GSC Analysis Center Report

F. Lemoine, D. Chinn, N. Zelensky, K. Le Bail

IDS Analysis Working Group Meeting

Prague, Czech Republic

May 31, 2012

Outline

I	Tests to update SINEX series gscwd12.
II	Preliminary Tests with DPOD2008, v1.7
III	Implimention of VMF1 in GEODYN.
IV	Preliminary Tests: Application of Atmospheric Loading on Jason2

SINEX series tests

I. Update mapping function to GMF from Niell (*Niell used in ITRF2008; gscwd12 continues this to avoid data series discontinuities*)

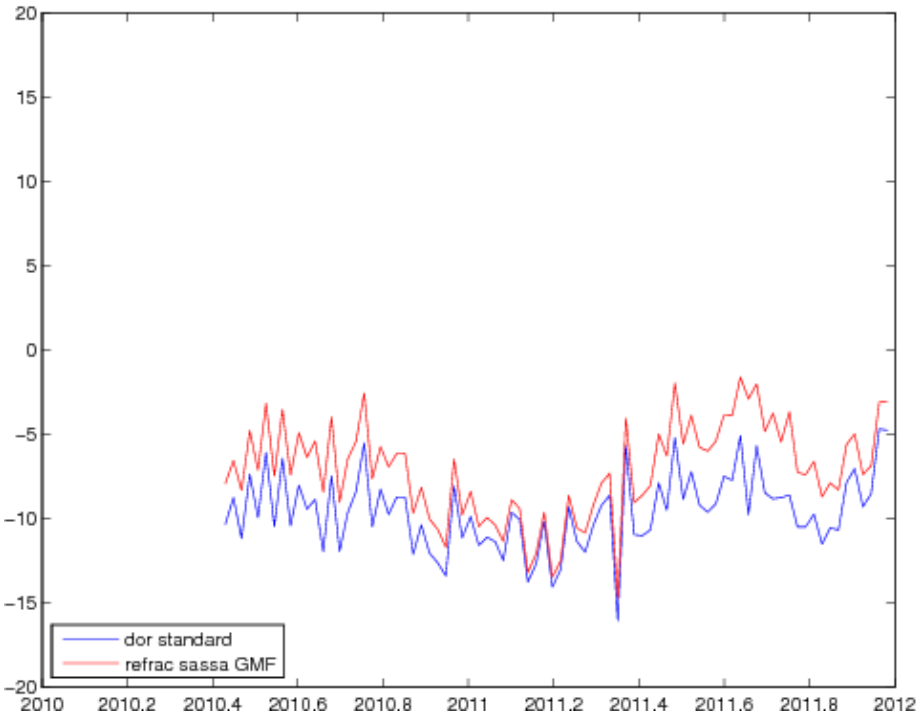
II. Use opr-12hrs on Jason-2 vs. opr-24hrs. (*Zelensky et al., 2011, AGU, showed reduction of 118-day signal in SLR+DORIS dynamic orbits when compared to JPL red-dyn or CNES/GDR-D orbits*)

III. Remove duplicate application of relativity correction (DORIS clock correction already applied at preprocessing).

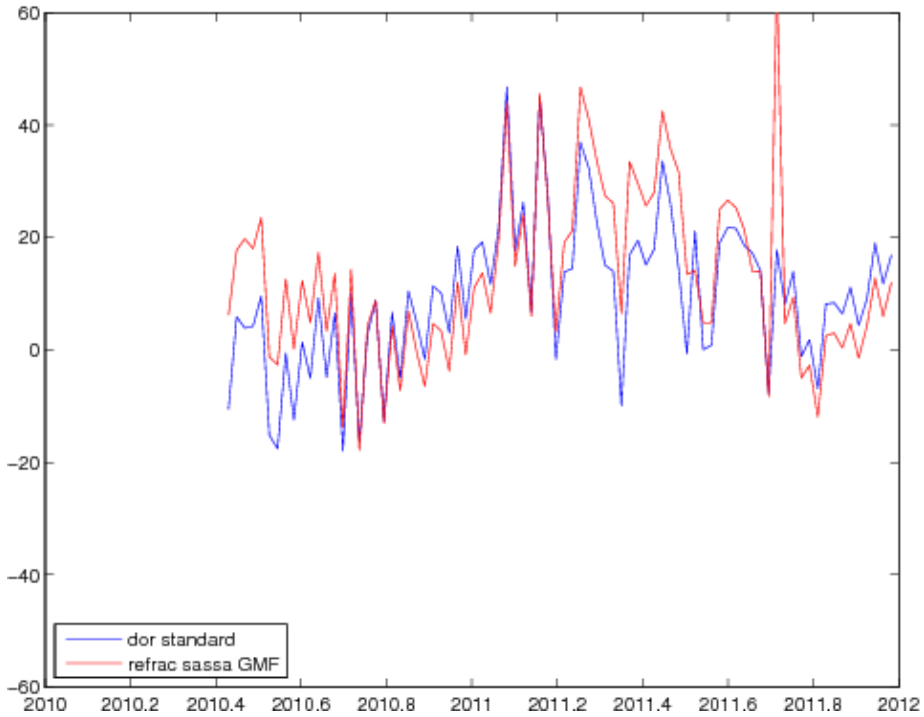
--->For each test examine impact on Scale, Tx,Ty,Tz and WRMS of weekly solutions for 2010-2011 (using all DORIS satellites).

Update to GMF from Niell

Scale

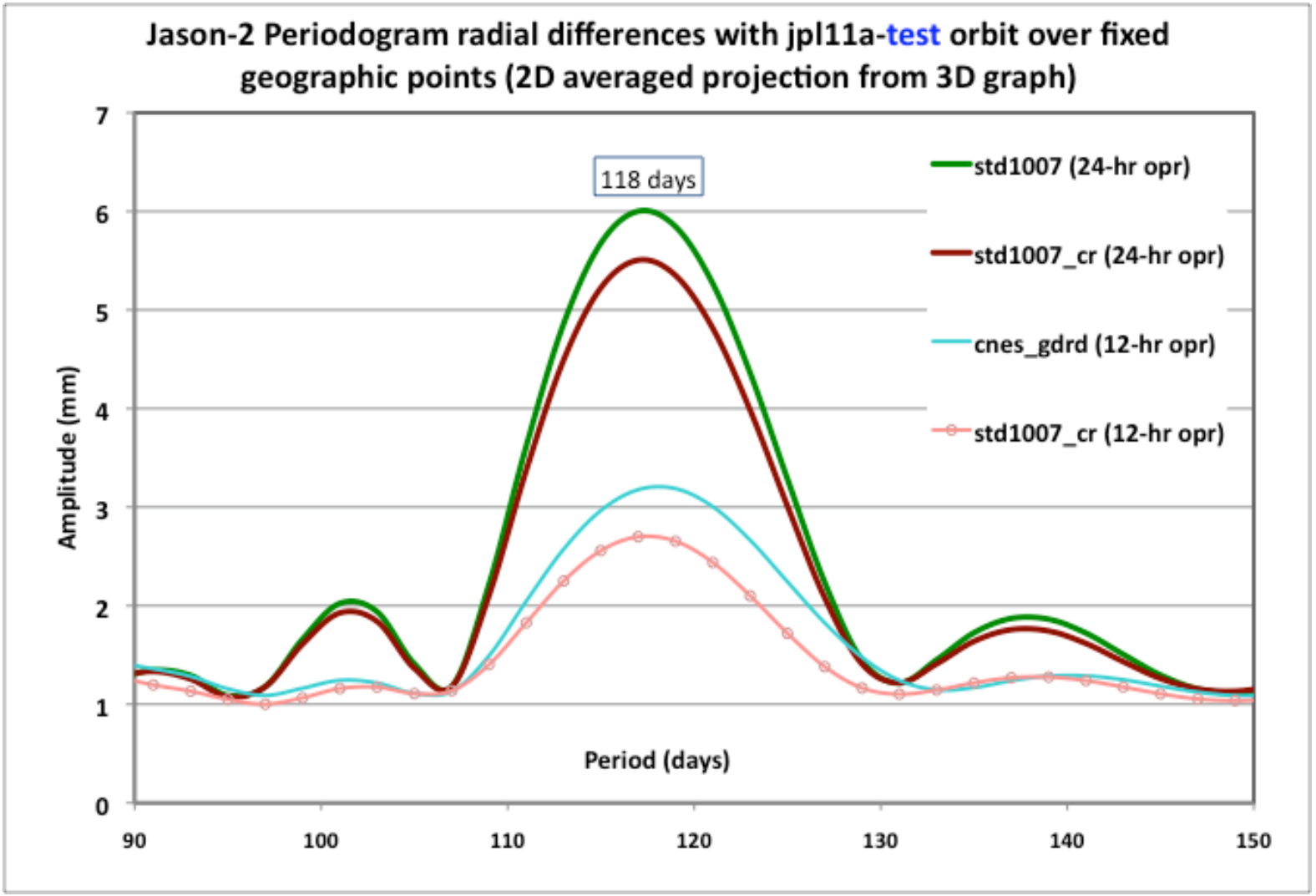


Tz



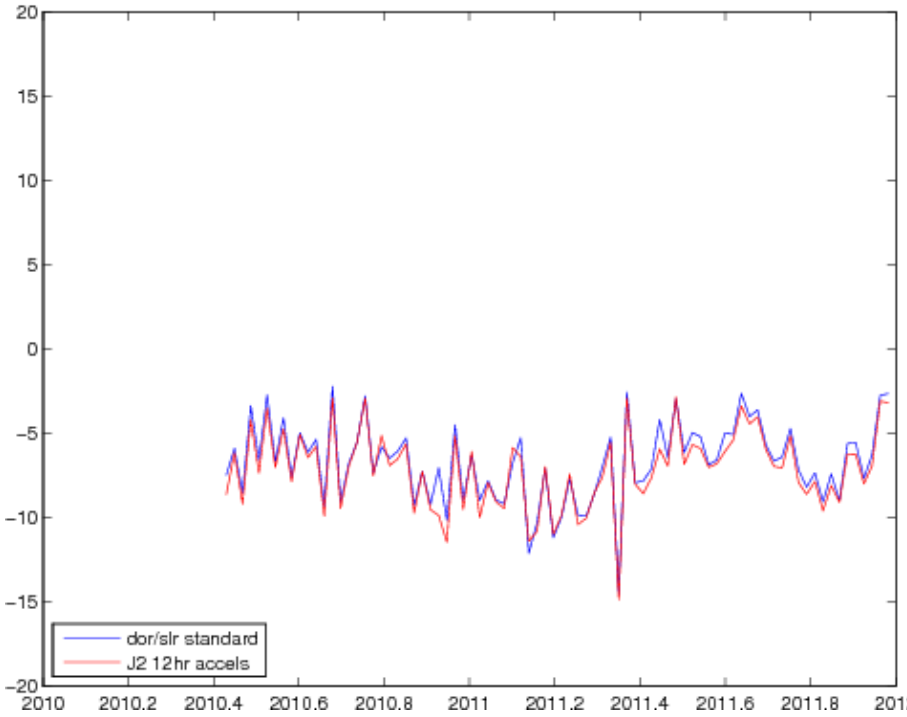
- +2-4 mm in scale;
- Semiannual change in Tz.

Apply 12-hr opr on Jason2

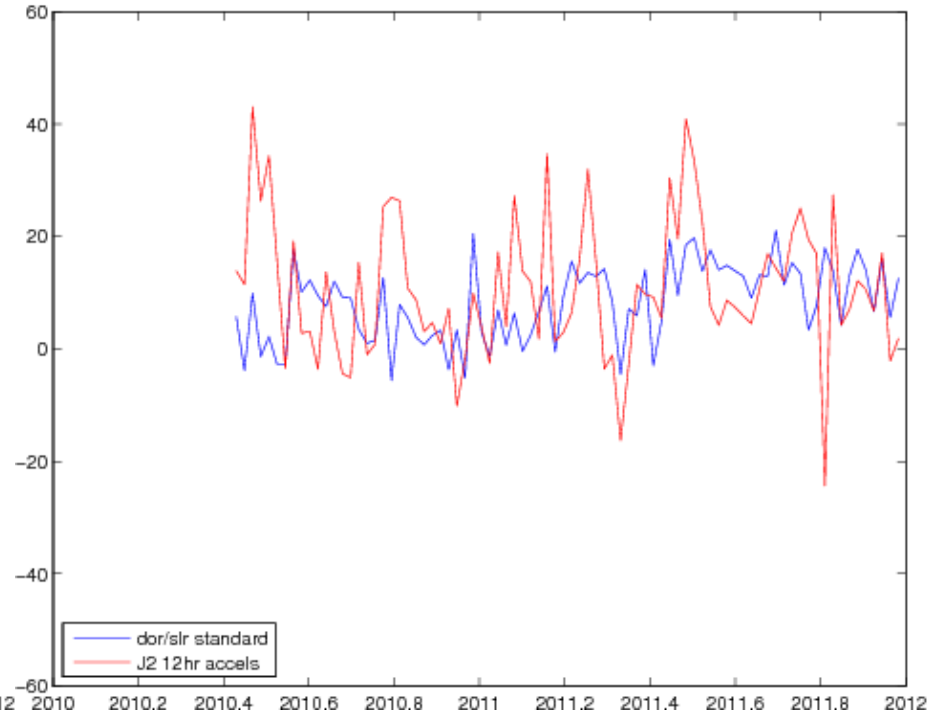


Apply 12-hr opr on Jason2

Scale

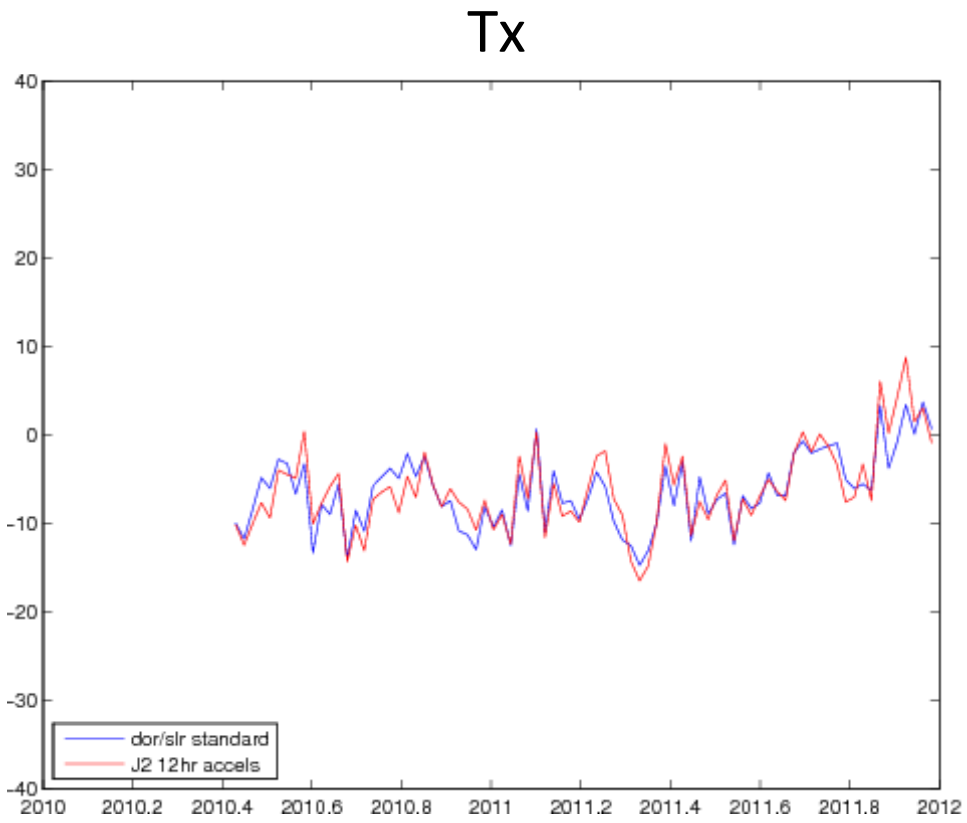


Tz



- Negligible effect on scale;
- Deterioration in Tz (more scatter)

Apply 12-hr opr on Jason2 (2)

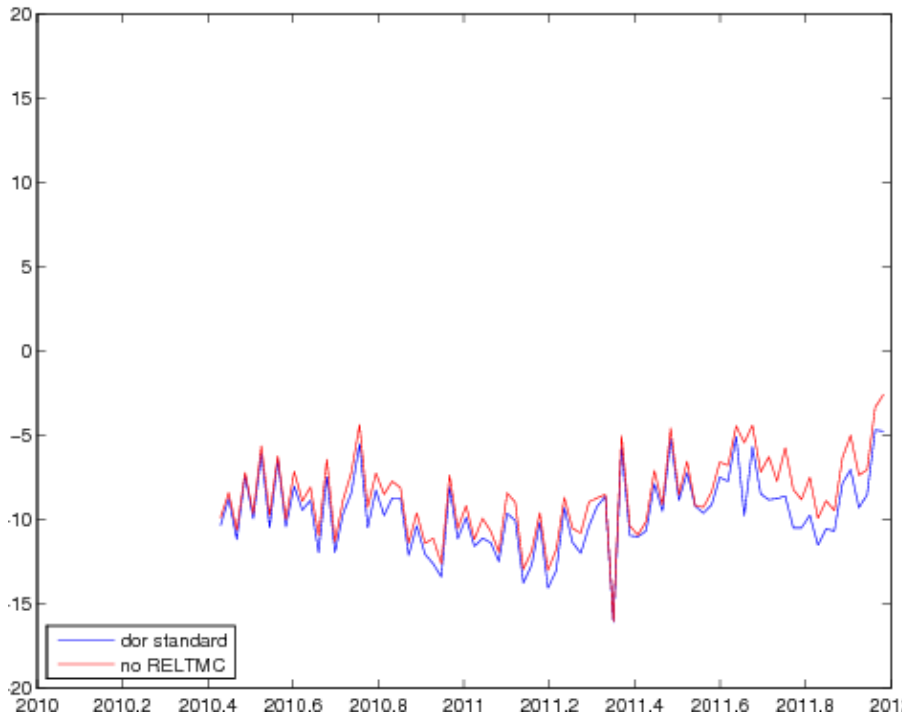


- ~118-day difference in Tx, Ty differences?
- Need longer time series in order to be able to do spectral analysis and verify if beta prime signal reduced in Tx and Ty.
- Further testing necessary. Would time-correlated opr's adjusted more frequently stabilize Tz and still remove Tx & Ty signal?

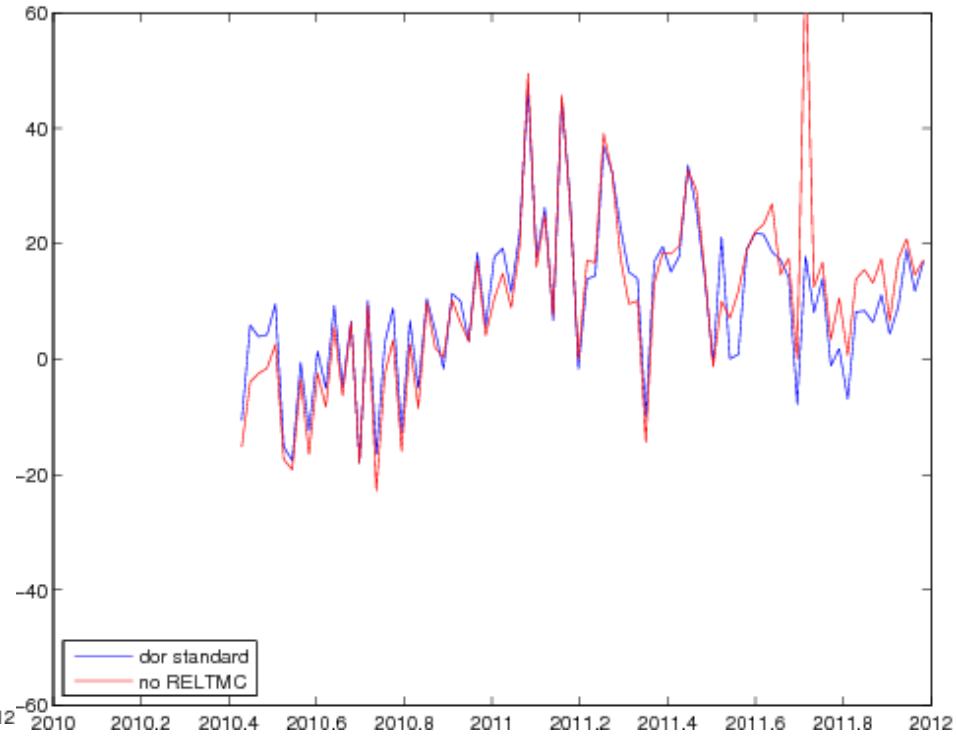
Remove RELTMC

(Duplicate GEODYN application of Relativity Clock Correction on DORIS; Already applied in DORIS2.2 format)

Scale



Tz

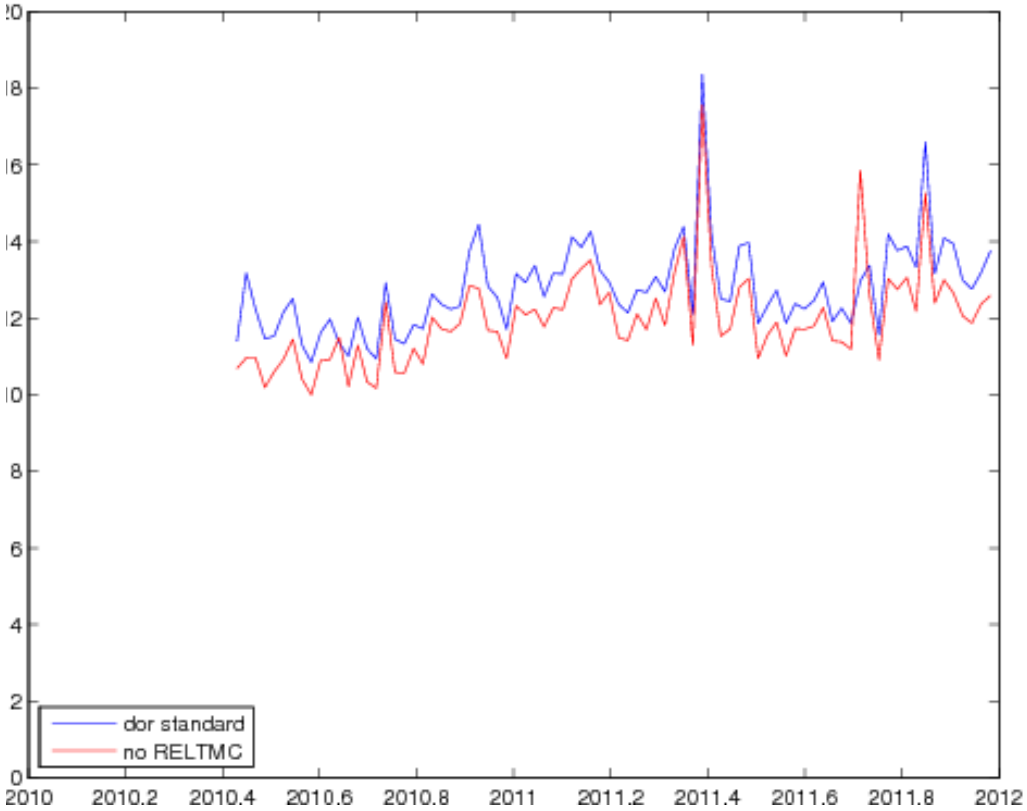


- +0.0 to 0.2 mm in scale.
- Semiannual signal in Tz seen in difference?

Remove RELTMC

(Duplicate GEODYN application of Relativity Clock Correction on DORIS)

WRMS



- 1 – 2 mm improvement in WRMS.

Next GSC IDS SINEX Series Plans

- Update to GMF/Saastoimonen.
- More opr adjustments Jason2?
- New geopotential model

  static field: GOC02S (*GRACE+GOCE+Lageos+CHAMP*)?

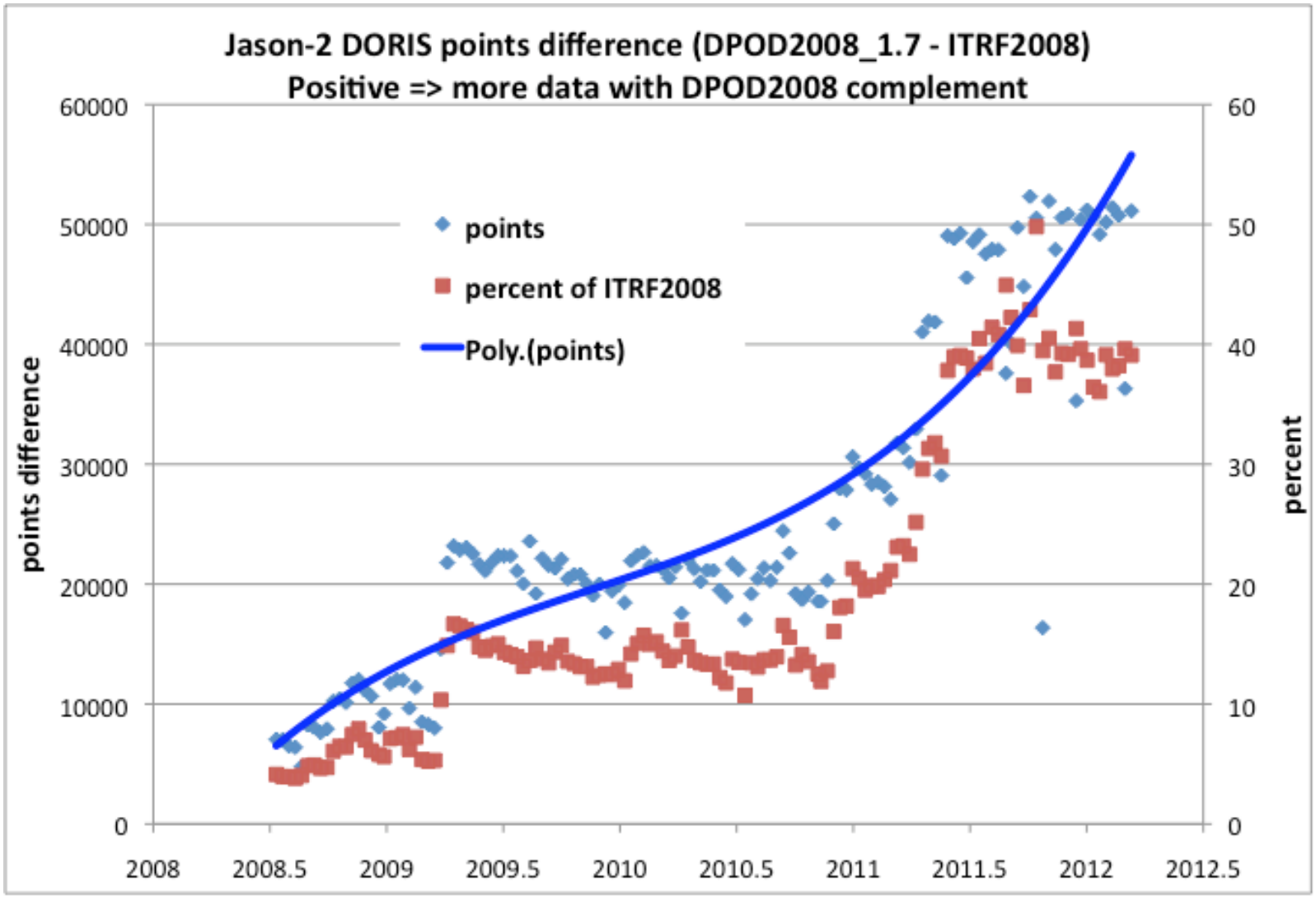
  Time-varying: TBD. Must be valid 1993-2012.
- New Annual+ Semiannual harmonics

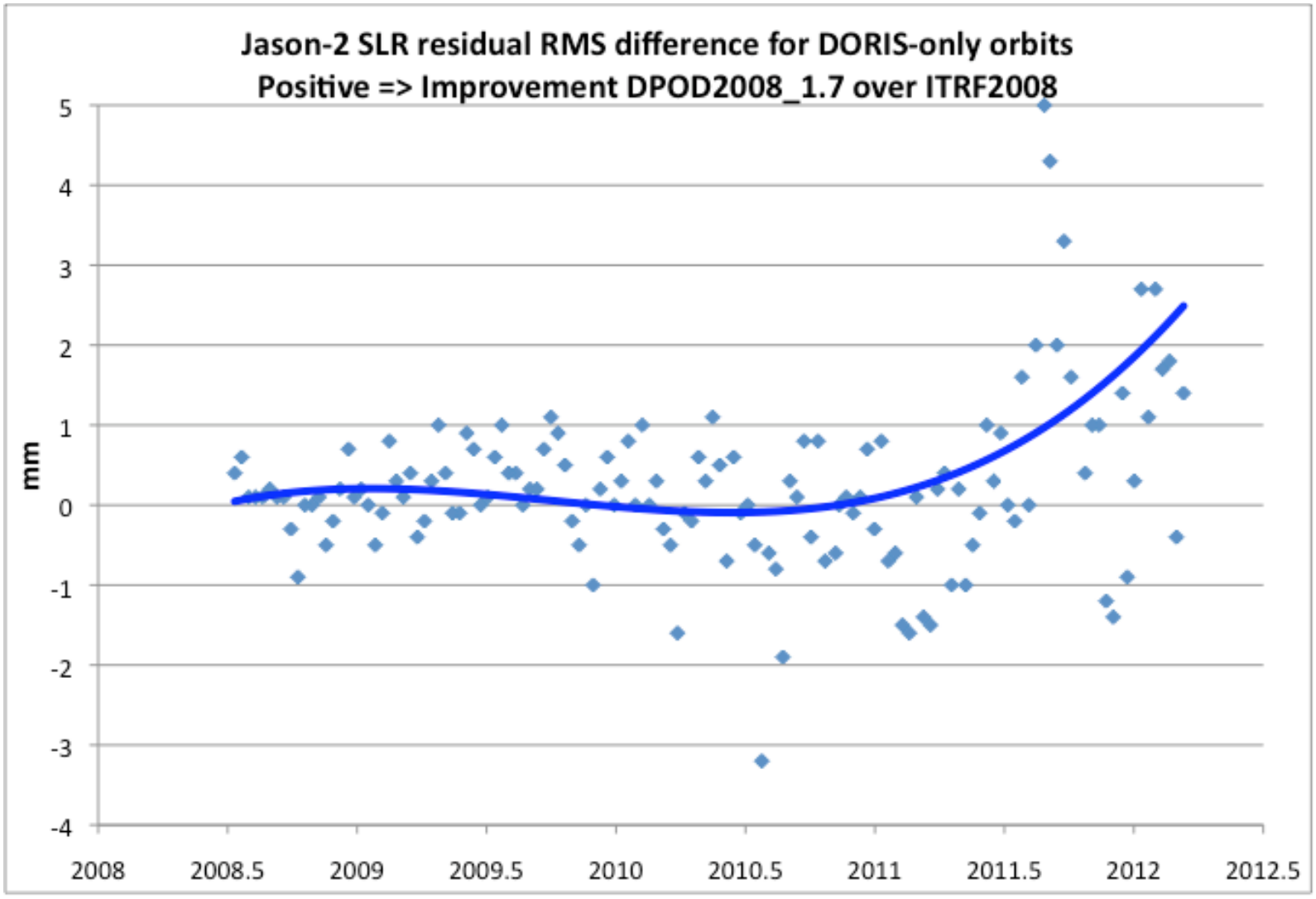
  GRACE-derived, multi-year fit.
- New ocean tide model:

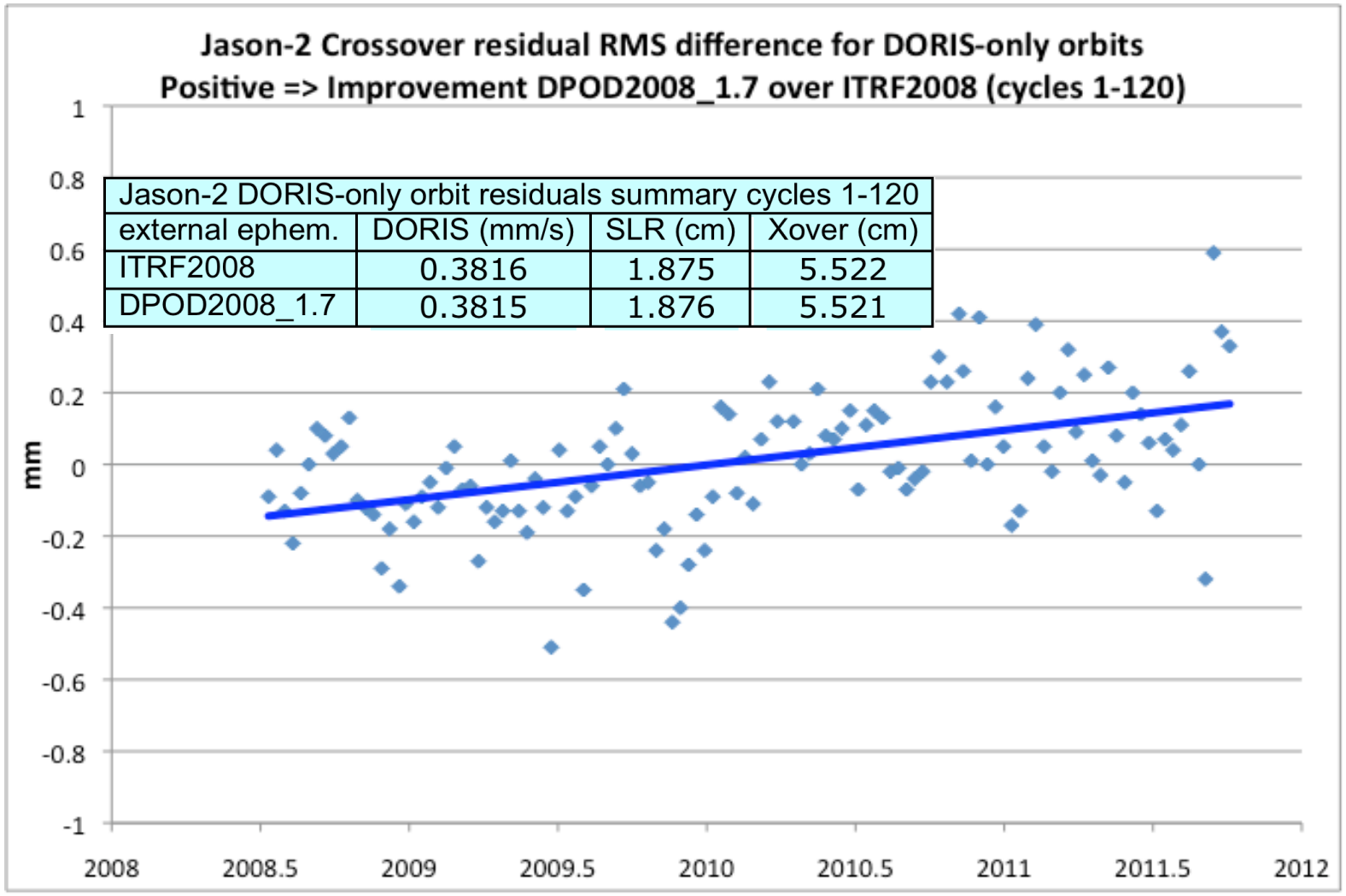
  -->tides and ocean loading & tidal geocenter.

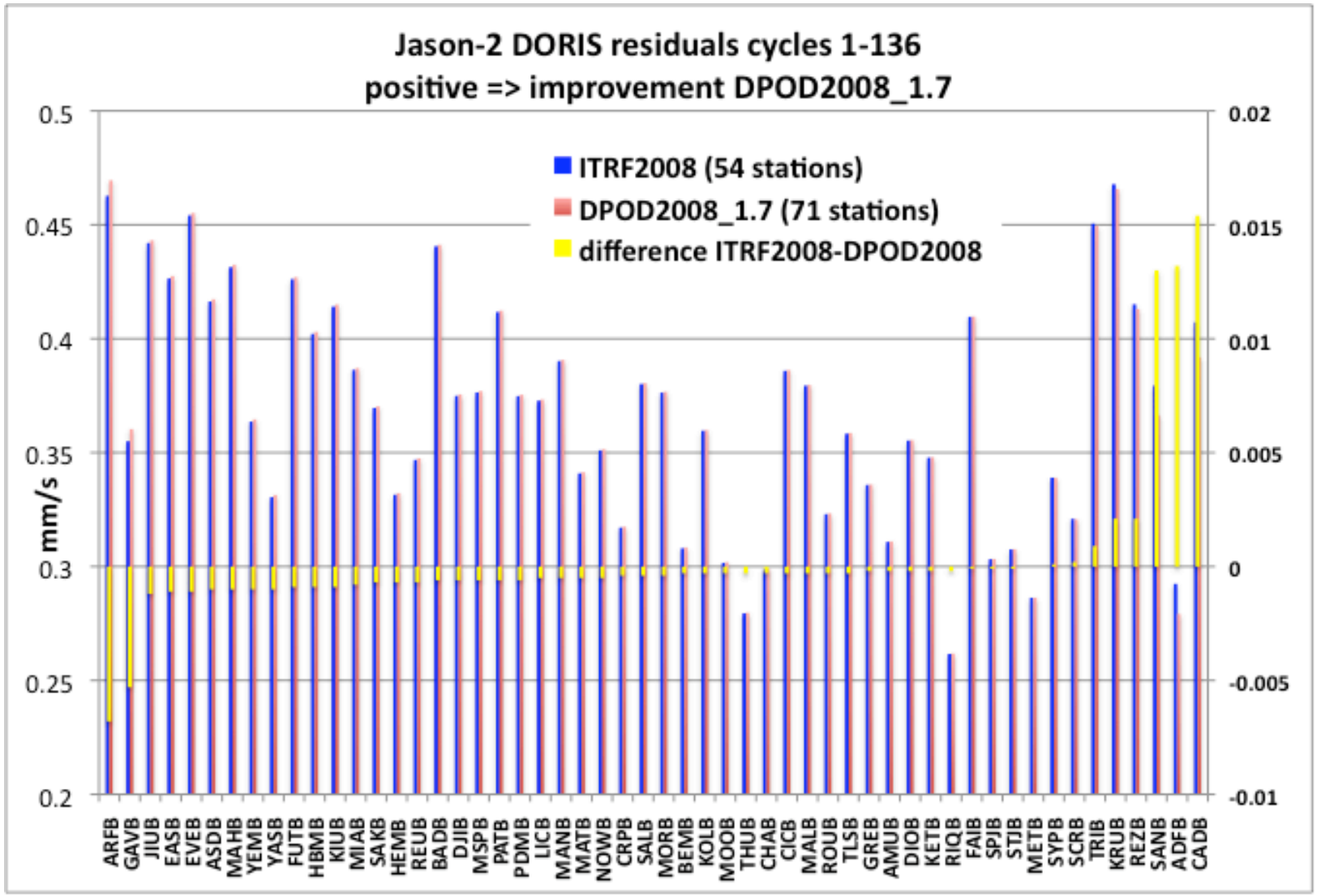
  Consider: EOT11a; TPX072atlas; GOTxx.
- Participate in IERS APLOAD campaign (by August 2012).
- Further improvements (2013). VMF1; Improved non-conservative force modelling; Improved planetary rad. Pressure
- New …. DPOD2008 (v1.7+…..)

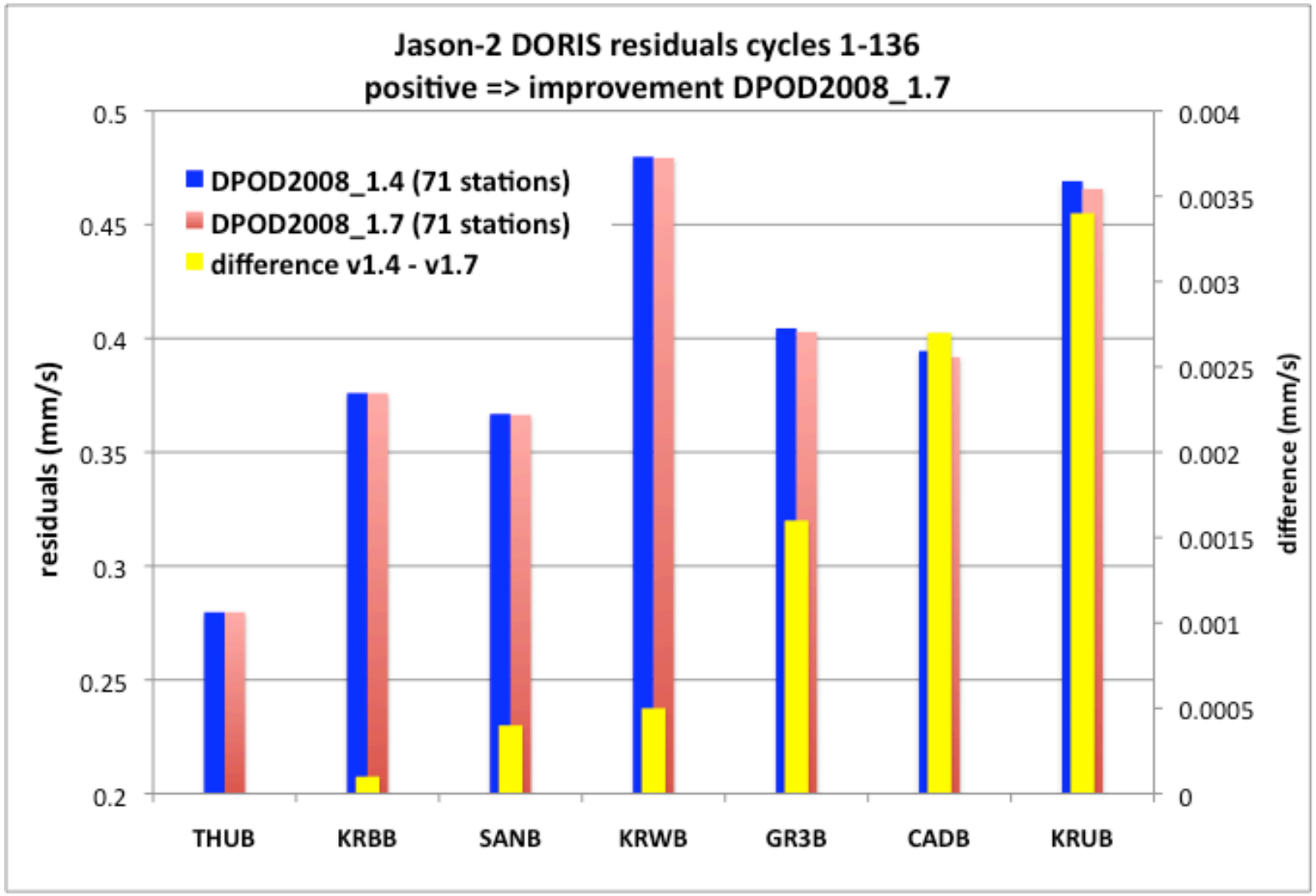
Preliminary Tests DPOD2008 v1.7


Jason-2 DORIS points difference (DPOD2008_1.7 - ITRF2008)
Positive => more data with DPOD2008 complement
points
percent of ITRF2008
Poly.(points)
points difference
percent
60000
50000
40000
30000
20000
10000
0
60
50
40
30
20
10
0
2008
2008.5
2009
2009.5
2010
2010.5
2011
2011.5
2012
2012.5


Jason-2 SLR residual RMS difference for DORIS-only orbits
Positive => Improvement DPOD2008_1.7 over ITRF2008
mm
5
4
3
2
1
0
-1
-2
-3
-4
2008
2008.5
2009
2009.5
2010
2010.5
2011
2011.5
2012
2012.5


Jason-2 Crossover residual RMS difference for DORIS-only orbits
Positive => Improvement DPOD2008_1.7 over ITRF2008 (cycles 1-120)
Jason-2 DORIS-only orbit residuals summary cycles 1-120
external ephem. | DORIS (mm/s) | SLR (cm) | Xover (cm)
ITRF2008 | 0.3816 | 1.875 | 5.522
DPOD2008_1.7 | 0.3815 | 1.876 | 5.521
mm
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
2008
2008.5
2009
2009.5
2010
2010.5
2011
2011.5
2012


Jason-2 DORIS residuals cycles 1-136
positive => improvement DPOD2008_1.7
ITRF2008 (54 stations)
DPOD2008_1.7 (71 stations)
difference ITRF2008-DPOD2008
mm/s
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.02
0.015
0.01
0.005
0
-0.005
-0.01
ARFB GAVB JIUB EASB EVEB ASDB MAHB YEMB YASB FUTB HBMB KIUB MIAB SAKB HEMB REUB BADB DJIB MSPB PATB PDMB LICB MANB MATB NOWB CRPB SALB MORB BEMB KOLB MOOB THUB CHAB CICB MALB ROUB TLSB GREB AMUB DIOB KETB RIQB FAIB SPJB STJB METB SYPB SCRB TRIB KRUB REZB SANB ADFB CADB


Jason-2 DORIS residuals cycles 1-136
positive => improvement DPOD2008_1.7
DPOD2008_1.4 (71 stations)
DPOD2008_1.7 (71 stations)
difference v1.4 - v1.7
residuals (mm/s)
difference (mm/s)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
THUB
KRBB
SANB
KRWB
GR3B
CADB
KRUB

Implementation of VMF1 in GEODYN

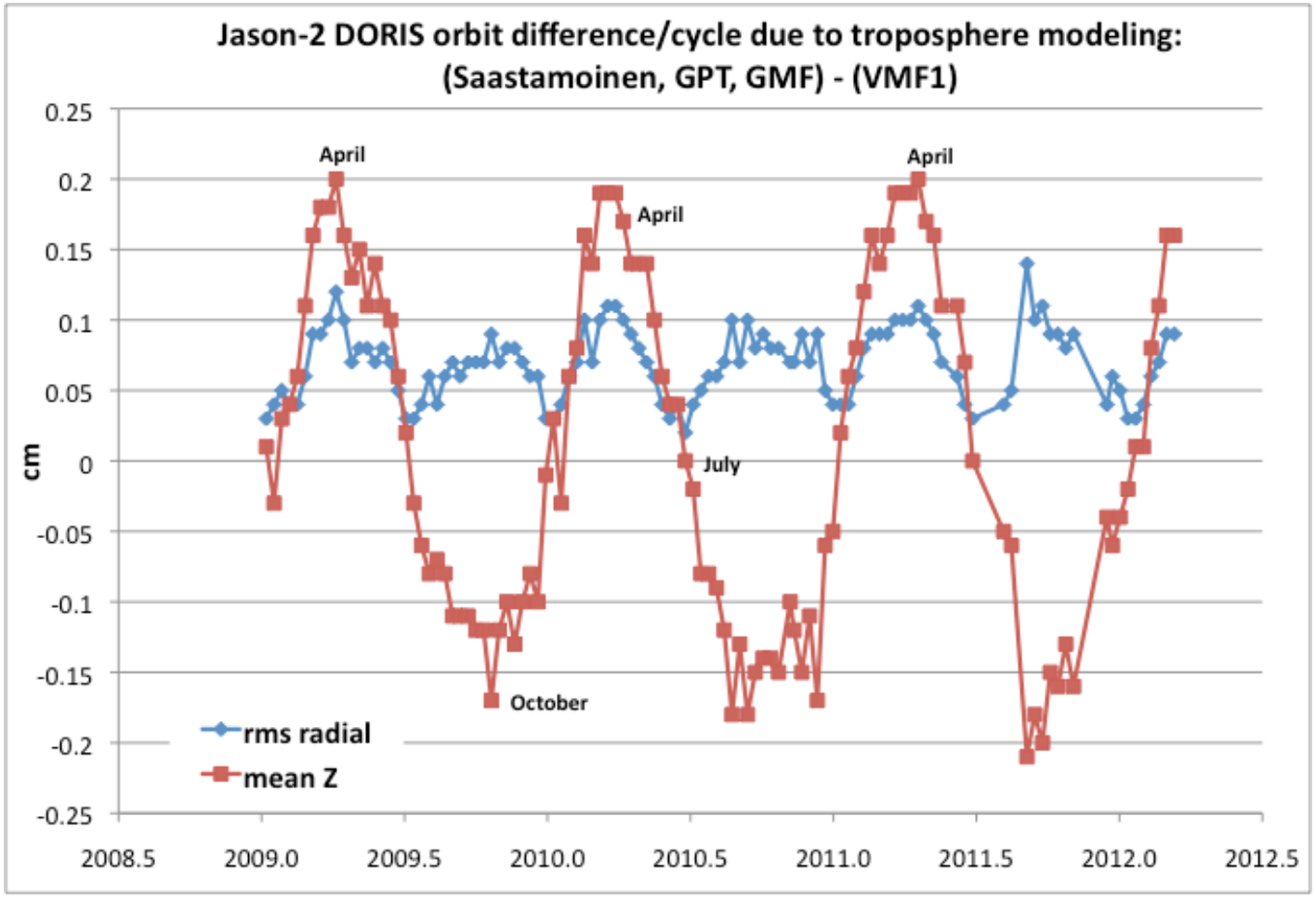
- Implementation underway to support GPS, VLBI & DORIS processing (all radiometric data types).
- Use 6-hrly grids; Retrieve hydrostatic & wet delays + mapping function; convert Zenith delays to station height according to Kouba (2009, JoG).
- Use of the grids gives more flexibility than using station-specific files.
- Preliminary testing on Jason2 (*results next slide*).
- Further validation will be done:

(1) Intercomparison of total zenith delays with independent GPS-troposphere product @ co-located sites.

(2) Assess impact on GEODYN processing of VLBI data; Are agreement with CALC/SOLVE of estimation of VLBI-related parameters improved?

(3) Compare grid-values of delays with pt values at certain stations (e.g. VLBI observation times).

Impact on Jason-2 POD



- 1 mm RMS signal in radial orbit differences;
- Annual signal in Z orbit differences – peak-to-peak of up to 3-4 mm.

Lemoine et al., GSC AC Report, May 31, 2012

Finita la Comedia.