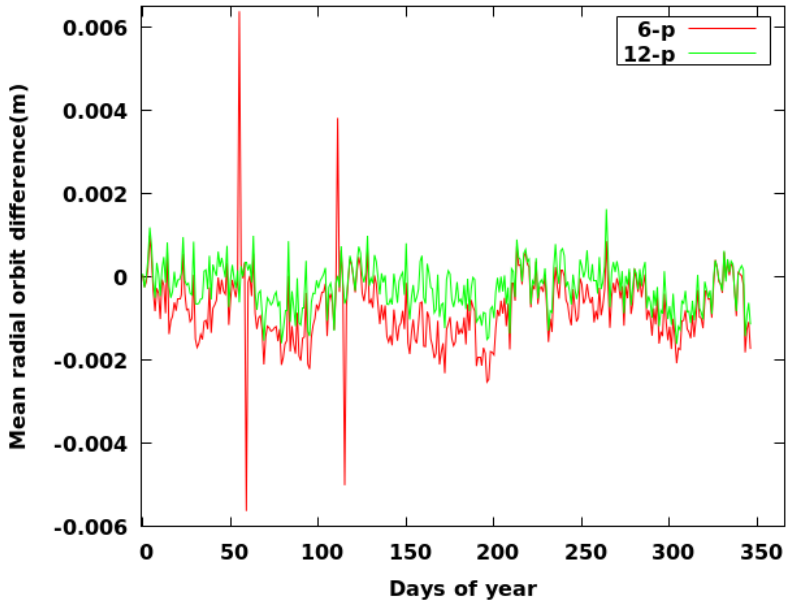
Amplirudes 10^{-9} m/s²	Along track	Cross track	SRP coefficient
	Mean	Mean	
12 plates	1.48	3.92	1.0053±0.022
6 plates	1.36	3.32	1.0119±0.076

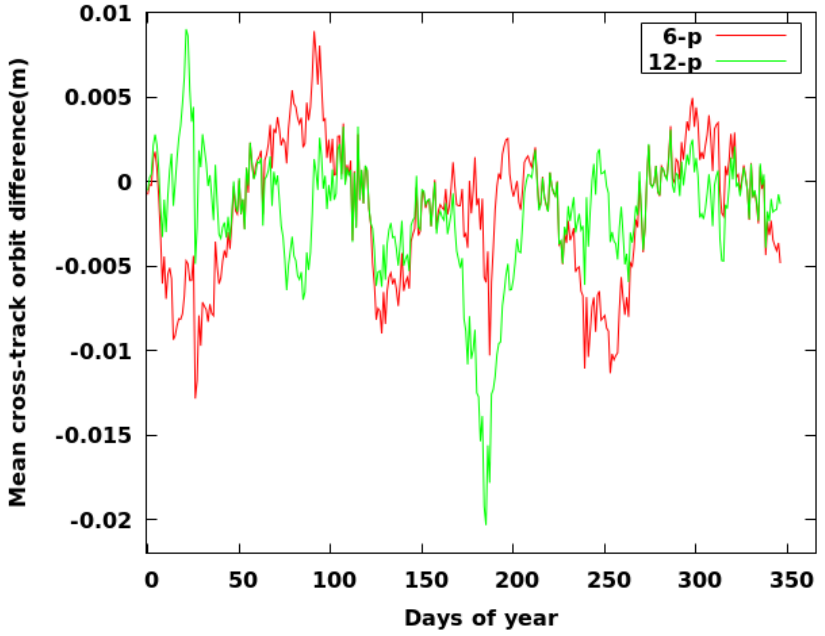


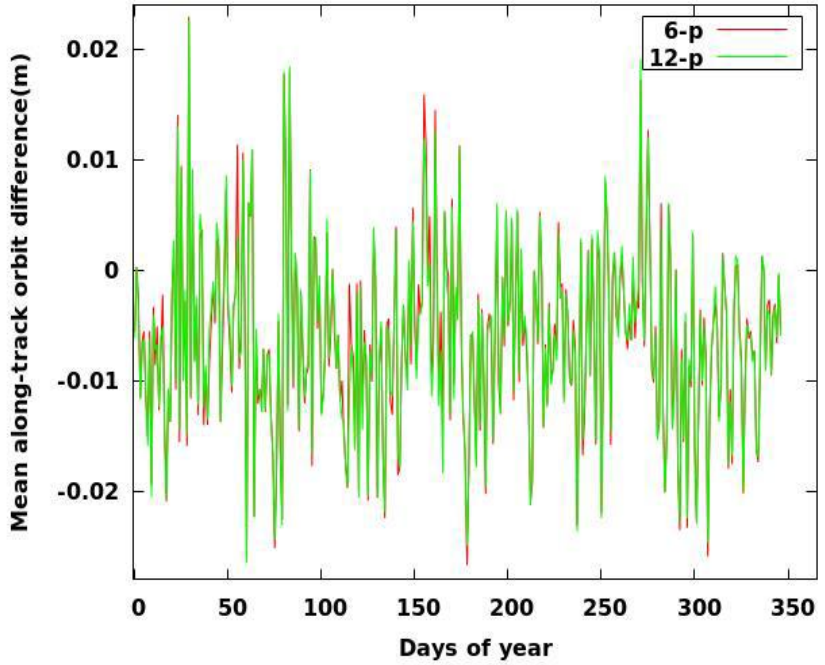
Testing of Sentinel-6 12 plates models (2)

- Mean differences w.r.t. CNES orbit

- 12 plates reduced radial bias
- No improvement in along and cross

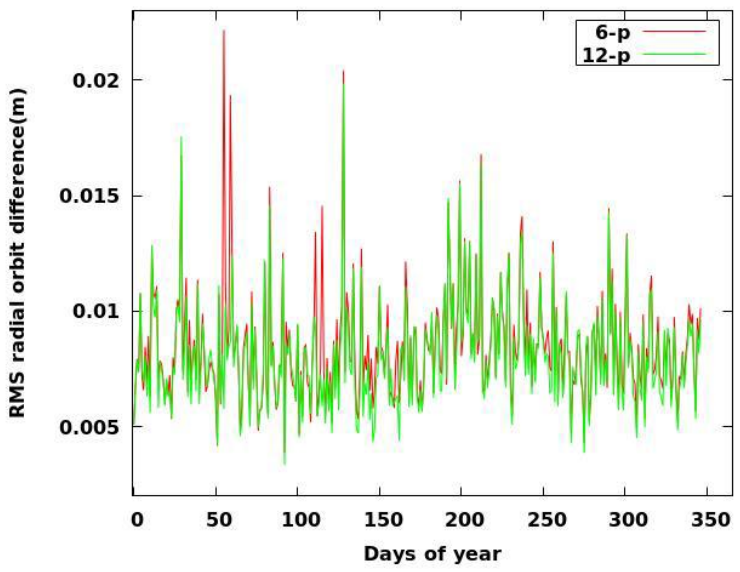


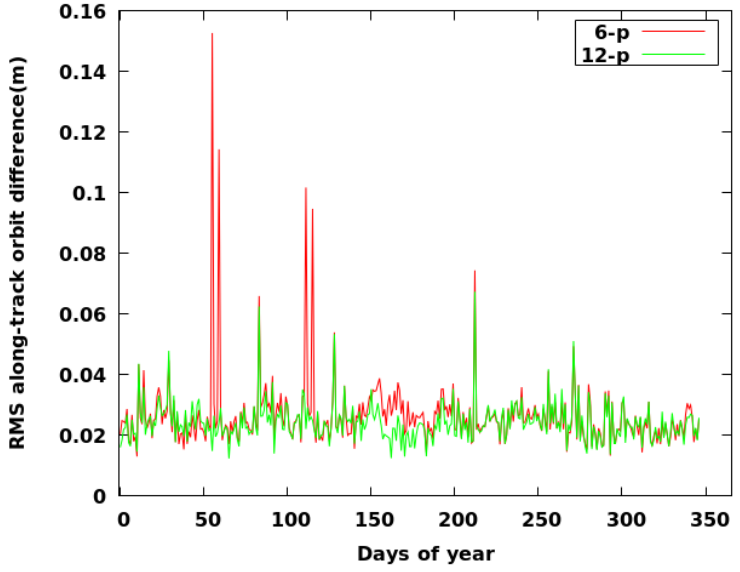


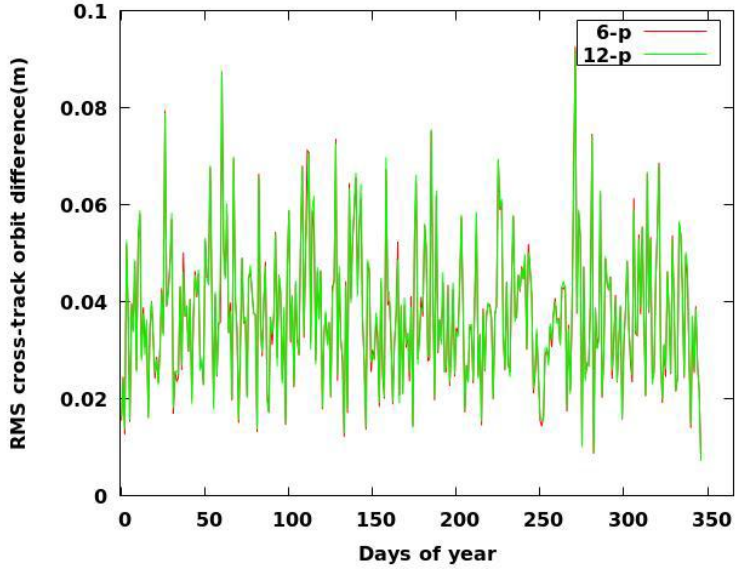


Testing of Sentinel-6 12 plates models (3)

- RMS differences w.r.t. CNES orbit
- 12 plates major improvement in the along track, elimination of some outliers







Testing Sentinel-6 30s and 1s quaternion sample interval

- Motivation: for some satellites, only 30 s quaternions are available
- Orbits characteristics are very similar on both cases
- Comparison to CNES orbit very similar
- Conclusions: No significant effect of denser quaternions

Sampling interval	Radial (mm)		Along (mm)		Cross (mm)	
	Mean	RMS	Mean	RMS	Mean	RMS
30 sec	-0.8	8.4	-6.0	26.5	-1.7	37.4
1 sec	-0.8	8.4	-6.3	26.5	-1.7	37.4

SWOT implementation

- **Implemented quaternions**
- **Very preliminary POD tests**
- **Residuals at the level of Sentinel-3B or Hy-2C**
- **Radial RMS w.r.t. CNES orbit is 12.2 mm. This value is larger than for other recent satellites (below 10 mm)**
- **Too high variations of SRP (mean 0.93, std. dev. 0.36)**
- **More testing required**

	Radial (mm)		Along (mm)		Cross (mm)	
	Mean	RMS	Mean	RMS	Mean	Median
30 sec	-0.8	12.2	-6.0	30.0	-1.7	33.1

VUGTK(GOP)-TUM project

- Title: ***Breaking the DORIS System Accuracy Limitations Caused by Clocks***
- GACR/DFG (joint program of Czech and German national grant agencies)
- Nov 2024- Oct 2027
- DORIS USO observation by GNSS (continue previous work)
- Stochastic USO model
- DORIS phase processing experiment
- Sentinel-3 tandem phase
- Simulation of DORIS system with all clocks linked to GNSS
- Genesis related simulations

Thanks for your attention !