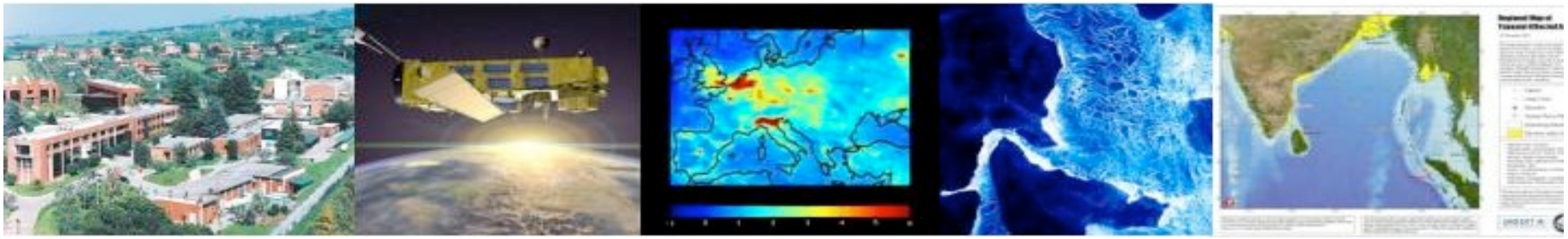
JASON-2 POD results from ESOC



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ESA/ESOC

Introduction

Jason-2 orbit solutions based on SLR, DORIS, and GPS

- Orbit comparisons
- Solar radiation pressure modeling
- Along-track CPR's
- GPS antenna phase maps (derived from residuals)

POD standards

Reference System

- Polar motion and UT1: IERS Bulletin A, IERS-2003 daily and sub-daily corr.
- Station coordinates: DPOD (v1.4) for Doris, LPOD (v10) for SLR, IGb05 for GPS, all station displacements according to IERS-2003
- Satellite reference: Post-launch value of mass and theoretical attitude model (with attitude event file)

Force Models

- EIGEN-GL05C static field degree/order 120 (C21 & S21 values replaced with IERS-2003 values)
- Atmospheric contribution to the gravity degree/order 20 (AGRA service at GSFC)
- IERS 2003 Solid Earth tides
- FES 2004 Ocean tides (all principal constituents, with admittance) degree/order 50
- Sun, Moon and all Planets (DE-405)
- Boxwing model for drag, solar radiation and Earth radiation (albedo & IR), using CNES Jason-1 GDR-C values with Cr fixed to 0.99
- MSIS-90 model for atmospheric density with HWM93 for winds

Orbit solutions

Estimated Orbit Parameters

- Satellite state vector
- 5 drag coefficients per 24 hours
- 2 sets of CPR's per 24 hours (along and cross track direction)

ESOC Orbit Solutions

ESOC SD

- SLR+DORIS solution (version 3)
- 7 day arcs

ESOC SDG

- SLR+DORIS+GPS solution (test version)
- 3 day arcs

External Orbit Solutions for comparison

CNES

- CNES GDR-C POE

Used tracking data

from CDDIS and AVISO

DORIS

- 10° elevation cut-off
- Troposphere: Temp./pressure from GPT, zenith delay (dry) from Saastamoinen mapped with GMF dry, estimated pass-specific zenith delay mapped with GMF wet
- Frequency: Bias per pass adjusted
- Weight: 0.35 mm/s

SLR

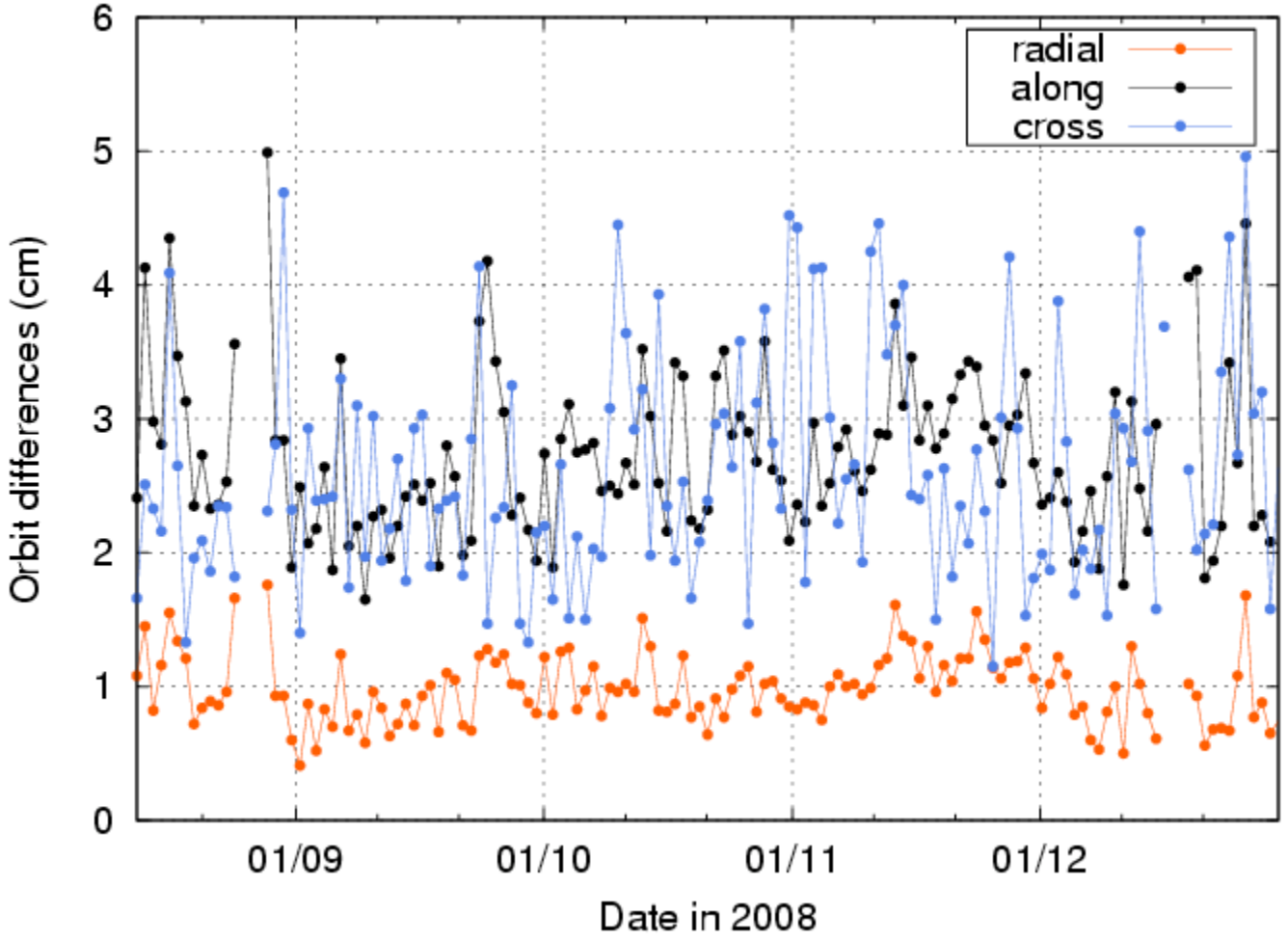
- 7° elevation cut-off
- Troposphere: Mendes-Pavlis following IERS-2003 update
- Retro-reflector: Constant correction of 4.9 cm for all stations
- Weight: 10 cm

GPS

- 7° elevation cut-off
- 30 sec sampled observations - undifferenced code and phase
- ESA orbits and clocks (30 sec)
- Phase windup correction applied
- No elevation dependent weighting applied
- No Jason-2 ANTEX correction applied
- Extended ANTEX correction used for GPS satellites (< 17°)
- Weight: 1 cm for phase, 1 m for code

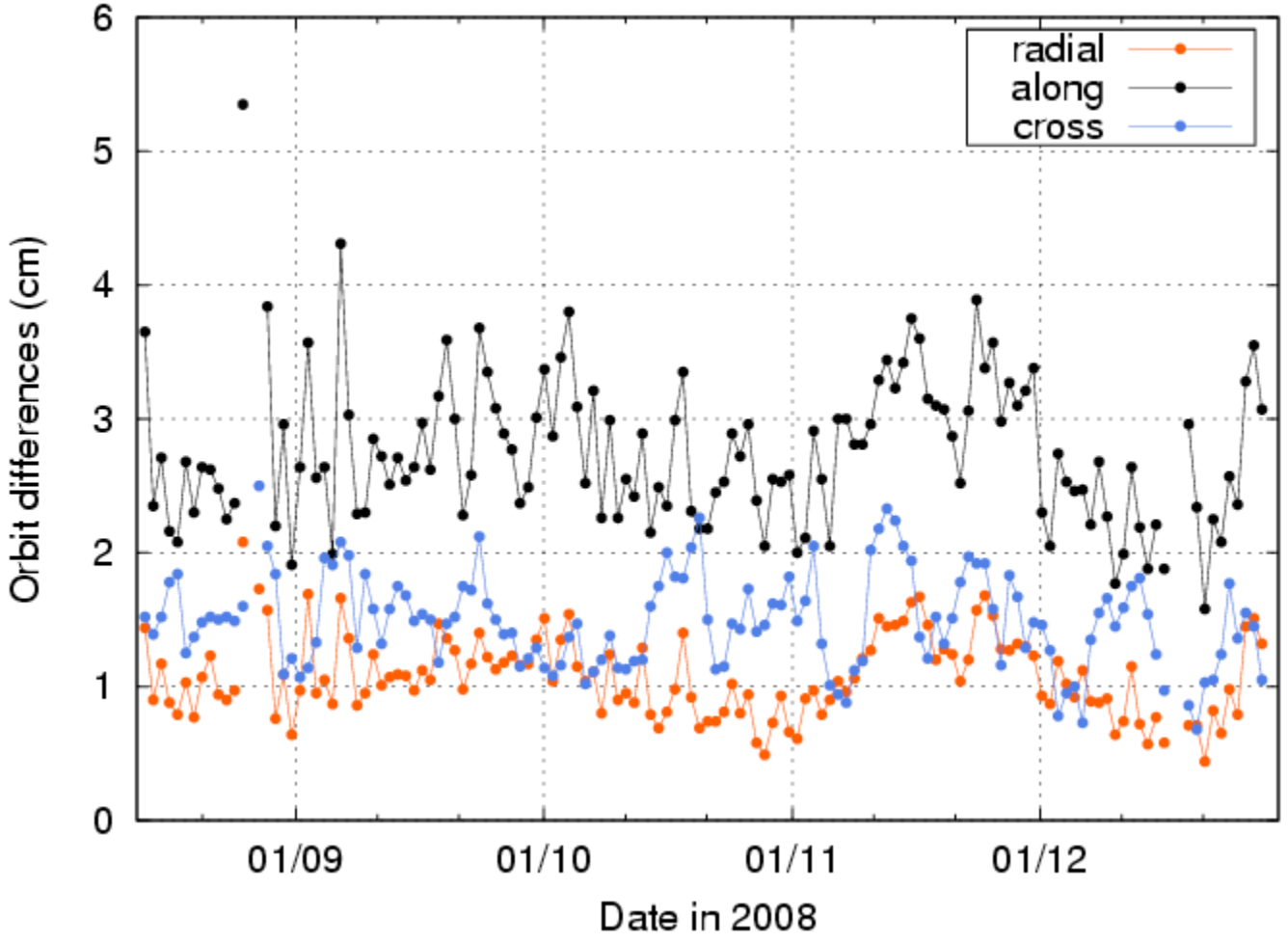
Orbit comparison – daily RMS difference

ESOC SD - CNES



Orbit comparison – daily RMS difference

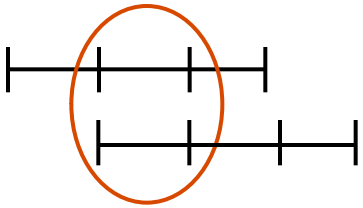
ESOC SDG - CNES

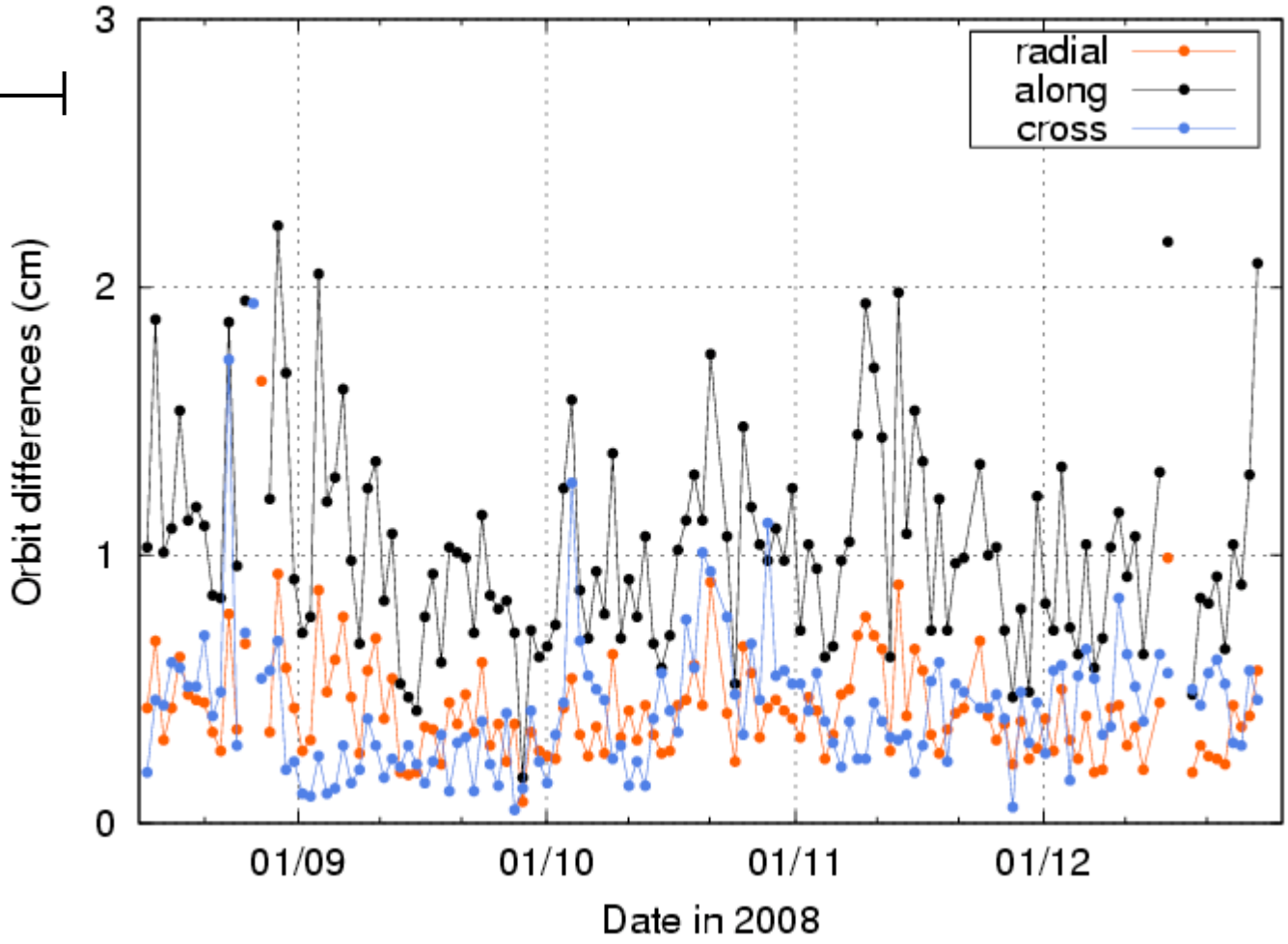


Notice the much smaller cross-track difference but slightly higher radial difference

Orbit overlap error – daily RMS difference

ESOC SDG





Solar radiation pressure model

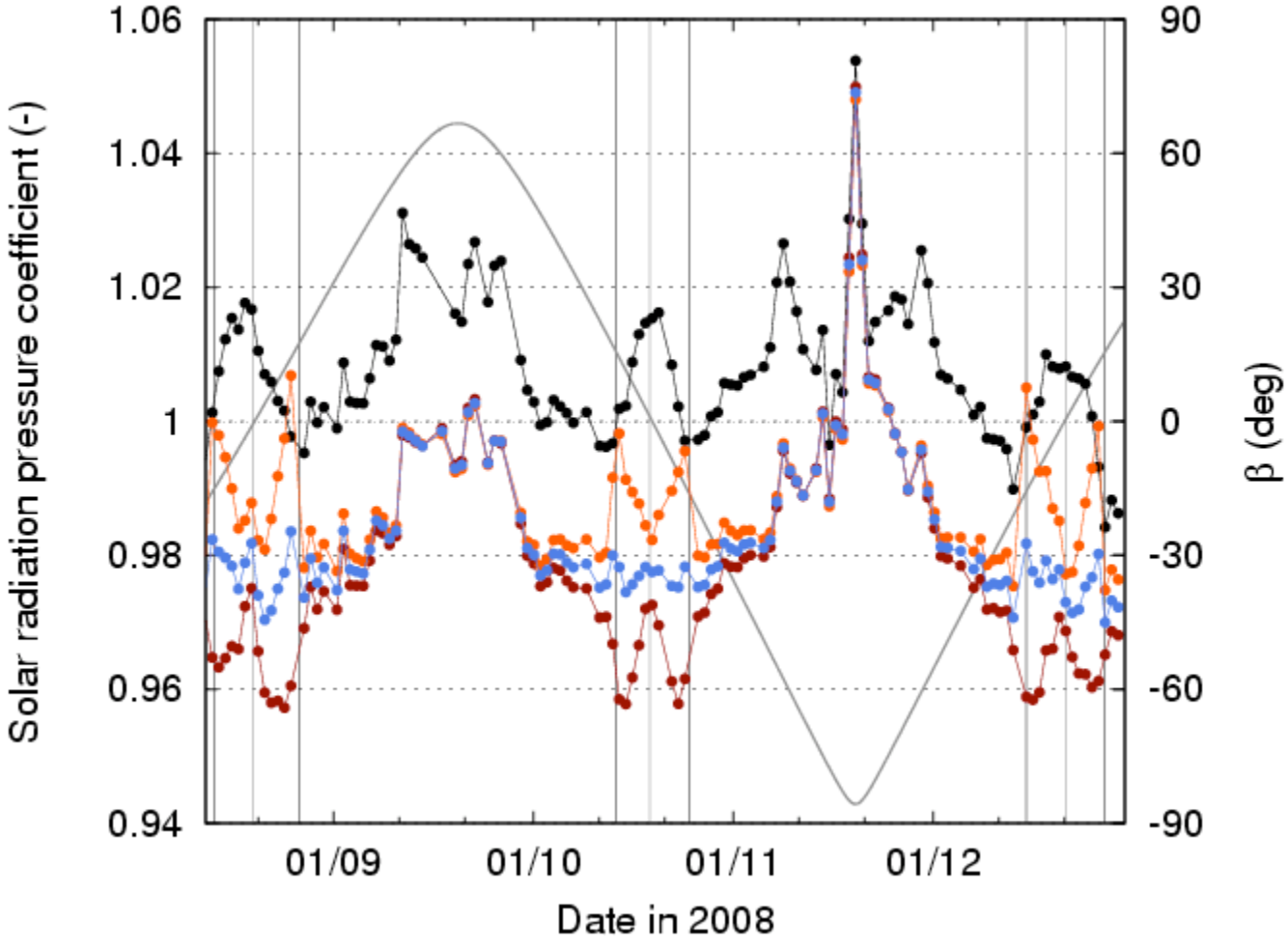
scale factor derived from different models

Constant area

Jason-1 GDR-C Boxwing

ESOC Boxwing

Jason-1 Boxwing

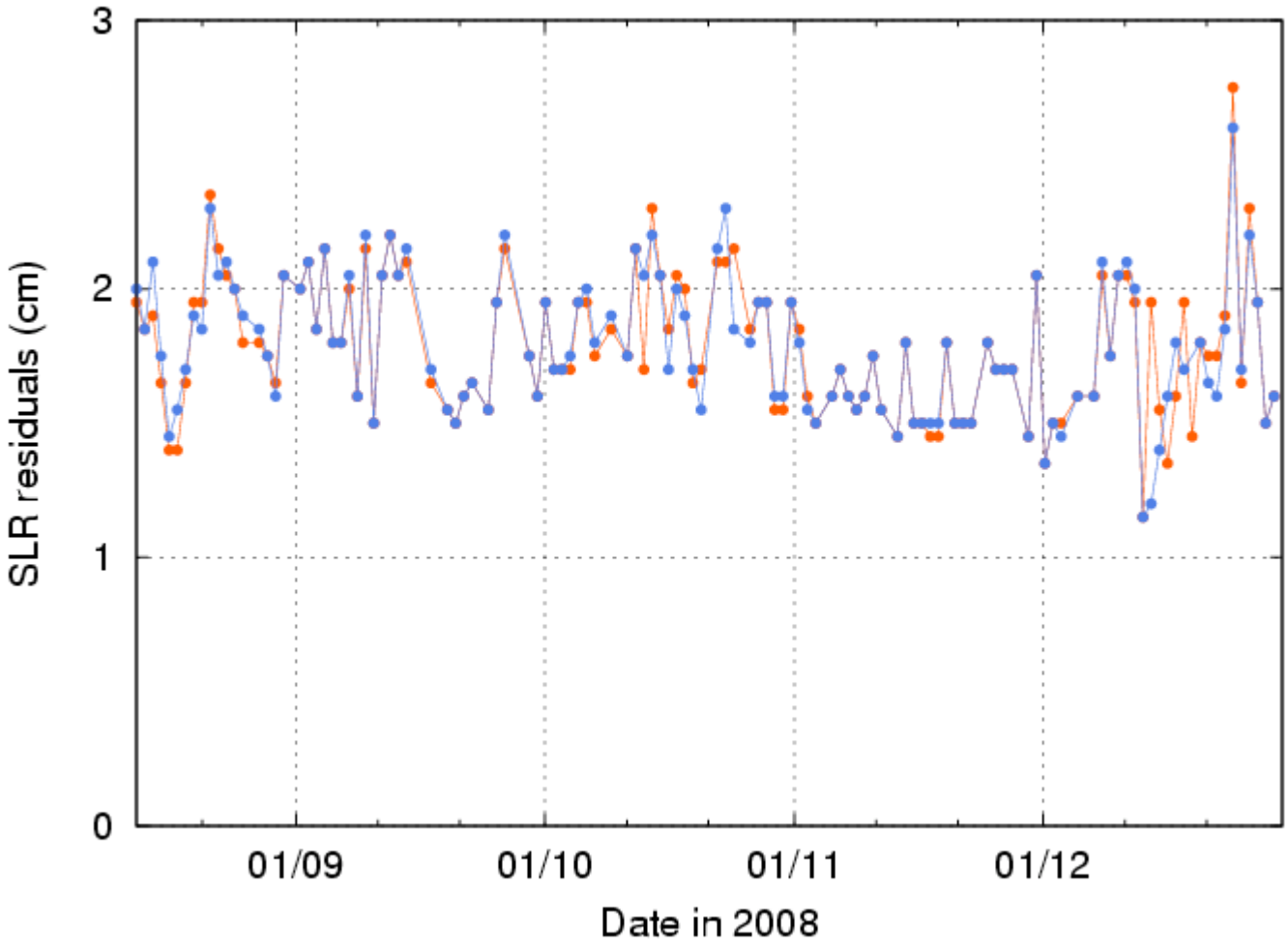


Solar radiation pressure model

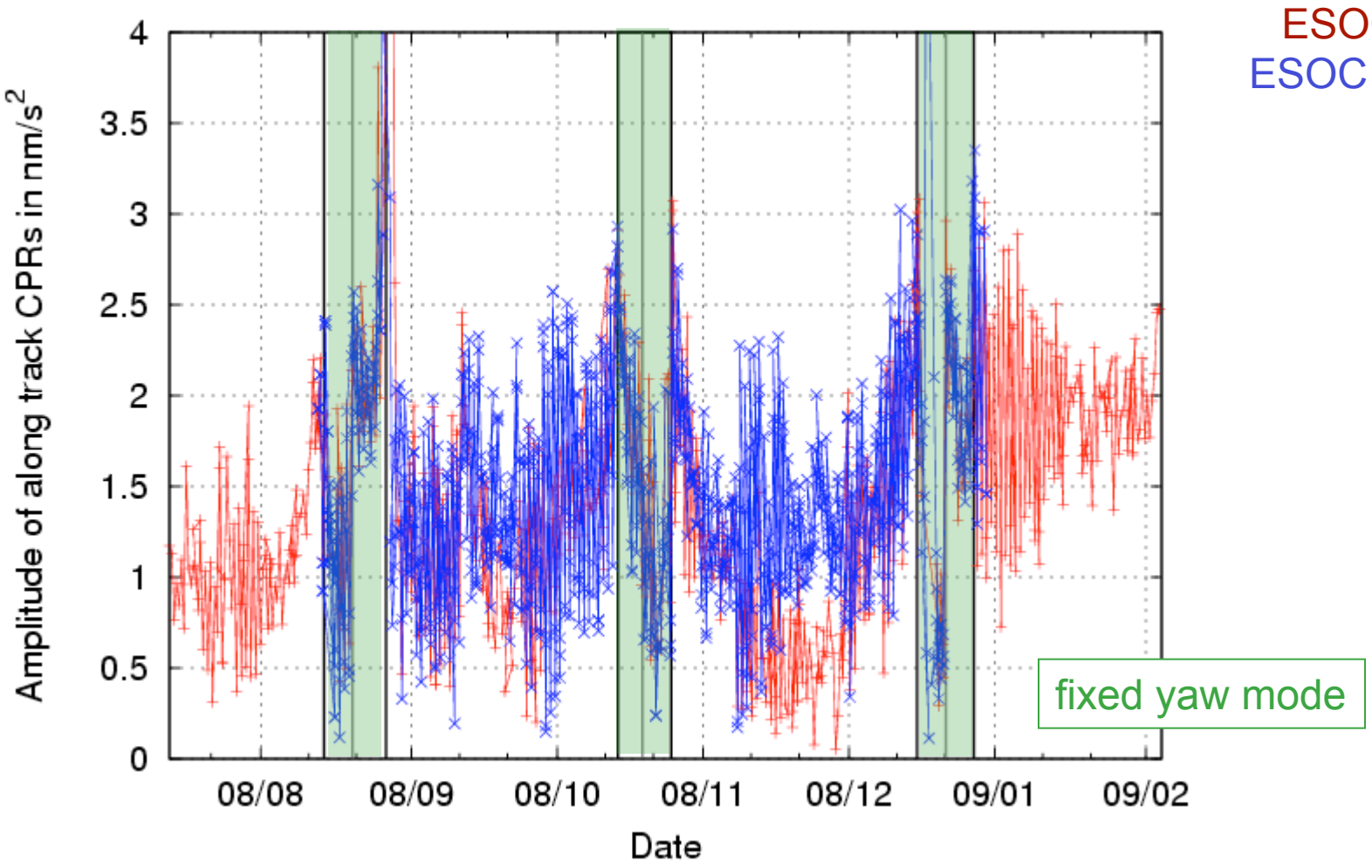
SLR residuals using different models

Jason-1 GDR-C Boxwing

ESOC BoxWing



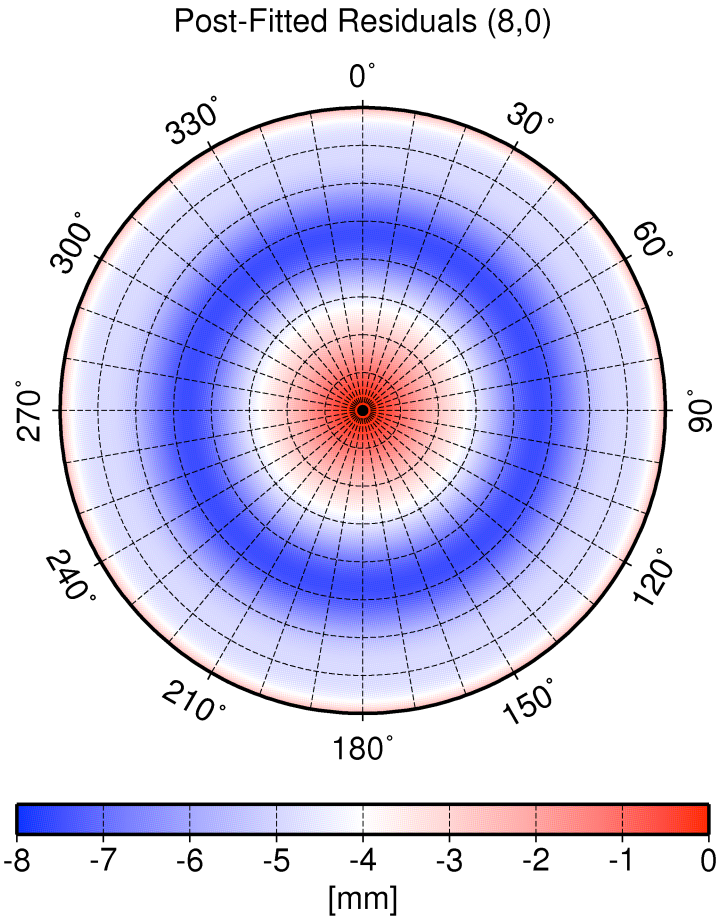
Along-track CPR's

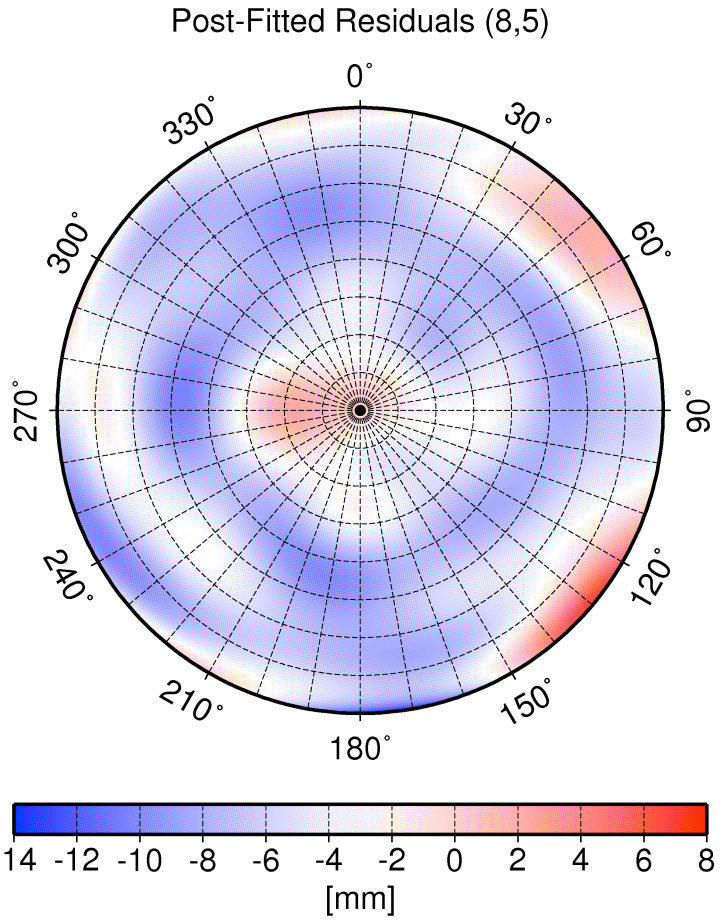


Notice the clear pattern correlating with the different attitude modes of Jason-2, and the different behavior for 2009 after the last transition to the yaw steering mode.

Jason-2 antenna phase maps

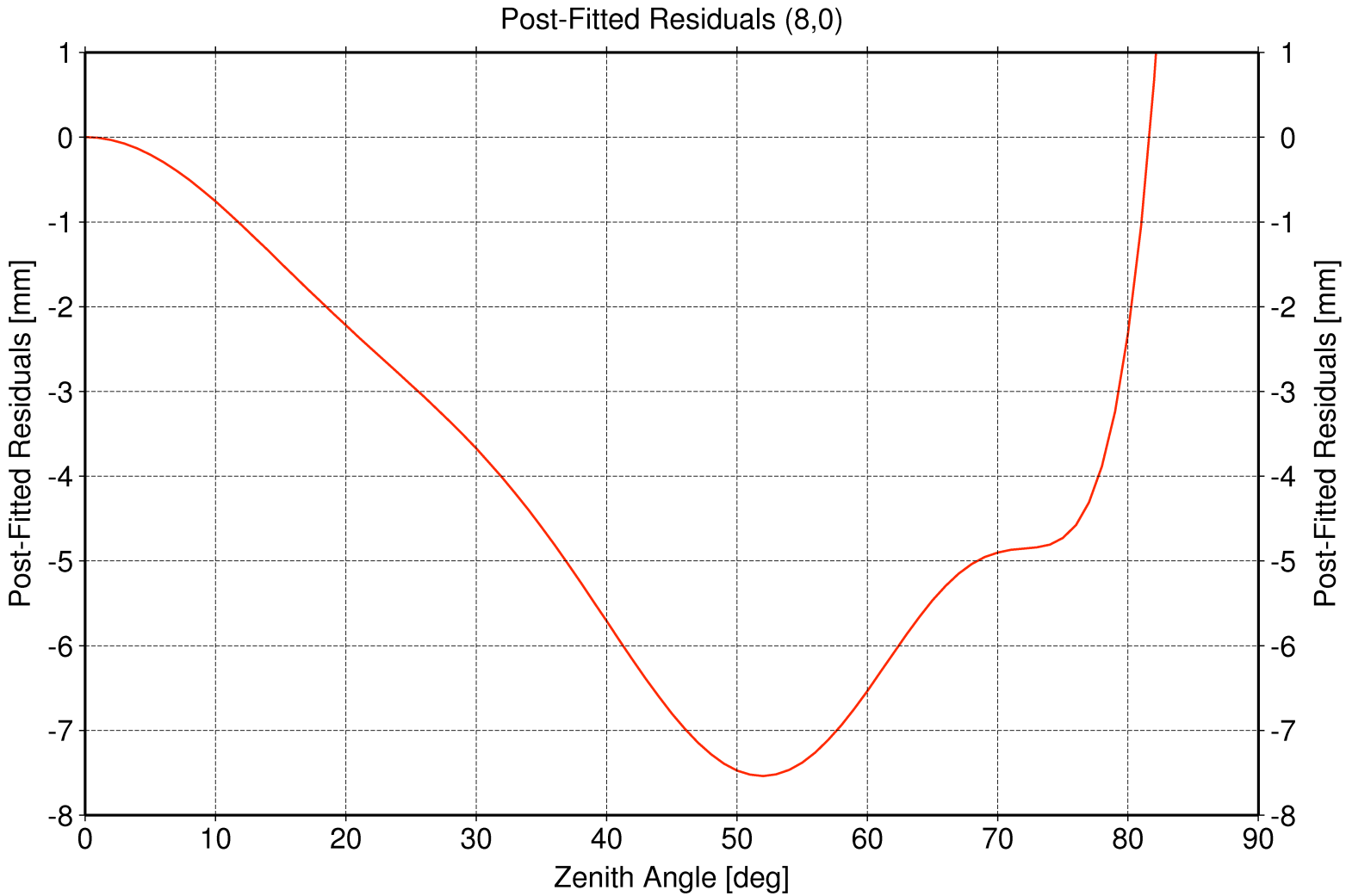
ESOC SDG





post-fitted GPS phase residuals

ESOC SDG



Outlook

- Tune the ESOC SLR – DORIS – GPS orbit solution
- Estimate a Jason-2 antenna phase map as part of the orbit estimation (derived from normal equation stacking)
- Provide a ESOC Jason-2 orbit solution on a routine basis