

Dependency of Geodynamic Parameters on the GNSS Constellation

S. Scaramuzza,
R. Dach, G. Beutler, D. Arnold, A. Jäggi

Astronomical Institute, University of Bern, Switzerland

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IGS Workshop, 08.–12. February 2016, Sydney, Australia

Overview

Introduction and Motivation

Geocenter Parameters

Earth Rotation Parameters

Summary and Conclusion

Levels of Multi-GNSS Analysis

GPS

GLONASS

recCLK

CRD

TRP

GCC

ERP

ORB

satCLK

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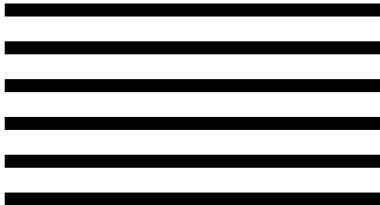
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Principle of Solution Generation

GPS



GLONASS



Principle of Solution Generation

GPS



ERP(GPS)

GLONASS

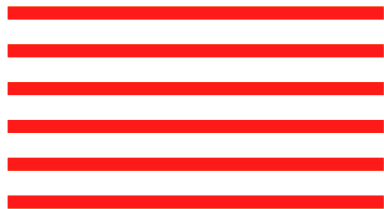


ERP(GLONASS)

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ERP(GPS)



ERP(GLONASS)



ERP(Combined)

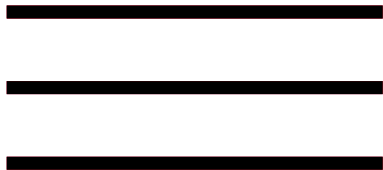
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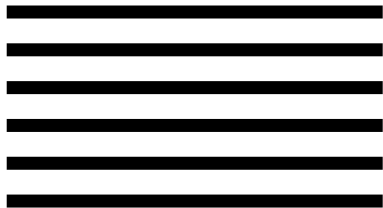


ERP(GLONASS)

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GCC(GPS)

GLONASS



GCC(GLONASS)

GCC(Combined)

Geocenter Parameters

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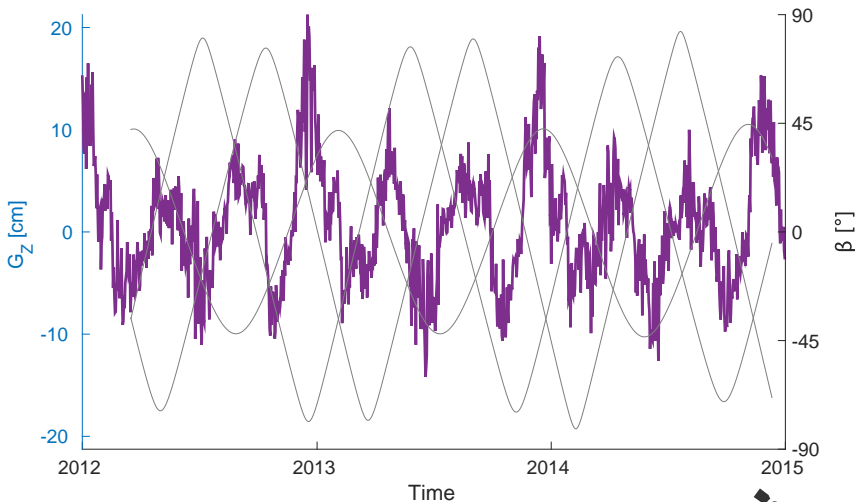
Geocenter Parameters

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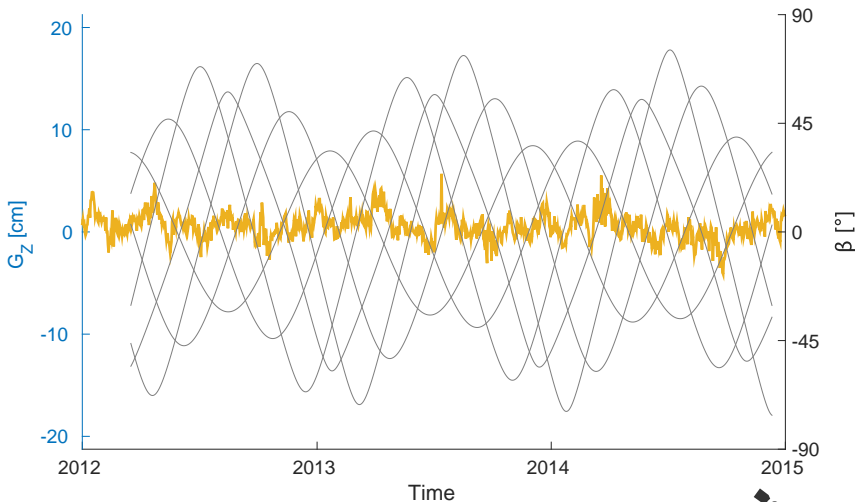
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Time series for GCC estimates: Z component from GLONASS



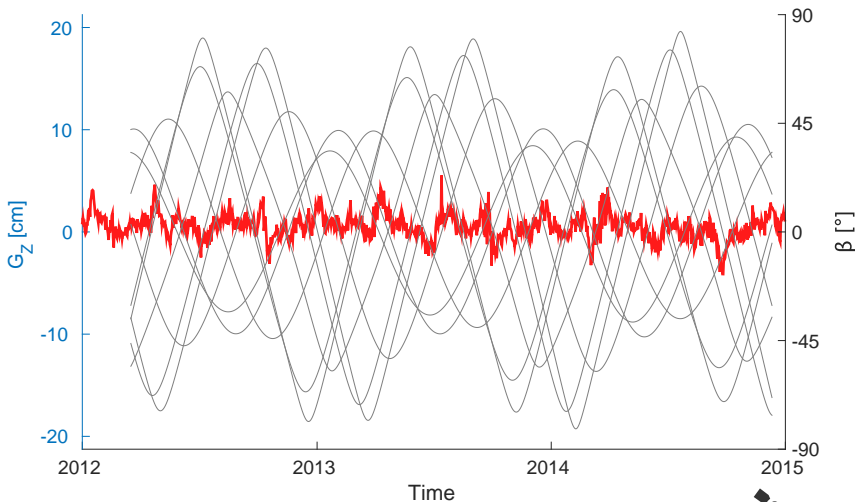
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Time series for GCC estimates: Z component from GPS



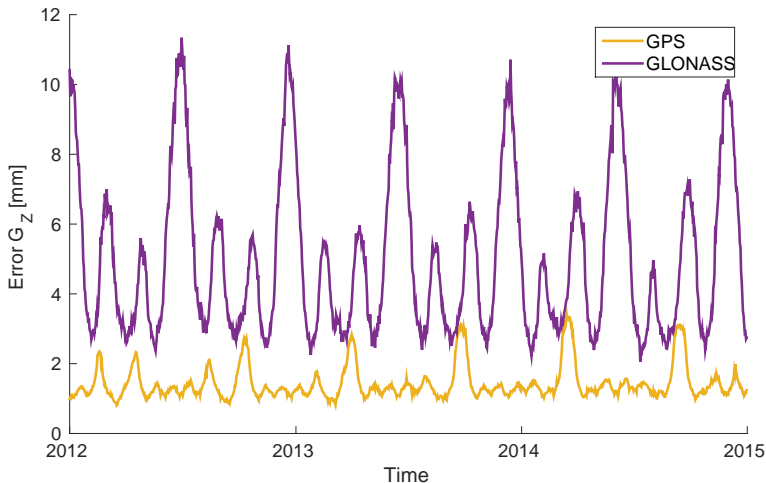
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Time series for GCC estimates: Z component from GPS+GLO



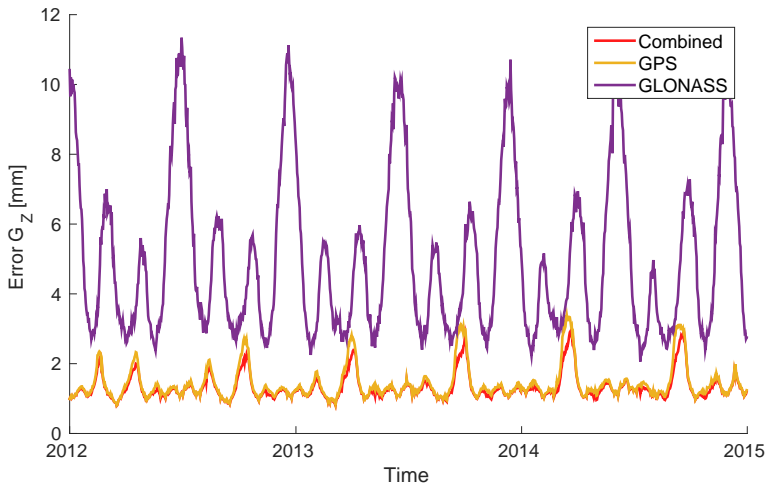
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Formal errors for GCC estimates: Z component



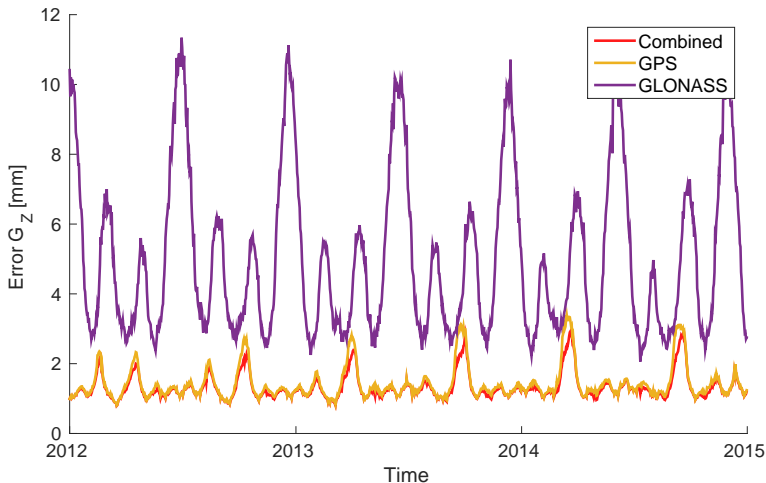
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In full agreement to Meindl et al., 2013: DOI 10.1016/j.asr.2012.10.026.

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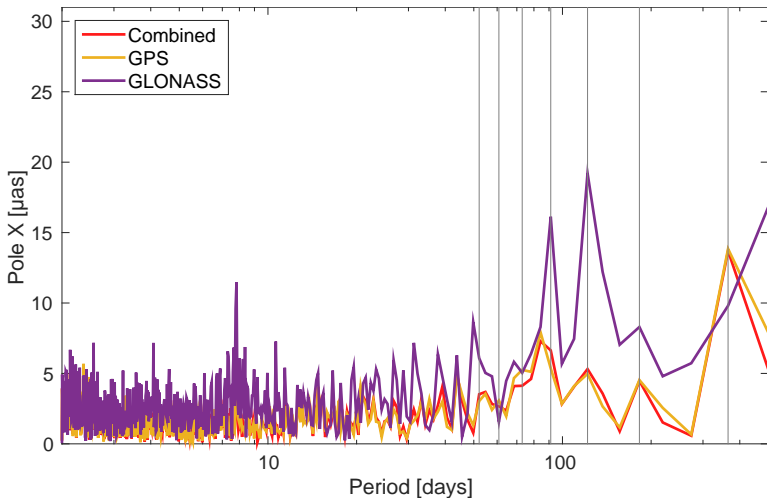
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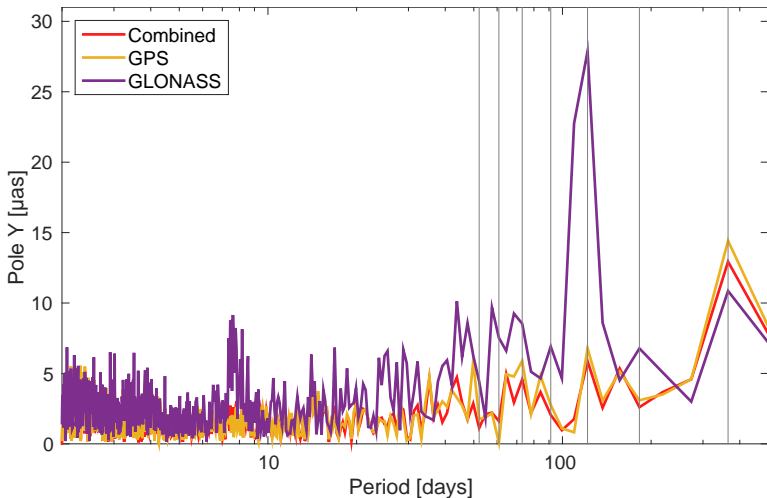
Amplitude spectra from ERP estimates: X component



Differences w.r.t. IERS C04 series (related to ITRF2008) have been analysed.

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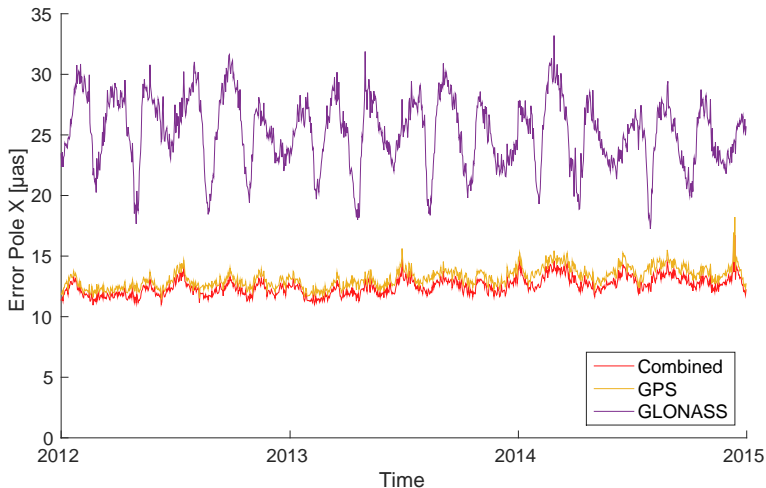
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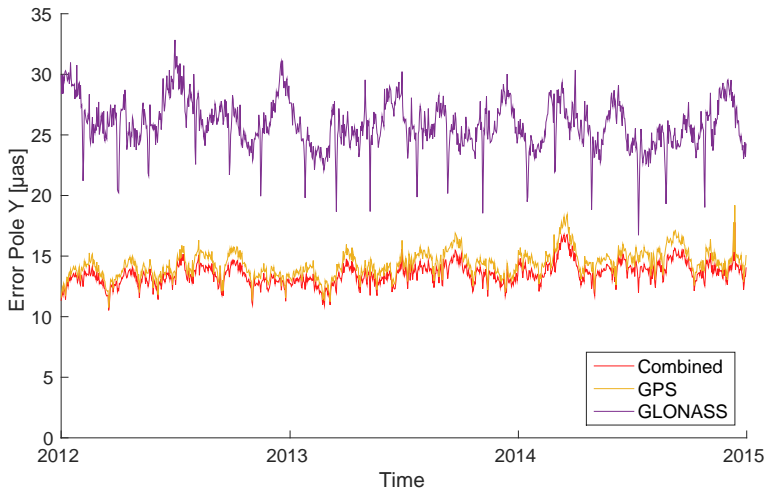
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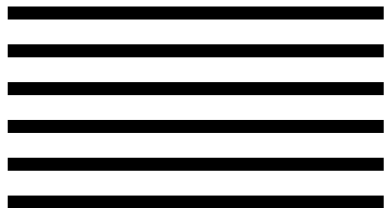
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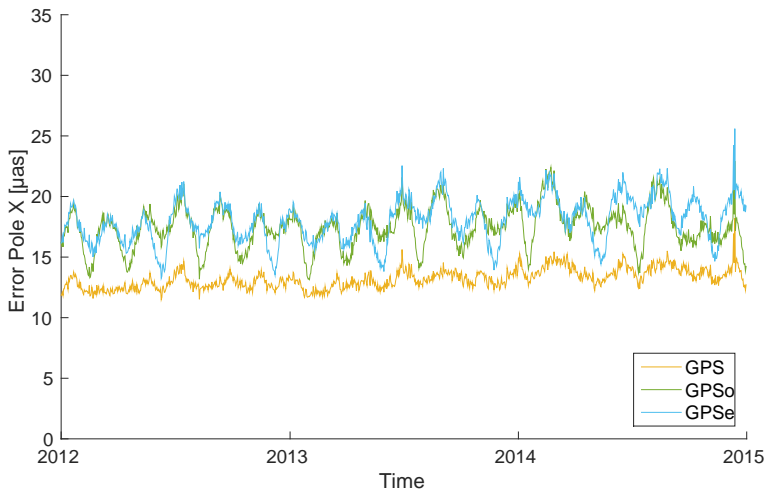
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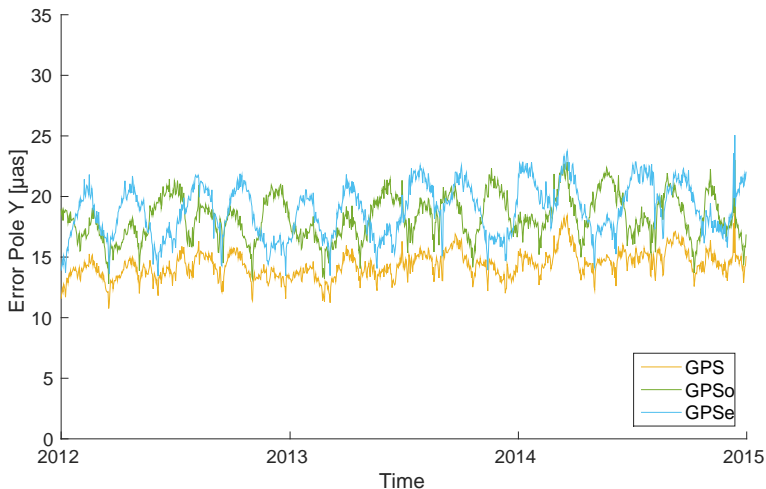
GPS: Two Three-Plane Constellations

Formal errors for ERP estimates: X component



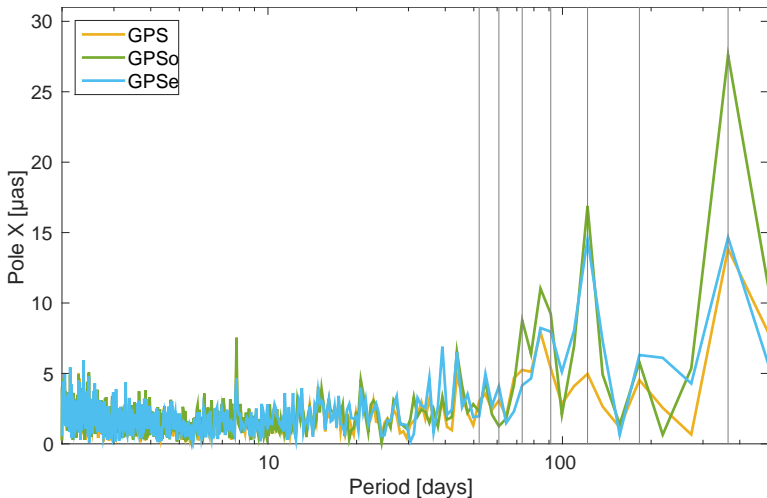
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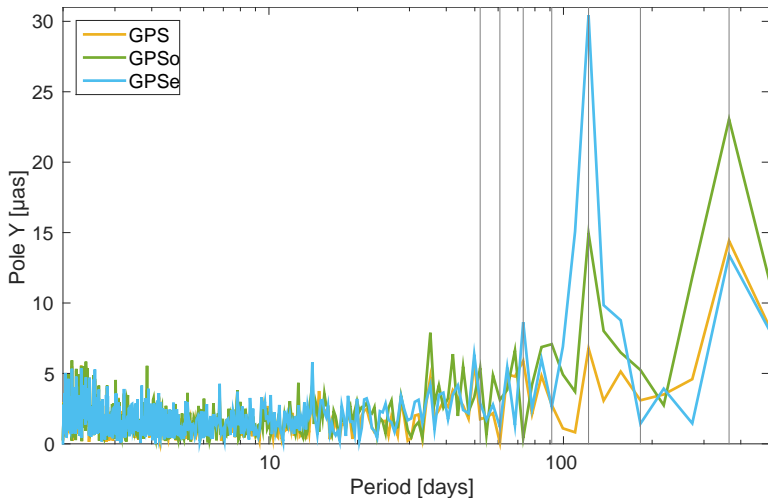
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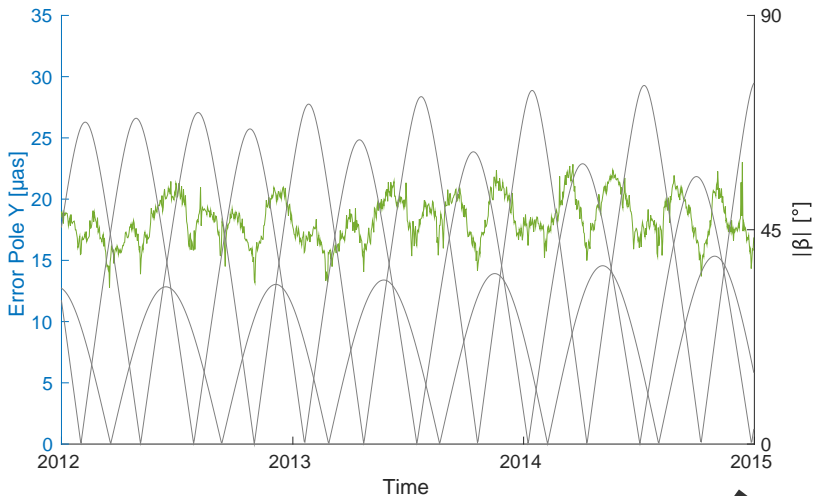
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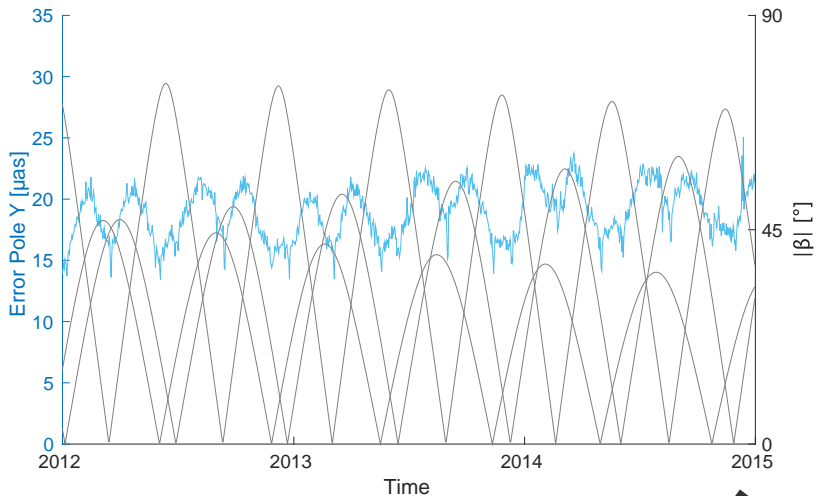
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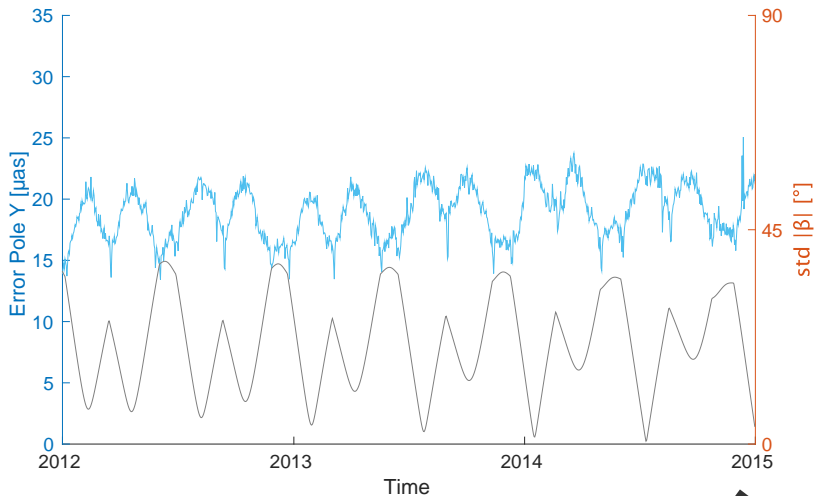
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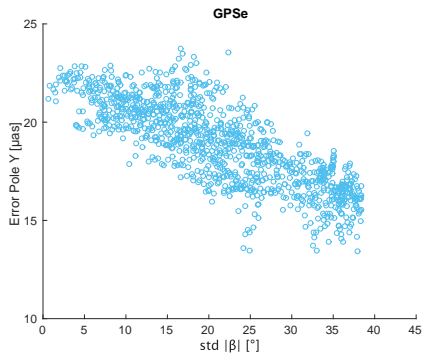
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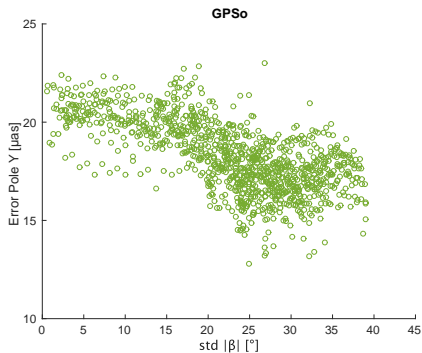
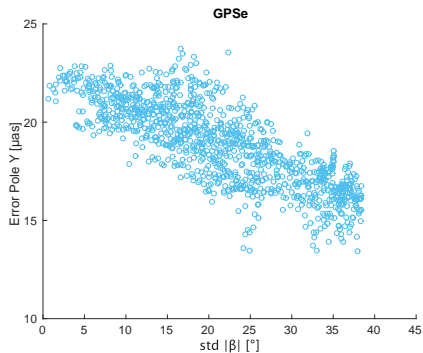
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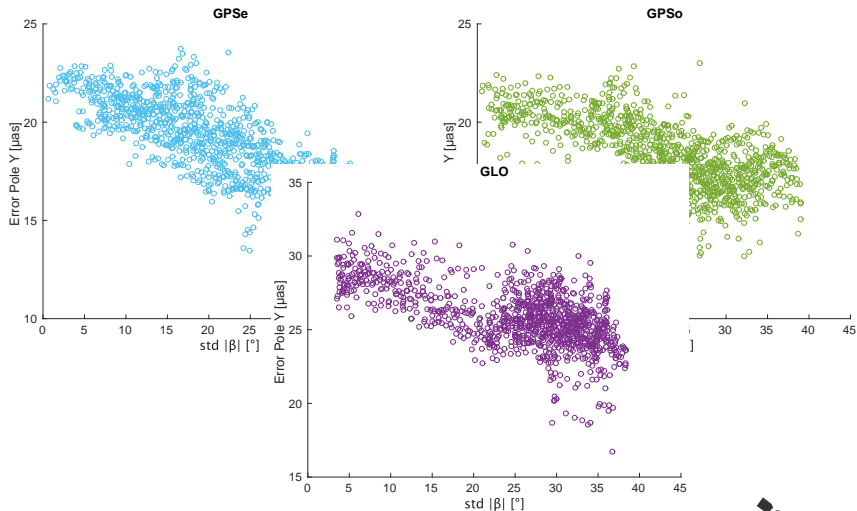
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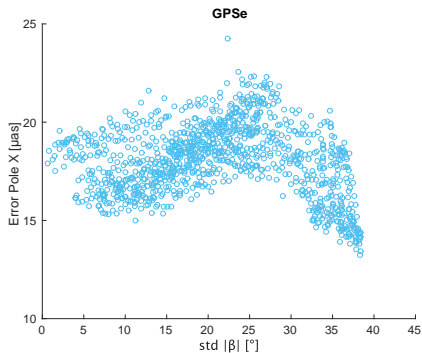
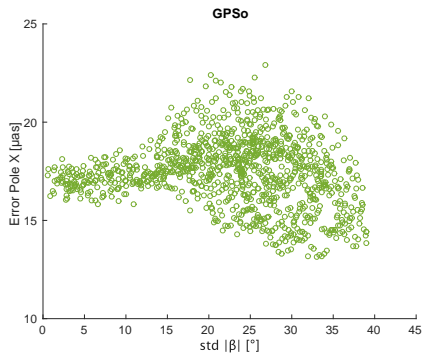
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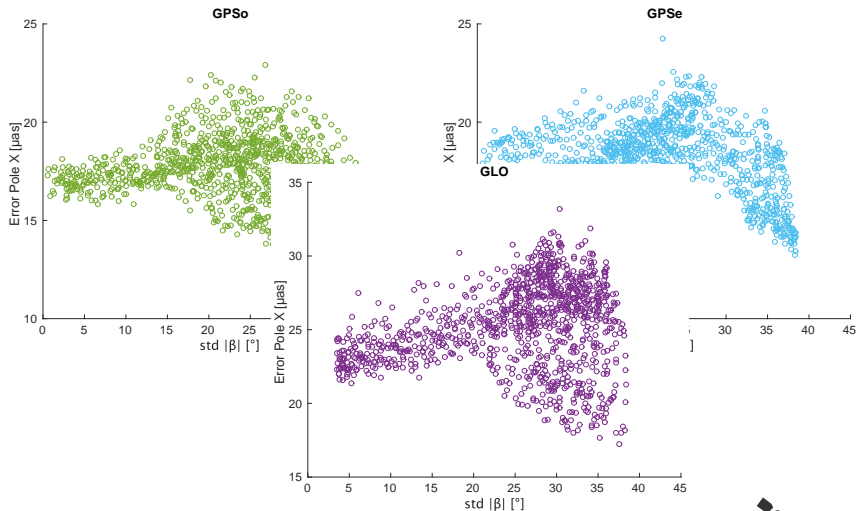
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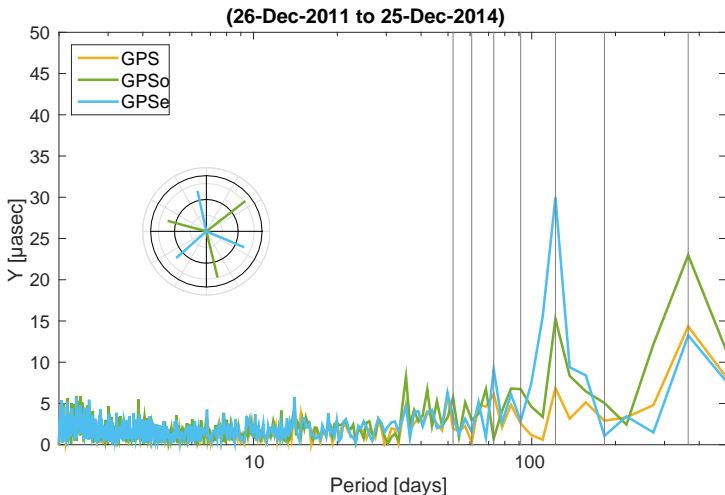
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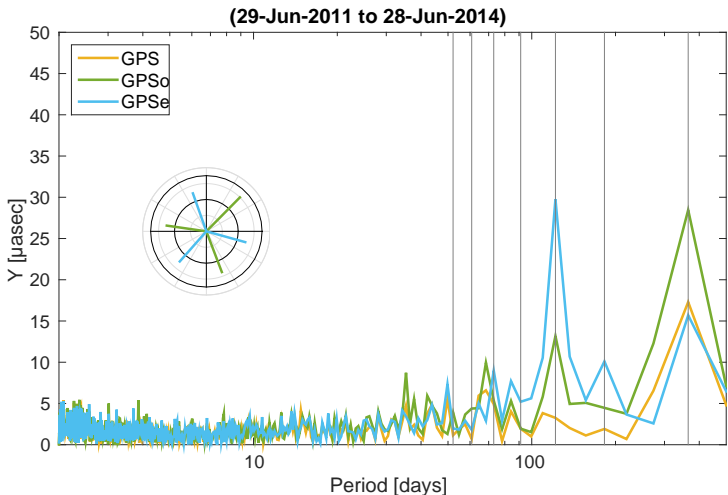
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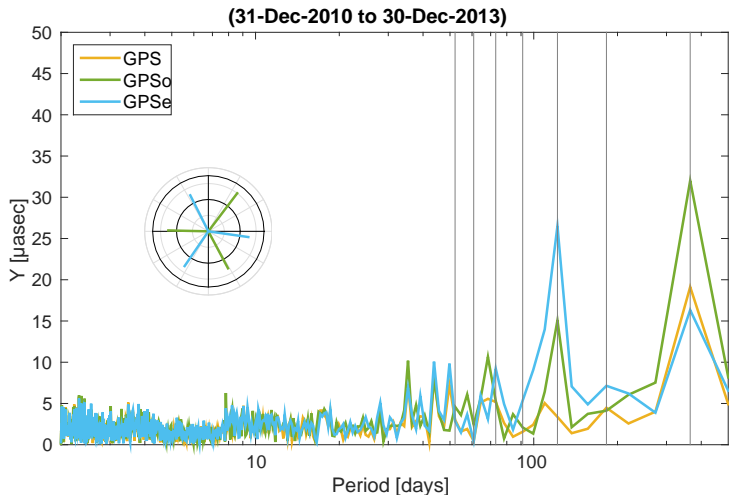
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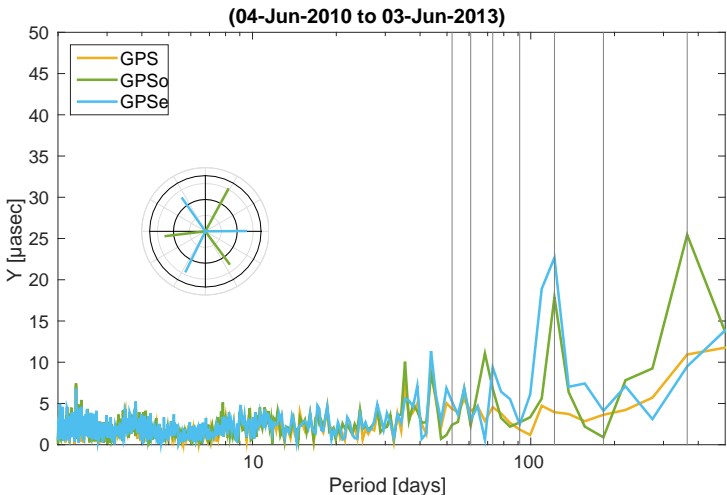
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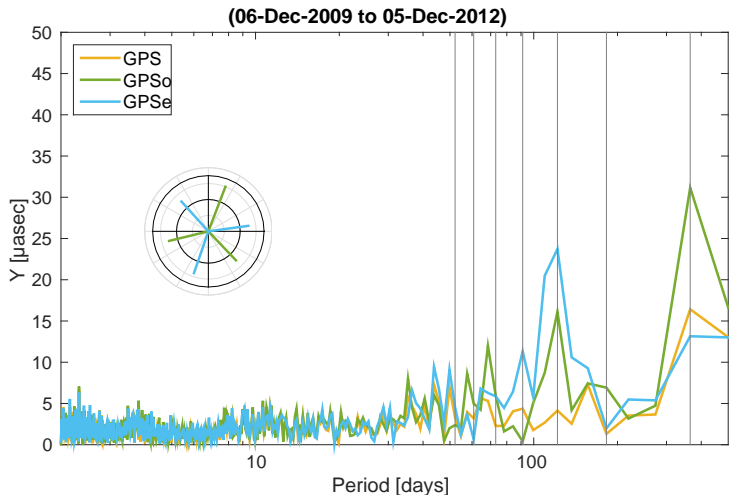
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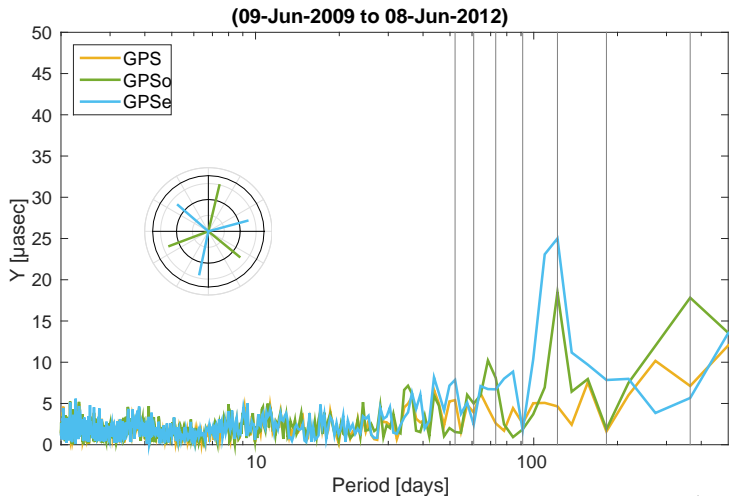
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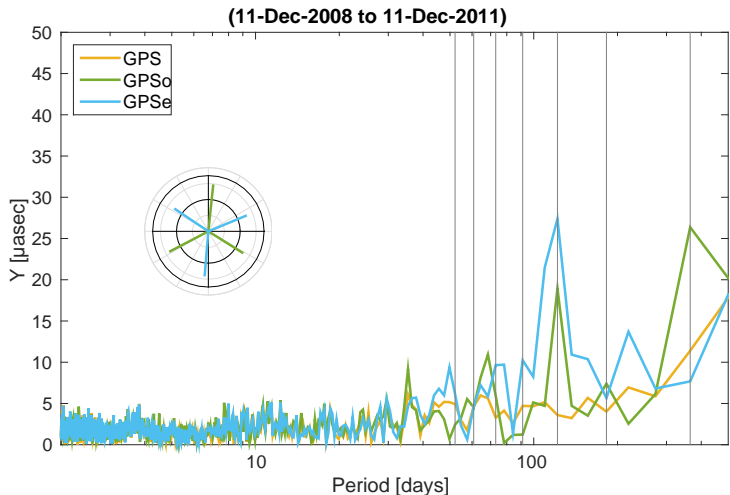
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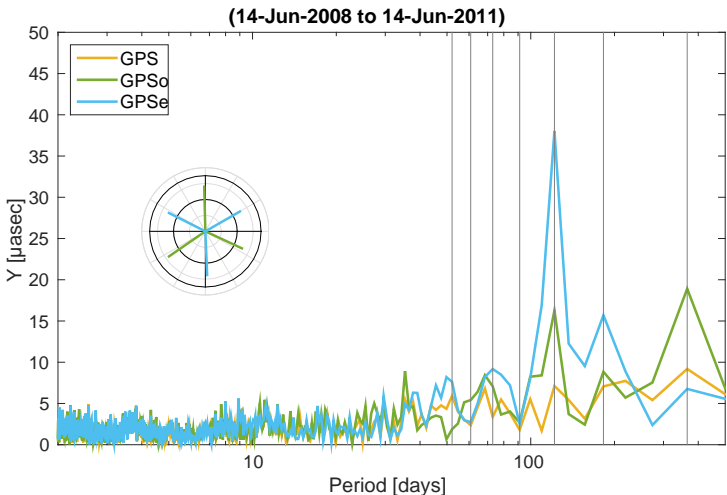
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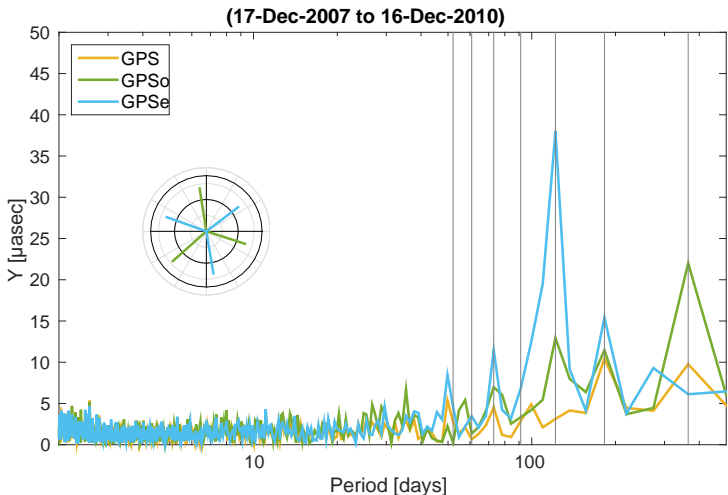
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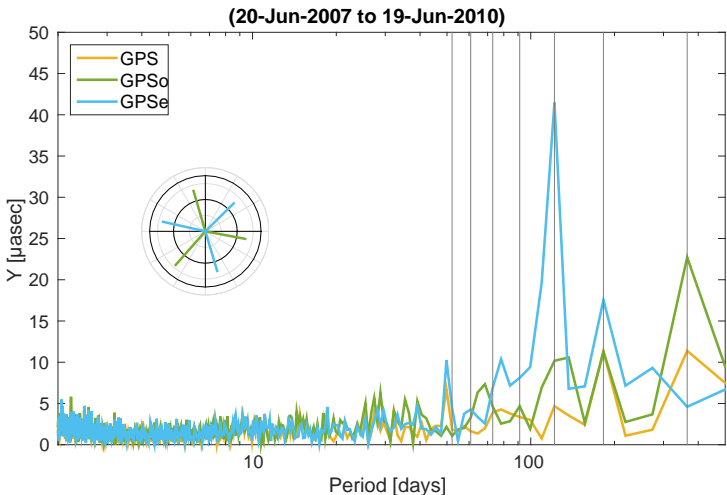
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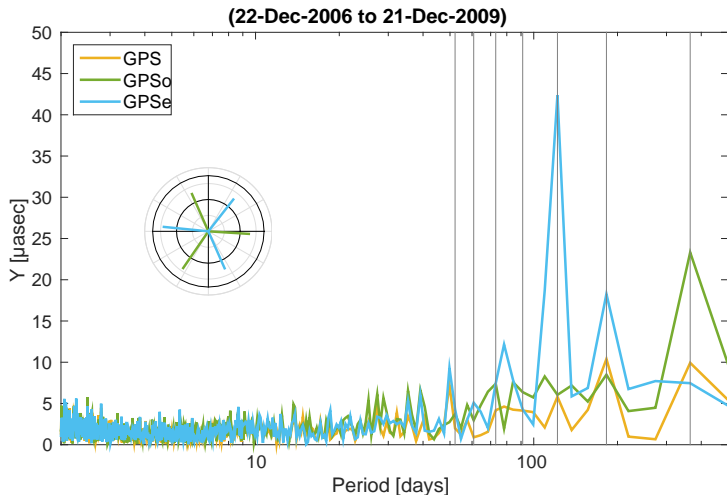
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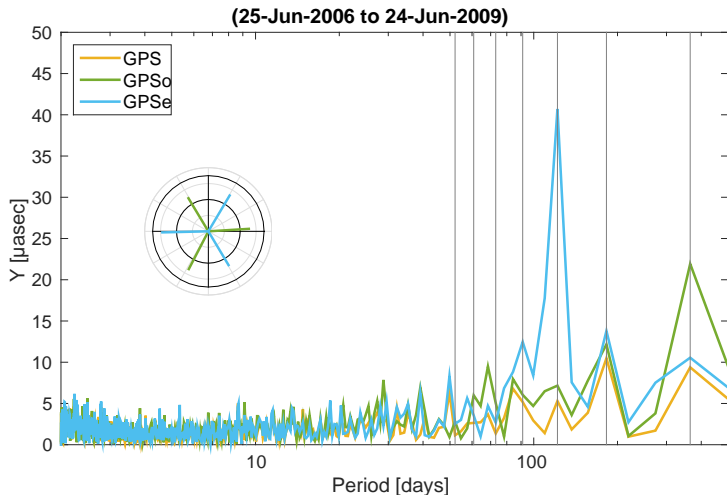
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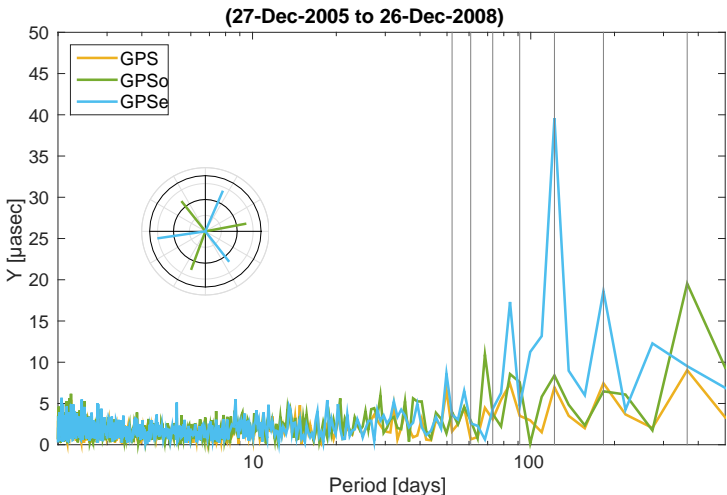
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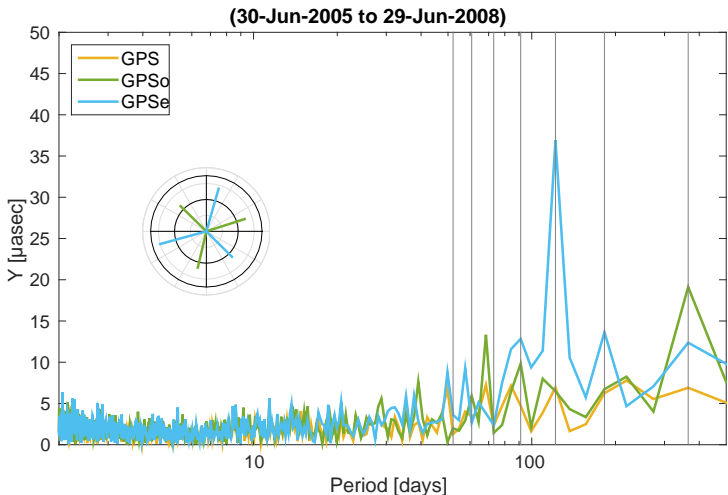
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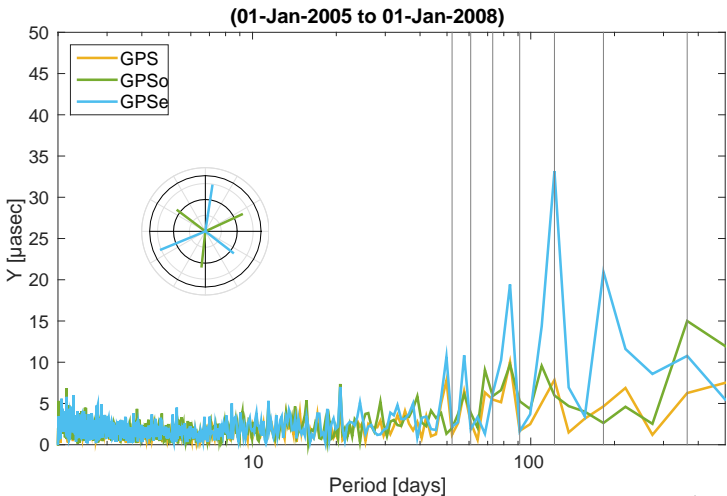
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Summary and Conclusion

- The setup of satellite-, plane-, or GNSS-specific ERP- and/or GCC-parameters was implemented.
 - It is enabled for internal purposes in the operational solution since May 2015 and the most recent reprocessing (see Poster by Sušnik et al.).
 - The results from a GNSS-specific setup on the NEQ-level are equivalent to independent GNSS-specific solutions.

Summary and Conclusion

- The setup of satellite-, plane-, or GNSS-specific ERP- and/or GCC-parameters was implemented.
- There is almost no contribution from GLONASS to a combined GPS+GLONASS GCC series (Z-component).
 - Meindl et al (2013): due to the inclination of GLONASS satellites (64°) the Sun may be almost perpendicular above the orbital plane, which results in a direct correlation with dynamic orbit parameters.

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- There is almost no contribution from GLONASS to a combined GPS+GLONASS GCC series (Z-component).
- The GLONASS contribution to the ERPs is mainly limited by the three-plane constellation.
 - The ERP results from the GLONASS constellation are comparable to solutions with a synthetic three-plane GPS constellation.
 - The geometric effect changes in time due to the regression of the nodes of the satellite's orbital planes.

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- There is almost no contribution from GLONASS to a combined GPS+GLONASS GCC series (Z-component).
- The GLONASS contribution to the ERPs is mainly limited by the three-plane constellation.
- Similar limitations may be expected for Galileo and the MEO-constellation of BeiDou.
- With a full multi-GNSS analysis the constellation effect should be heavily reduced, ideally eliminated.

THANK YOU for your attention



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