

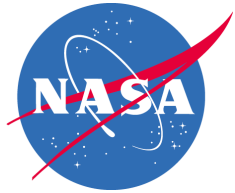
# GSC Analysis Center Report

*F.G. Lemoine, D.S. Chinn, N.P. Zelensky,  
D.D. Rowlands, D.E. Pavlis, S. Melachroinos*

*5<sup>th</sup> COL Meeting*

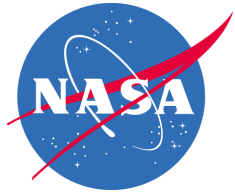
*München, DGFI, Germany*

*May 29, 2012*



# Outline

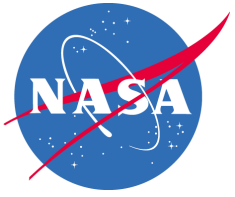
- I Tests to update DORIS SINEX series gscwd12.
- II Implementation of VMF1 in GEODYN.
- III Preliminary Tests: Application of Atmospheric Loading on Jason2



# DORIS SINEX series tests

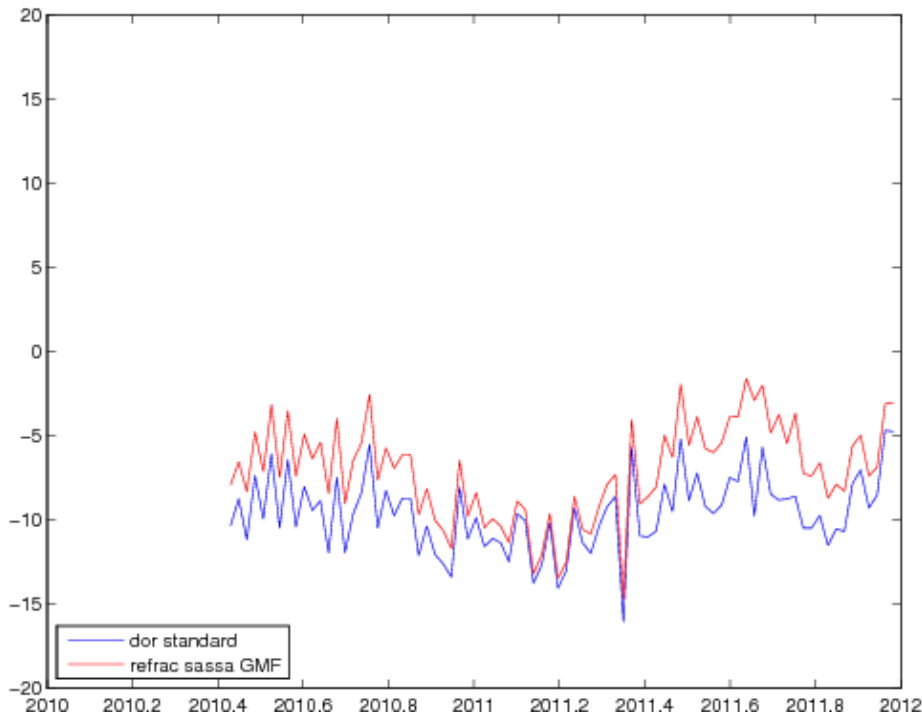
- I. Update mapping function to GMF from Niell (*Niell used in ITRF2008; gscwd12 continues this to avoid data series discontinuities*)
- II. Use opr-12hrs on Jason-2 vs. opr-24hrs. (*Zelensky et al., 2011, AGU, showed reduction of 118-day signal in SLR+DORIS dynamic orbits when compared to JPL red-dyn or CNES/GDR-D orbits*)
- III. SPOT5-SAA test (remove four SAA stations on SPOT5, Adjust separately) *test needs to be redone*).

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

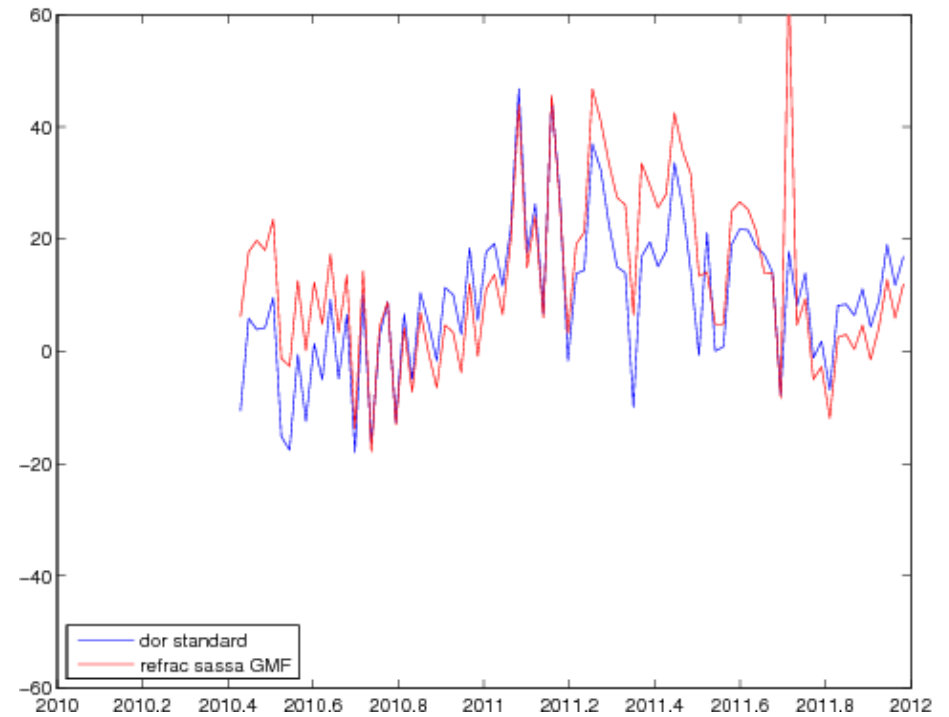


# Update to GMF from Niell

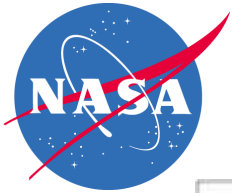
Scale



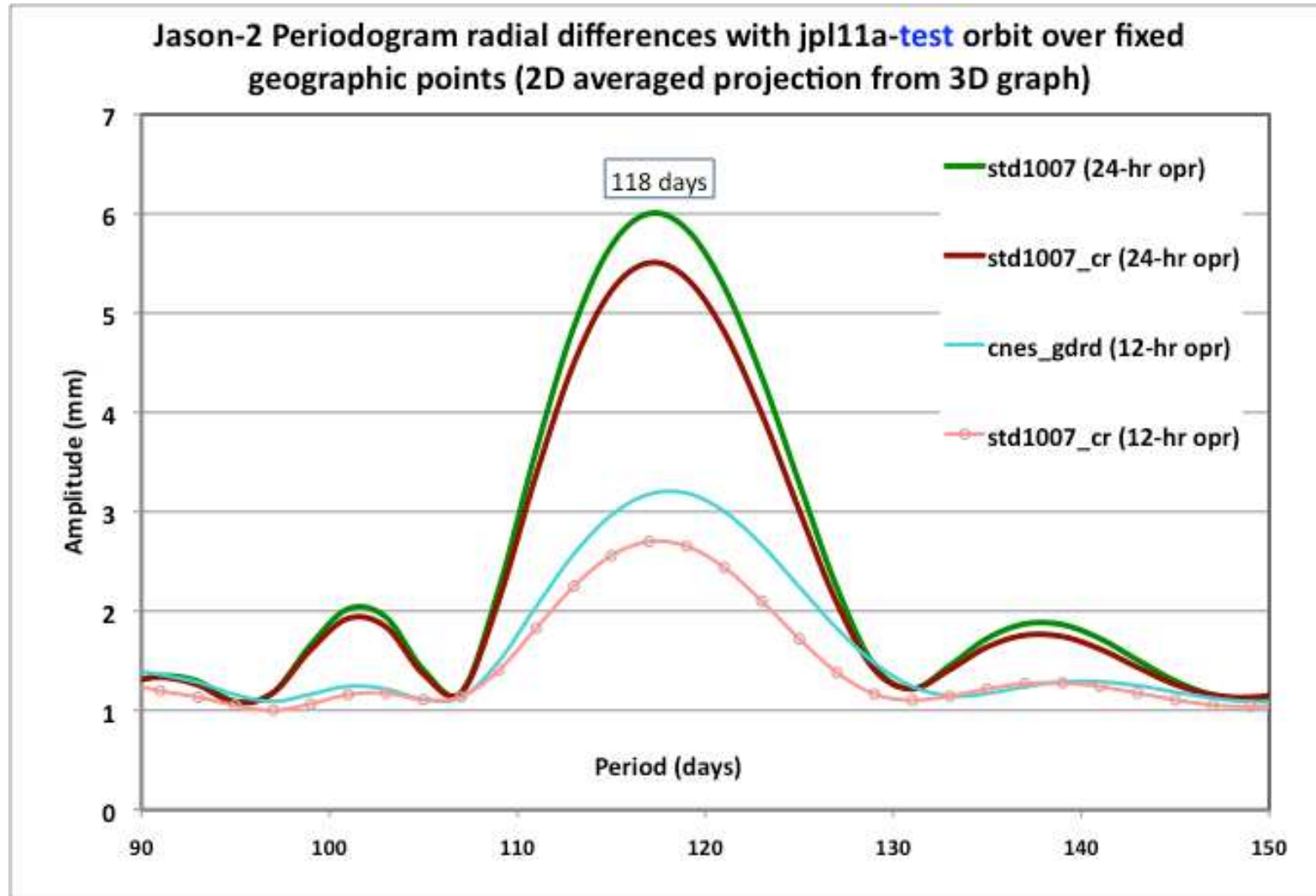
Tz

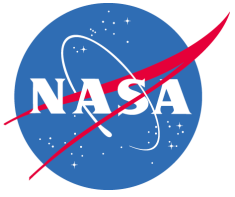


- +2-4 mm in scale;
- Semiannual change in Tz.



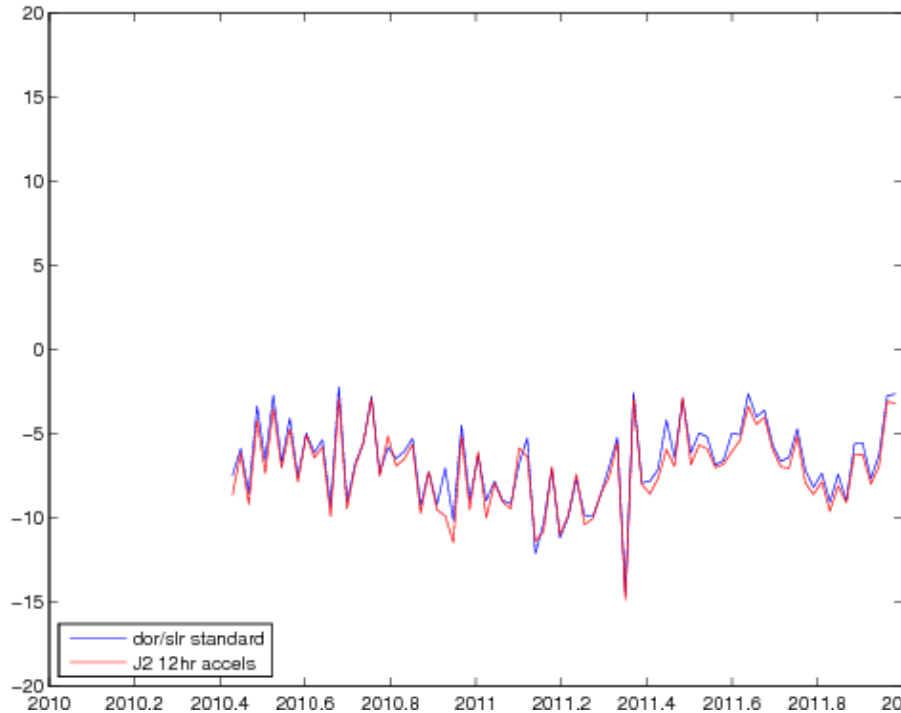
# Apply 12-hr opr on Jason2



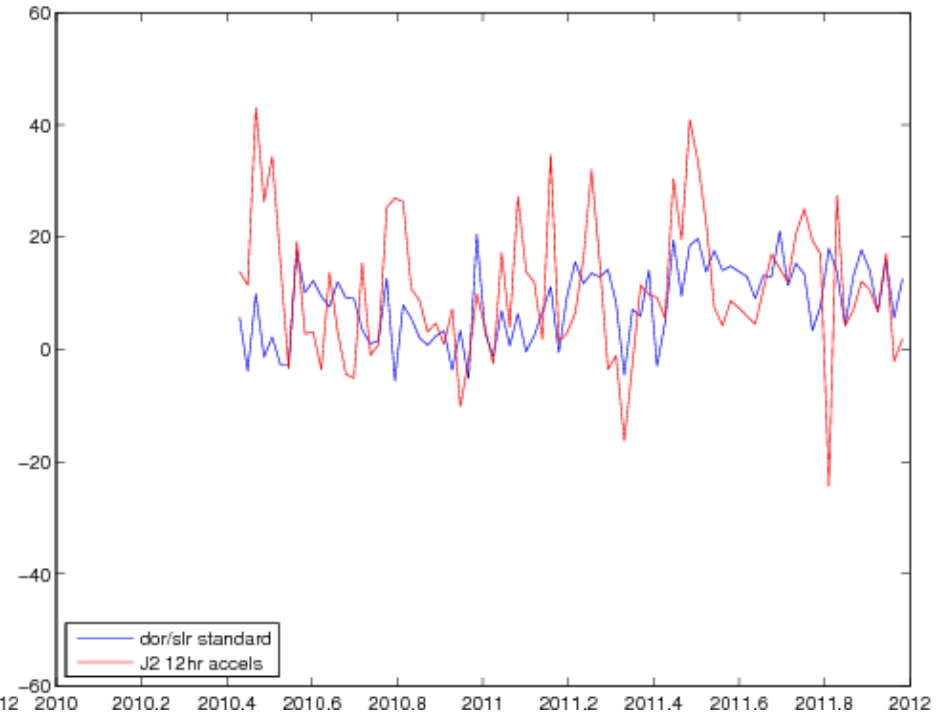


# Apply 12-hr opr on Jason2 (1)

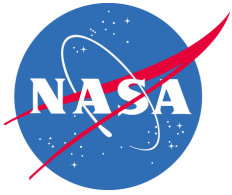
Scale



Tz

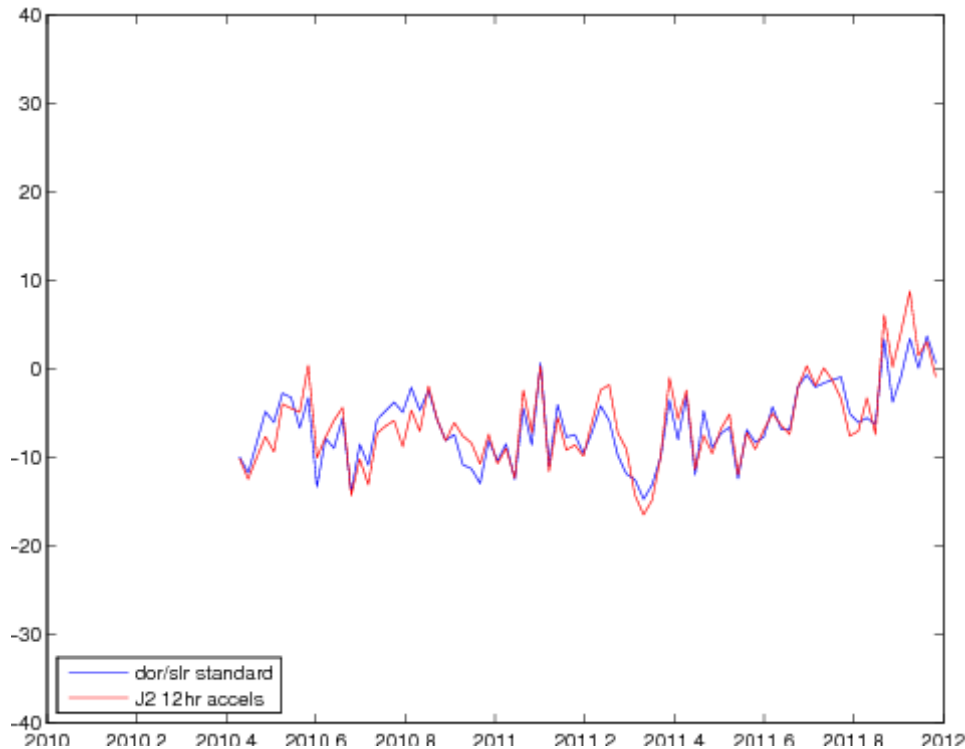


- Negligible effect on scale;
- Deterioration in Tz (more scatter)

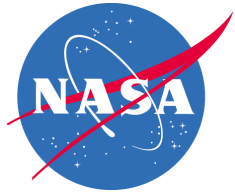


# Apply 12-hr opr on Jason2 (2)

Tx



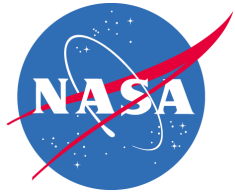
- ~118-day difference in Tx, Ty differences?
- Need longer time series in order to be able to do spectral analysis and verify if beta prime signal reduced in Tx and Ty.
- Further testing necessary. Would time-correlated opr's adjusted more frequently stabilize Tz and still remove Tx & Ty signal?



# Next GSC IDS SINEX Series Plans

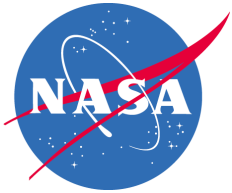
- Update to GMF/Saastoimonen.
- More opr adjustments Jason2?
- New geopotential model
  - static field: GOC02S (*GRACE+GOCE+Lageos+CHAMP*)?
  - Time-varying: TBD. Must be valid 1993-2012.
- New Annual+ Semiannual harmonics
  - GRACE-derived, multi-year fit.
- New ocean tide model:
  - >tides and ocean loading & tidal geocenter.
  - Consider: EOT11a; TPX072atlas; GOTxx.
- Participate in IERS APLOAD campaign (hopefully by August 2012).
- Further improvements (2013). VMF1; Improved non-conservative force modelling; Improved planetary rad. pressure



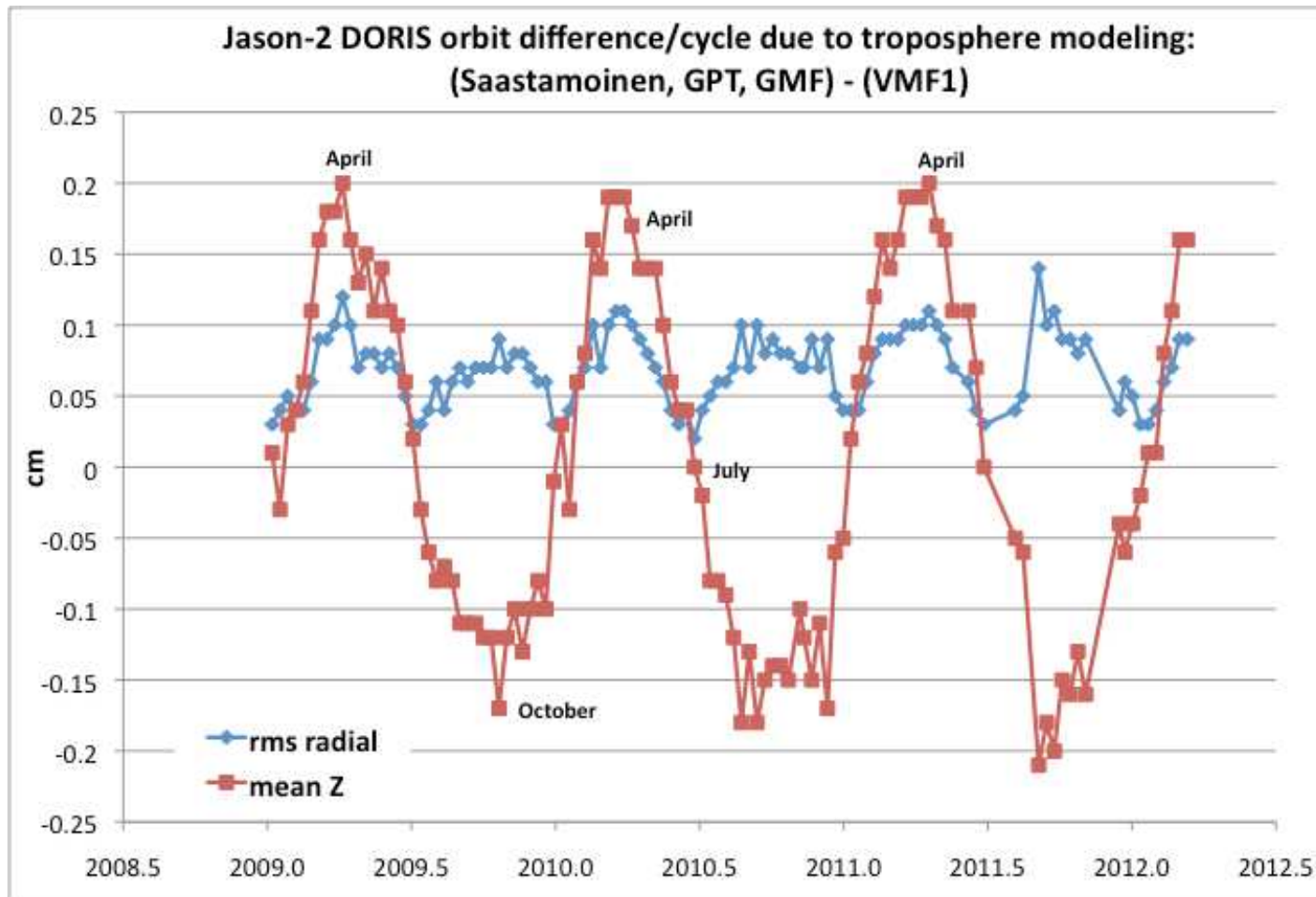


# Implementation of VMF1 in GEODYN

- 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 point values at certain stations (e.g. VLBI observation times).

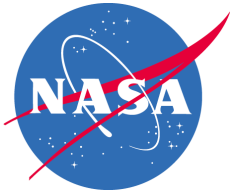


# Impact on Jason-2 POD



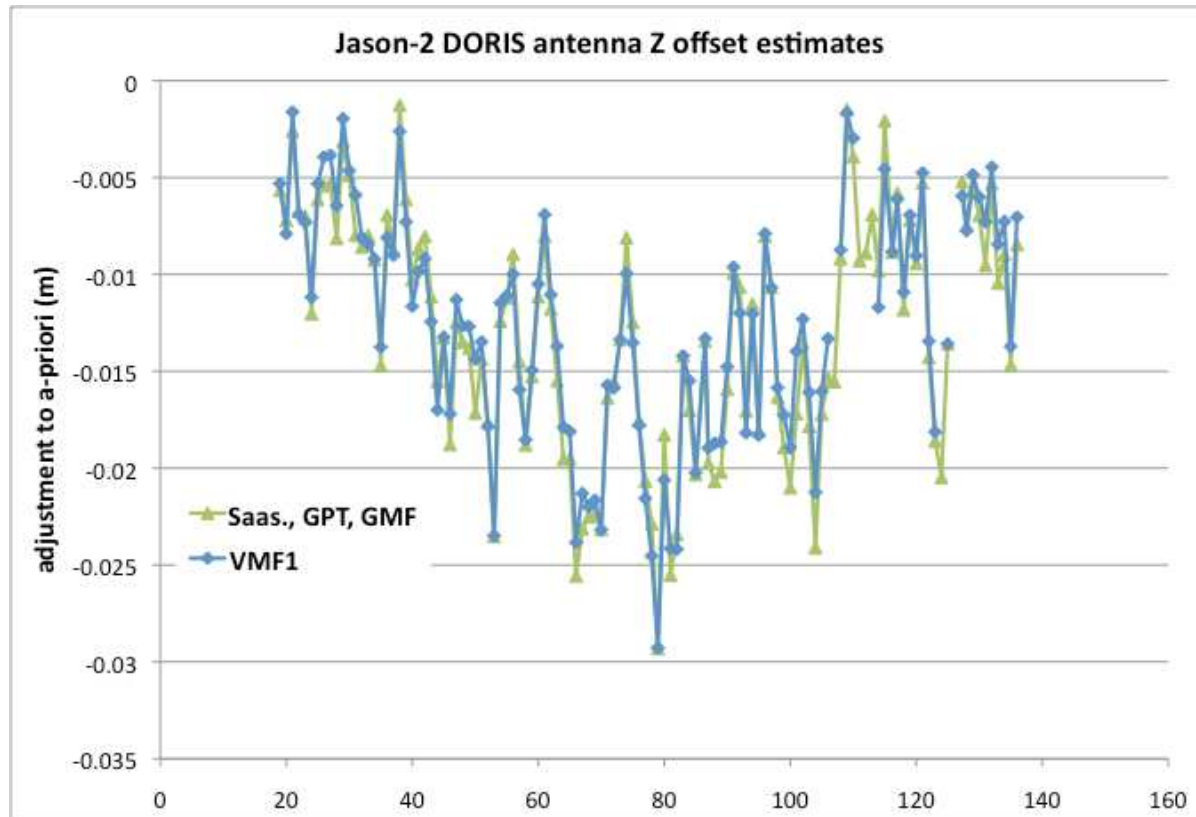
- 1 mm RMS signal in radial orbit differences;
- Annual signal in Z orbit differences – peak-to-peak of up to 3-4 mm.

Lemoine et al., CSC AC Report, May 29, 2012

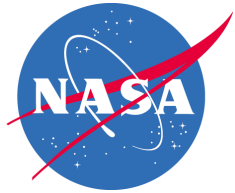


# Impact on Jason-2

## DORIS Z-Offset Correction

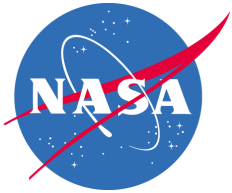


- Little difference between GMF/GPT & VMF1.
- There is another effect on Jason2 that requires explanation or it is a still-unknown artifact of our processing..



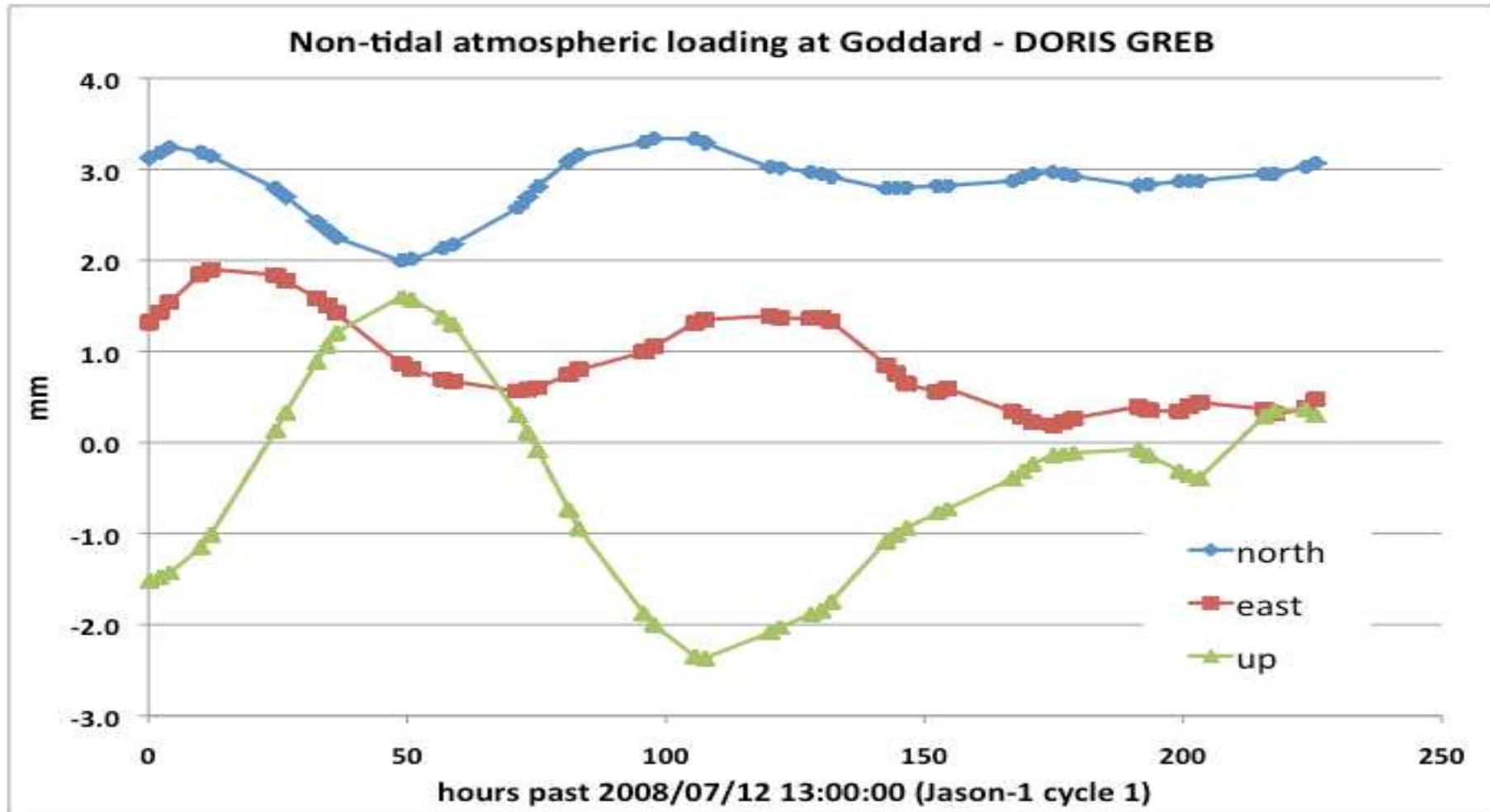
Evaluation of non-tidal atmospheric station loading on SLR/DORIS Jason-2 POD with GEODYN @ NASA GSFC. Apply Atmospheric Loading at the observation Level on Jason-2, for 57 cycles (~2008.5-2010) and evaluate orbit differences using SLR+DORIS data.

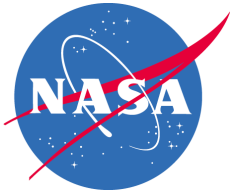
- “nominal” orbit strategy includes SLRF2008 / DPOD2008 stations, and the Eigen\_gl04s gravity field (*std1007 parameterization*)
- “apload\_nos1s2” non-tidal atmospheric station surface displacements from ECMWF 6-hour pressure data (*from Jean-Paul Boy, EOSt/Strasbourg, 2012*).



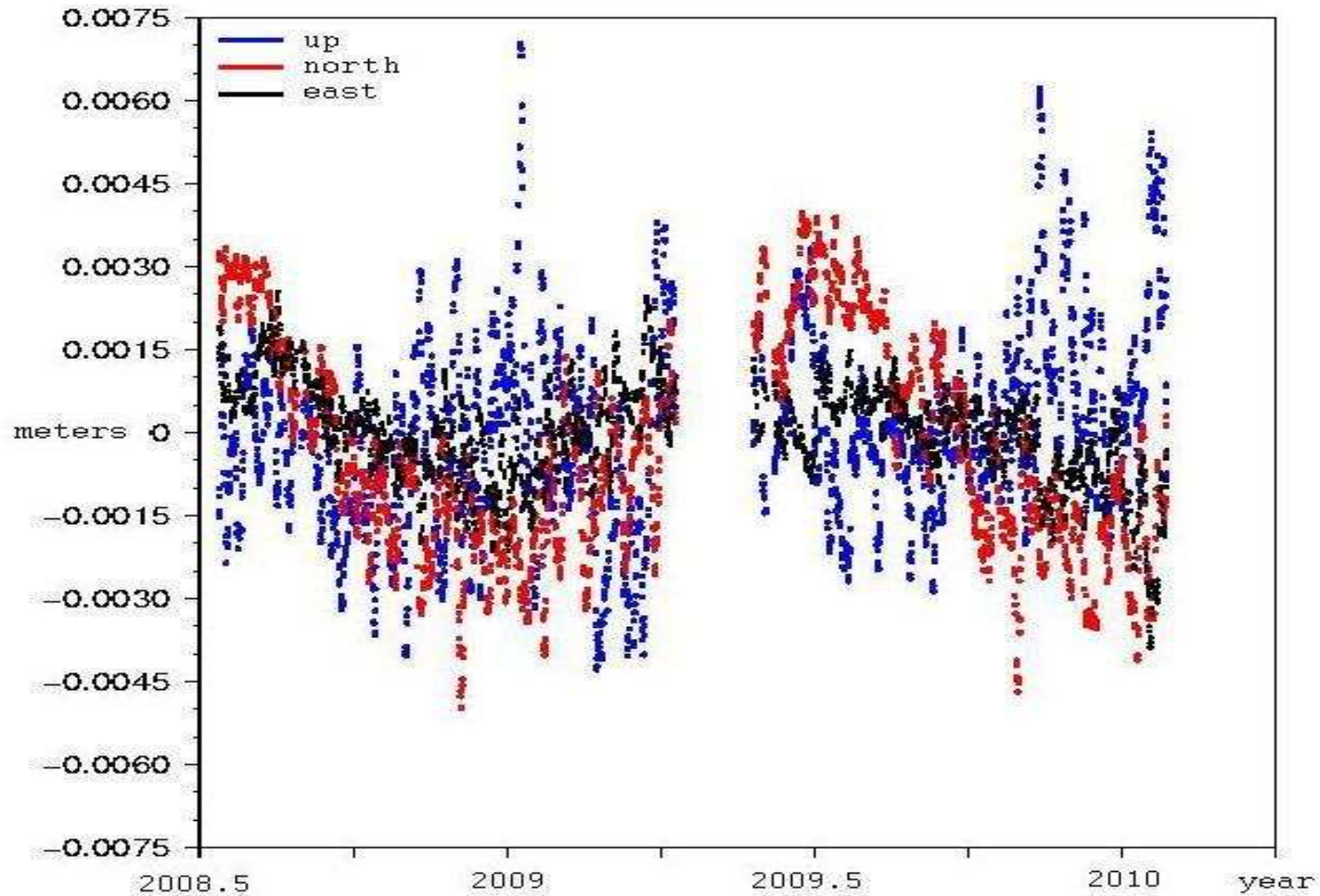
# APLOAD Correction at Greenbelt (from ECMWF-6hr)

(for Jason2 Cycle 1, July 2008)

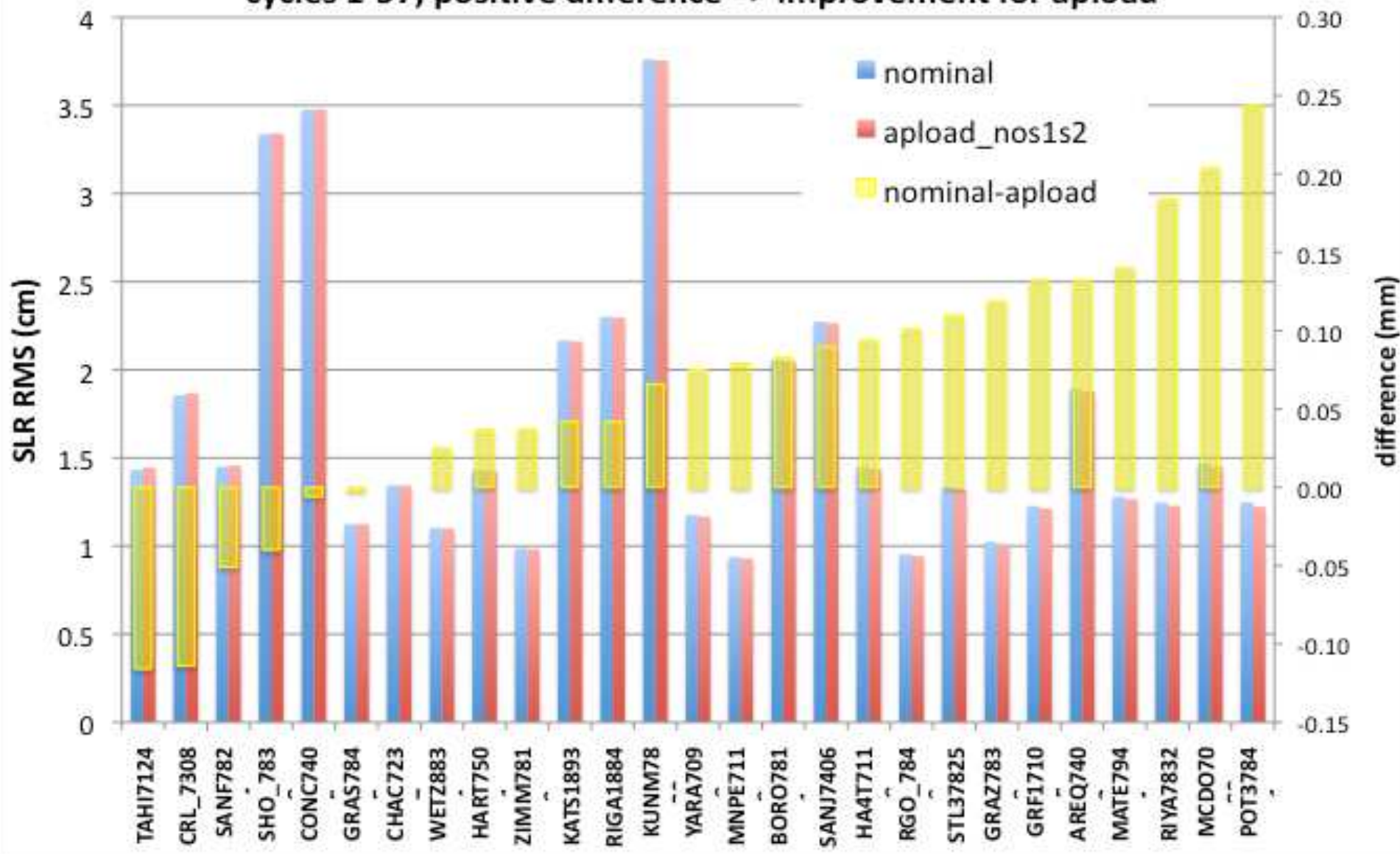


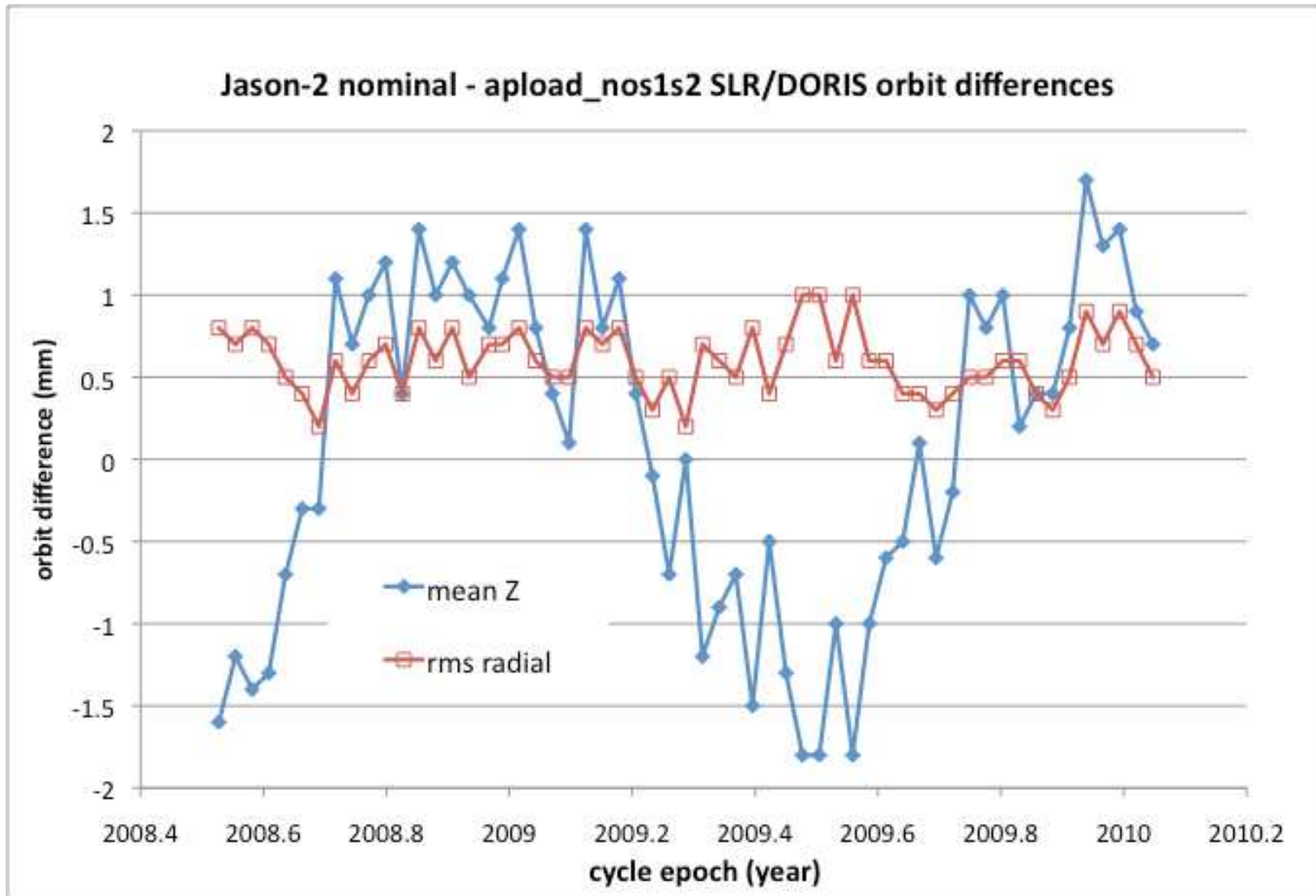
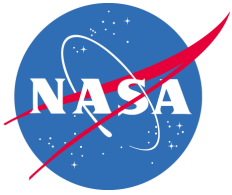


# APLOAD Correction at Greenbelt (from ECMWF-6hr) (for Jason2 Cycles 1-57)

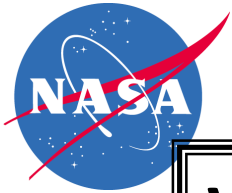


### Evaluation non-tidal atmospheric loading on Jason-2 SLR/DORIS POD cycles 1-57; positive difference => improvement for apload









## Other GEODYN Improvements Underway

### **VLBI**

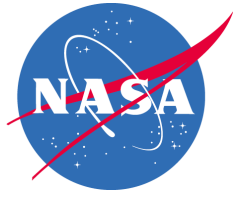
- Addition of ability to estimate nutations into GEODYN.
- Continue inter-calibration of CALC/Solve & GEODYN.

### **GPS**

- Add capability to fix ambiguities.
- Edit half-cycle slips (Jason2)
- Improve radiation pressure modelling (probably implement macromodel, rather than GPSM04).
- Jan Kouba (2009) attitude model is implemented.

### **DORIS & SLR**

- Improved radiation pressure modelling. Self-shadowing for altimetric & DORIS satellites.
- Improved planetary radiation pressure models.



Thank you for your attention.