CENTRE NATIONAL D'ÉTUDES SPATIALES

JASON-2 POD STATUS

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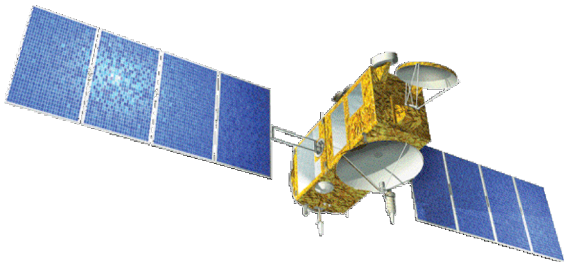


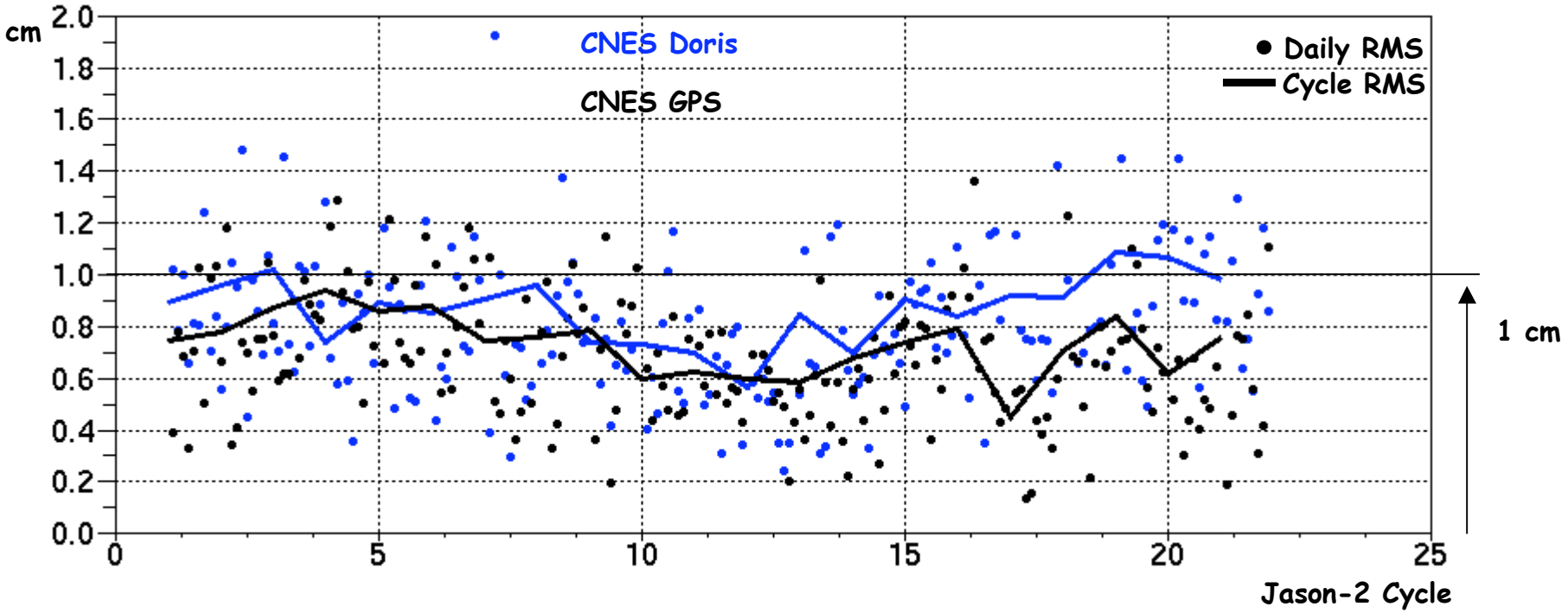
Doris Analysis Working Group Meeting - Paris, 23-24 March 2009

Contents

- Status of Jason-2 D/L/G POD processing at CNES
  - Consistency of different tracking techniques
  - Comparison with orbits from other groups (GSFC, ESOC)
- JASON-2 Doris Phase Center Offset

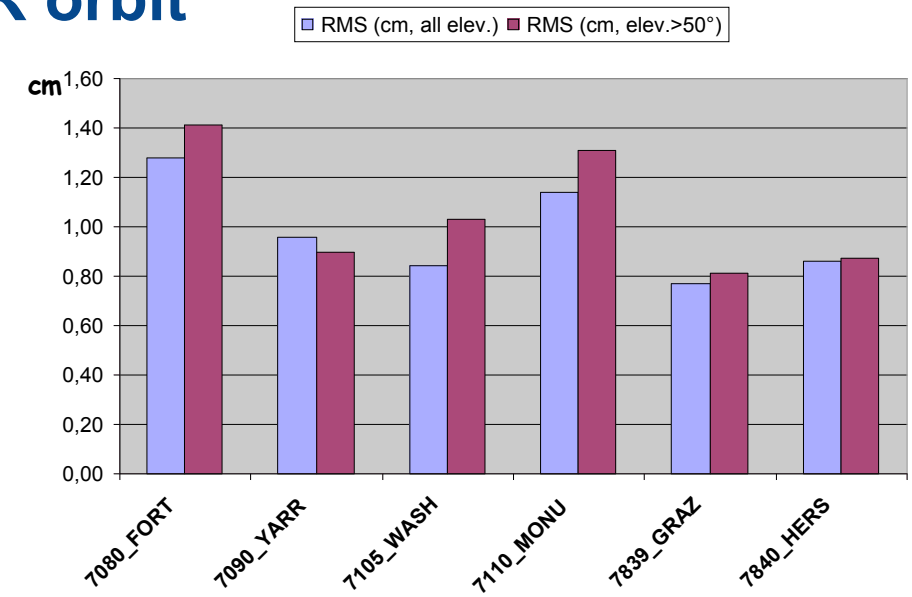
Comparison of Doris and GPS only orbits with respect to D+L+G POE

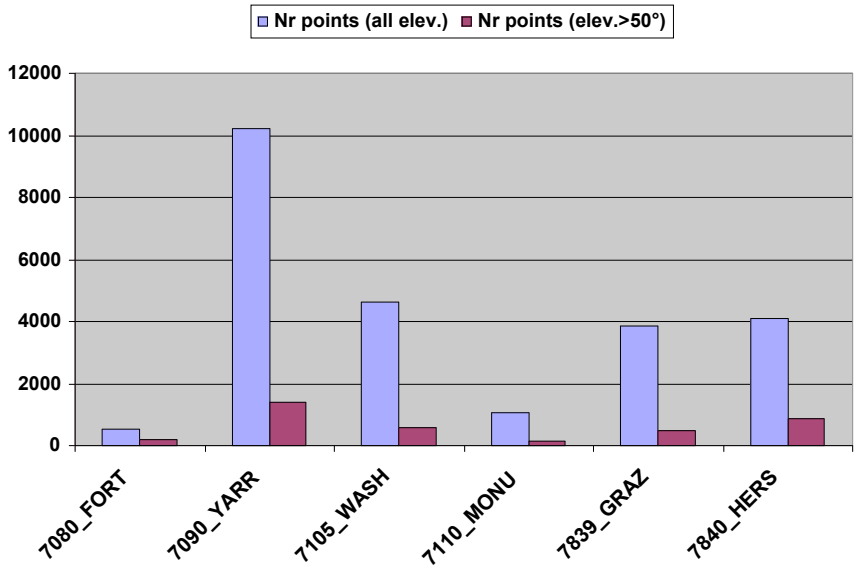
- Good radial consistency between the standard GDR POE (D+L+G) and orbits from intermediate processing steps (Doris only , GPS only) , < 1 cm RMS per cycle

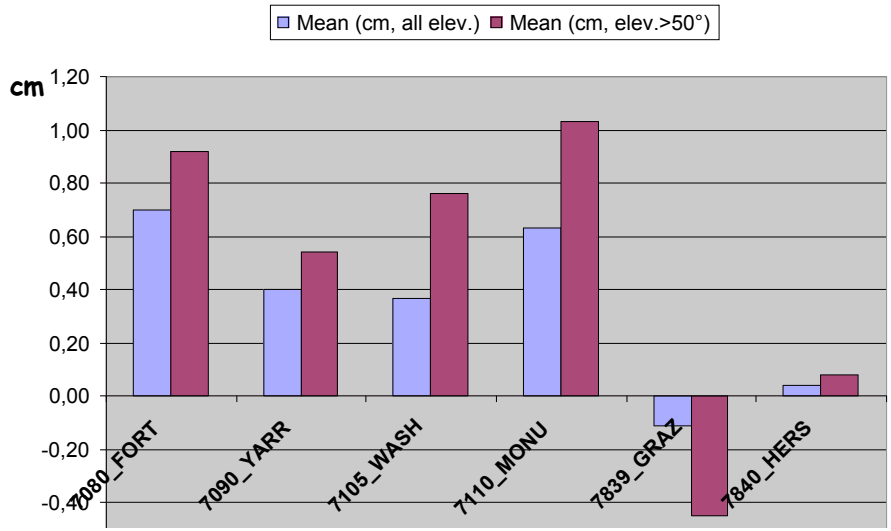


SLR Residuals on D+L+G GDR orbit

- Post-fit SLR residuals at 1 cm level on reference stations (LPOD05v11)
  - Below 1 cm, where most measurements are performed
- Dependency of SLR residuals from elevation is not very significant

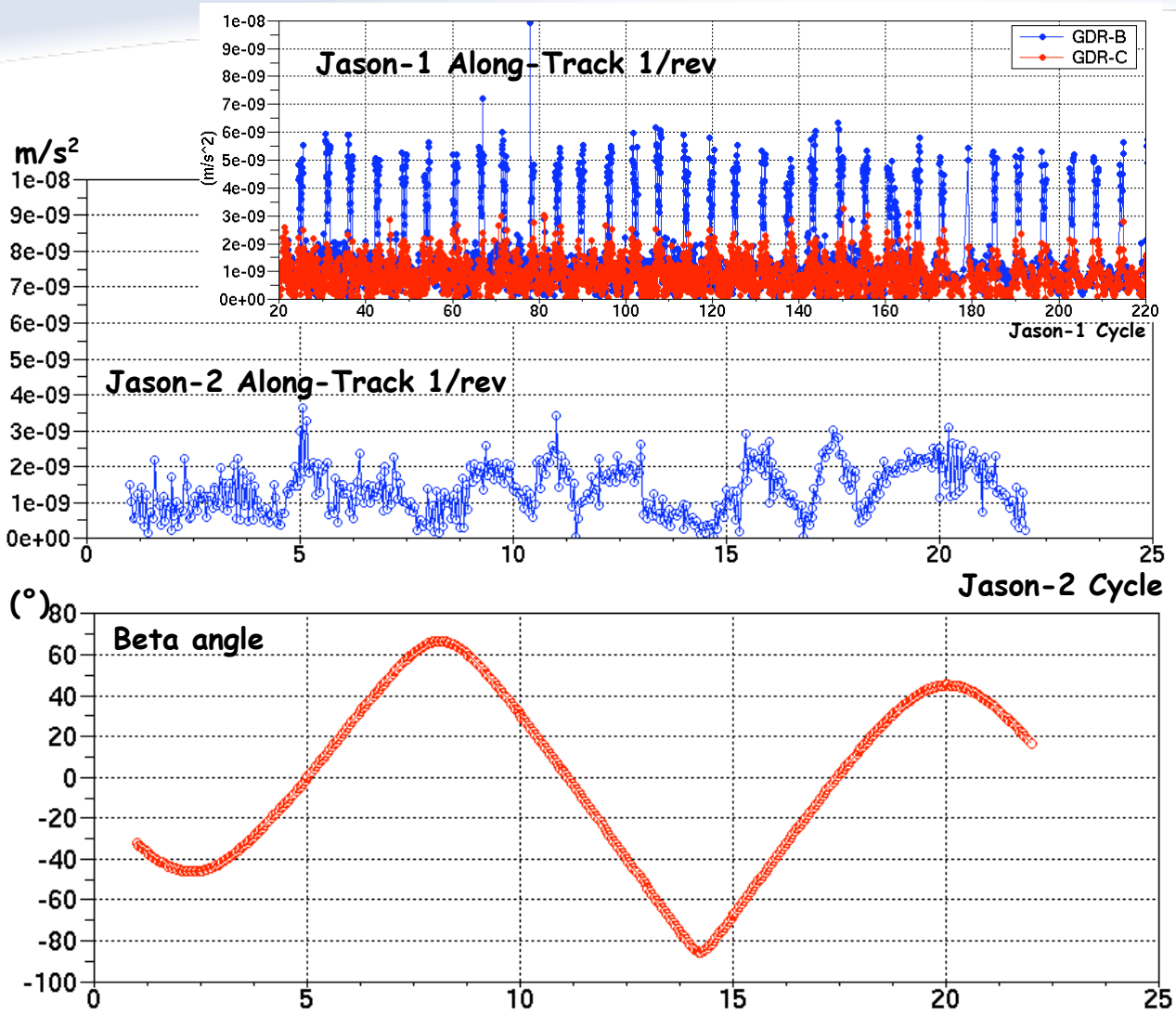




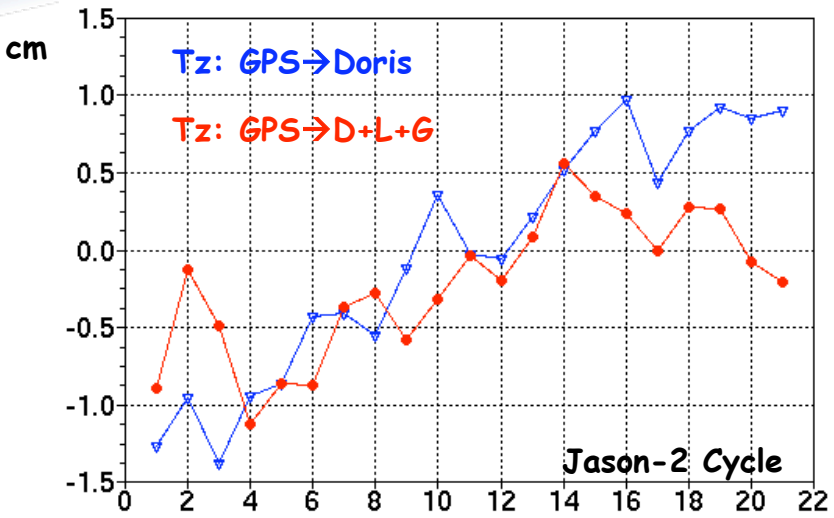


Surface forces models

- Amplitude of along-track 1/rev error is similar to that found on Jason-1 (GDR-C model)
- The model was initially scaled to 1.0 according to results on cycle 1-3. The behavior seem to have changed with time
- No major impact expected on the orbit
- Further analysis is needed to better calibrate the model

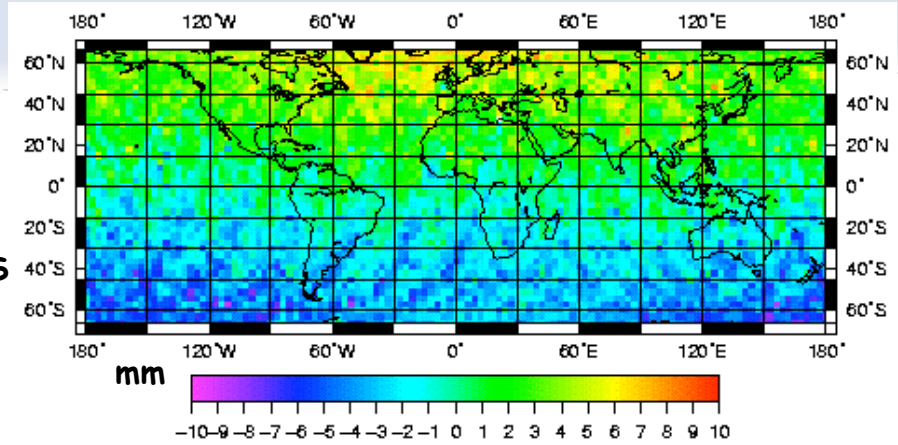


Z Centering

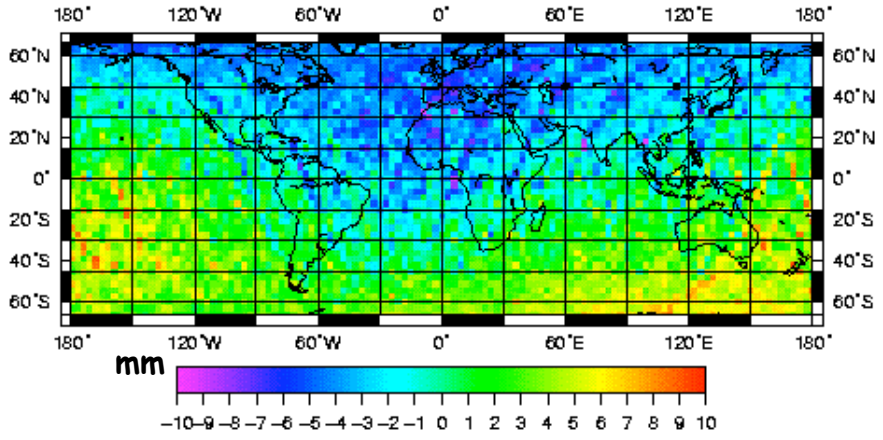


- Clear trend in the Z shift between Doris and GPS orbits: part of annual signal?
- GDR orbit (D+L+G) is between the two

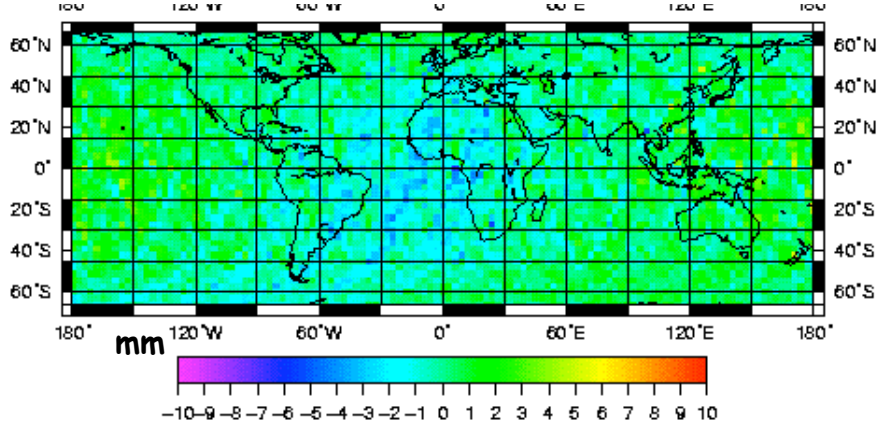
Mean radial difference GPS - DORIS CY 1-11



Mean radial difference GPS - DORIS CY 11-21



Mean radial difference GPS - DORIS CY 1-21

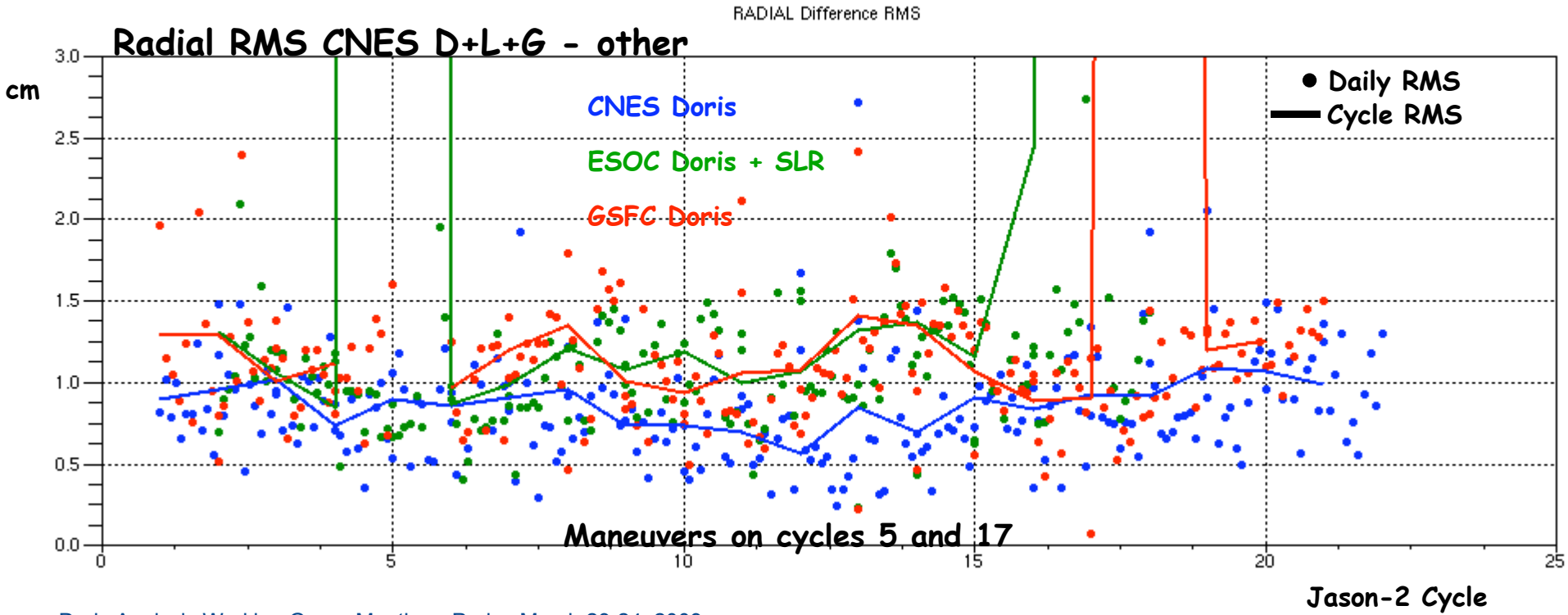


Doris-based orbits with respect to reference D+L+G POE

- **Following slides :**
  - **Radial , Along-track , Cross-track comparison of various Doris based orbits with respect to CNES reference orbit (DLG POE)**
    - CNES Doris-only orbits (RINEX based)
    - ESOC *.ja2.v2.sp1
    - GSFC gsfc_ja2_poe_dor_std0809.*
  - **SLR analysis**

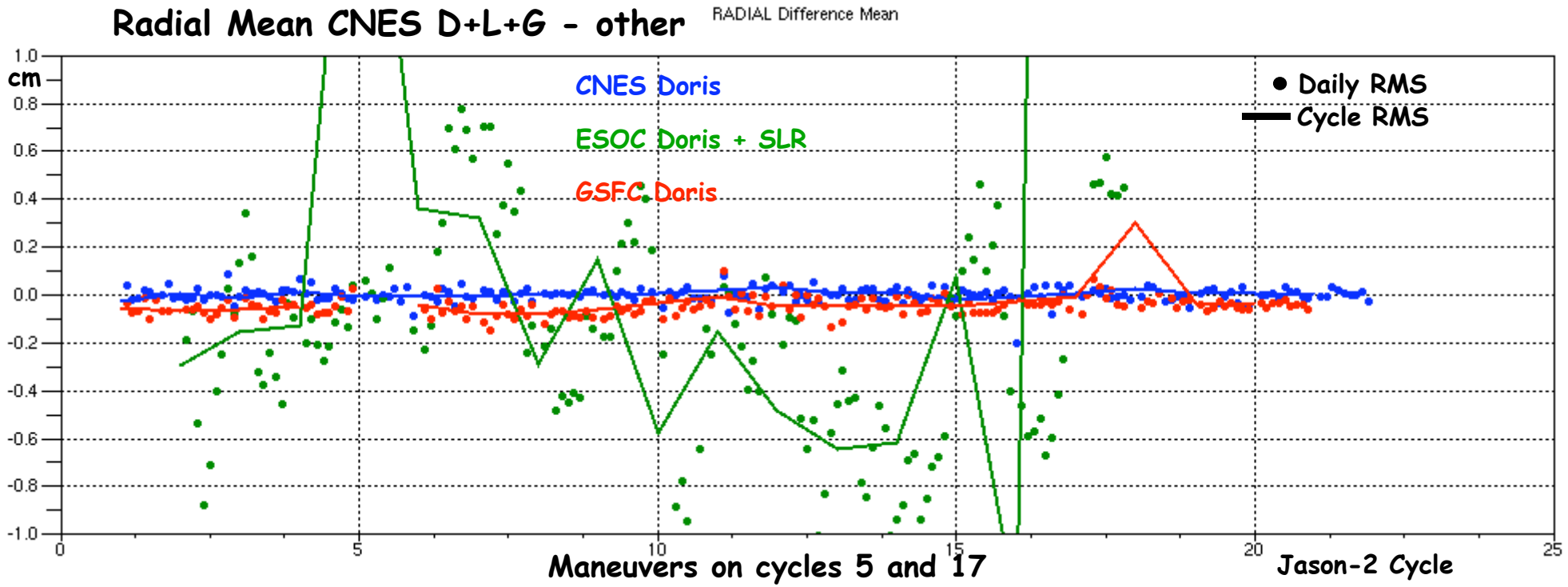
Doris-based orbits with respect to reference D+L+G POE

- Good radial RMS consistency between different orbits (< 1.5 cm RMS)
- CNES Doris closer to CNES D+L+G (similar modeling)



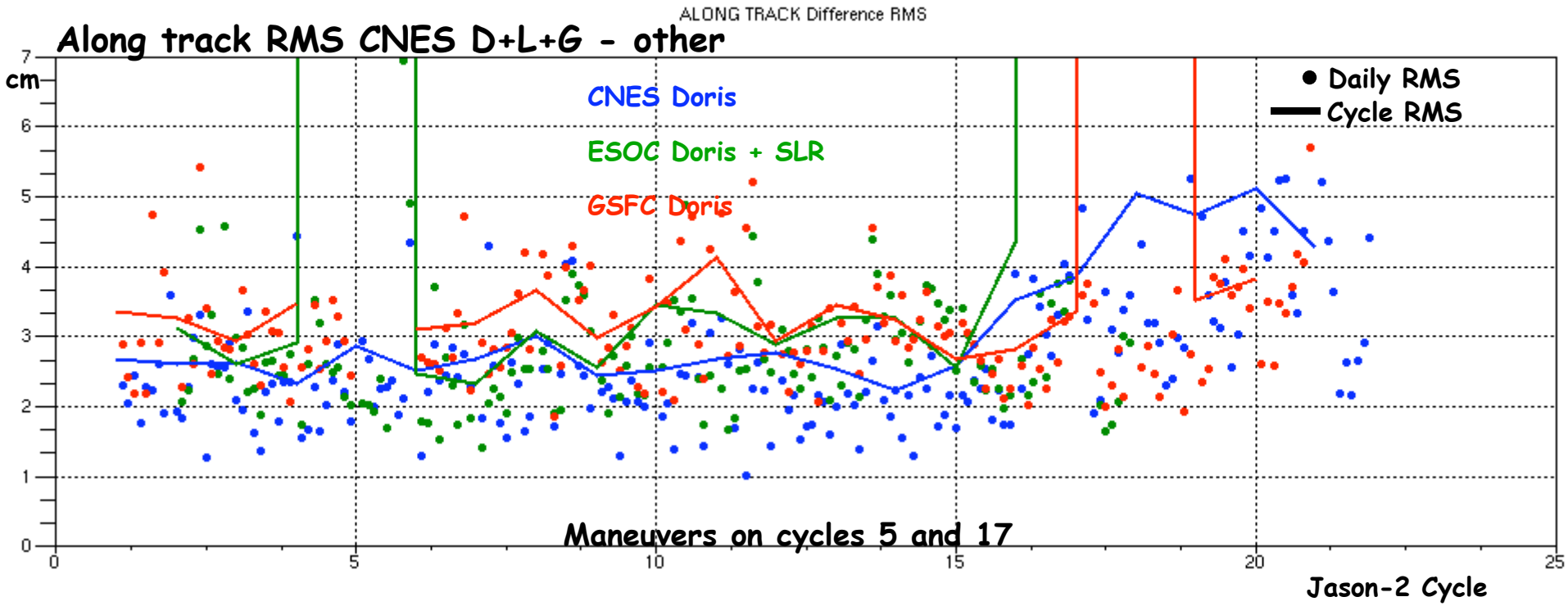
Doris-based orbits with respect to reference D+L+G POE

- Significant radial signal in the mean difference of ESOC orbit wrt to other orbits at 120 days period



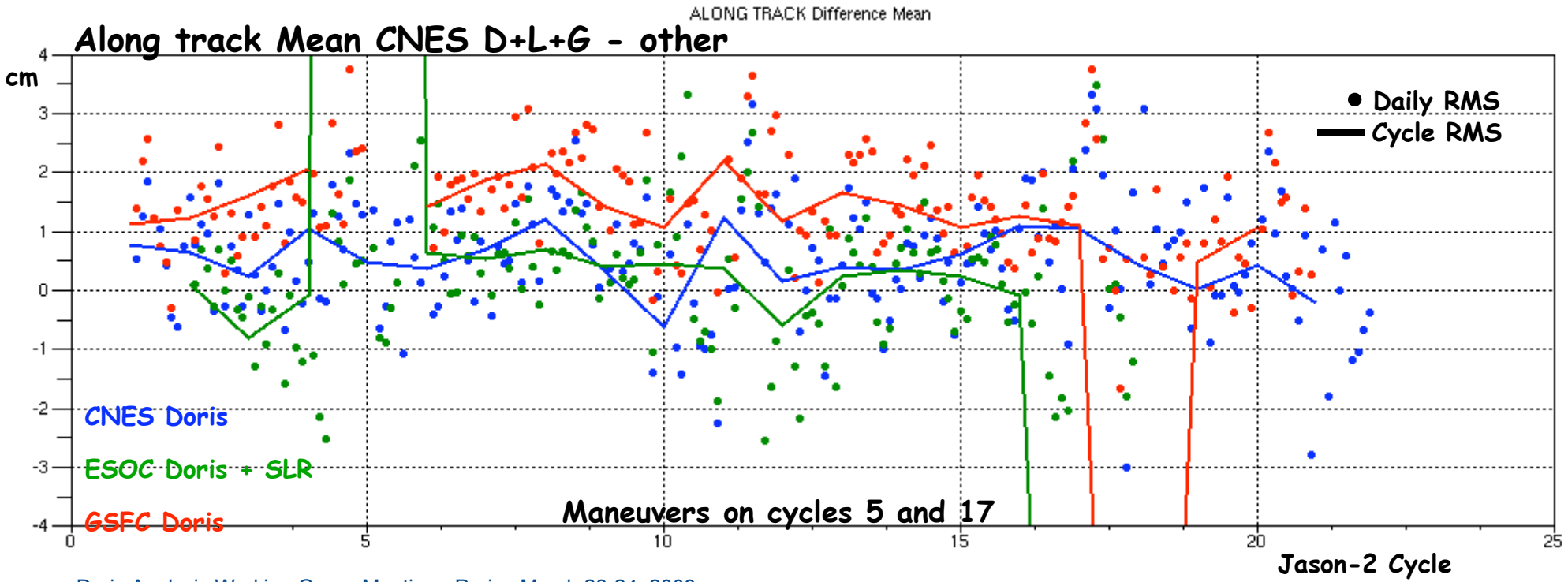
Doris-based orbits with respect to reference D+L+G POE

- Drag coefficients of CNES Doris only solution more constrained along-track from cycle 16 for test purposes



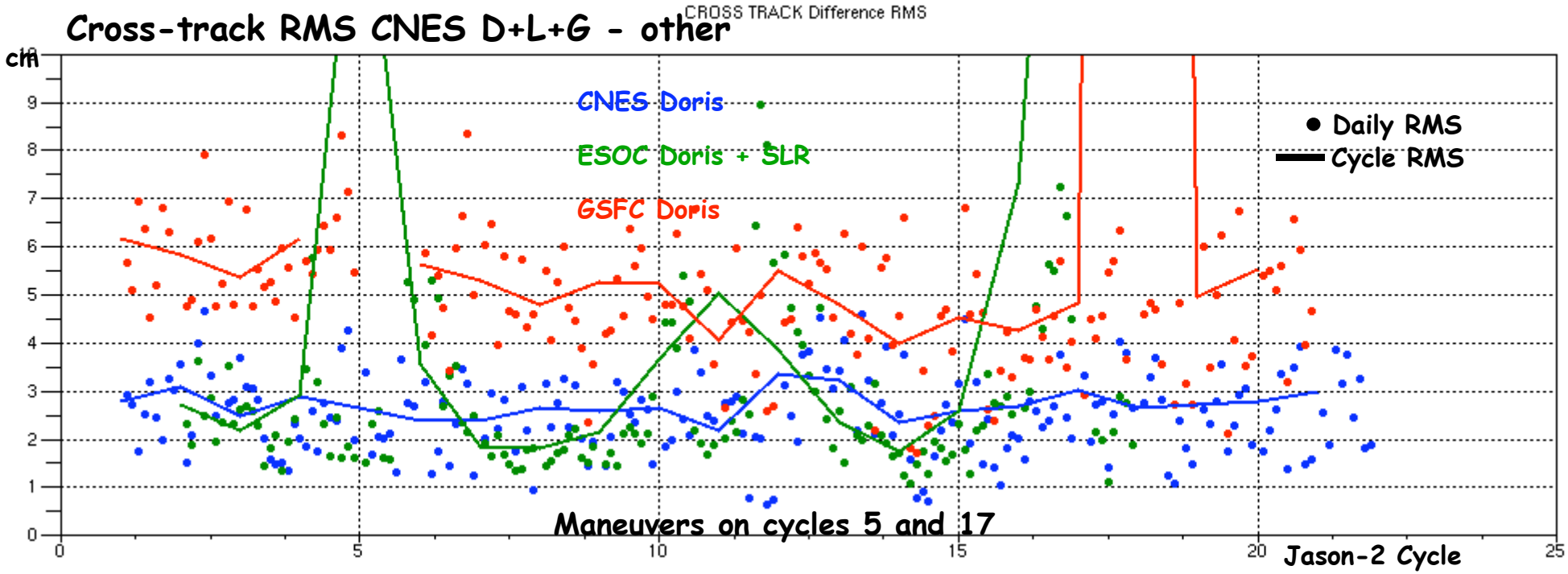
Doris-based orbits with respect to reference D+L+G POE

- Along track bias of CNES Doris orbits with respect DLG POE orbit is below 1 cm
  - Based on current analysis, no time-bias needs to be applied in Doris processing



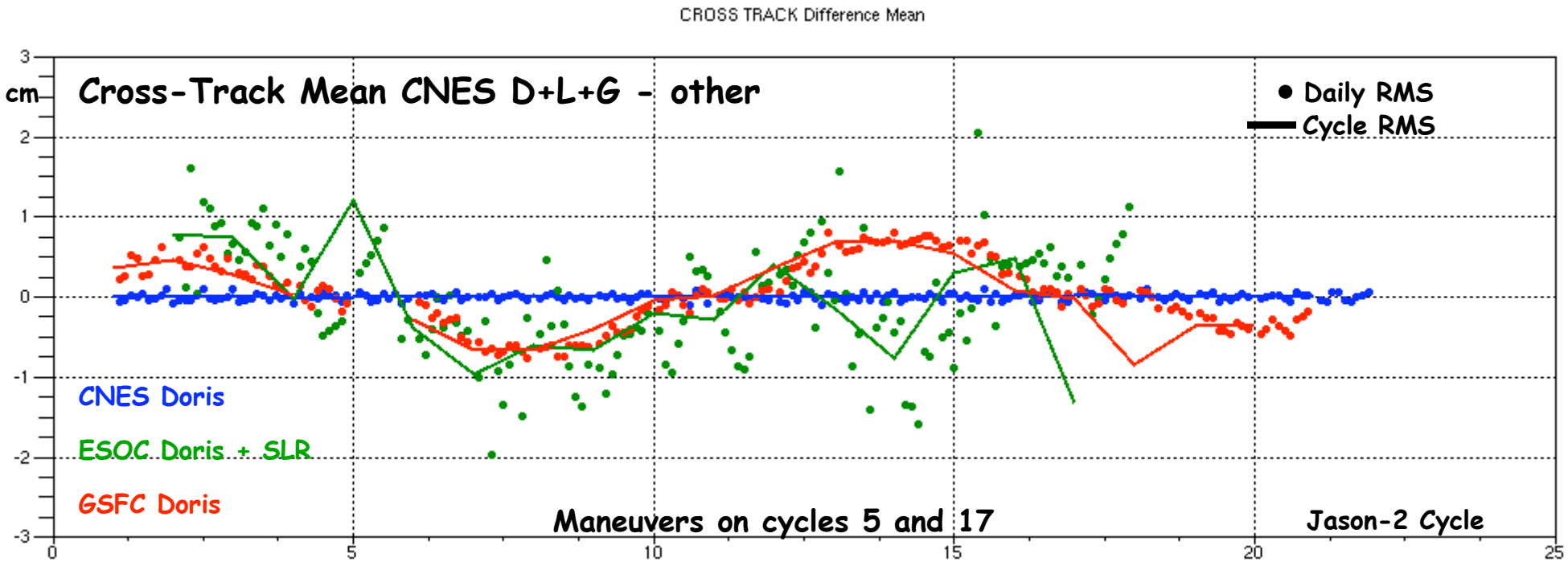
Doris-based orbits with respect to reference D+L+G POE

- Higher cross-track dispersion of GSFC Doris only orbit



Doris-based orbits with respect to reference D+L+G POE

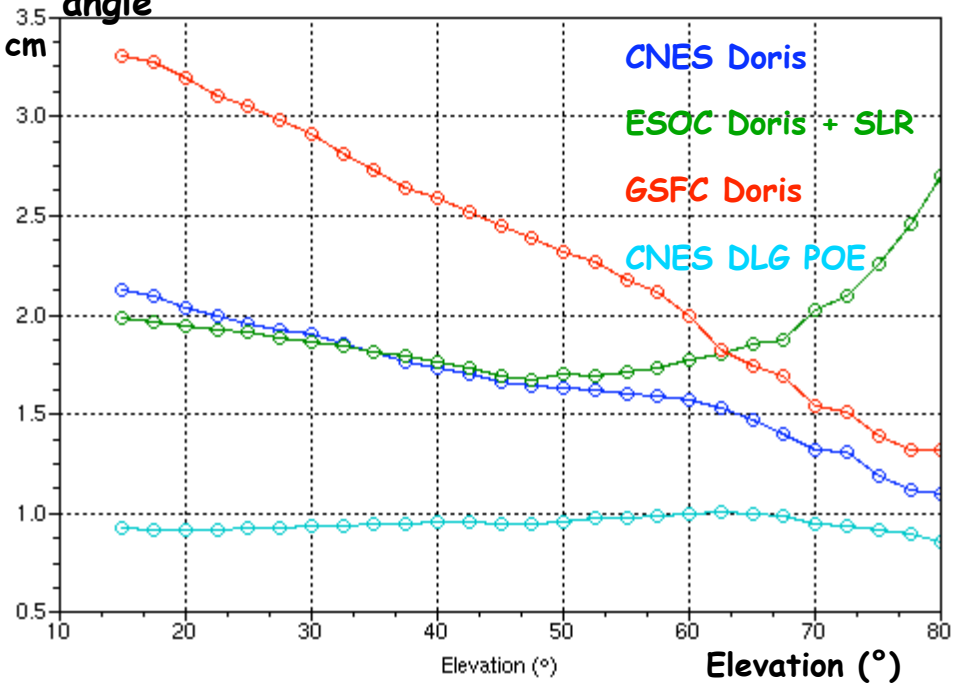
- Cross-track mean shows 120 signal
  - Typical of differences in SRP modeling



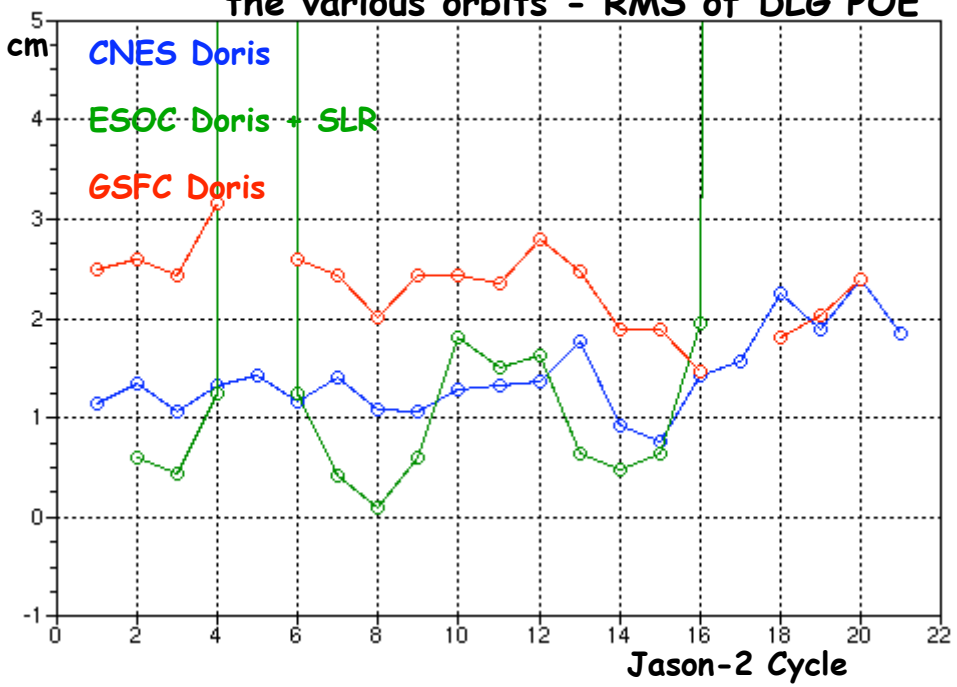
Doris-based orbits with respect to reference D+L+G POE

- SLR residuals on reference stations (LPOD05v11) clearly reflect the differences previously shown in the various solutions

RMS of SLR residuals above a given elevation angle



Difference between SLR residuals RMS of the various orbits - RMS of DLG POE

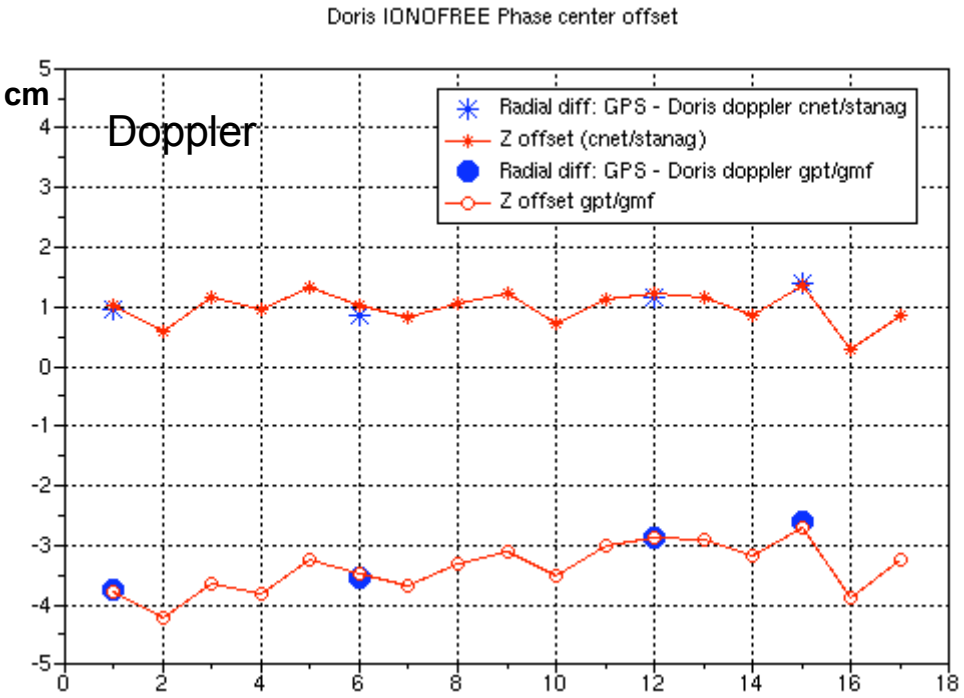


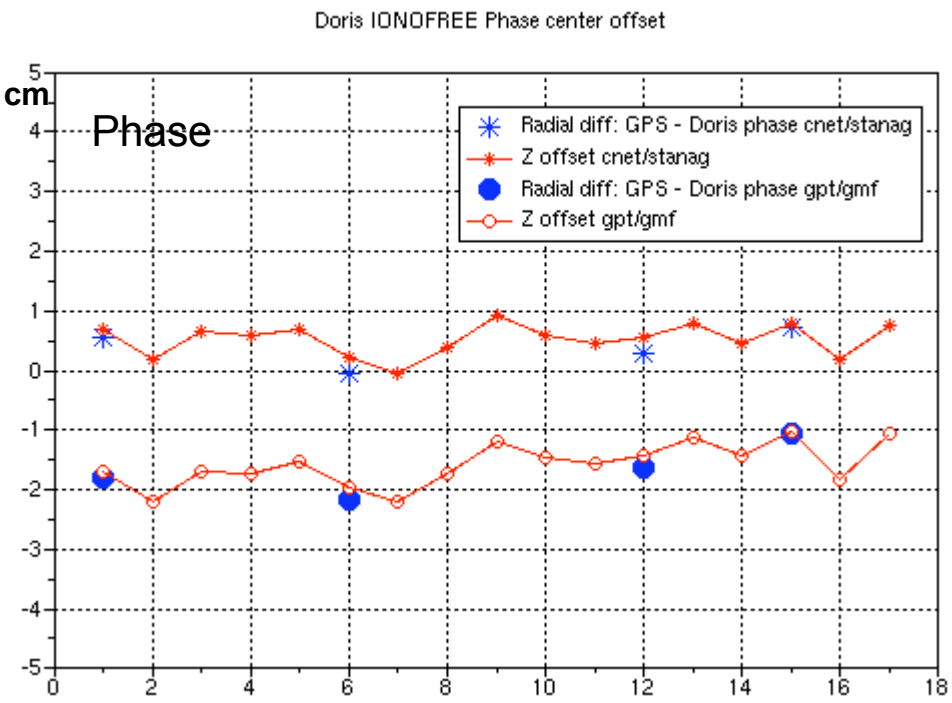
Jason-2 Doris Antenna offset

- Follow-up of the discussion initiated by N. Zelensky during last meeting in Nice (~ 13 cm offset along Z axis)
- Estimation of the offset over Jason-2 cycles 1-17
- RINEX as input data, attitude from quaternions
- Using either Doppler (phase increments) or direct phase measurements
- Cut-off : measurements rejected below 10 degrees
- With 2 different troposphere models
  - Saastamoinen for dry vertical delay + GPT/GMF (wet delay estimated)
  - CNET for a priori + GPS STANAG (tropospheric correction currently present in DORIS files)
- Meteorological data from beacons not used
- Method
  - By directly estimating the offset using a fixed GPS orbit
  - By estimating a constant radial acceleration during Doris-only orbit determination (cross-validation)

Jason-2 Doris Antenna offset

- For cycles 001,006,012,015 estimation of a radial acceleration that compensates for the offset
  - The resulting orbit is compared to an independent GPS orbit (blue dots in plot below)





Jason-2 Doris Antenna offset

- Results largely depend on the adopted tropospheric model
  - and very likely on the measurement distribution in elevation (cut-off angle)
- Phase and Doppler don't observe exactly the same offset
  - More observability using phase measurements
  - Lower impact of clock errors using doppler measurements
- How to distinguish between
  - Tropospheric bias
  - Doris receiver phase center position
  - Unmodeled frequency drifts

  remains an open issue
- Estimated offset never exceeds - 4 cm (doppler+gptgmf case)

Backups

Jason-2 Doris Antenna offset

- Direct estimation of DORIS offset with either Doppler or Phase measurements, on fixed GPS orbit