

The contributions to the WG COL by CODE:

1. GNSS solution

2. SLR solution

Extensions to the WG COL:

Combined GNSS-SLR solution

*Daniela Thaller
Astronomical Institute, University of Bern (AIUB)*

GNSS contribution

- GPS + GLONASS
- **Daily** SINEX files: codYYDDDDpd01.**n3**.Z
- submitted 12. November 2011

→ Parameters:

- Station coordinates
- Polar motion: daily
- UT / LOD: daily
- Nutation: daily
- Troposphere zenith delays: 2-hourly
- Troposphere gradients: daily
- Geocenter coordinates
- Satellite antenna offsets

Piece-wise-linear polygon

⇒ 2 „offsets“ are given

⇒ drifts are implicitly contained

SLR contribution

- Lageos 1+2
- **Weekly** SINEX files: codYYDDDDlw01.**n3**.Z
- submitted 4. October 2011

→ Parameters:

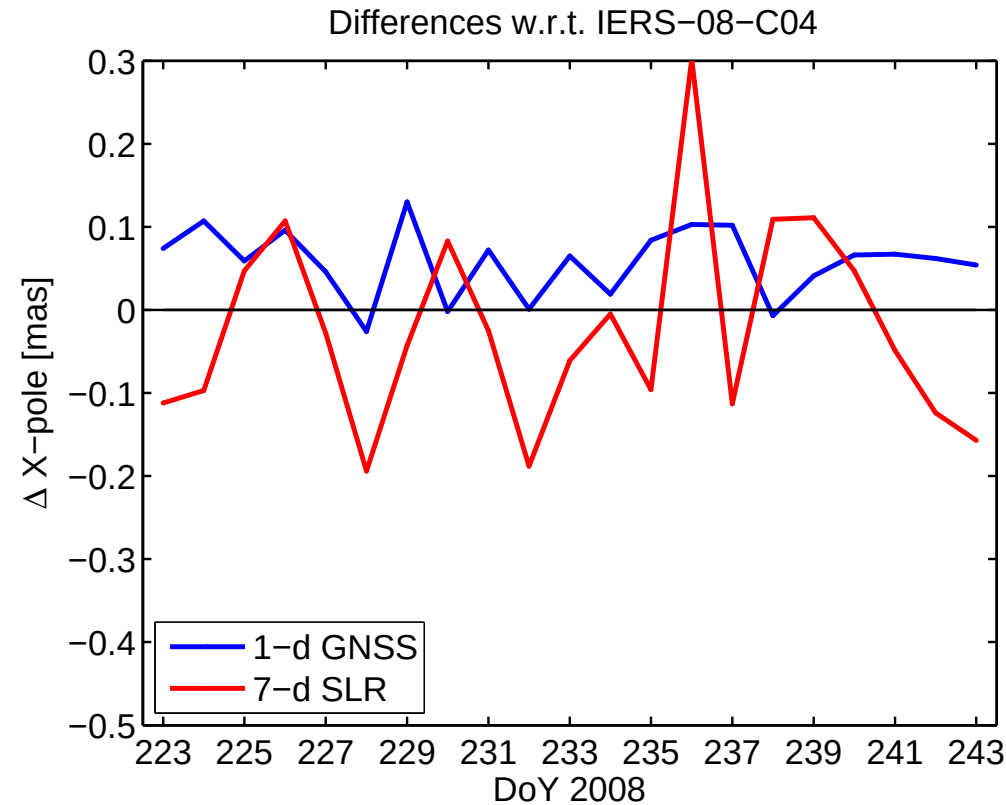
- Station coordinates
- Polar motion (**offset+drift**): daily
- UT/LOD: daily
- Range biases for selected sites

Piece-wise-linear offset+drift

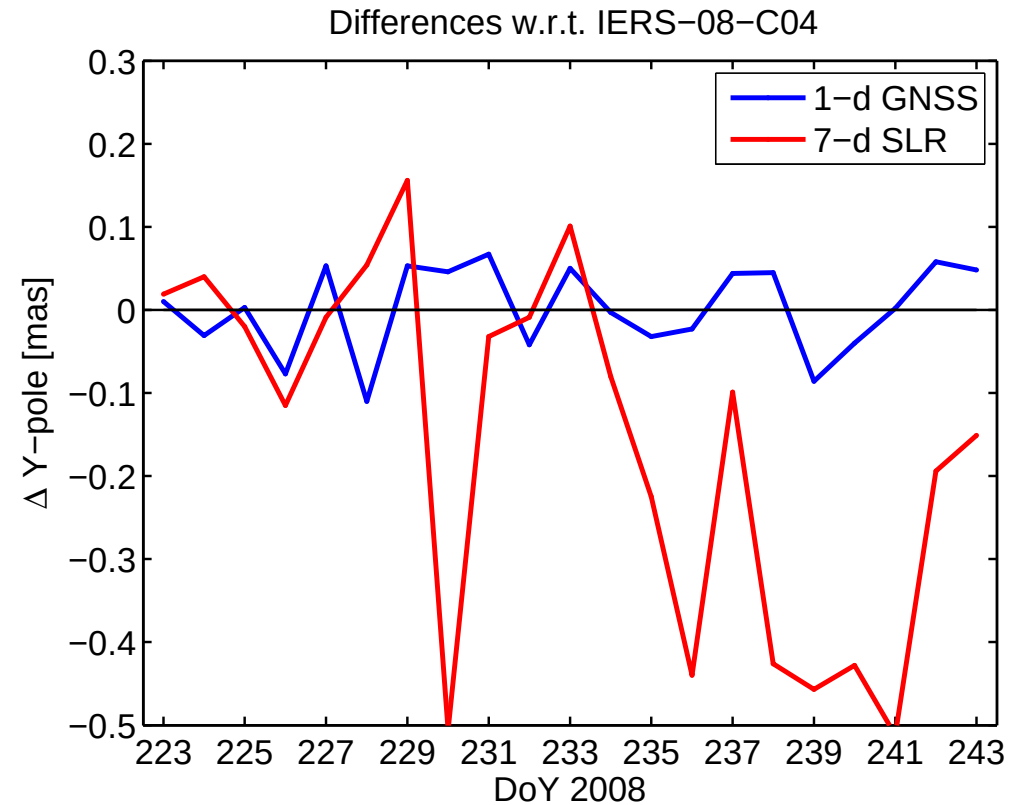
⇒ Offsets given at 00:00 UTC

⇒ Drifts given at 12:00 UTC

ERP from GNSS and SLR



1-d GNSS	61.5	±	40.1	μas
7-d SLR	-26.1	±	115.2	μas



1-d GNSS	1.5	±	51.2	μas
7-d SLR	-138.8	±	208.3	μas

SLR observations to GNSS

2 GPS + 3 GLONASS satellites

Number of stations per day: 4 – 9

#Observation / Station / Satellite / Day: 1 - 47

⇒ Resulting **number of observations per day** very small: **48 - 191**

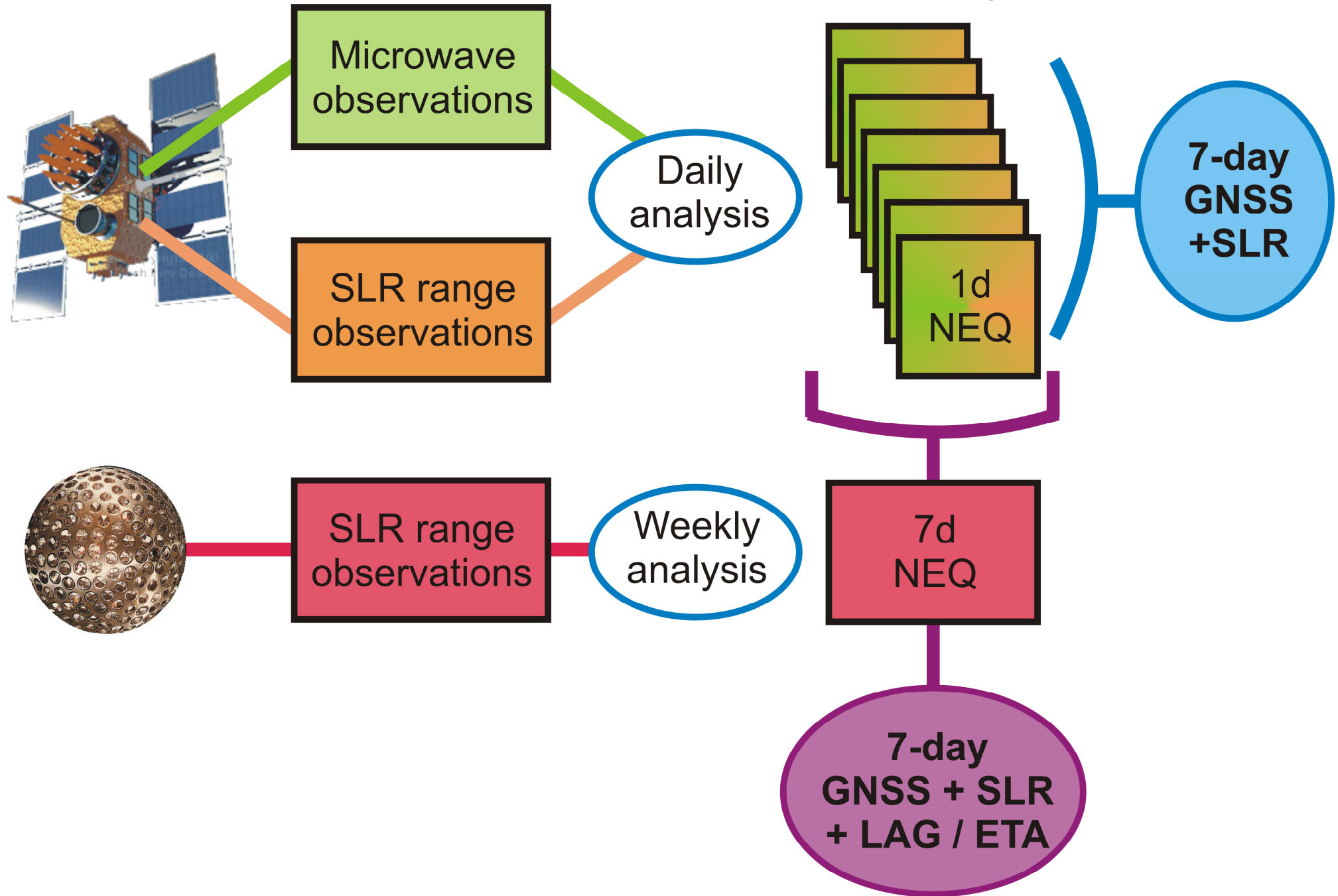
⇒ SLR-only solution not possible!

⇒ Only **combined solution with GNSS** possible

⇒ Only **weekly** solution reasonable

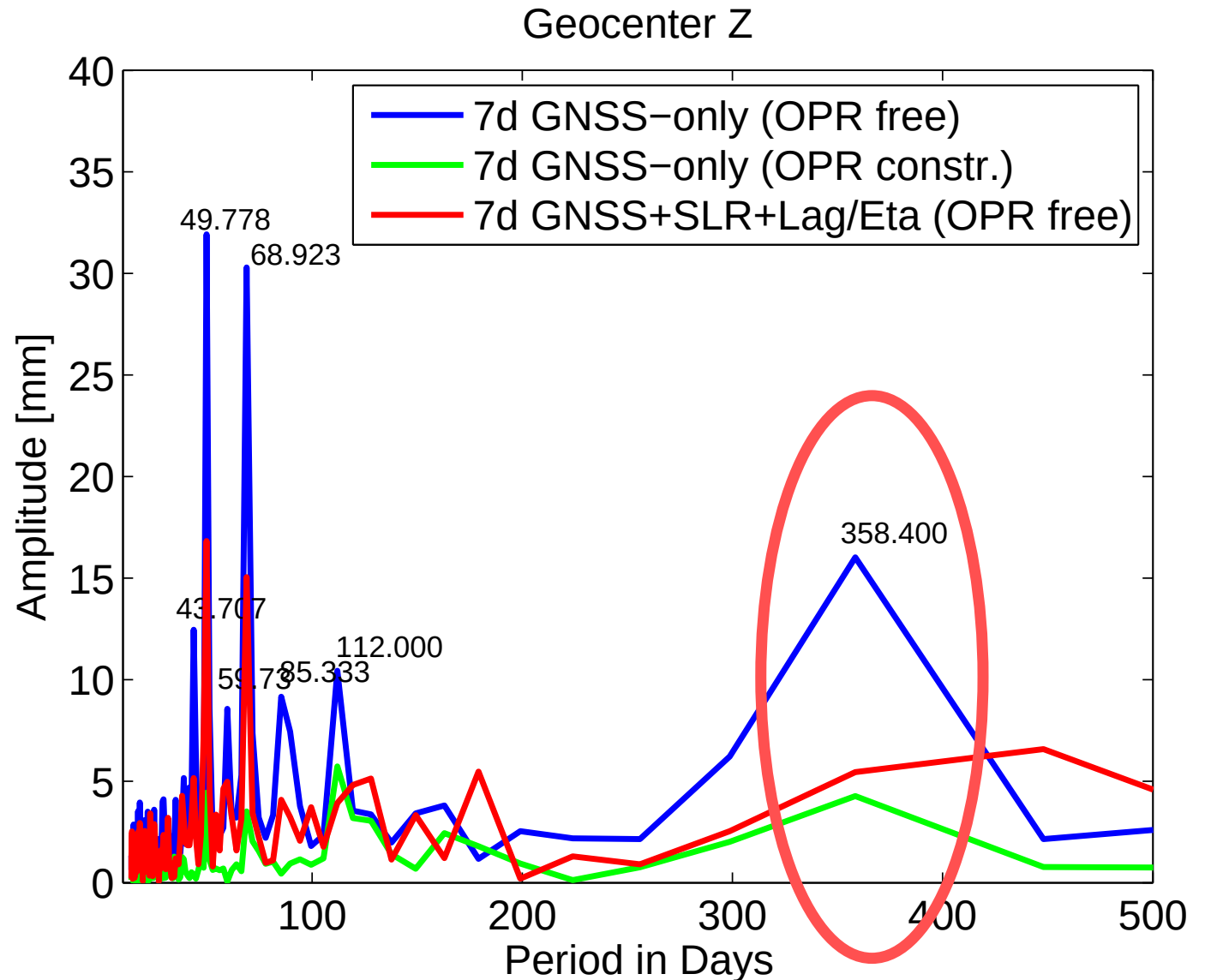
⇒ But still very weak estimates for coordinates of SLR stations!

Combined GNSS-SLR analysis



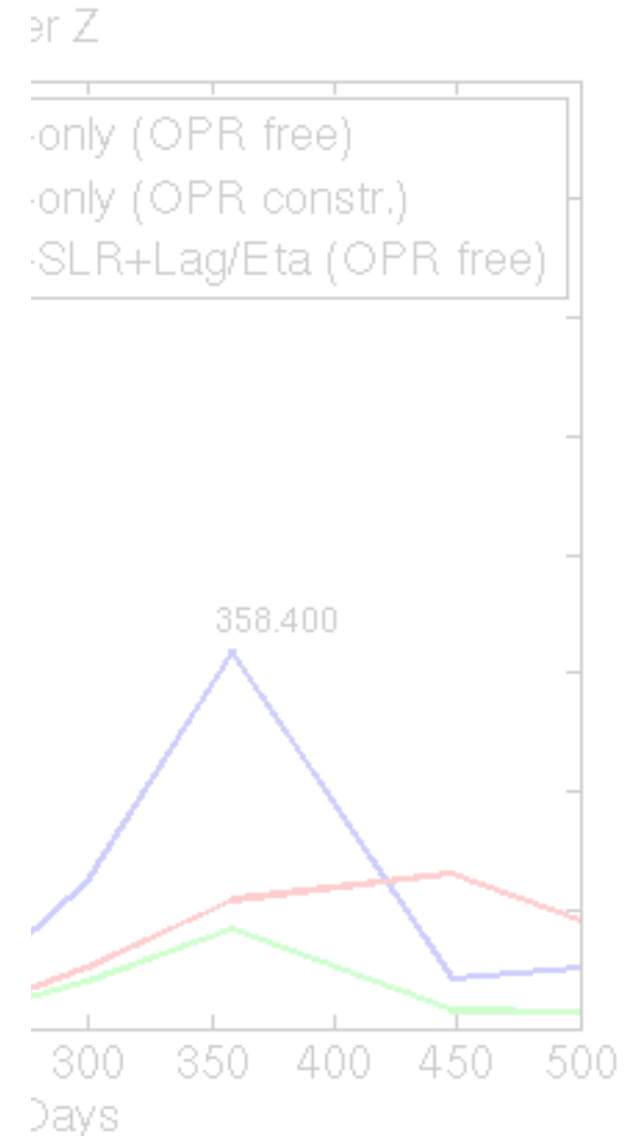
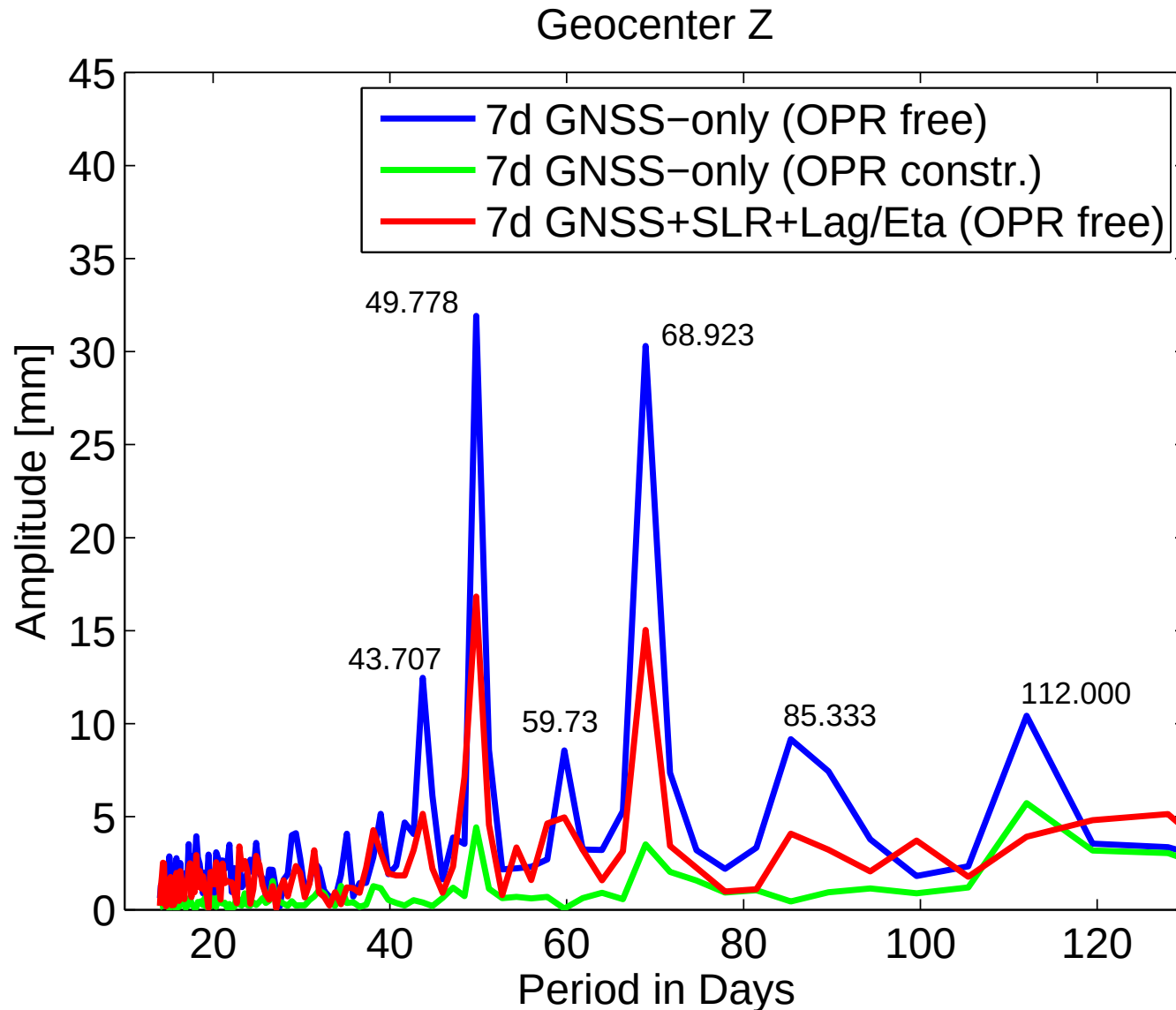
Combined GNSS-SLR analysis: Geocenter

The **amplitude vanishes** for the frequency of the **draconitic GPS year**
(similar to constraining OPR parameters in GNSS-only solution)



Combined GNSS-SLR analysis: Geocenter

The **amplitudes are reduced** for most of the **sub-frequencies** of the draconitic GPS year, but they are still present.

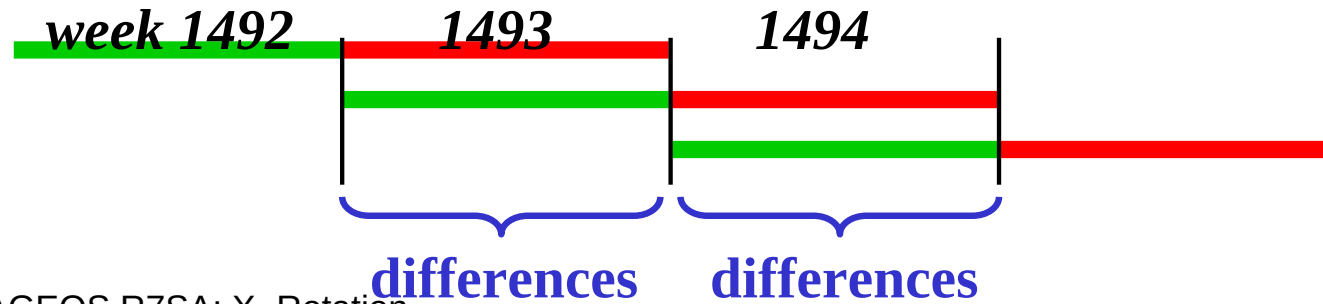


Combined GNSS-SLR analysis : LAGEOS orbit

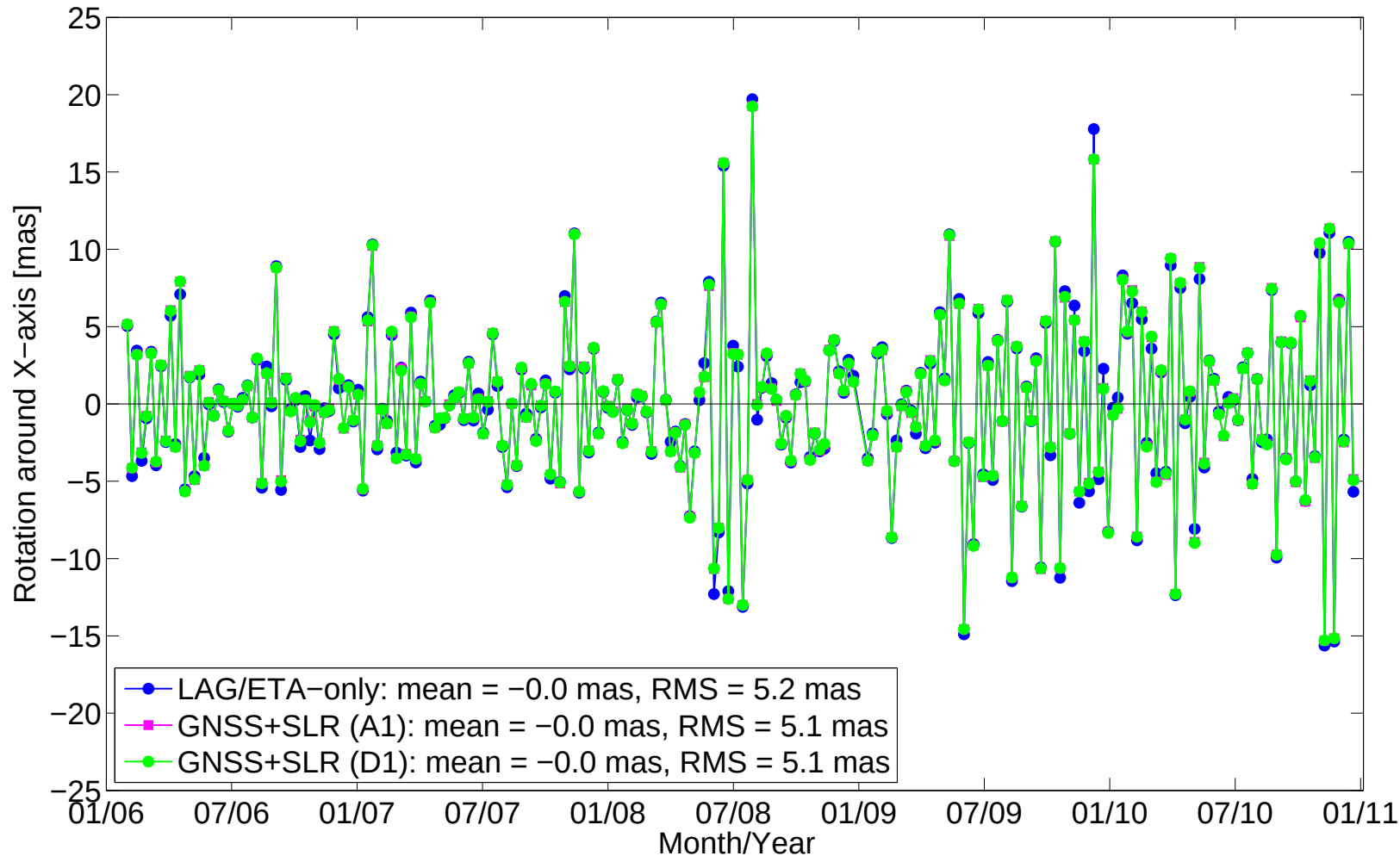
Orbit overlaps over 1 week:

Estimated orbit vs.

Prediction from previous week



Predicted vs. estimated LAGEOS R7SA: X-Rotation

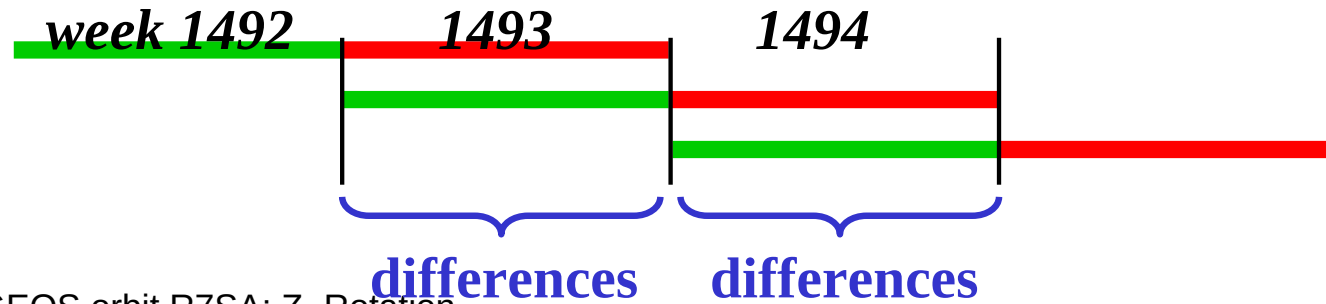


Combined GNSS-SLR analysis : LAGEOS orbit

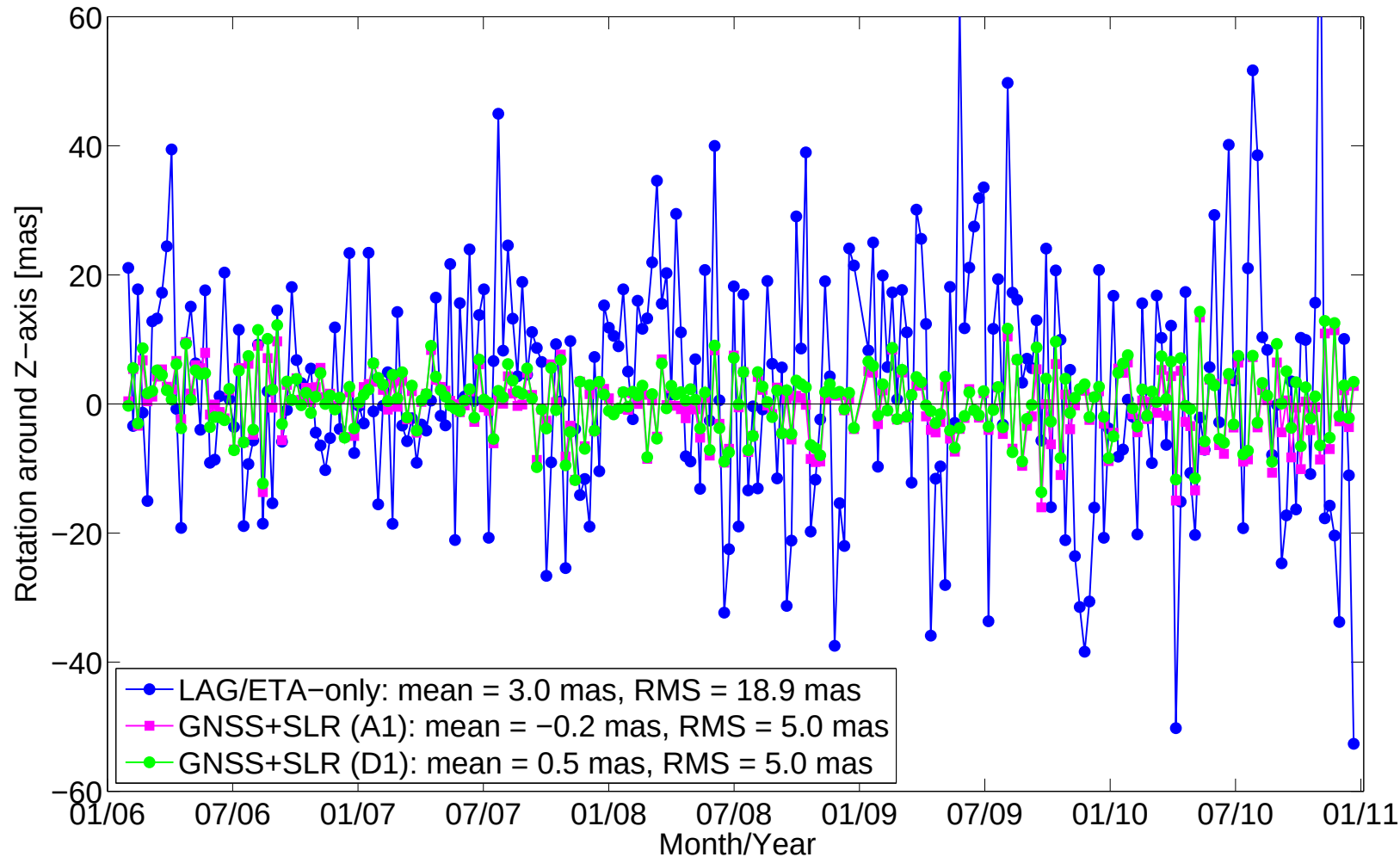
Orbit overlaps over 1 week:

Estimated orbit vs.

Prediction from previous week



Predicted vs. estimated LAGEOS orbit R7SA: Z-Rotation



Summary

- Up to now „**standard**“ **solutions** contributed for GNSS and SLR:
 - Parameterization
 - Satellites included
 - Technique-wise solutions

- **Combined GNSS-SLR** solutions using SLR data to GNSS satellites are computed and tested internally
 - „Combination at observation level“
 - Can be submitted to COL
 - Attention: using only SLR@GNSS will cause problems

- **General comments:**
 - Extension of the time span for more reliable analysis
 - Combined solutions vs. Single-technique solutions