CENTRE NATIONAL D'ÉTUDES SPATIALES

Status of Jason-1/Jason-2 POE

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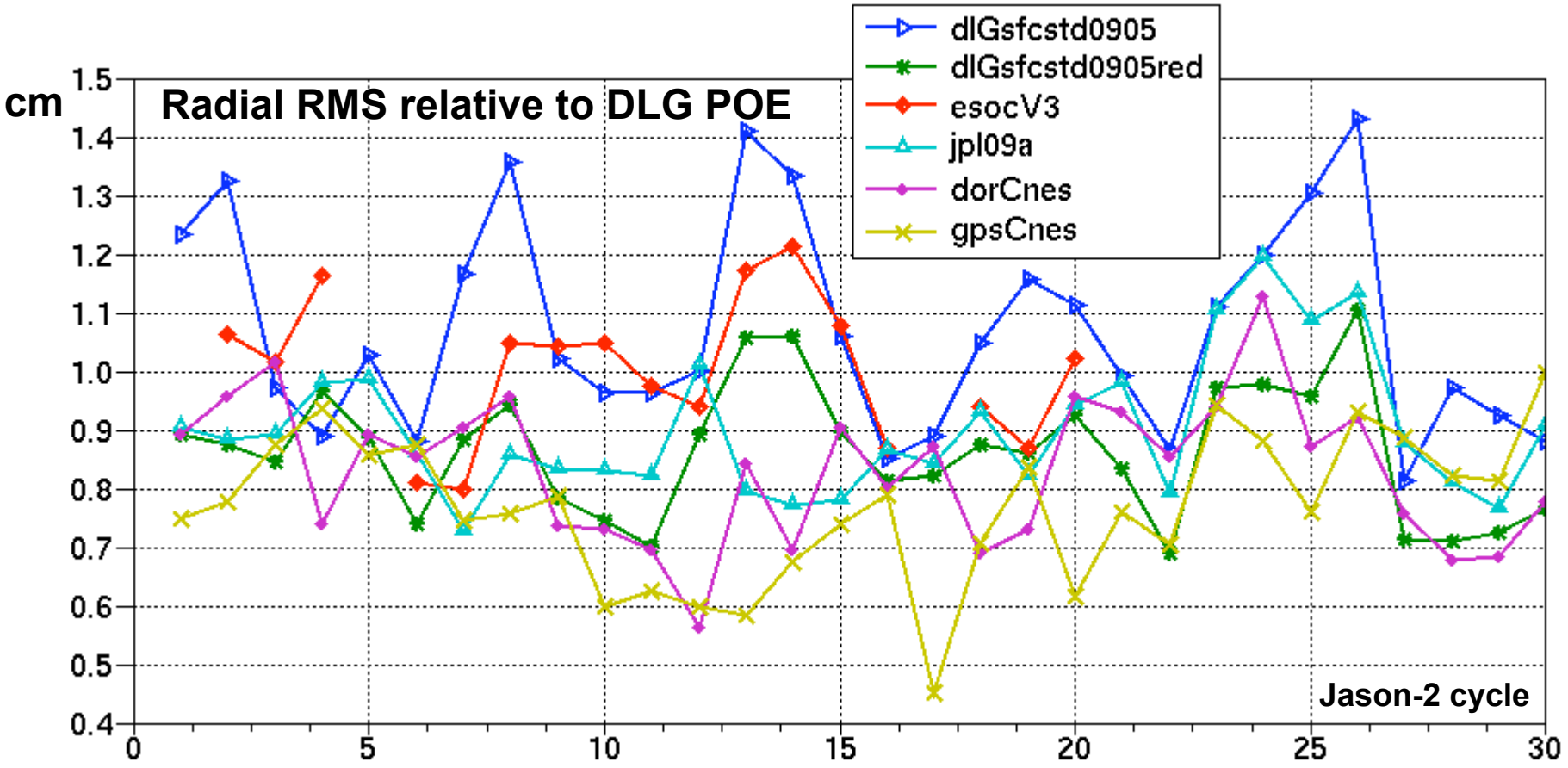
Precision Orbit Determination and Geoid session
OSTST Meeting, June 22-24 2009 – Seattle

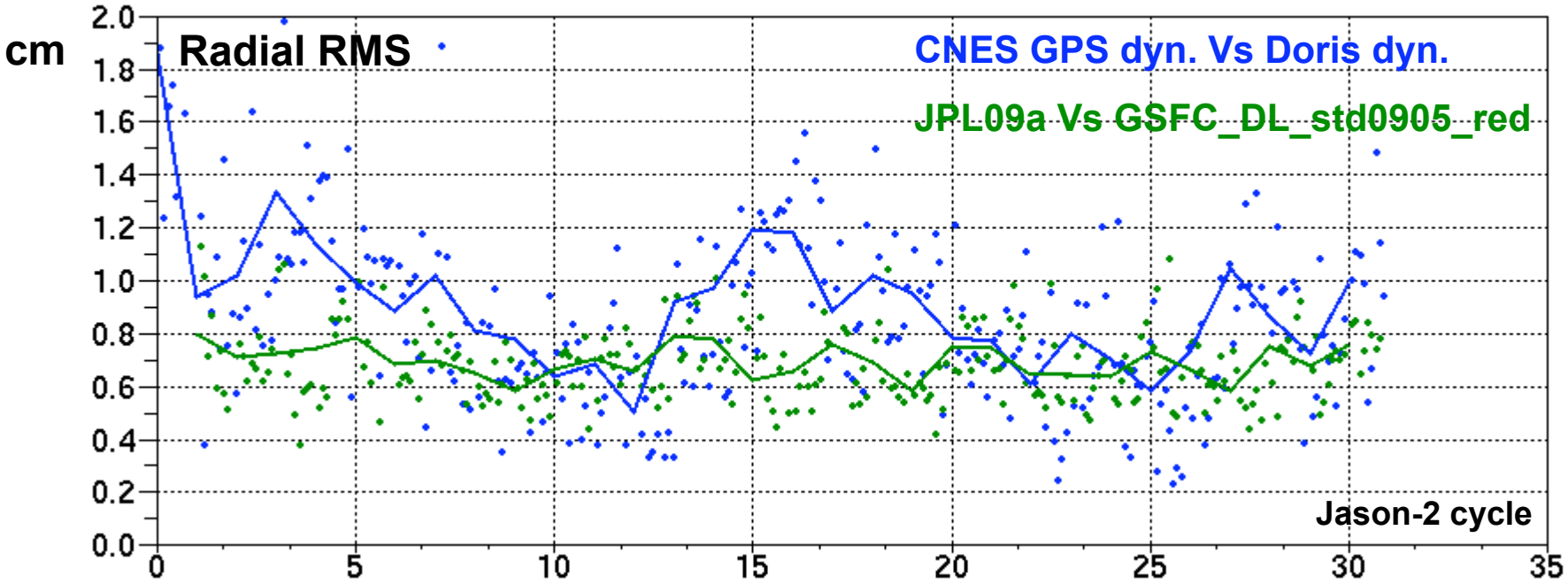
Jason-2: Comparison of different orbits to POE

- Good agreement between different solutions, close or better than 1 cm for all orbits



Jason-2: Tracking data consistency

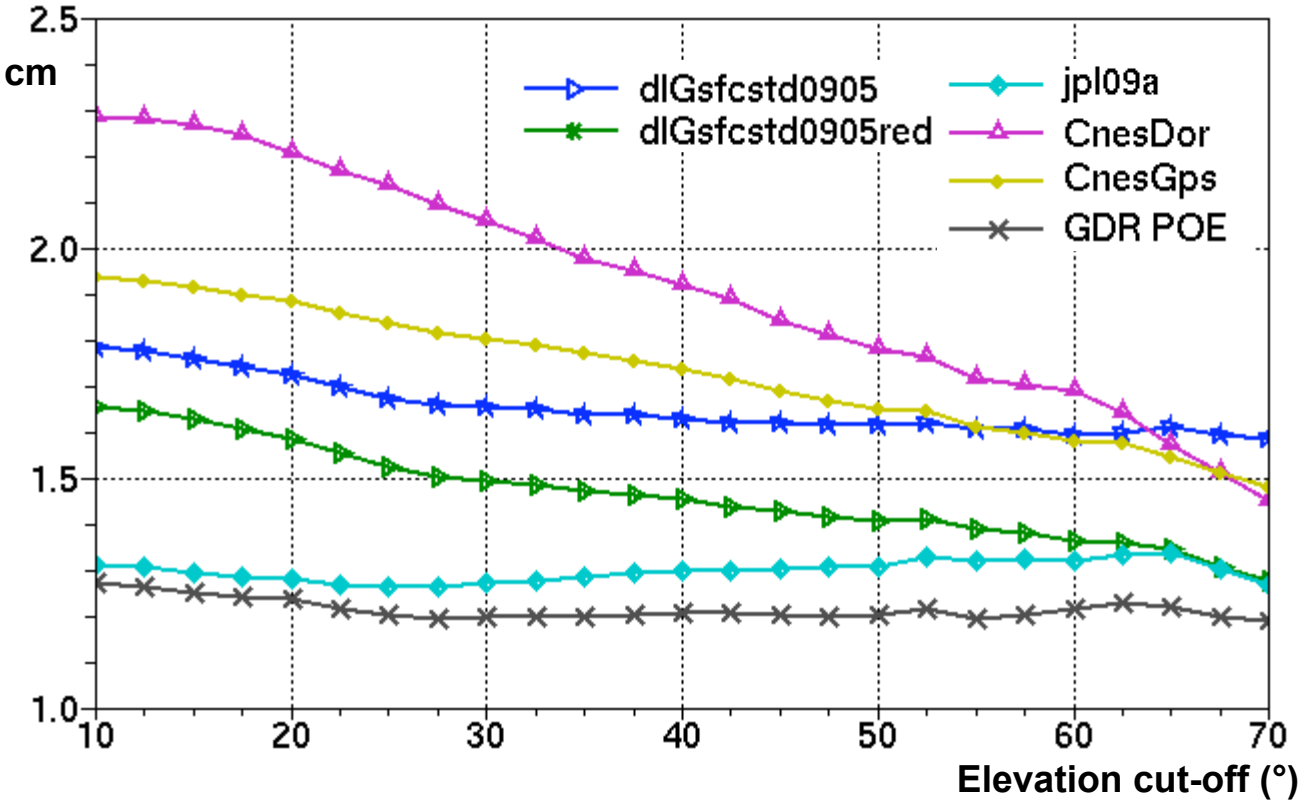
- Orbits obtained with different tracking techniques can compare at 7 mm level in radial direction
  - stable between reduced dynamic orbits (D/L GSFC Vs GPS JPL)
  - affected by modeling errors on dynamic orbits (sharing the same models, Cnes D Vs Cnes G)



Jason-2: SLR residuals on different orbits

- Degraded RMS for non-GPS orbits when low elevation data is included
- Similar performance of SLR statistics for reduced dynamic orbits (JPL GPS , GSFC DL)
- SLR is included in GDR-POE solution
- CNES dynamic Doris and GPS orbits exhibit similar radial performance

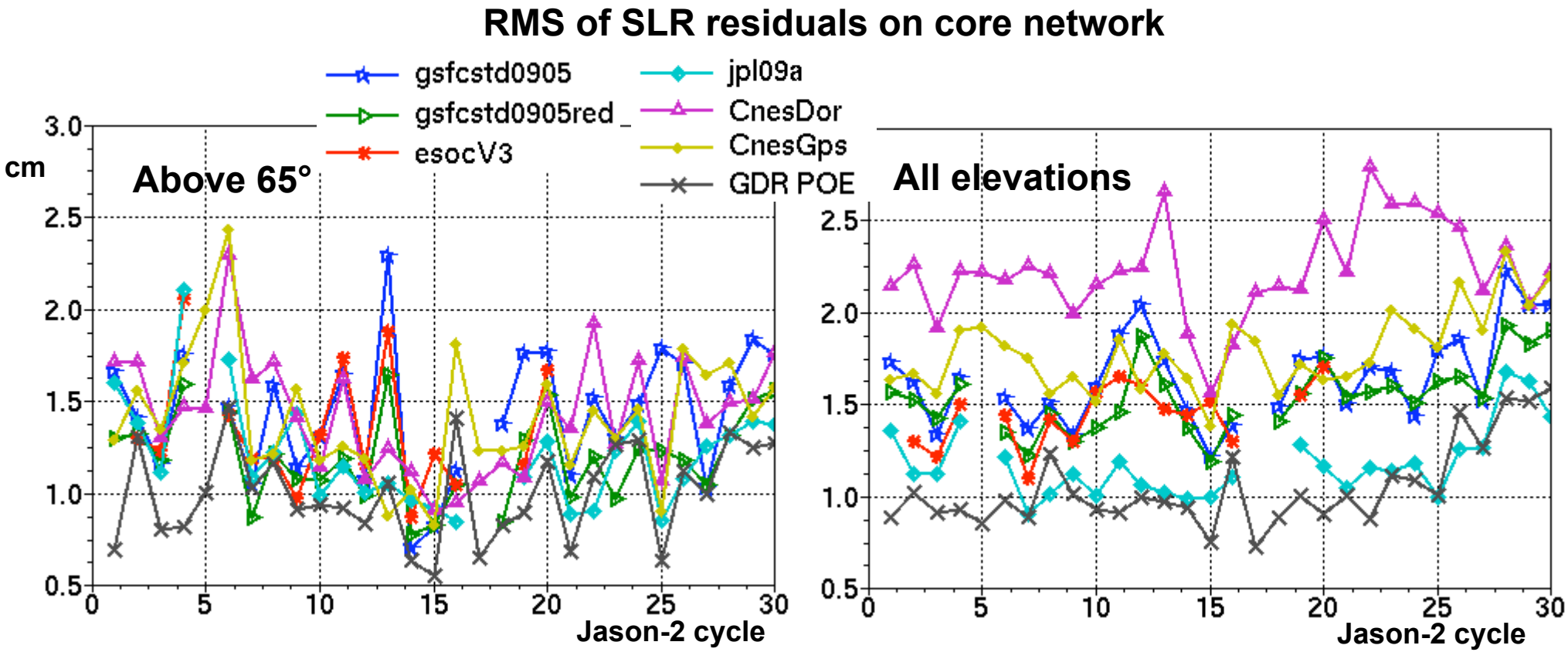
RMS of common SLR residuals on core network(*) obtained by varying the elevation cut-off angle



(*) 7090YARR 7105WASH 7110MONU 7839GRAZ 7080FORT 7840HERS 8834WETZ 7810ZIMM

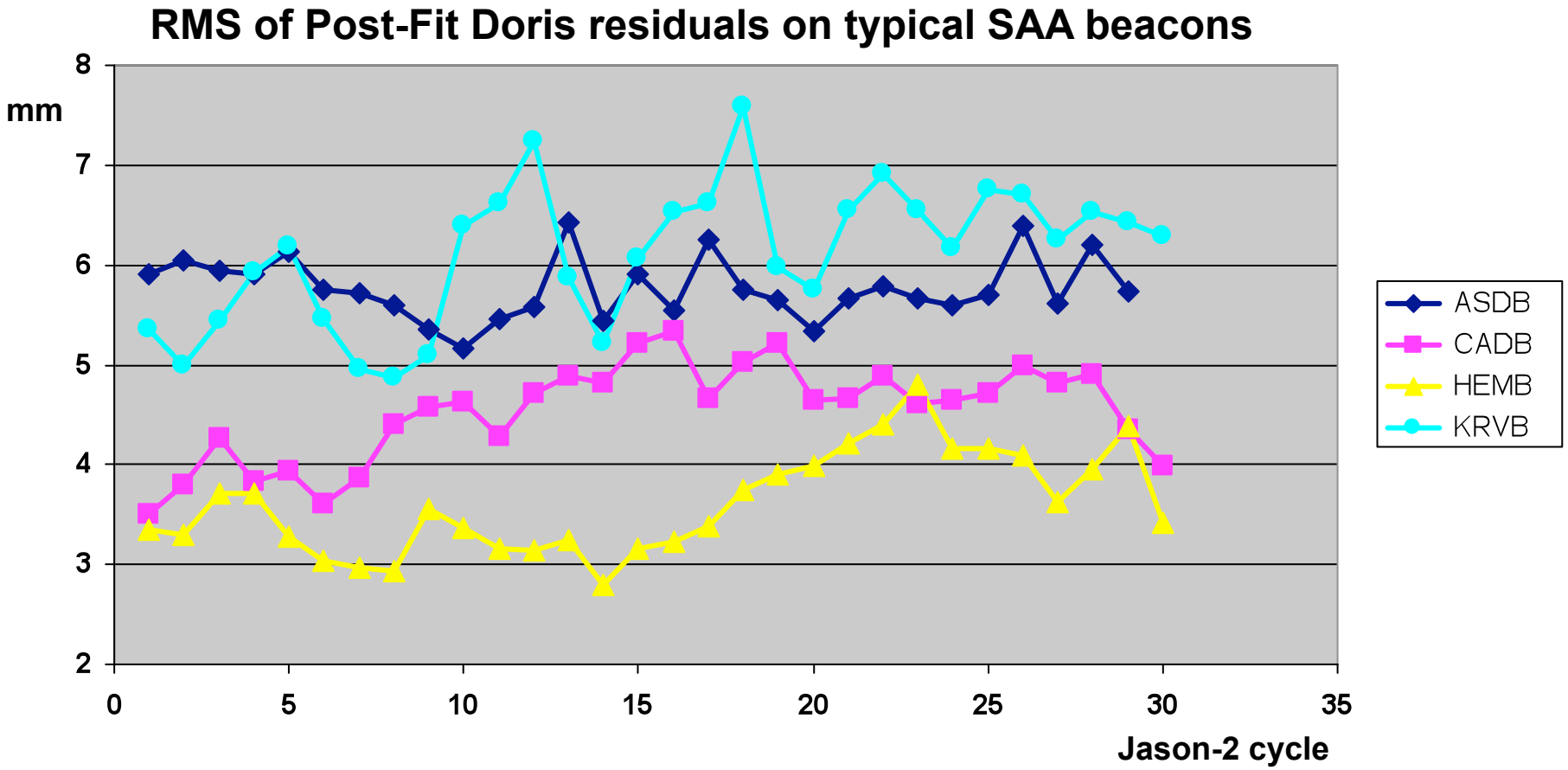
Jason-2: SLR residuals on different orbits

- High elevation SLR residuals per cycle indicate a stable radial accuracy close to 1 cm for all orbits



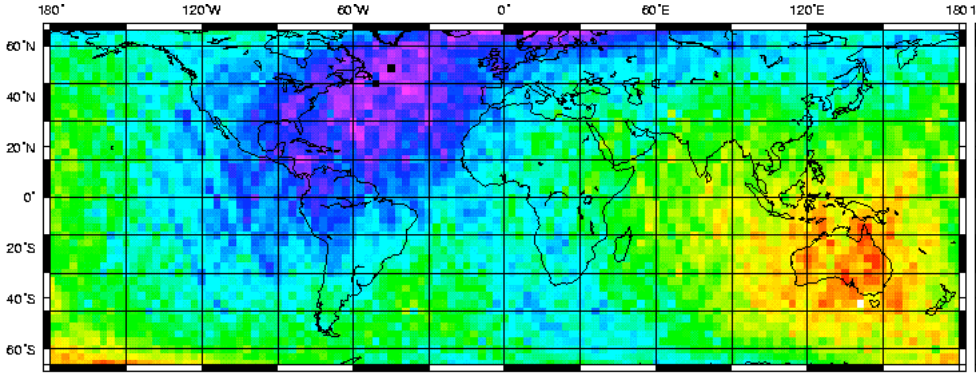
Jason-2: Doris and SAA

- No conclusive sign of degradation due to SAA on Jason-2 doris residuals

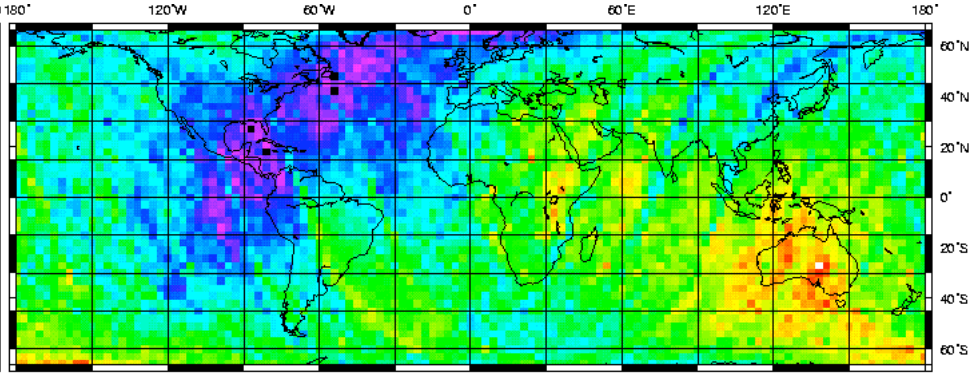


Jason-2: Orbit comparison – Geographically correlated radial differences

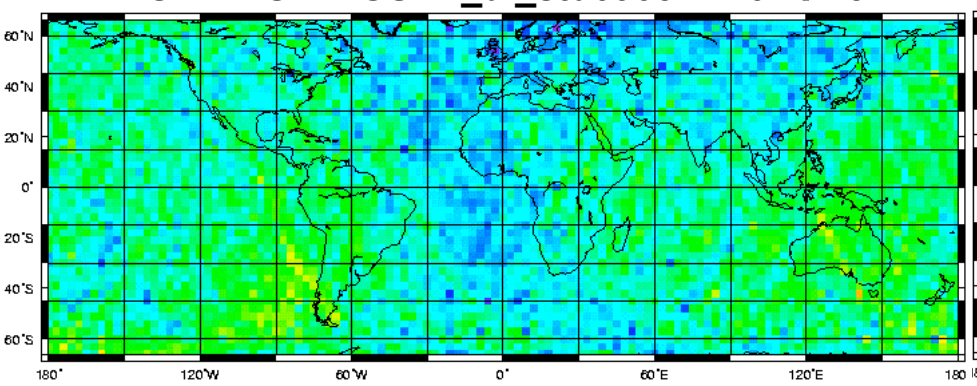
GDR POE – JPL09A CY 01→15



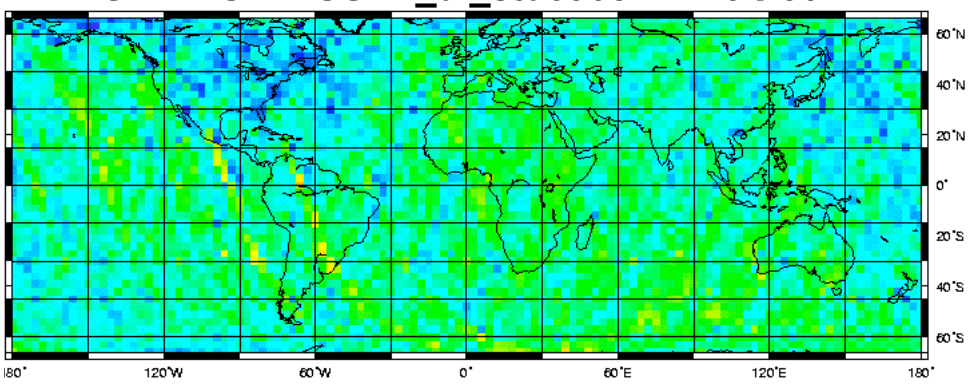
GDR POE – JPL09A CY 16→30

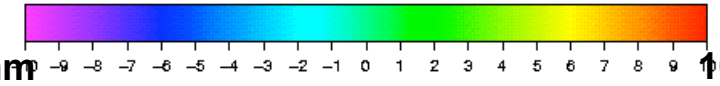


GDR POE – GSFC_dl_std0905 CY 01→15



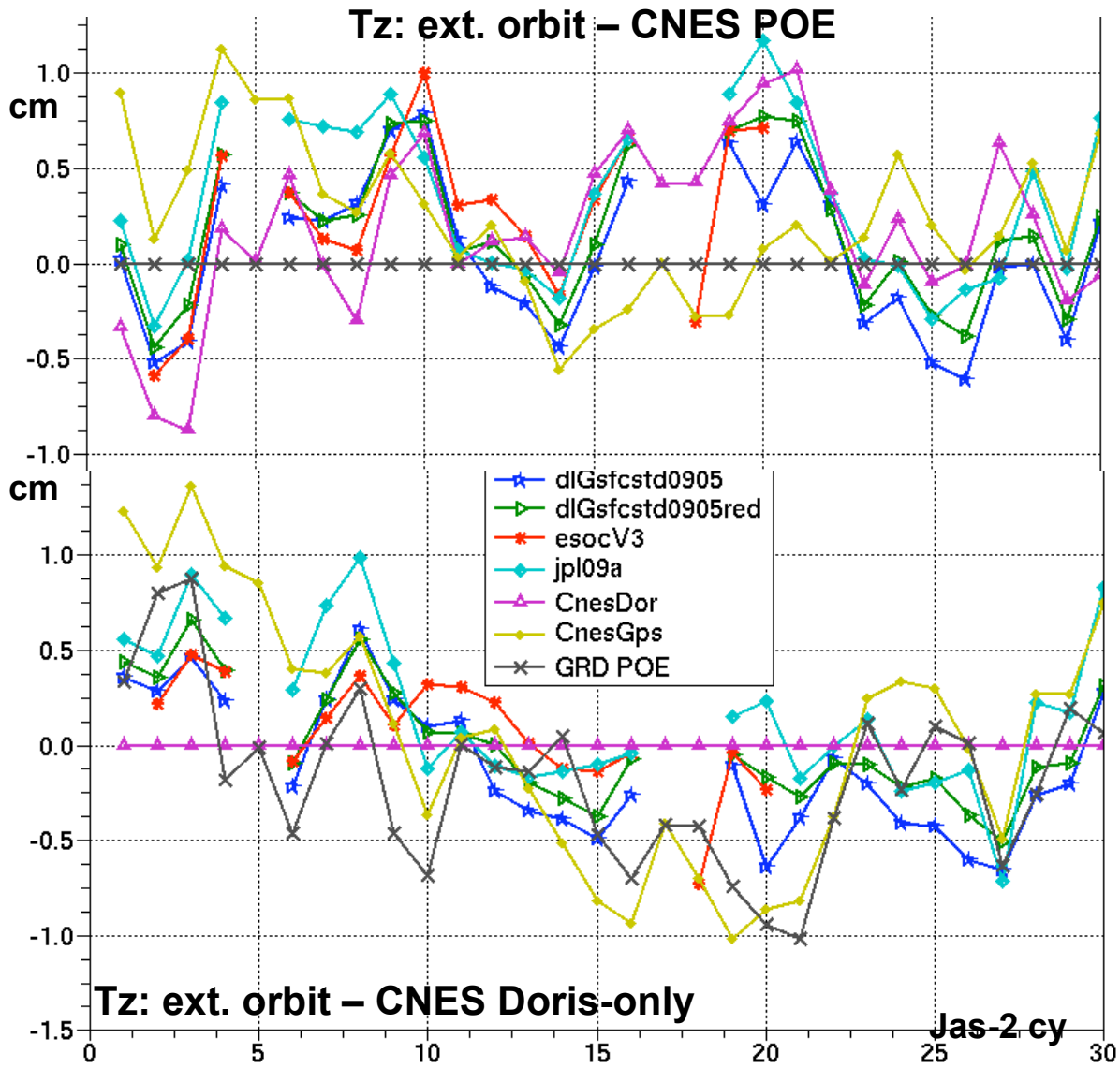
GDR POE – GSFC_dl_std0905 CY 16→30





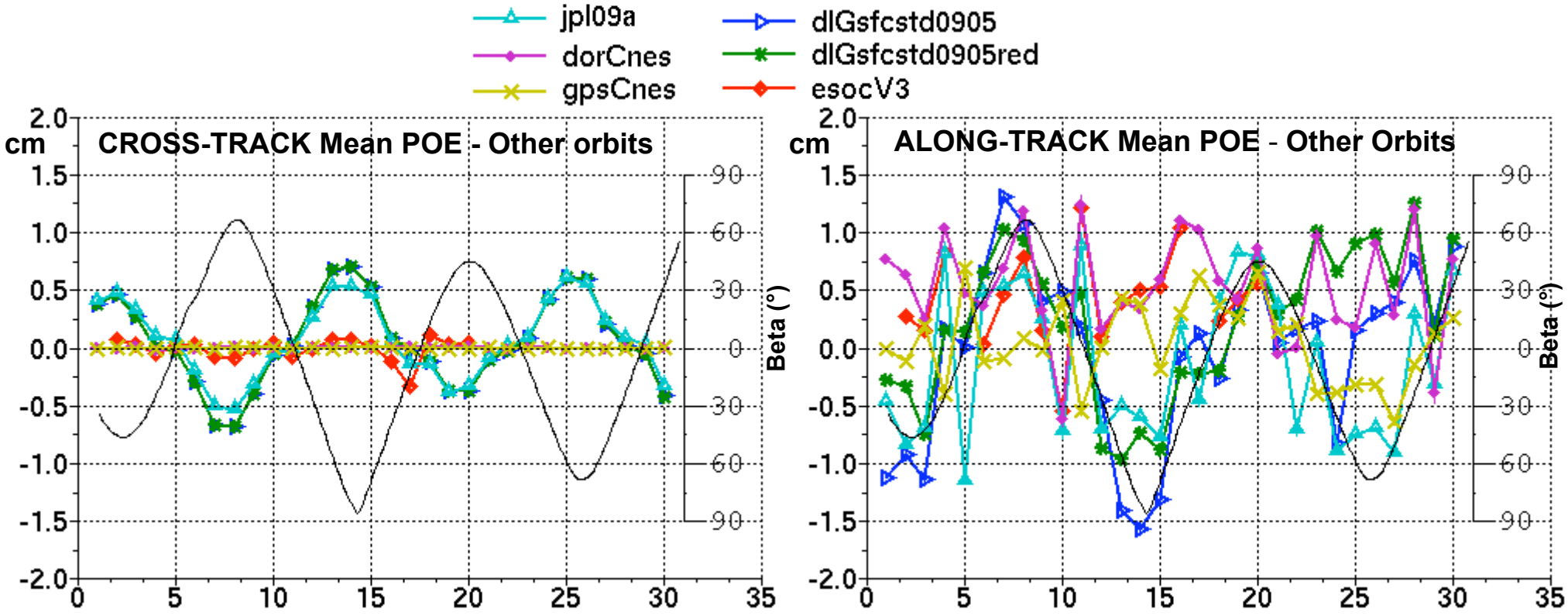
Jason-2: Orbit comparison - Centering

- 120-days signature present in Z when comparing external orbits (JPL,GSFC) to CNES POE
- Long-term behavior (annual signal?) when all orbits are compared relative to Doris only orbits



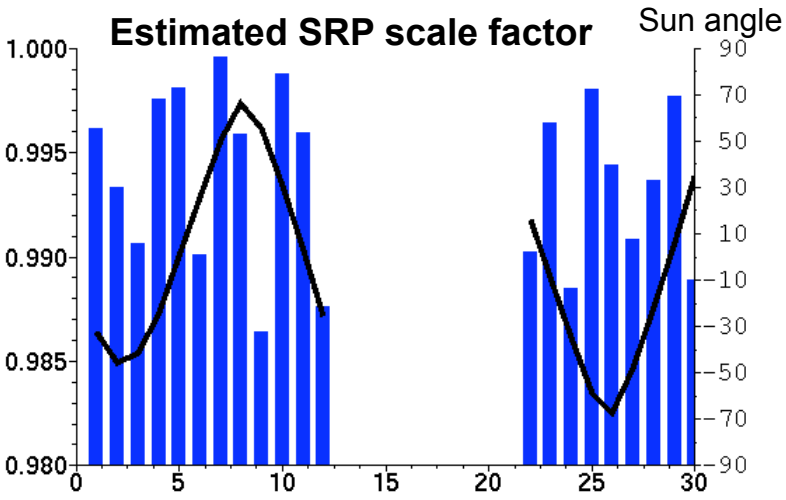
Jason-2: External orbit comparison – Along/Cross track

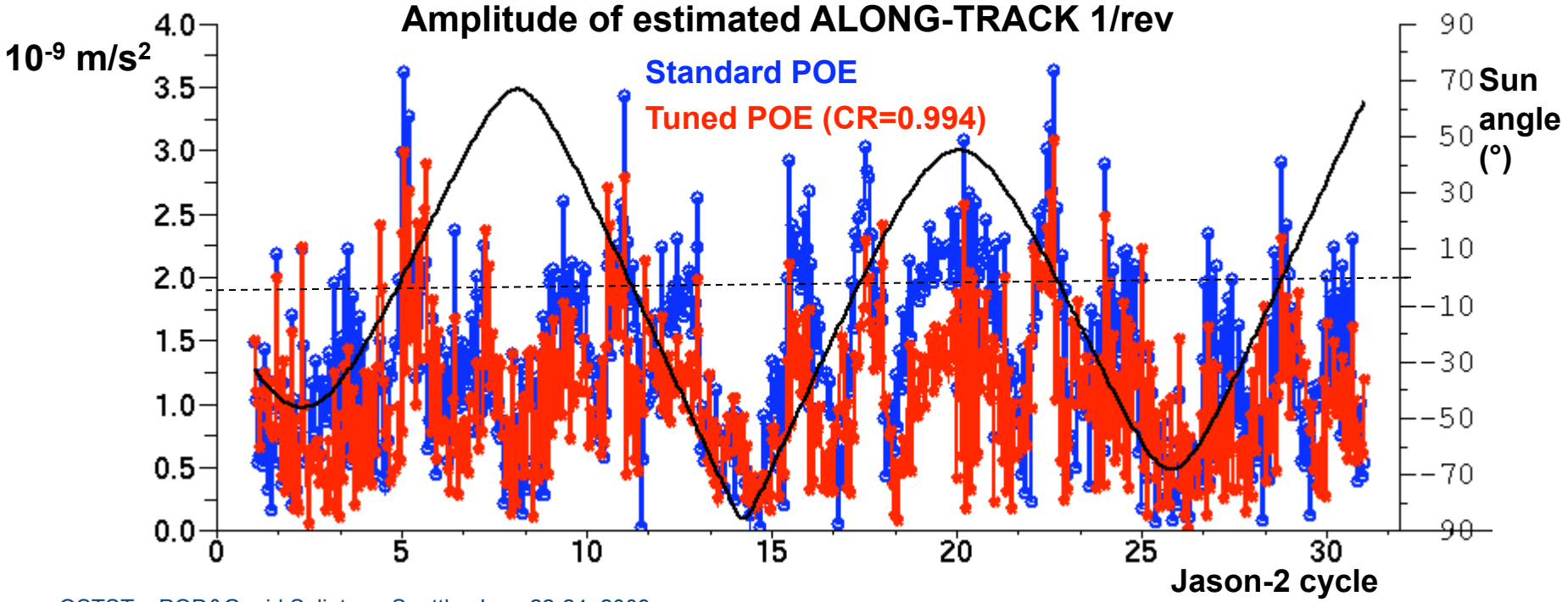
- Cross-track mean reflects differences in SRP modeling
- Along-track mean shows some beta angle dependent pattern with less evident correlation



Jason-2: Estimated empirical parameters

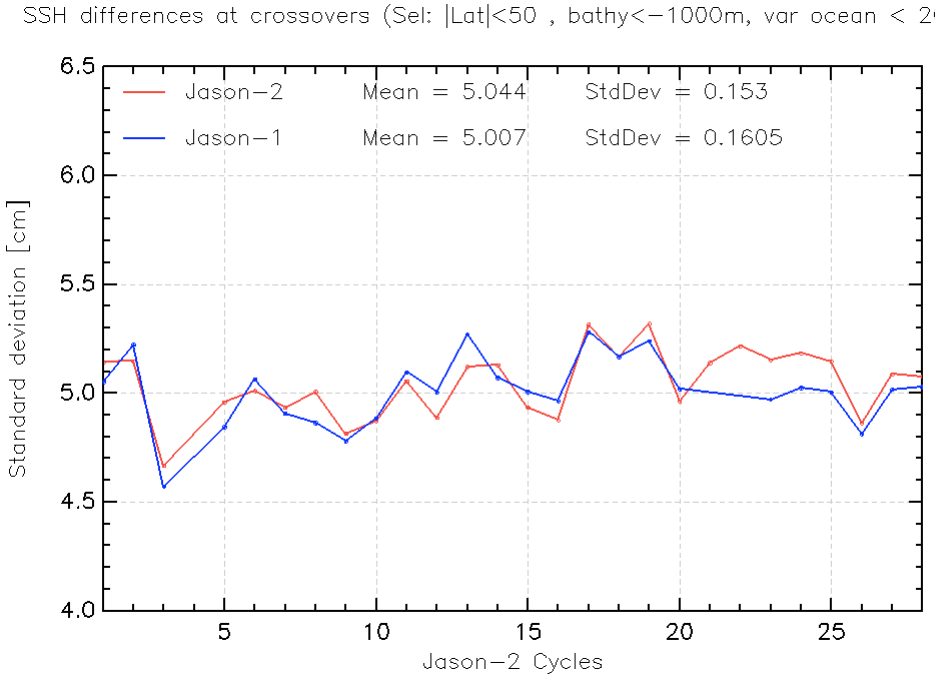
- Current model mean scale error is below 1 %
- Significant error around flip (higher when satellite is flying forward)

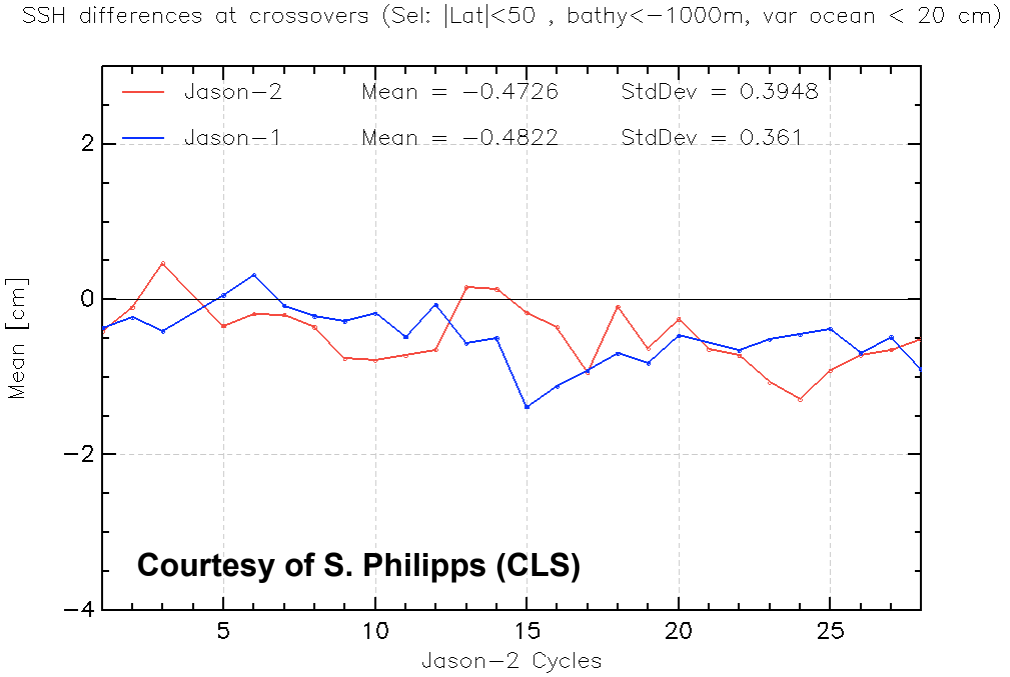




Jason-2: Orbit Performance - Crossovers

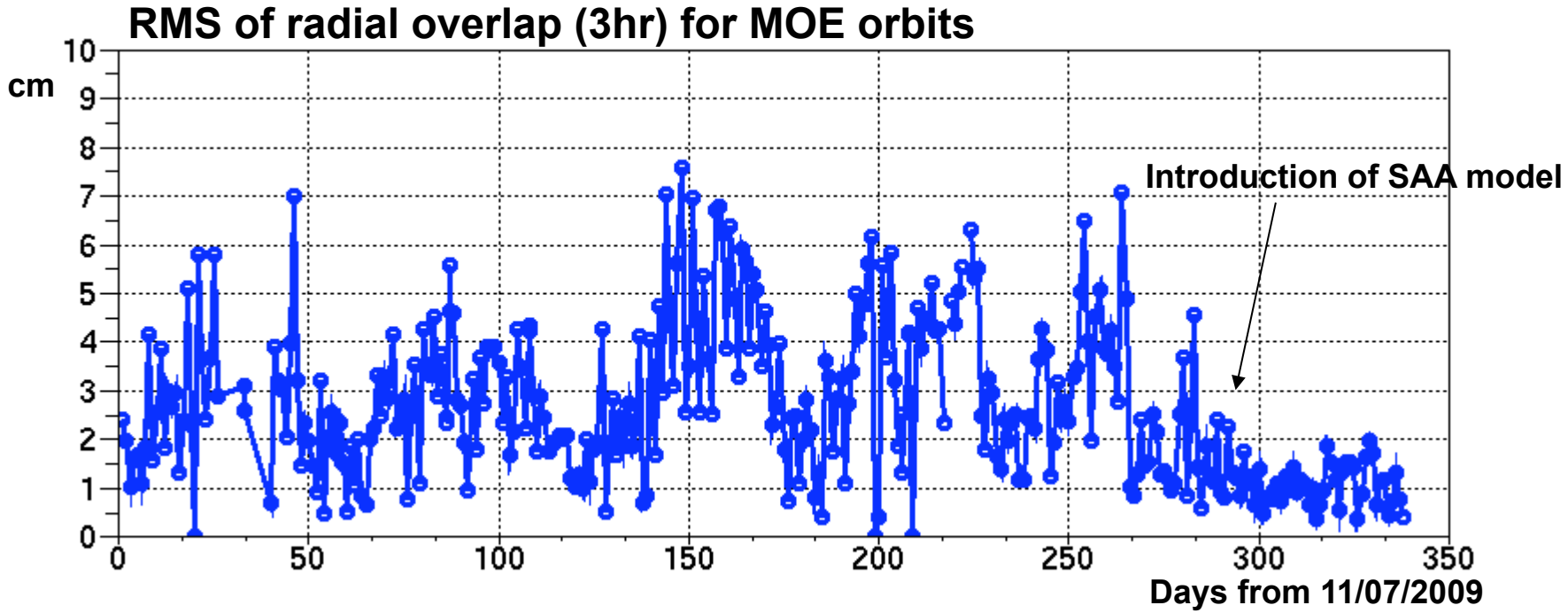
- **Jason-1 / Jason-2 indicate equivalent performance in term of crossover residuals**





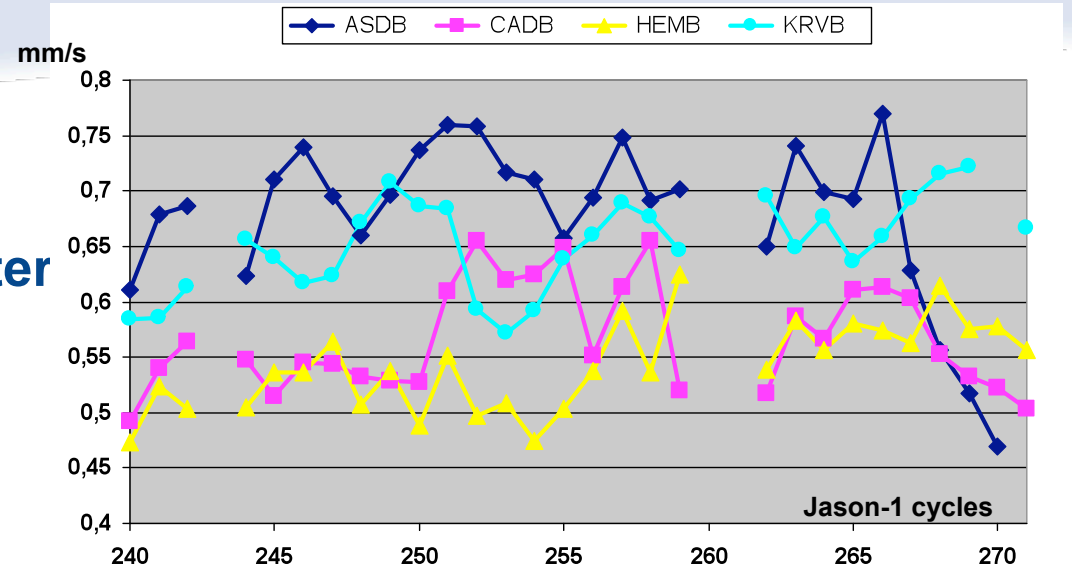
Jason-1 performance - MOE

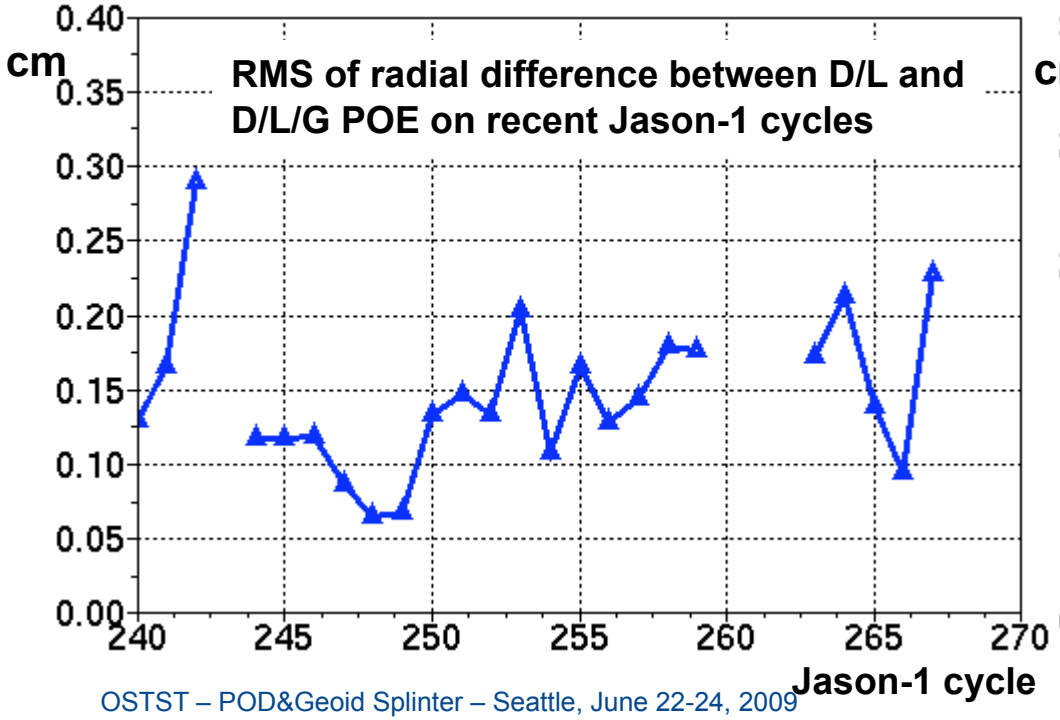
- Corrected version of SAA model (new ground-track) is now implemented on both POE and MOE
  - noticeable improvement on MOE overlaps and doris post-fit residuals (as no SAA correction was applied before April 05, 2009)

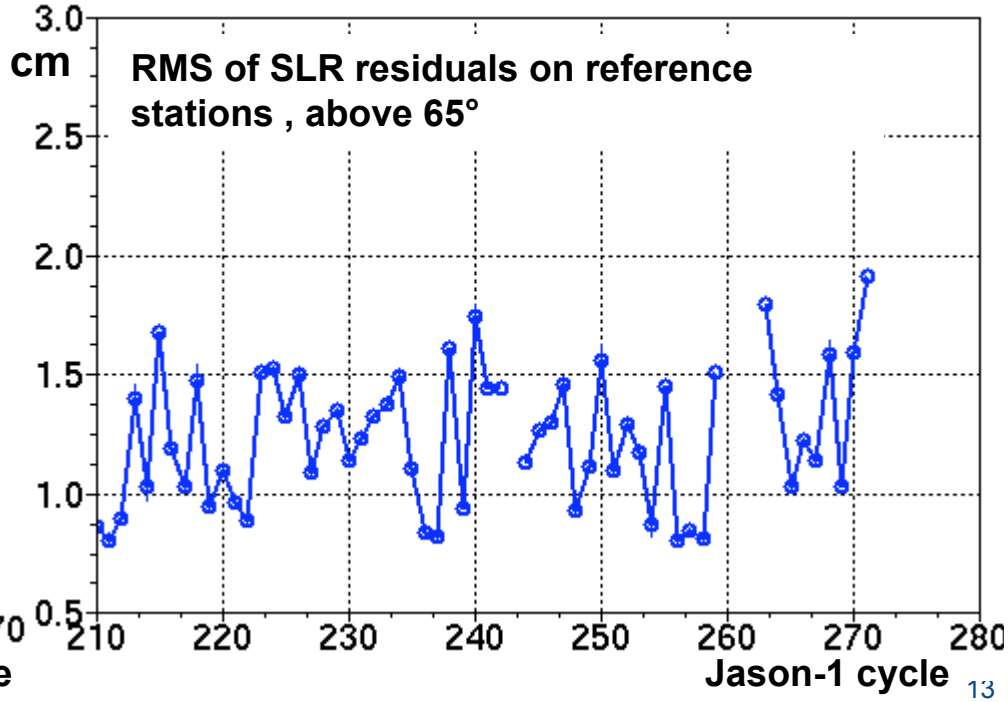


Jason-1 performance -POE

- POE accuracy seems stable after
  - loss of GPS receiver
  - update of SAA model (cy 262)

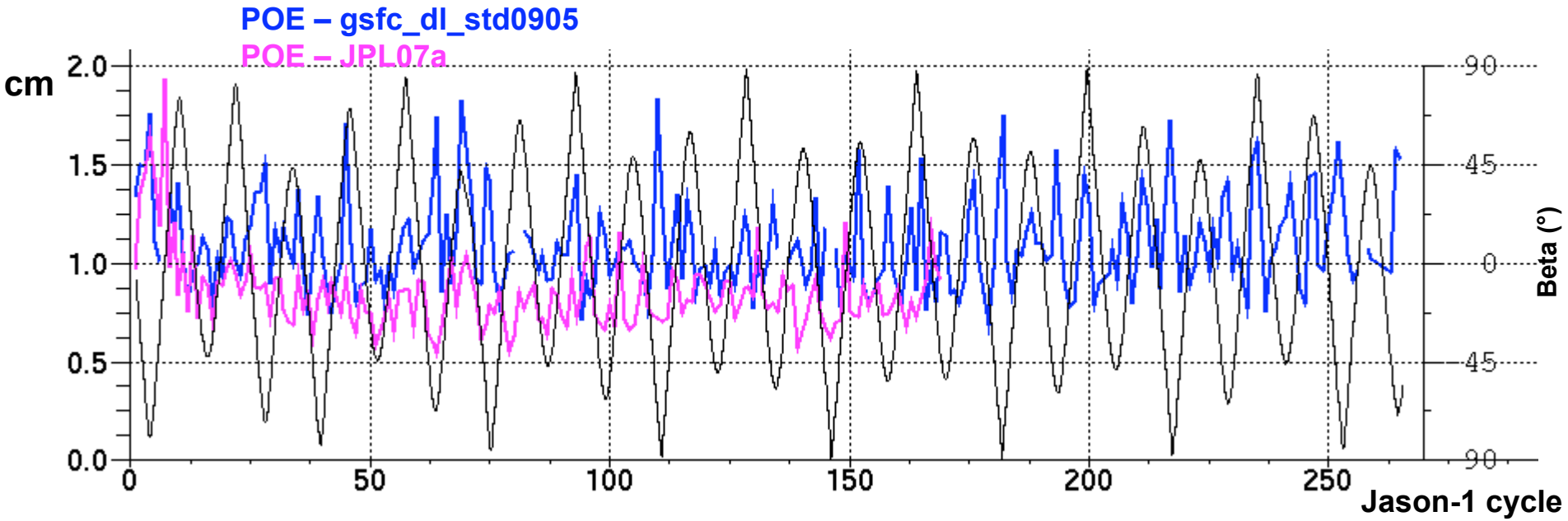






Jason-1 performance - POE

- Comparison with external orbits indicate stable properties of the GDR orbits
- Differences in surface forces attitude models



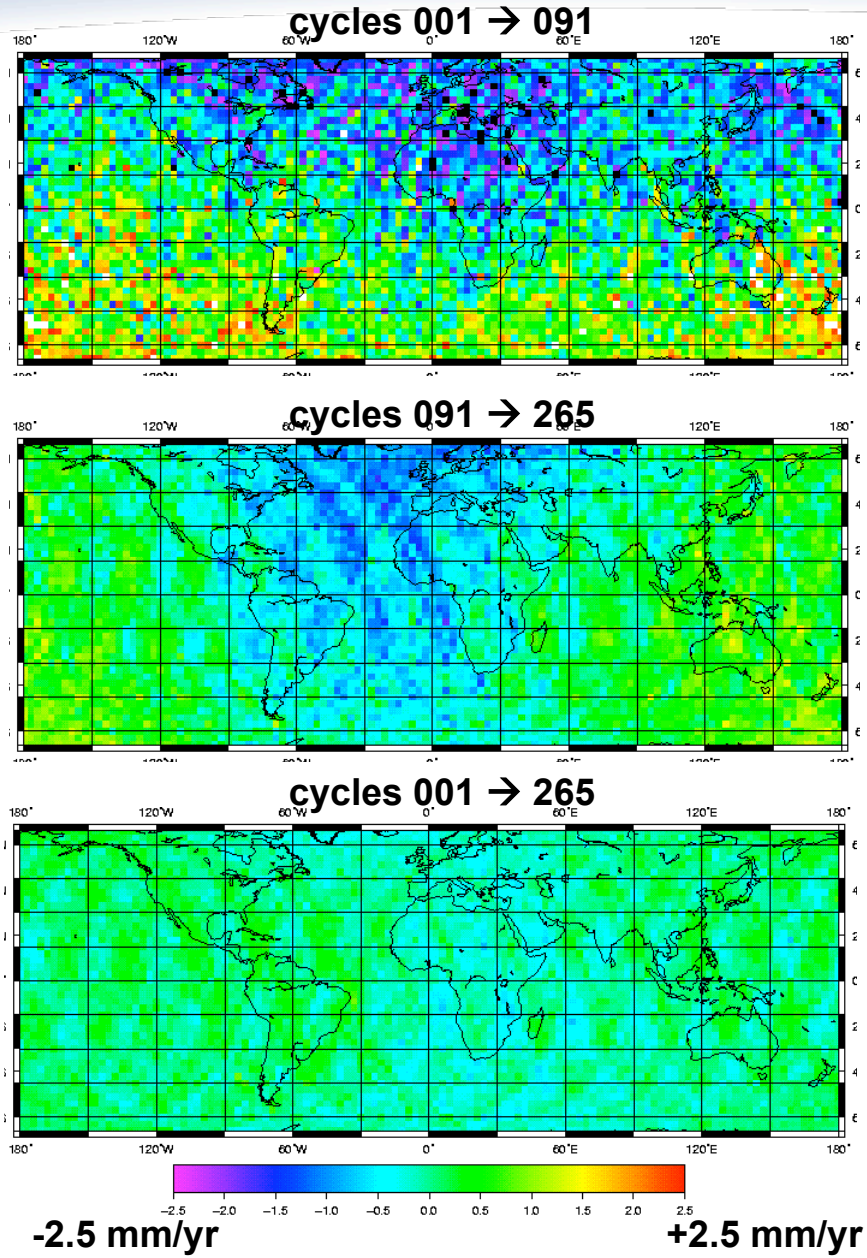
Jason-1 performance - POE

- **GSFC-CNES comparison:**

  Radial difference rate is stronger before Doris instrument change, indicating a N/S drift of about 2 mm/yr

  Some geographically correlated pattern remain after cycle 091

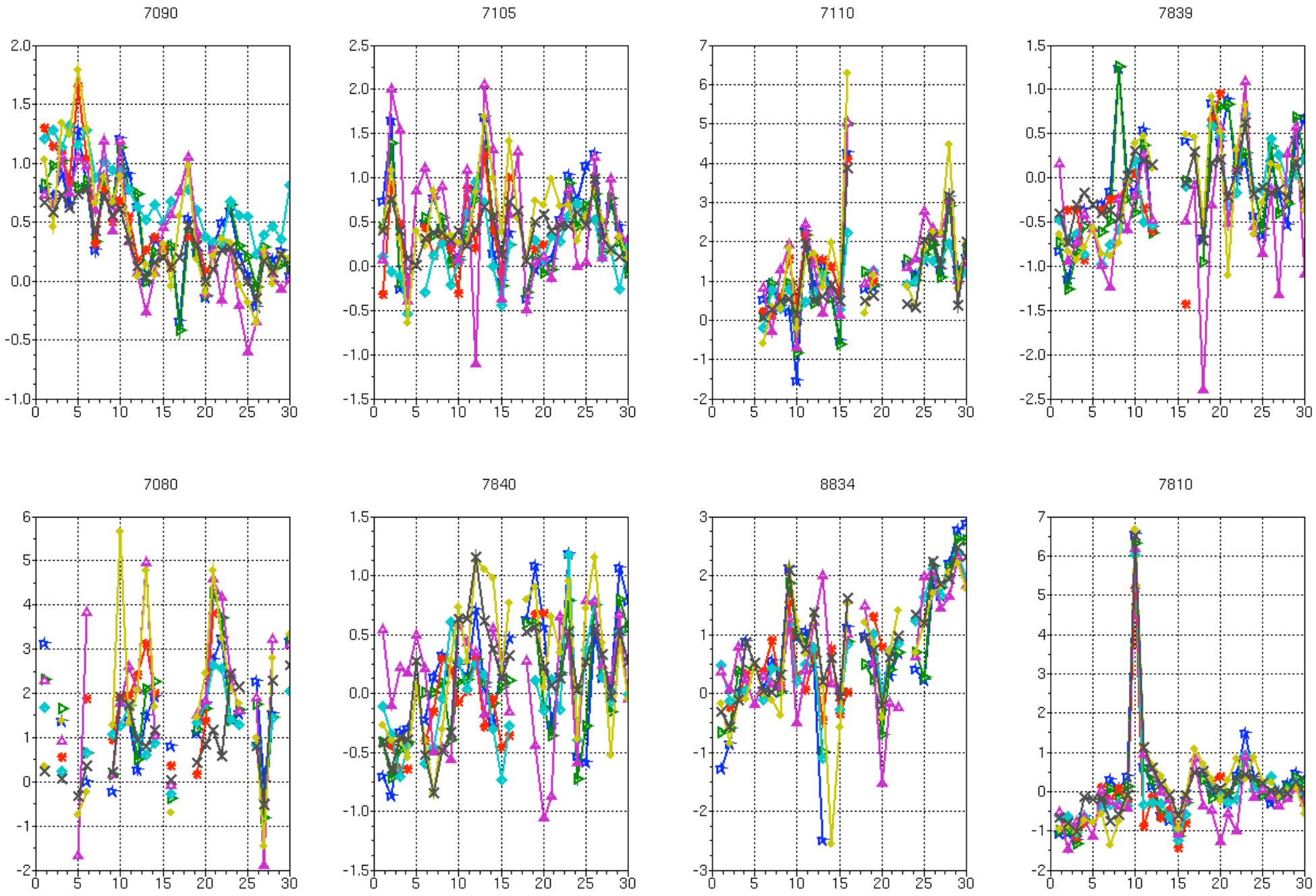
  Relative radial drift is small (<1 mm/yr) when the entire series is considered



Conclusions

- Jason-2 Doris,GPS,SLR POE complies with the accuracy required by GDR products
  - Comparison of orbits from different groups
  - High elevation SLR residuals
  - Altimeter crossover residuals
- Some margin of improvement expected from next POD standards
  - SRP model and surface forces in general
  - Better modeling of time varying gravity
- Stable accuracy of Jason-1 POE after loss of GPS tracking and update of SAA model

Backups


7090
7105
7110
7839
7080
7840
8834
7810

JASON-2

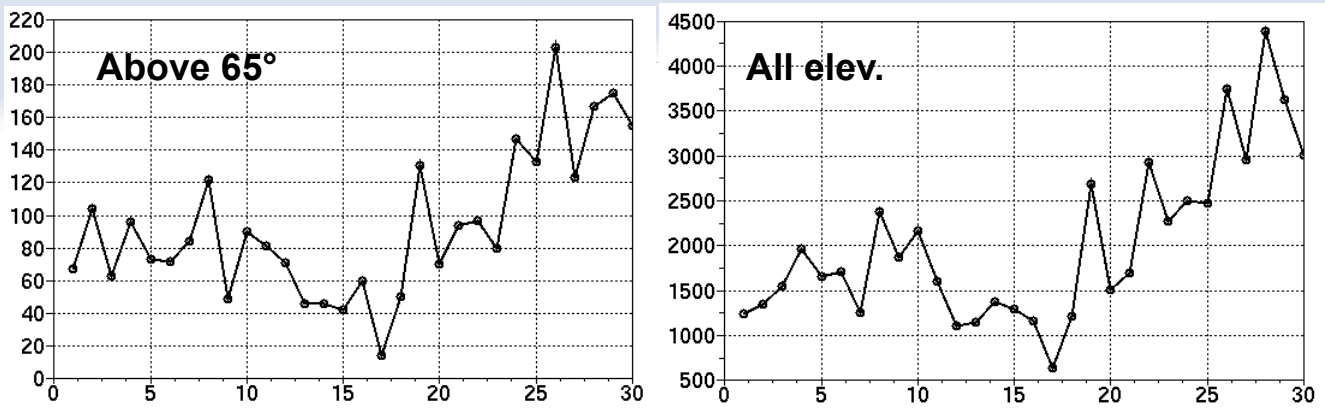
SLR residuals on Doris and GPS orbits

7090 7105 7110 7839
7080 7840 8834 7810

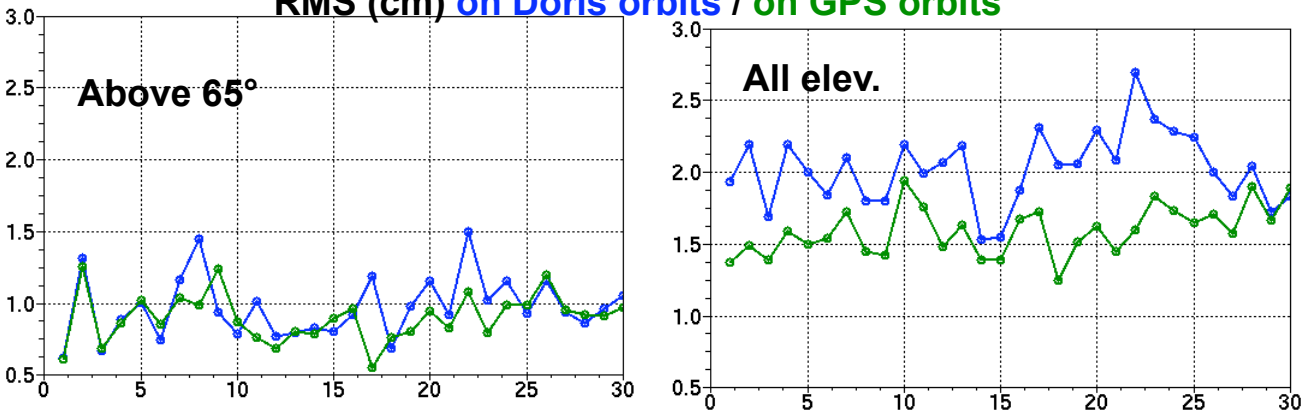
Bias per station per cycle removed

Bias per station per cycle not removed

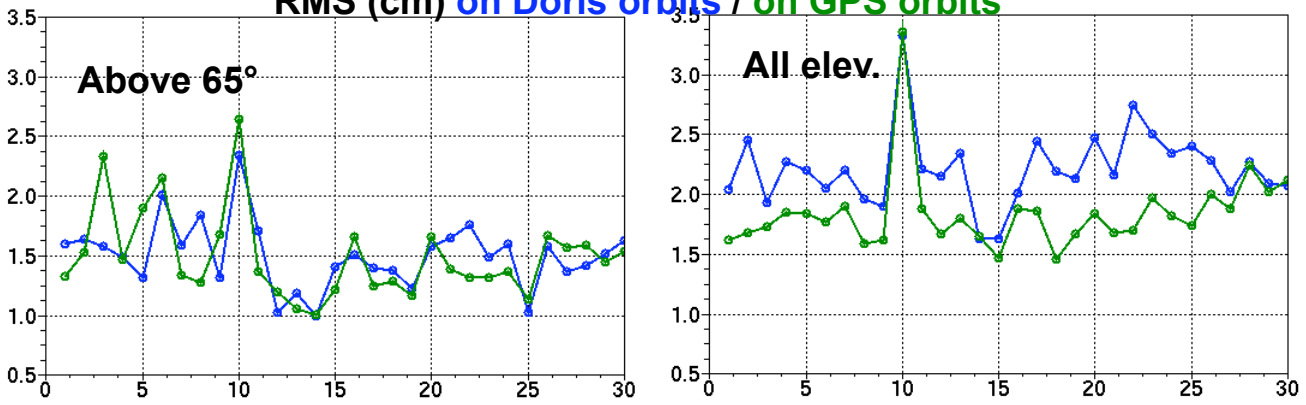
Number of measurements



RMS (cm) on Doris orbits / on GPS orbits

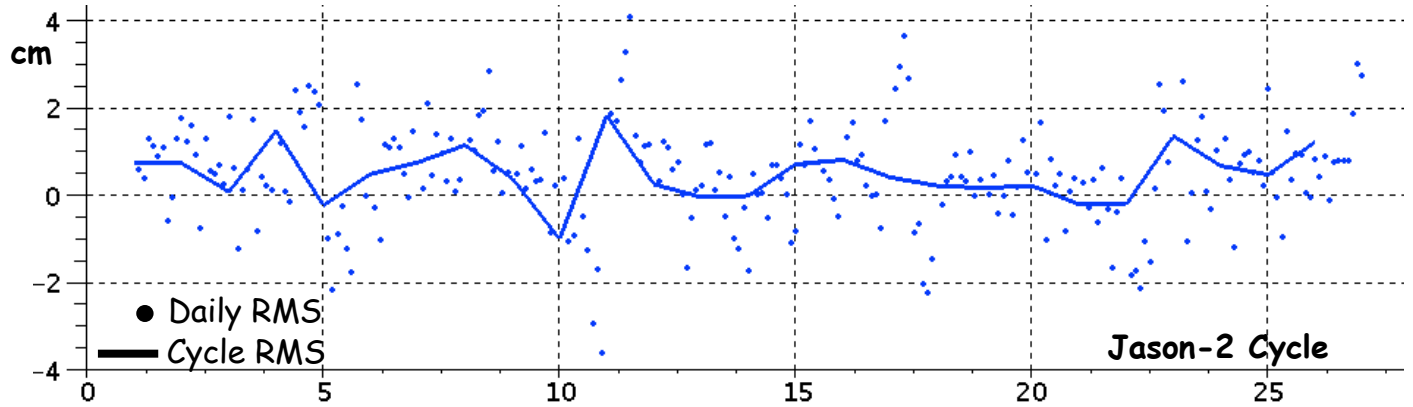


RMS (cm) on Doris orbits / on GPS orbits

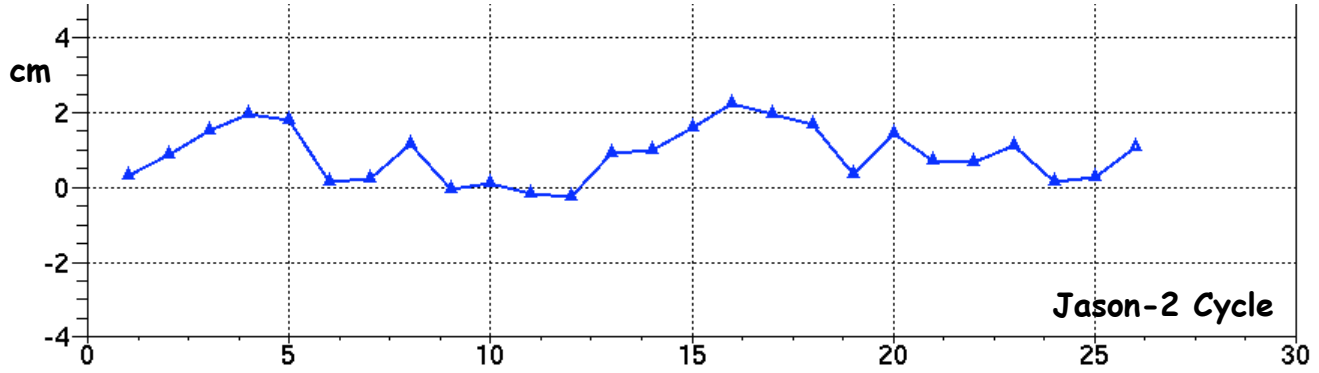


Doris POE Time-Tagging

- **POE Doris time tagging accuracy better than 1.5 microsec, measured by**
  - **GPS: Along track mean difference between GPS / Doris orbits (mean ~ 5 mm)**



  - **SLR: Mean of along track SLR bias per pass over each cycle, from SLR residuals on Doris-only orbits (mean ~ 8mm)**



JASON-2 Doris residuals