

Status of Jason-1 and Jason-2 GDR orbits

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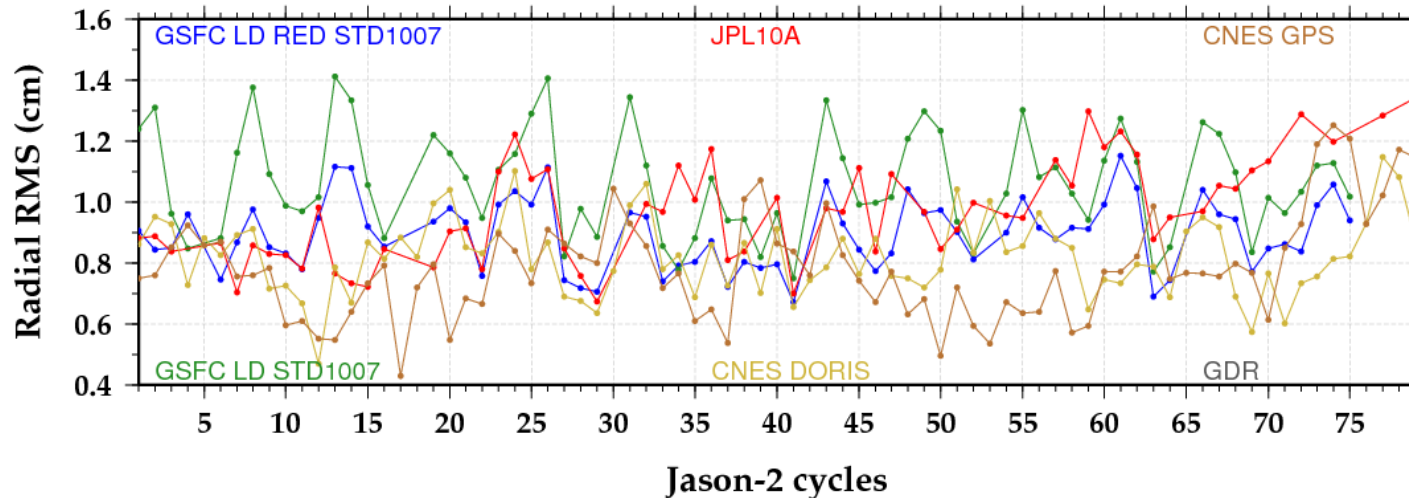
Precise Orbit Determination and Geoid Applications
Ocean Surface Topography Science Team Meeting, Lisbon, October 2010



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Jason-2 orbits comparison: radial component

■ RMS of radial orbit differences relative to the GDR solution



- ◆ Radial differences of the GDR orbits w.r.t. the reduced dynamic solutions (**GSFC LD RED** and **JPL10A**) generally below 1 cm.
- ◆ 60-day variations in the RMS of radial differences between the **GSFC LD** and GDR dynamic orbits.
- ◆ **Overall good agreement between the different orbit solutions.**



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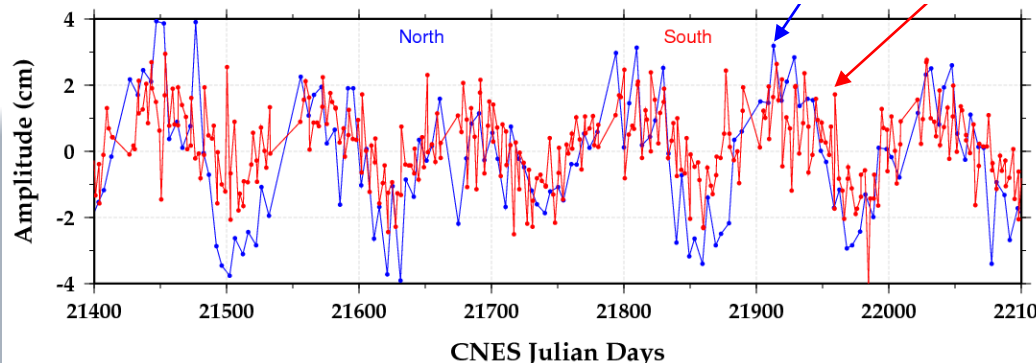
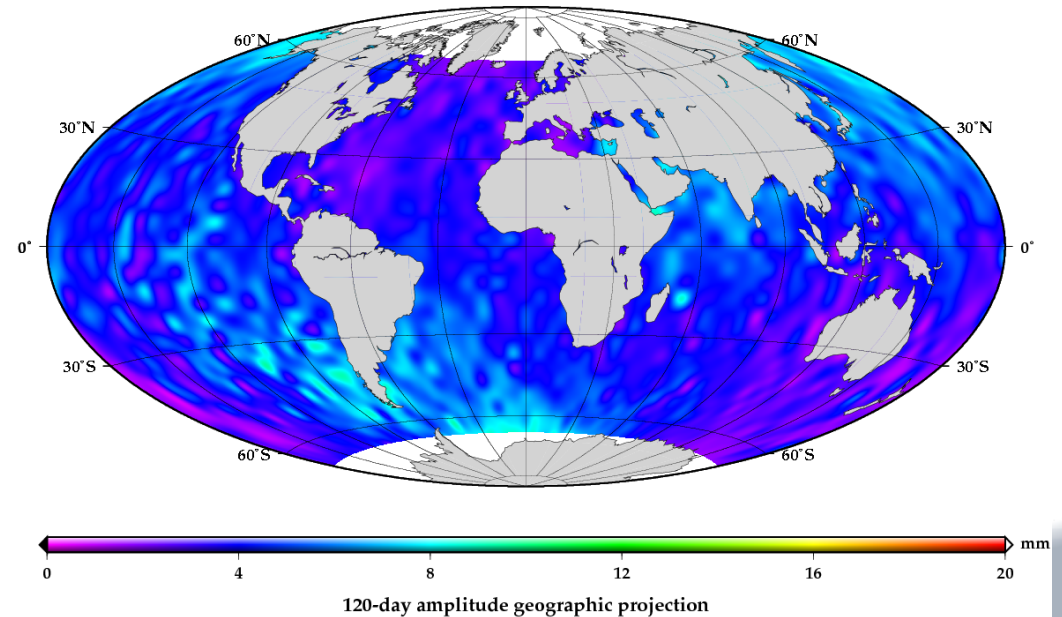
Jason-2 orbits comparison: geographically correlated radial differences

■ 120-day signal

Typical 120-day radial signal of SRP modeling differences between the GDR and GSFC dynamic orbits.

No conclusive 120-day radial signal between the GDR and JPL10A orbit solutions.

Jason-2 GDR - JPL10A radial differences, cycles 1-79



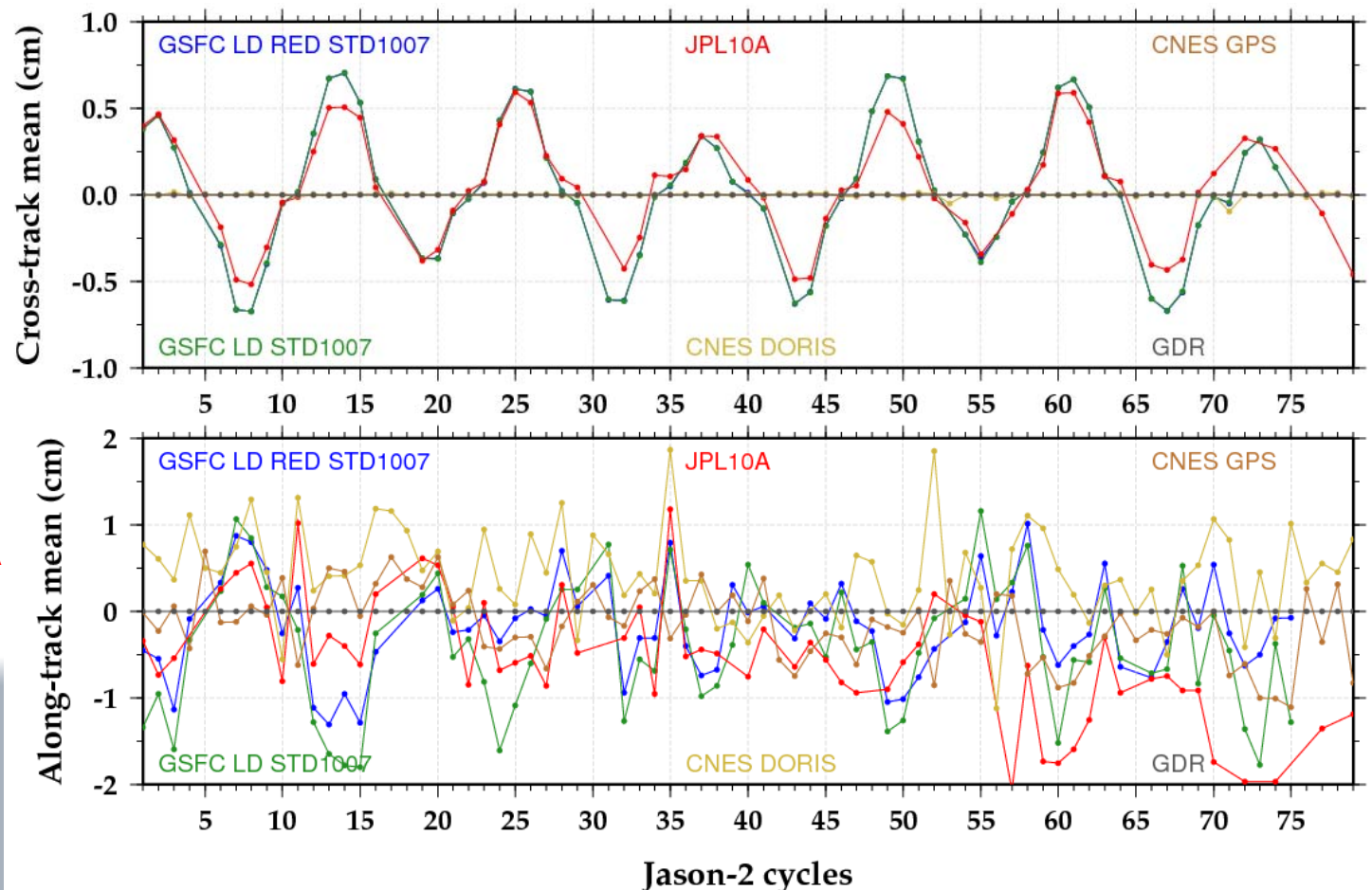
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Jason-2 orbits comparison: cross/along-track components

■ Mean of cross/along-track differences relative to the GDR solution

Other typical SRP modeling differences between GSFC, JPL and CNES.

Along-track divergence between JPL10A and GDR after the 50s cycles?



Jason-2 orbits comparison: Z-centering

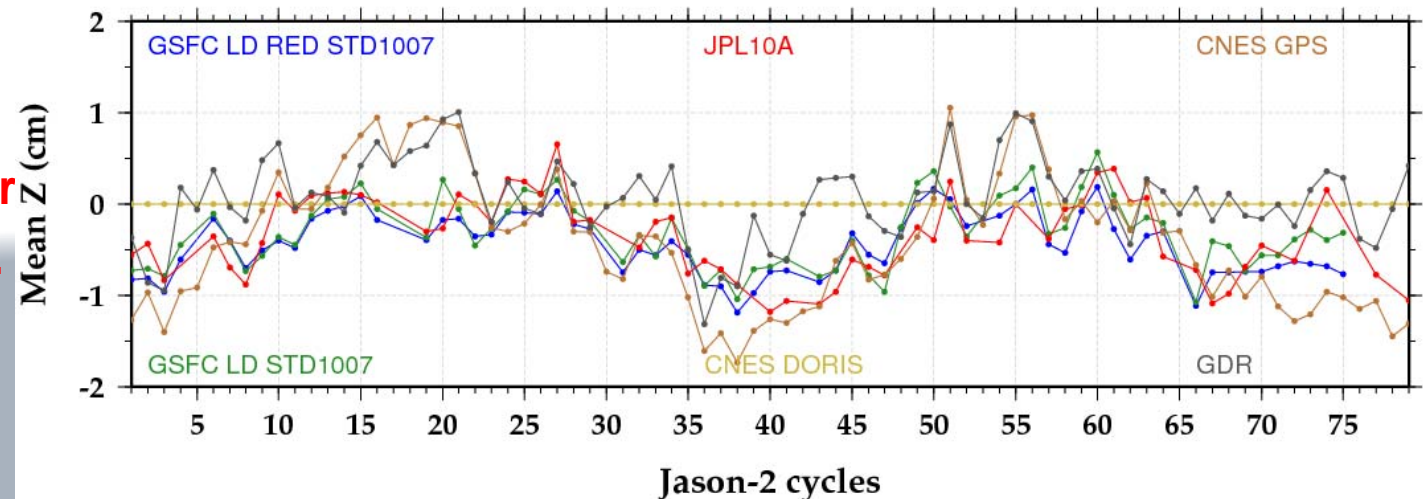
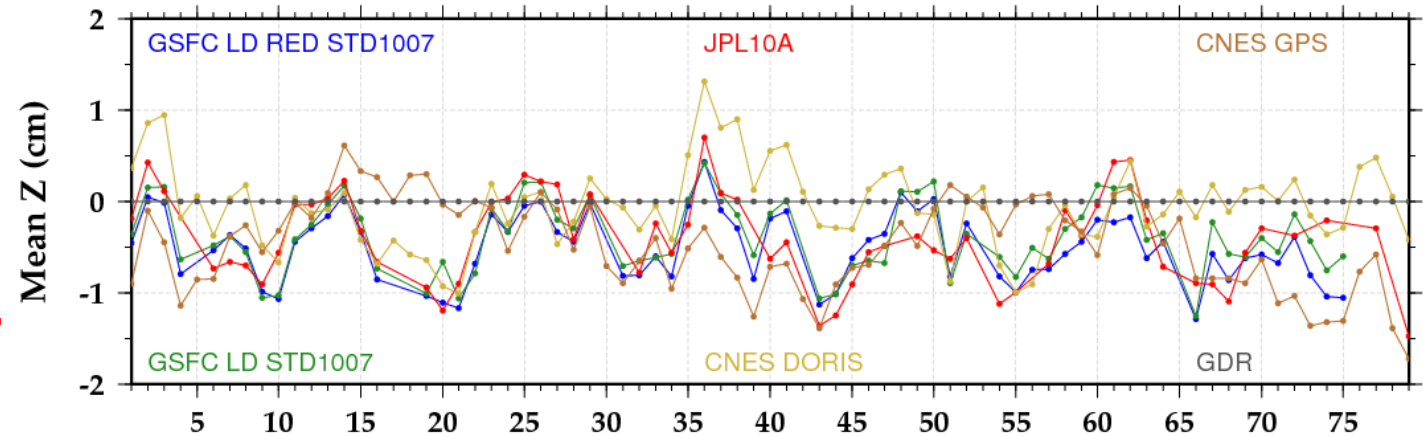
■ Mean of Z orbit differences

◆ GDR – others

Negative Z-shift
due to the
transformation
ITRF05 – ITRF08.

◆ DORIS – others

Puzzling annual
signal.
Somewhat higher
w.r.t. CNES GPS.



SLR validation of the different Jason-2 orbit solutions

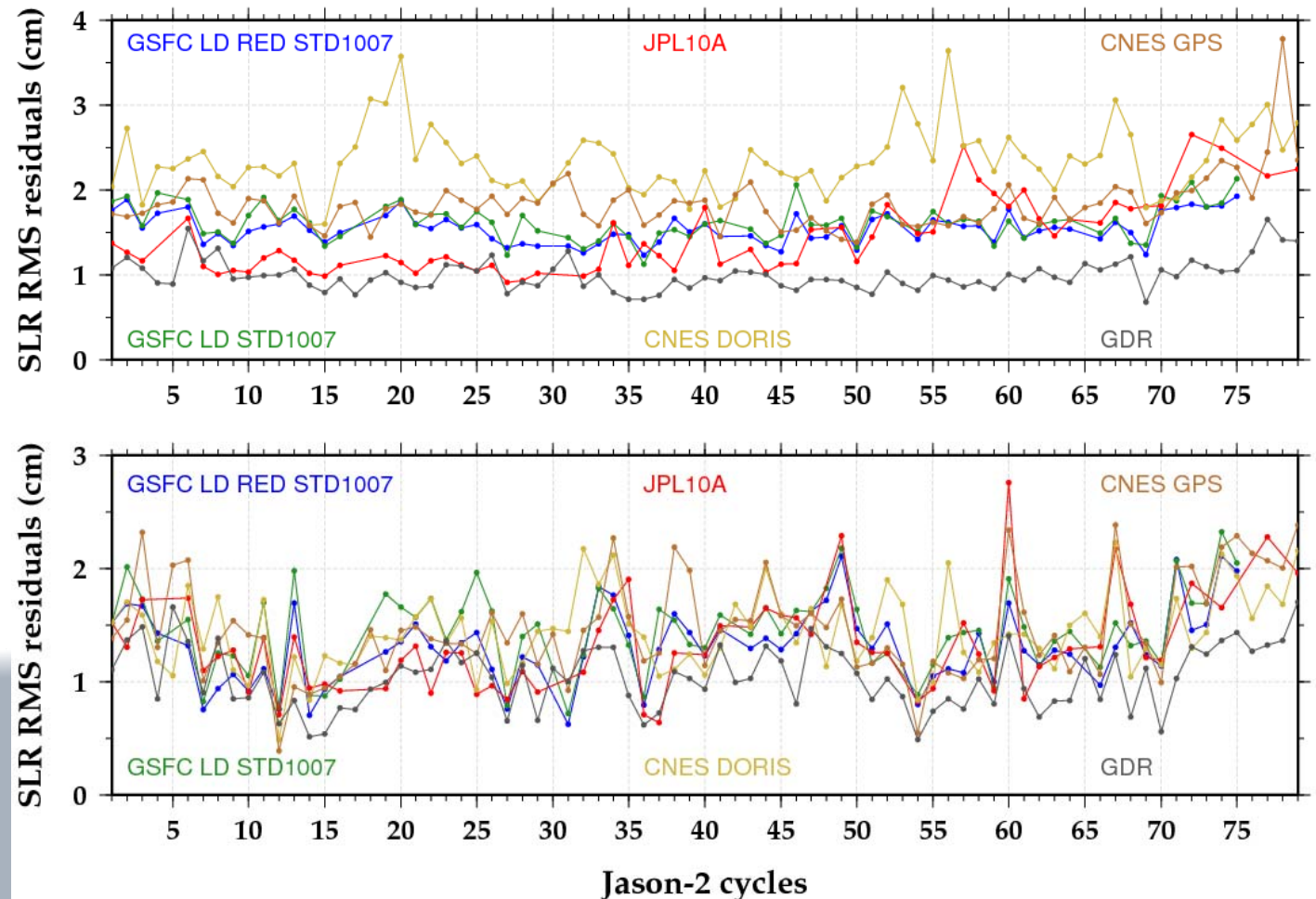
■ RMS of SLR residuals on core network (7080Fort 7090Yarr 7105Wash 7110Monu 7839Graz 7840Hers 7810Zimm)

◆ All elevations

Increase in low-elevation SLR JPL10A residuals.

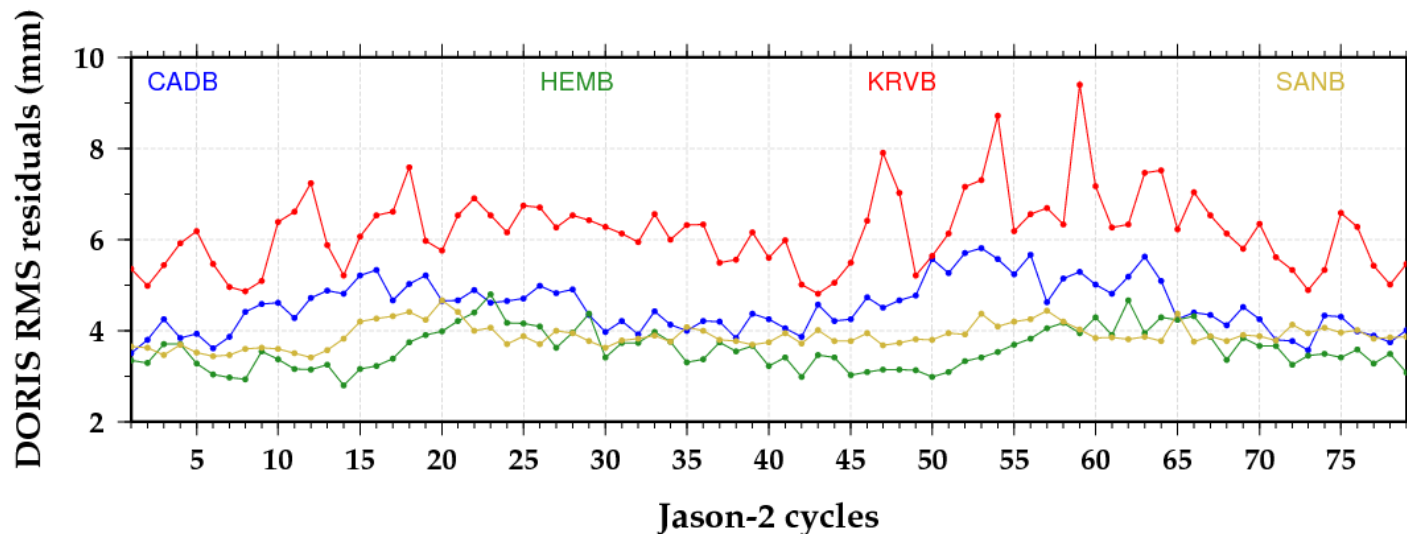
◆ Above 70°

~1 cm radial orbits accuracy (SLR used in the GDR solution).



Effect of the South Atlantic Anomaly on DORIS residuals

■ RMS of DORIS post-fit residuals on Jason-2 GDR orbits



◆ No conclusive sign of degradation on typical SAA beacons.



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Effect of ITRF2008 on Jason orbits (1/6)

■ Data

◆ Satellites and cycles spans

- Jason-1: cycles 1-20 (without cycles 5 and 8), 100-120, 200-220 and 300-310.
- Jason-2: cycles 1-23, 24-47 and 48-70.

◆ Orbits computed

- DORIS-only orbits.
- DORIS+SLR orbits.



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Effect of ITRF2008 on Jason orbits (2/6)

■ Processing methods

◆ SLR bias strategy

- Biases solved-for either per-pass or per-arc.
- Bias-solution strategy identical for ITRF2008 and LPOD2005/SLRF2005.

◆ Missing data and stations

- Available Earth Orientation Parameters only consistent with ITRF2005 (C04 series).
- Use of the transformation parameters for 12 DORIS stations ITRF2008 coordinates.

◆ **Only the position and velocity coordinates of the DORIS and SLR stations differ between the ITRF2005 and ITRF2008 orbit solutions: the same stations and the same measurements are considered in the comparison.**



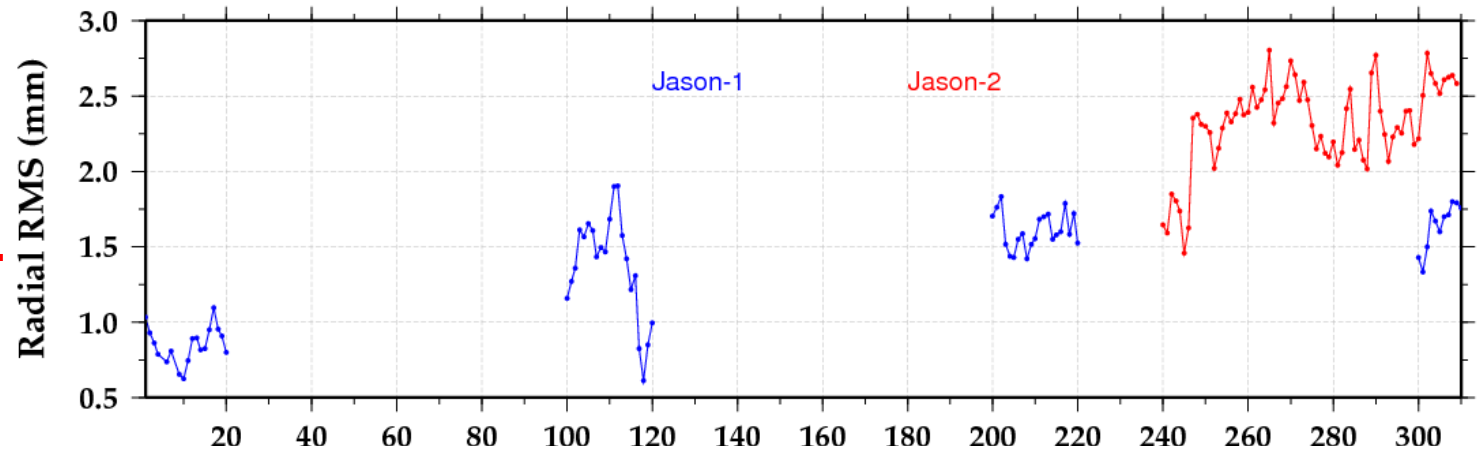
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Effect of ITRF2008 on Jason orbits (3/6)

■ RMS of radial orbit differences

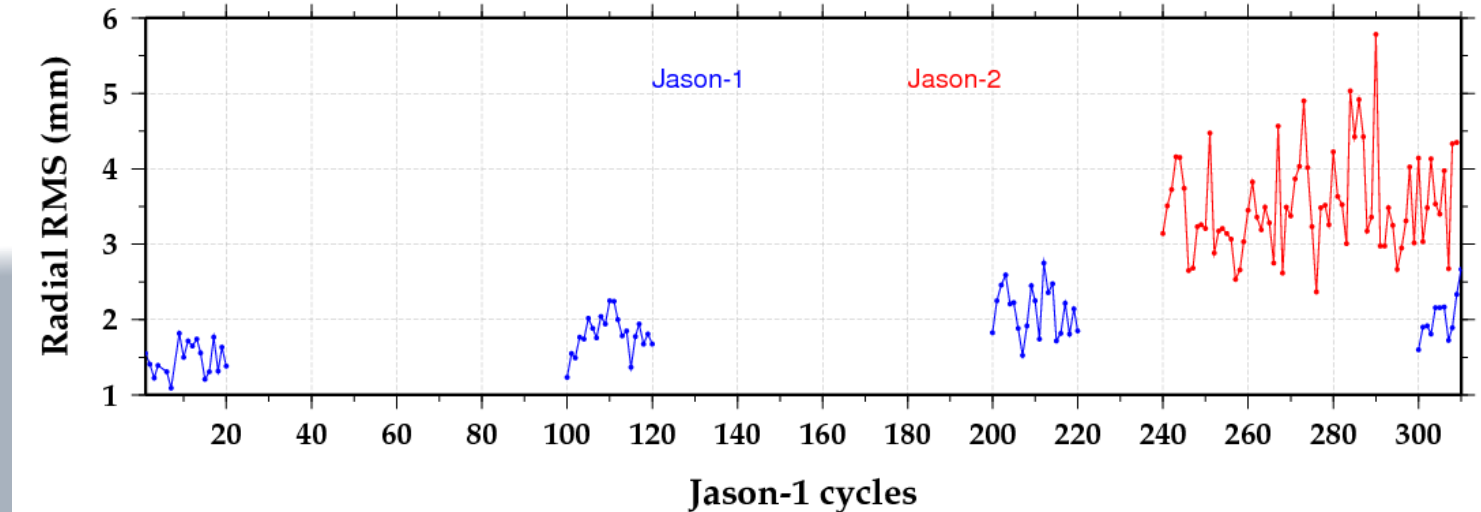
◆ DORIS-only

Orbit change stronger on J2.



◆ DORIS+SLR

Orbit change below 5 mm radial RMS.

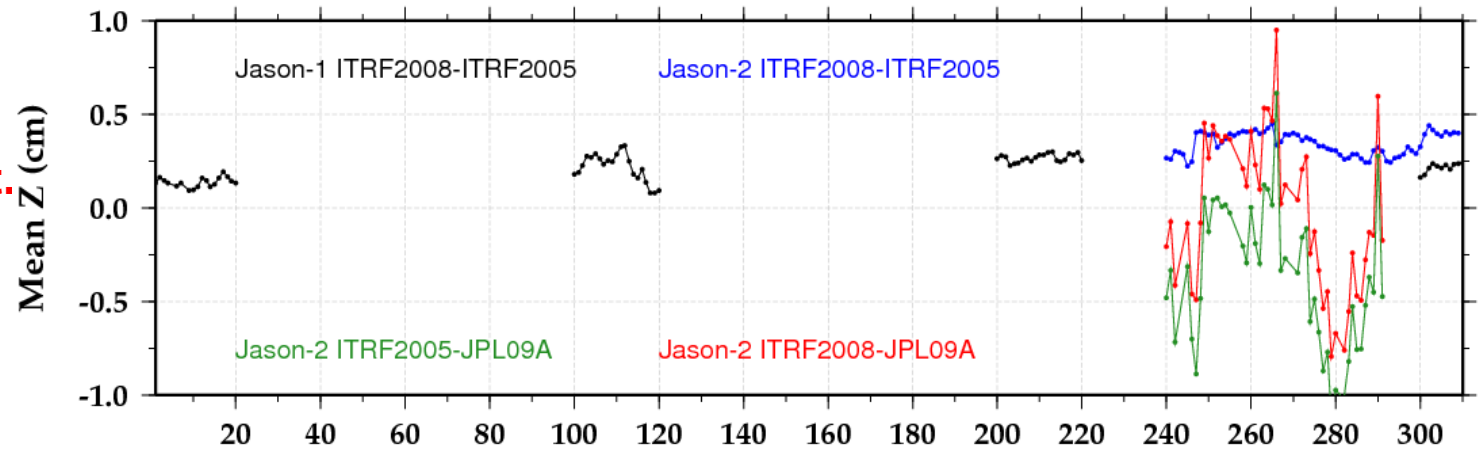


Effect of ITRF2008 on Jason orbits (4/6)

■ Mean of Z orbit differences

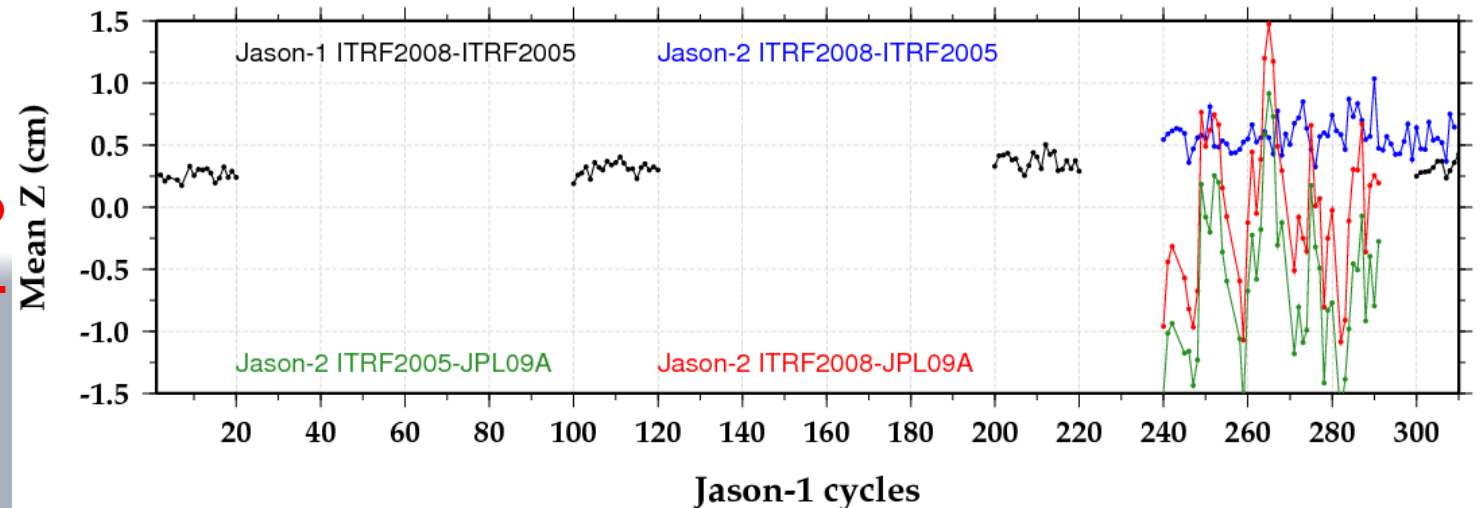
◆ DORIS-only

Positive Z-shift.



◆ DORIS+SLR

DORIS/SLR
orbits closer to
GPS-only orbit.

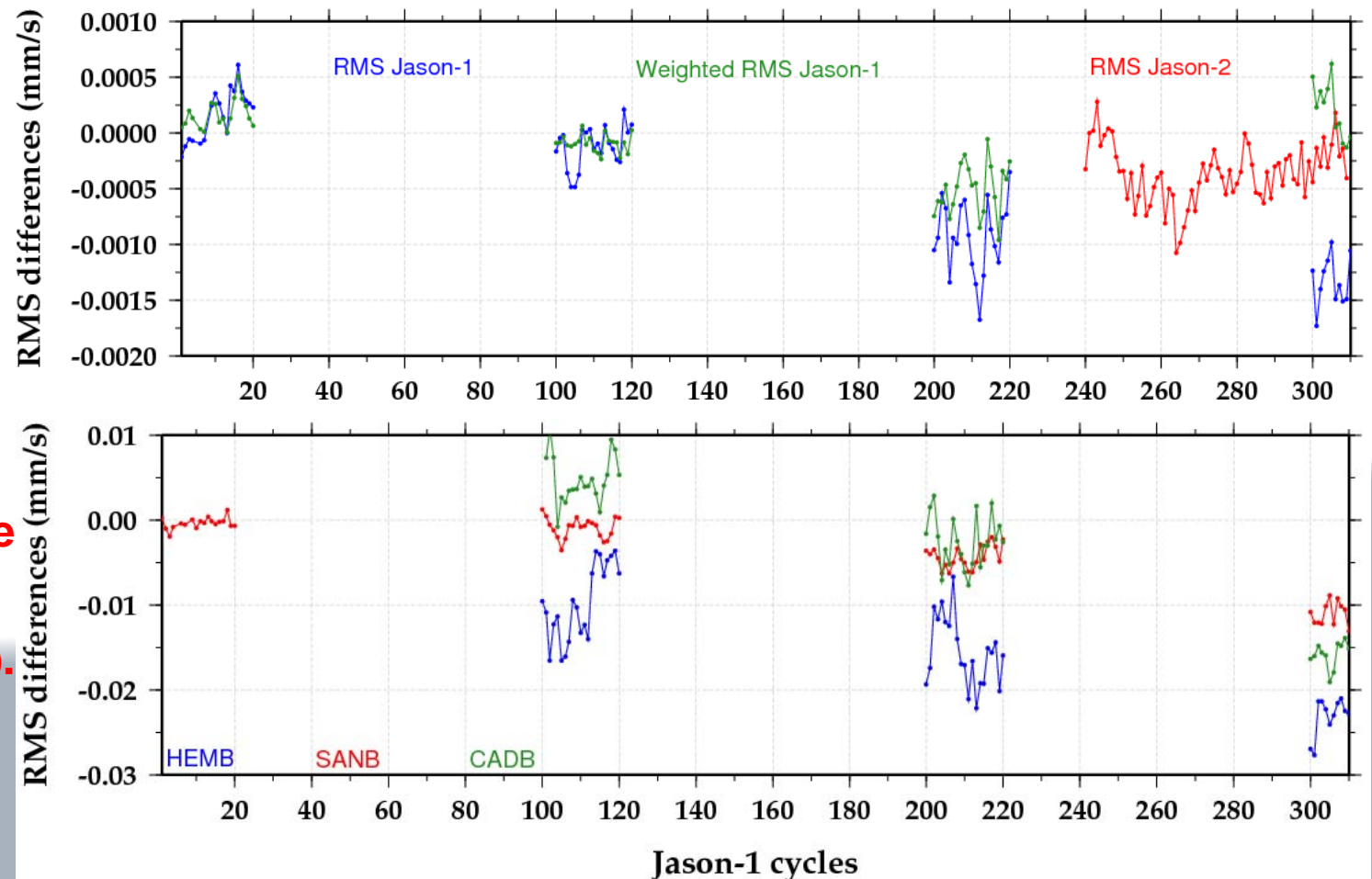


Effect of ITRF2008 on Jason orbits (5/6)

■ Difference of DORIS RMS residuals (ITRF2005-ITRF2008)

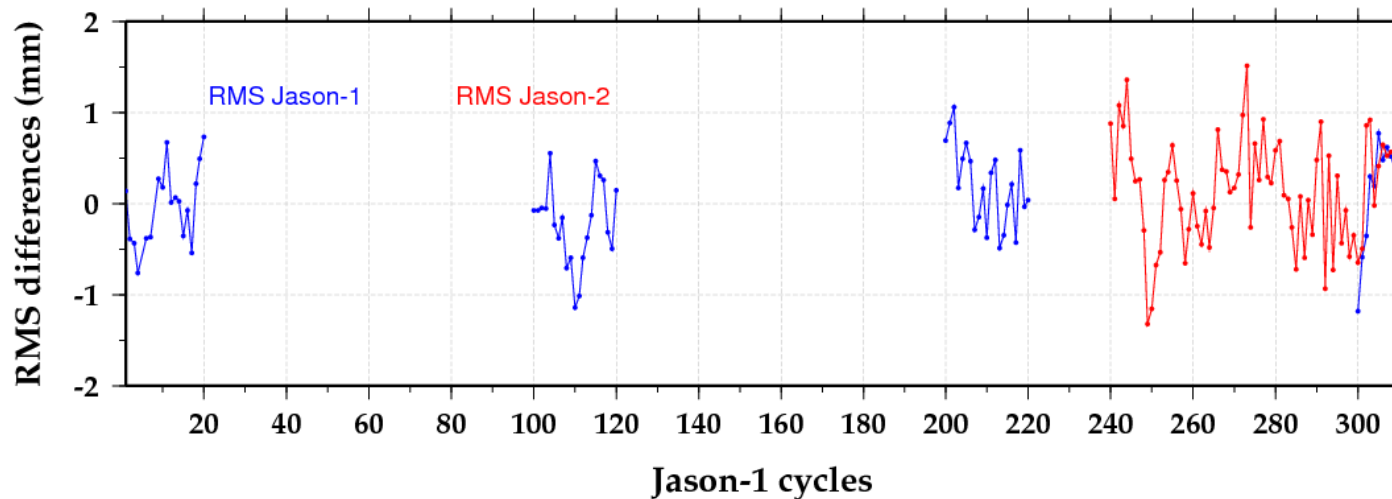
Very slight degradation in DORIS RMS residuals.

A degradation somehow driven by some SAA stations (HEMB, CADB).



Effect of ITRF2008 on Jason orbits (6/6)

■ Difference of SLR RMS residuals (ITRF2005-ITRF2008)



- ◆ **Very small improvement in SLR RMS residuals (cf. Arequipa L7403 in the backup slides).**



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Summary

■ Jason-2 orbits comparison

- ◆ 120-day radial signal of SRP modeling differences between GDR and GSFC dynamic orbits.
- ◆ Along-track divergence between JPL10A and GDR after the 50s cycles?
- ◆ Overall ~1 cm radial orbits accuracy.

■ Effect of ITRF2008 on Jason orbits

- ◆ Orbit change below 5 mm radial RMS.
- ◆ DORIS/SLR orbits closer to GPS-only orbit.
- ◆ Very small improvement in SLR RMS residuals.



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Backup slides

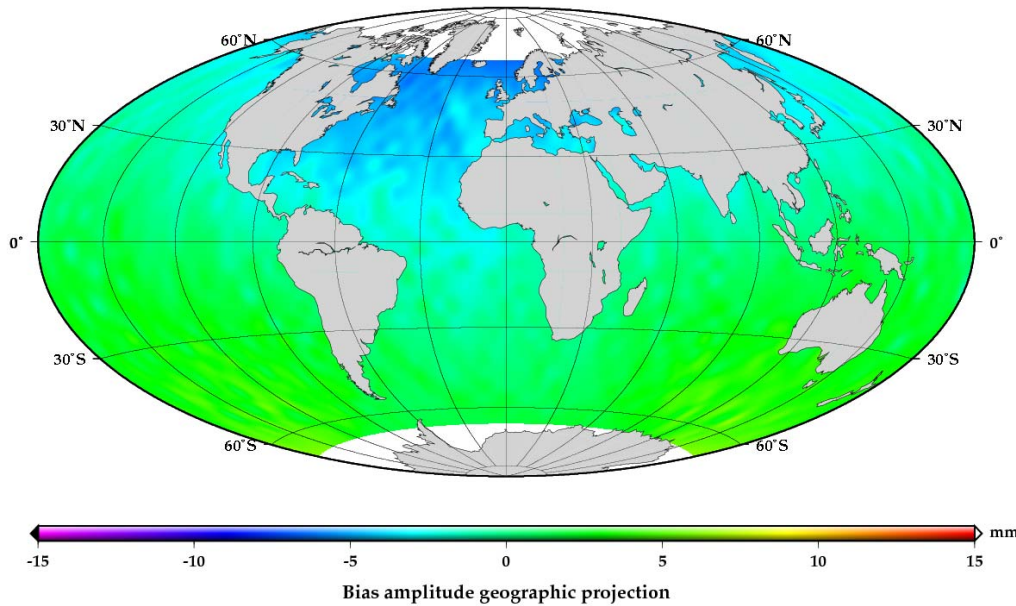


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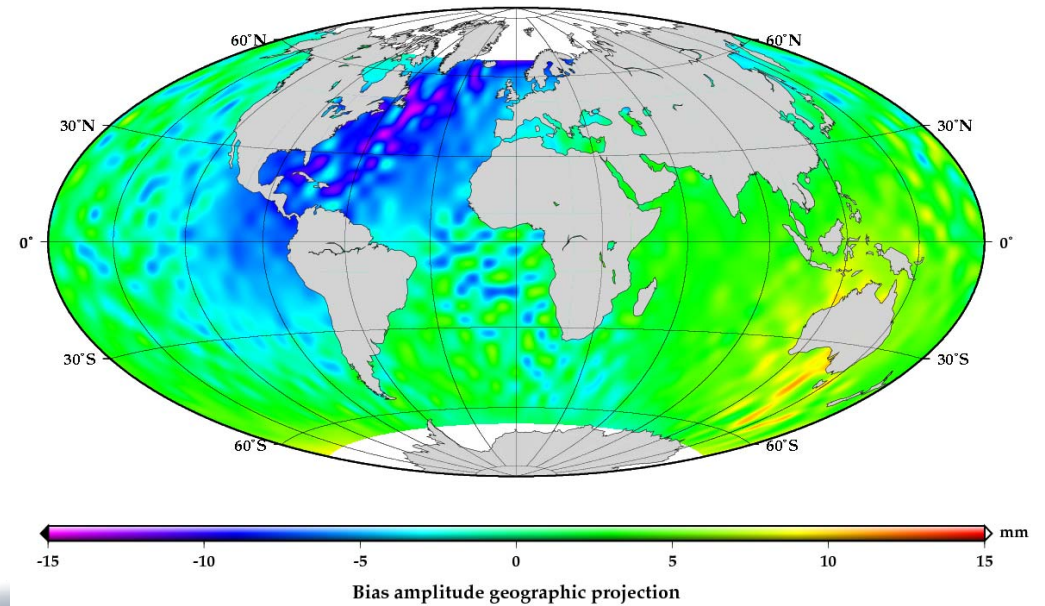
Jason-2 orbits comparison: geographically correlated radial differences (1/3)

■ Bias

Jason-2 GDR - GSFC LD RED STD1007 radial differences, cycles 1-75



Jason-2 GDR - JPL10A radial differences, cycles 1-79

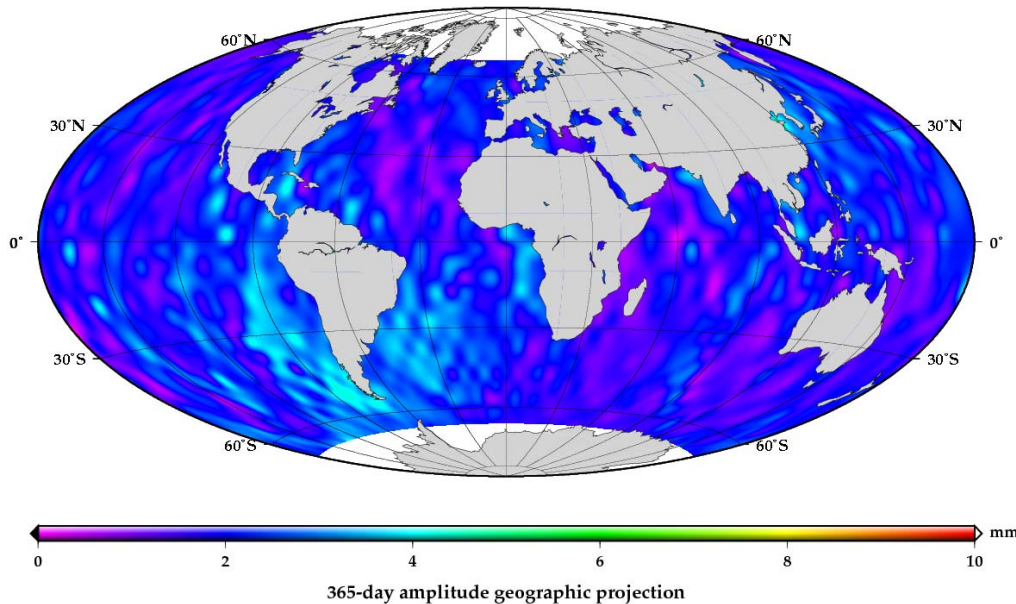


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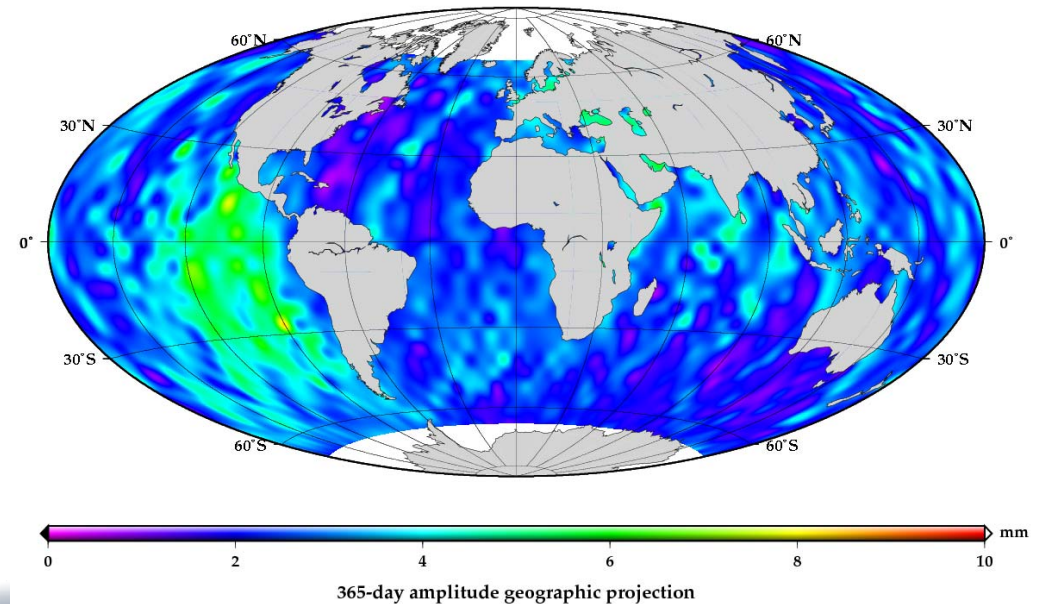
Jason-2 orbits comparison: geographically correlated radial differences (2/3)

■ 365-day signal

Jason-2 GDR - GSFC LD RED STD 1007 radial differences, cycles 1-75



Jason-2 GDR - JPL10A radial differences, cycles 1-79

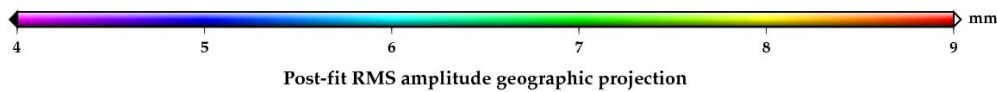
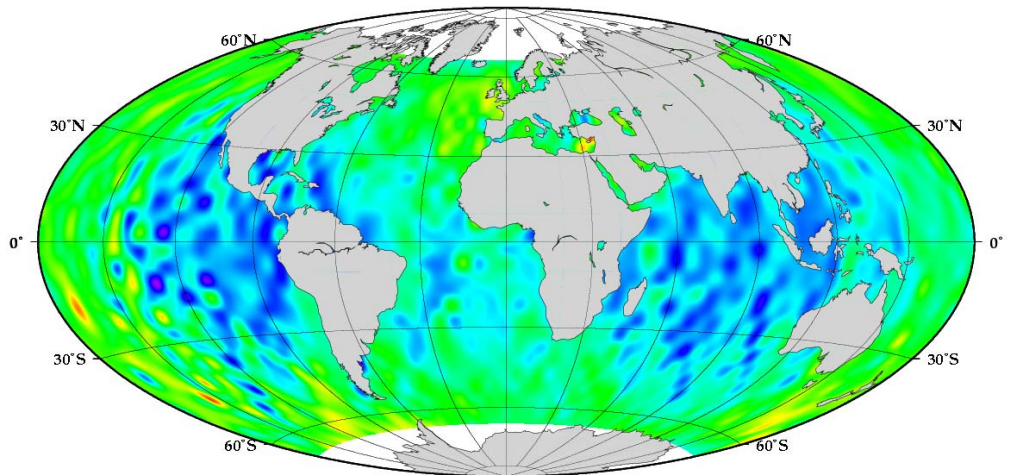


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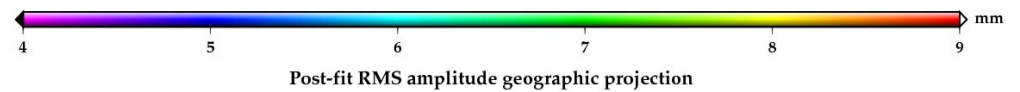
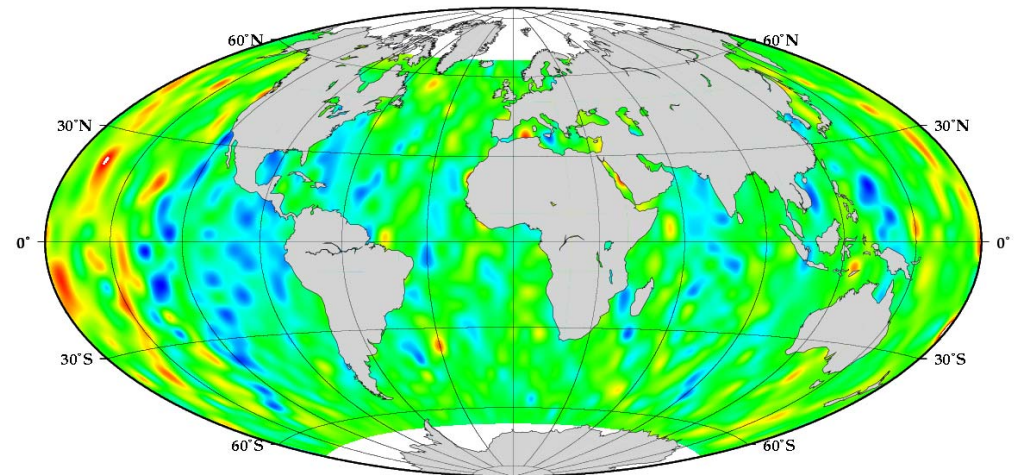
Jason-2 orbits comparison: geographically correlated radial differences (3/3)

■ Post-fit RMS

Jason-2 GDR - GSFC LD RED STD1007 radial differences, cycles 1-75



Jason-2 GDR - JPL10A radial differences, cycles 1-79

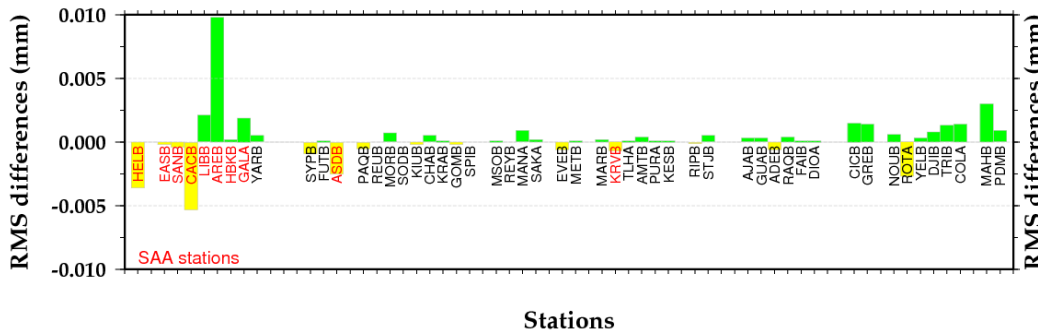


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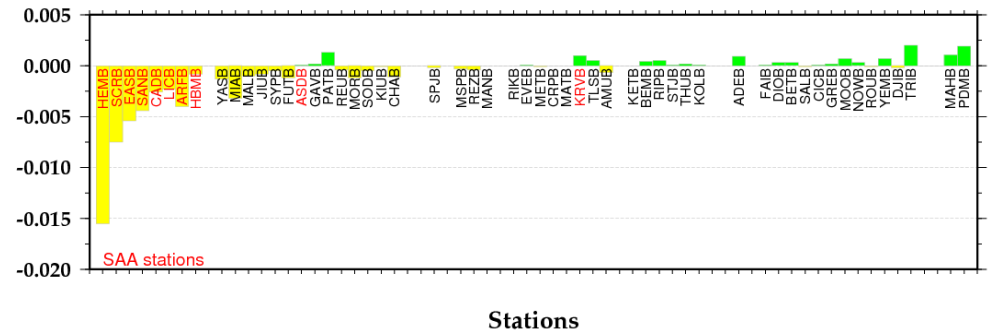
Effect of ITRF2008 on Jason orbits (1/5)

■ Difference of Jason-1 DORIS RMS residuals (ITRF2005-ITRF2008)

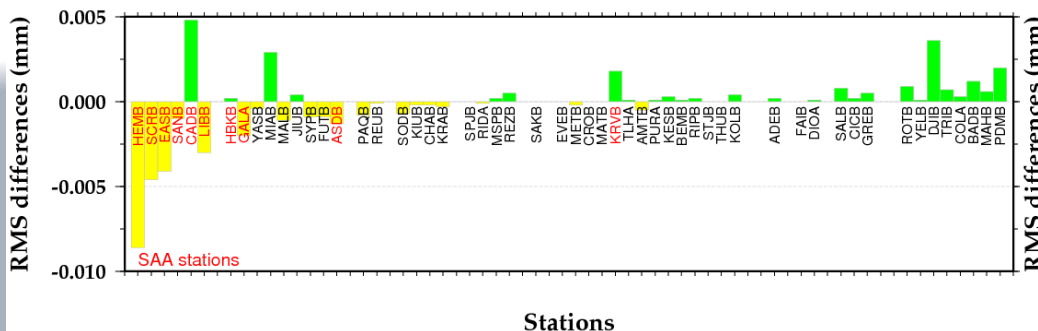
◆ Cycles 1-20



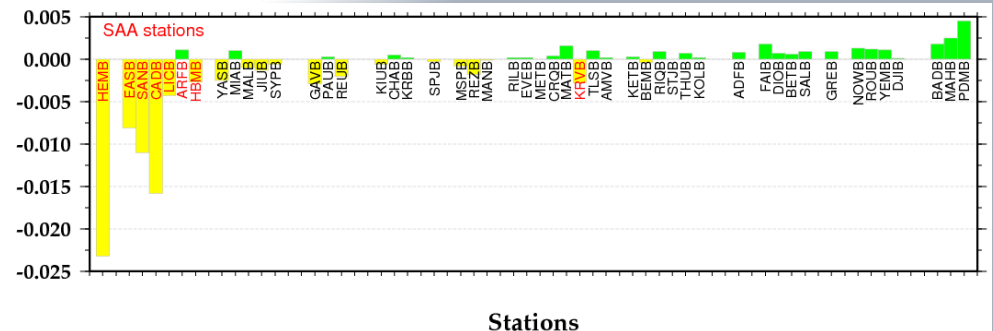
Cycles 200-220



◆ Cycles 100-120



Cycles 300-310



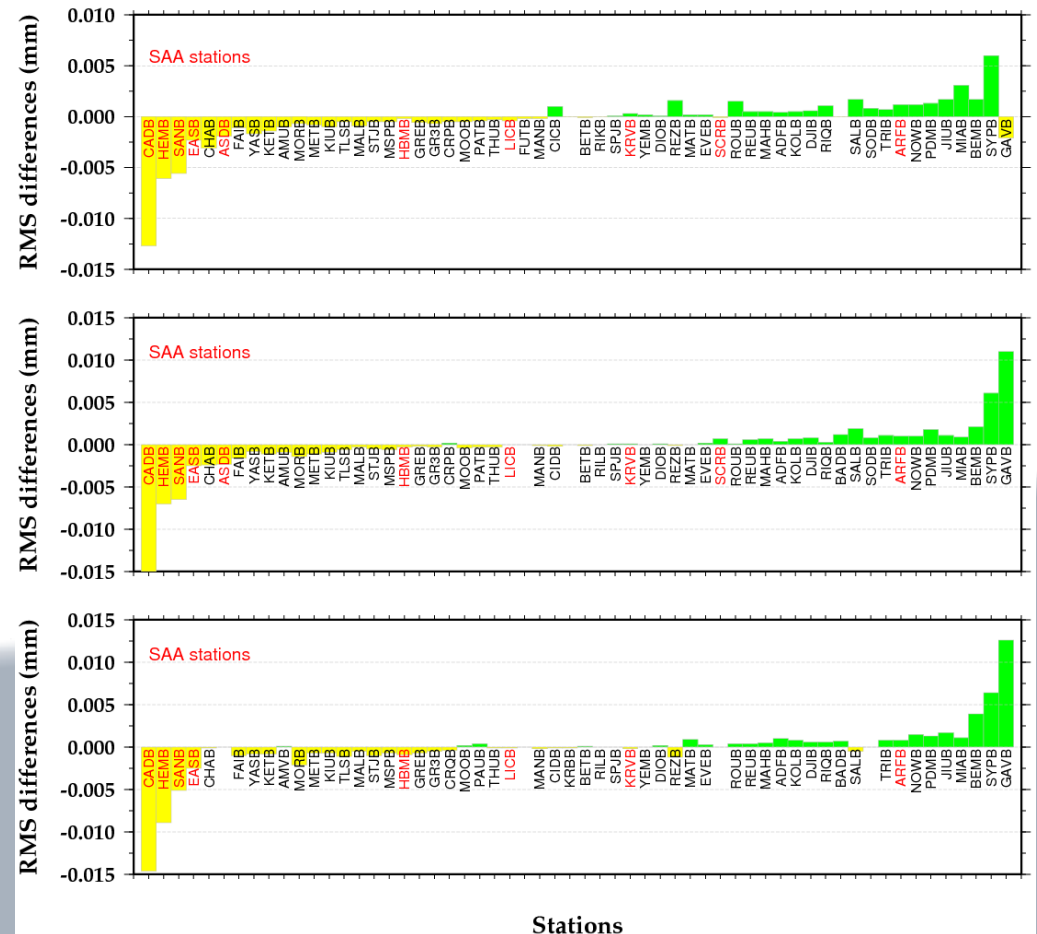
Effect of ITRF2008 on Jason orbits (2/5)

■ Difference of Jason-2 DORIS RMS residuals (ITRF2005-ITRF2008)

◆ Cycles 1-23

◆ Cycles 24-47

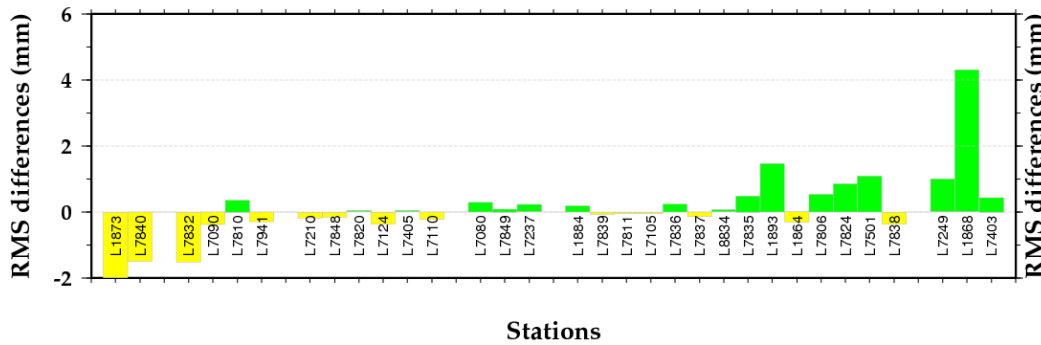
◆ Cycles 48-70



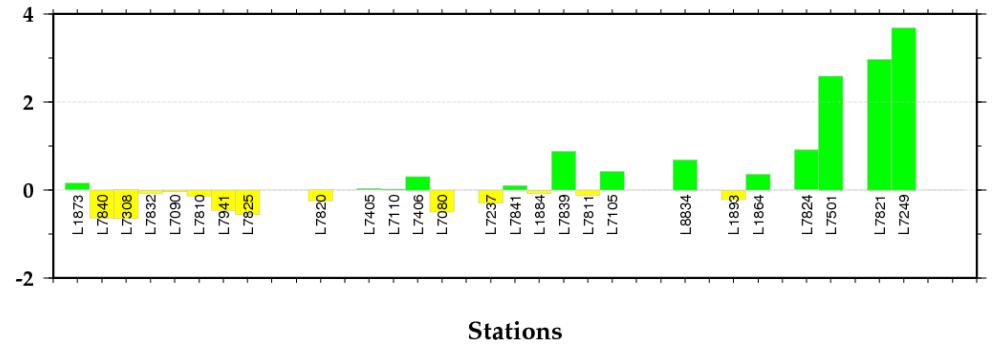
Effect of ITRF2008 on Jason orbits (3/5)

■ Difference of Jason-1 SLR RMS residuals (ITRF2005-ITRF2008)

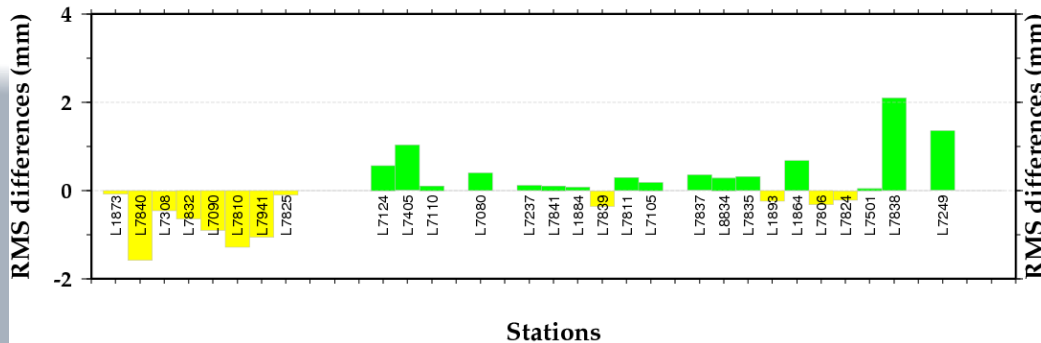
◆ Cycles 1-20



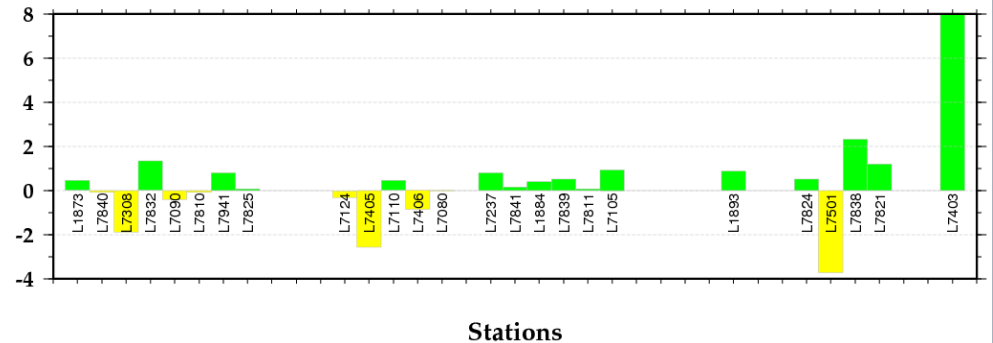
Cycles 200-220



◆ Cycles 100-120



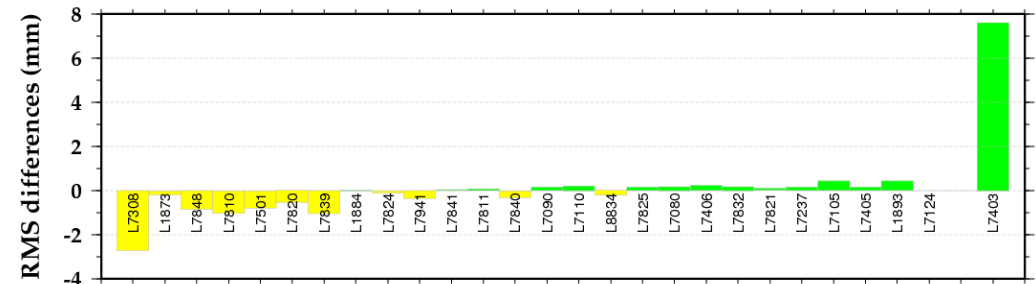
Cycles 300-310



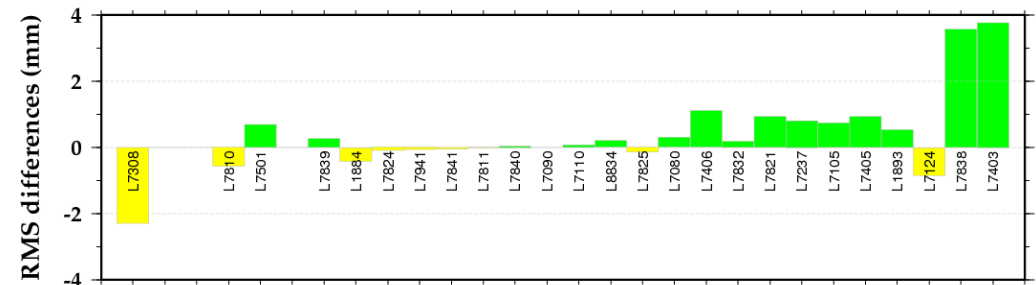
Effect of ITRF2008 on Jason orbits (4/5)

■ Difference of Jason-2 SLR RMS residuals (ITRF2005-ITRF2008)

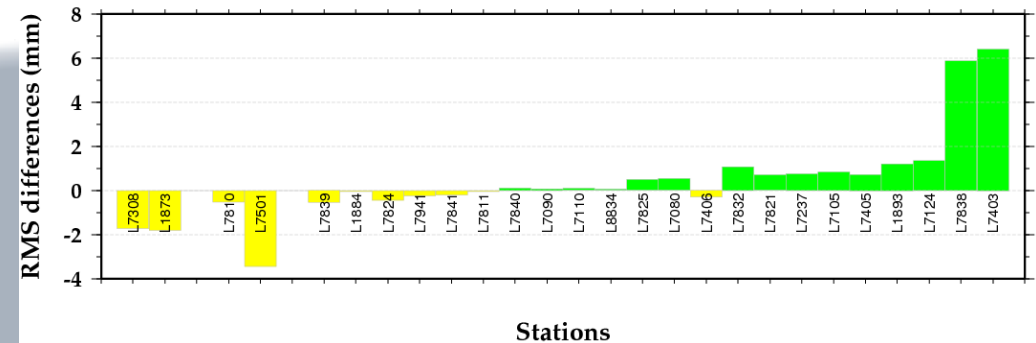
◆ Cycles 1-23



◆ Cycles 24-47

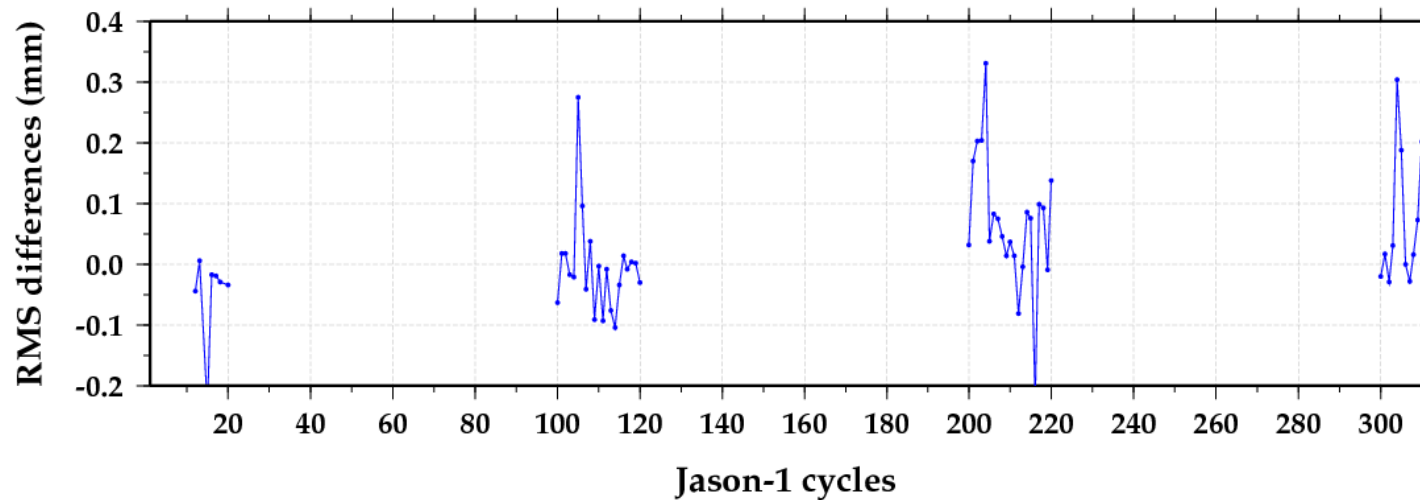


◆ Cycles 48-70



Effect of ITRF2008 on Jason orbits (5/5)

■ Difference of Jason-1 RMS weighted crossovers (ITRF2005-ITRF2008)



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