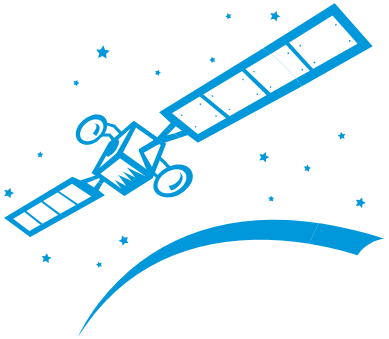

Generating precise and homogeneous orbits for Jason-1 and Jason-2

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Overview

- Motivation
- Processing strategies for Jason-1 and Jason-2
- Jason-1/2 solar radiation pressure modelling
- Tracking data used
- Orbit comparison results
- Summary

Motivation

- There is a need for high-quality homogenous altimetry products
  → i.e. precise and homogeneous orbits for altimetry satellites.
- The Navigation Support Office at ESOC is involved in the processing and validation of the ESA altimeter missions:
  ERS-1/2, Envisat and Cryosat-2 since the launch of each mission.
- We have the capability and the software (NAPEOS) to process efficiently all geodetic tracking techniques (SLR, DORIS, and GPS) in a combined processing.
- This presentation will focus on the Jason-1/2 POD carried out at ESOC using the NAPEOS software.

Processing strategy Jason-1/2

- Very close to CNES GDR-C standards
- Modeling according to latest standards (IERS2003)
- GPS + DORIS + SLR used, technique-specific weighting
- ESA final GPS orbits and clocks (30s) introduced (kept fixed)
- Estimated parameters
  - Orbit parameter (3-day arcs)
    - SV
    - 4 CPRs (sin/cos in along-track/cross-track) every 12h
    - 5 Drag parameters every 24h
  - GPS phase ambiguites
  - Jason-1/2 clock bias (30s)
  - DORIS station frequency bias, time-tag bias, atmospheric zenith delay correction

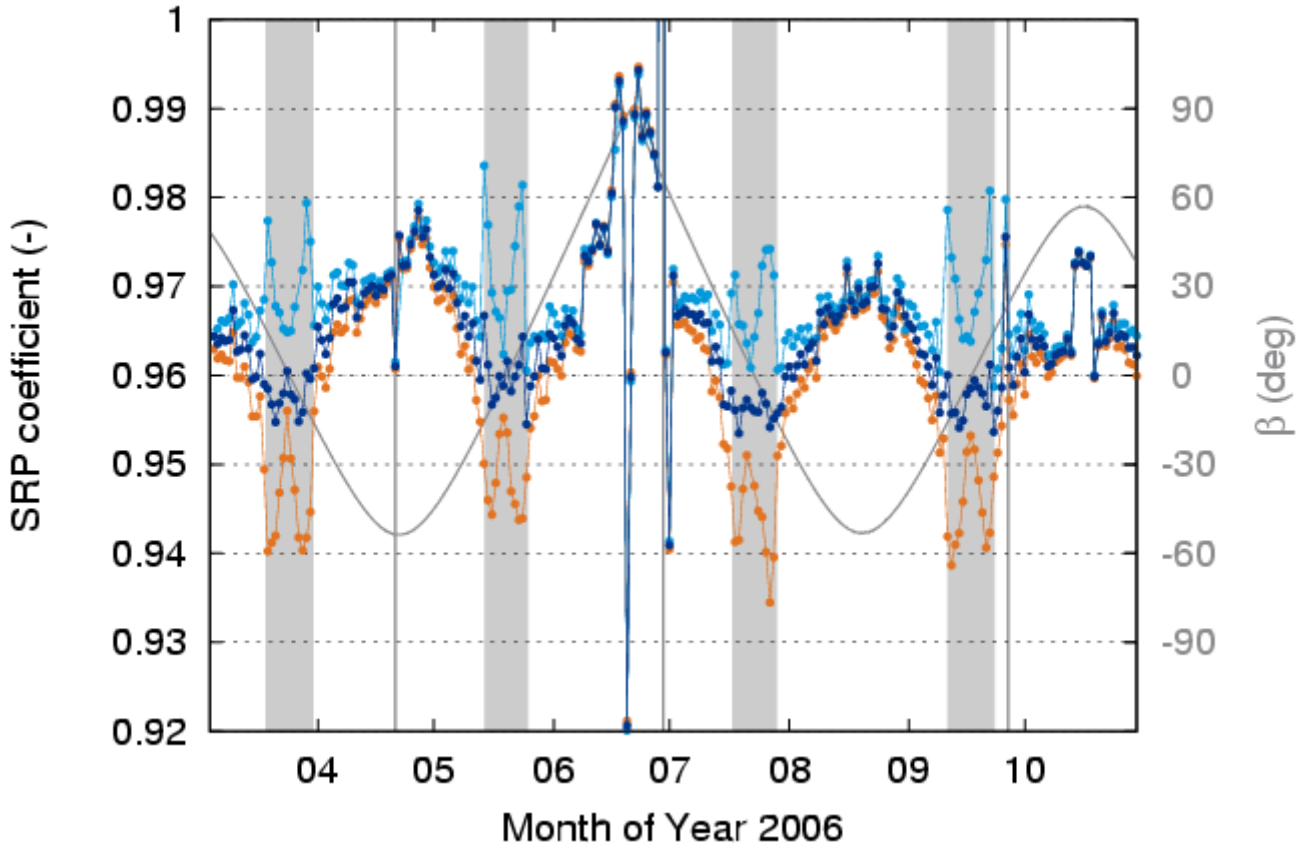
POD test solutions

Some of the various test solutions for Jason

- Scaling of solar radiation pressure model
  - Estimation of satellite-specific scaling factor (next slides)
- Macro model for box-wing (modelling of surface forces)
  - CNES provides Jason-1 GDR-A and update GDR-C (next slides)
- GPS antenna phase centre modelling
  - Sensor System antenna with GFZ chokering (S67-1575-14+CRG)
  - PCO only
  - Phase centre maps (PCO+PCV) from robotic calibration (IfE)
- Attitude modelling
  - Quaternions
  - Nominal attitude model (with attitude event file)

Scaling of solar radiation pressure model

Jason-1



Jason-1 GDR-C

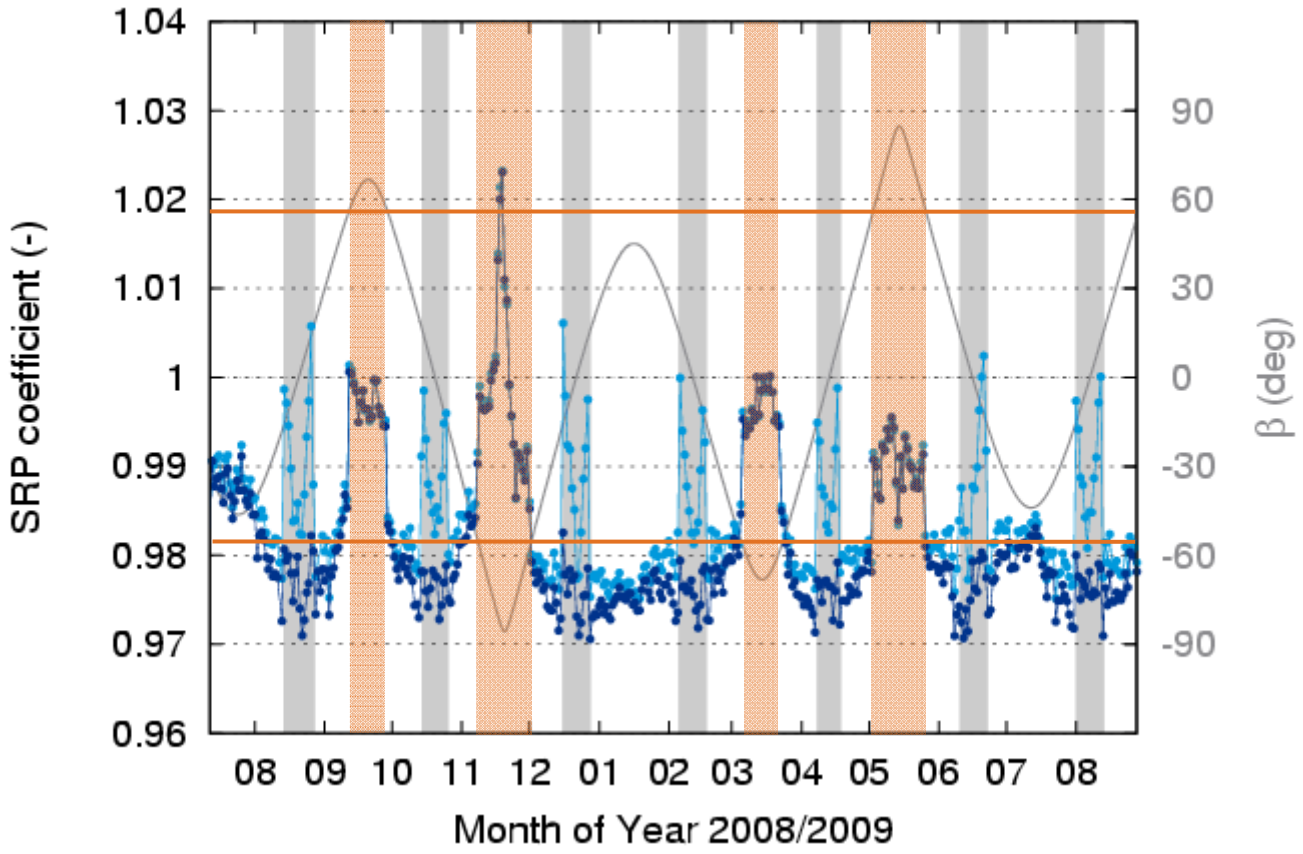
Jason-1 ESOC

Jason-1 GDR-A

fixed yaw mode

Scaling of solar radiation pressure model

Jason-2



Jason-1 GDR-C

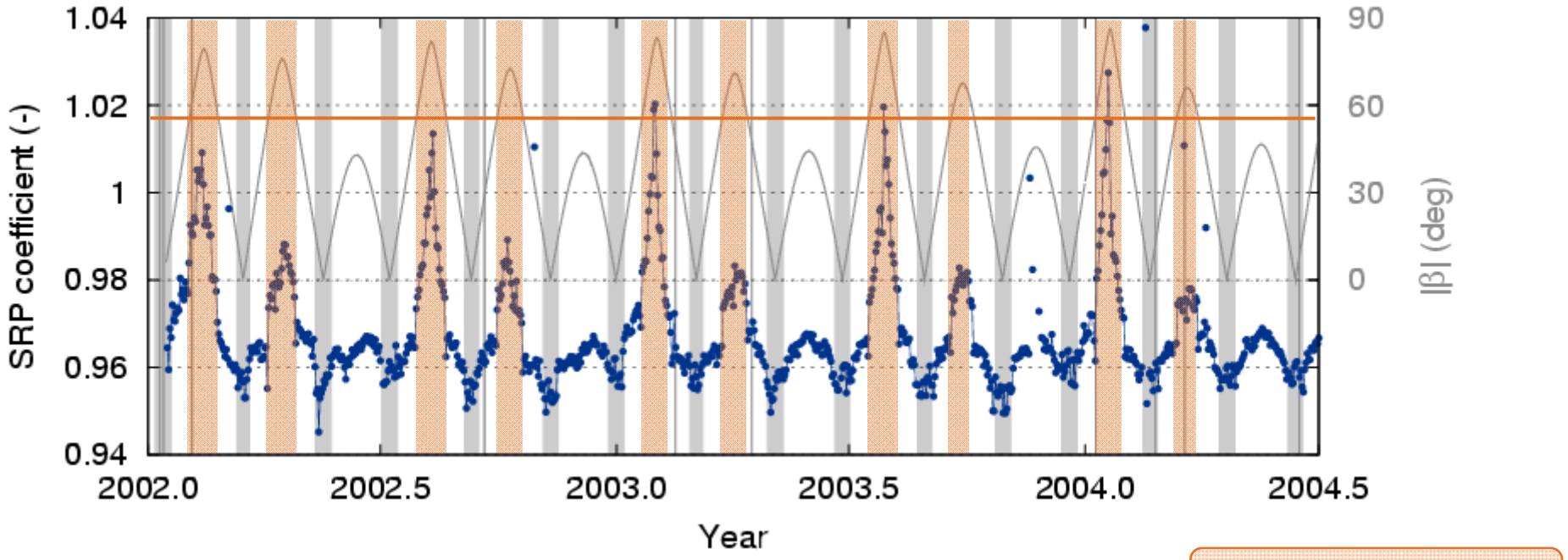
Jason-1 ESOC

fixed yaw mode

55.7° full Sun

Scaling of solar radiation pressure

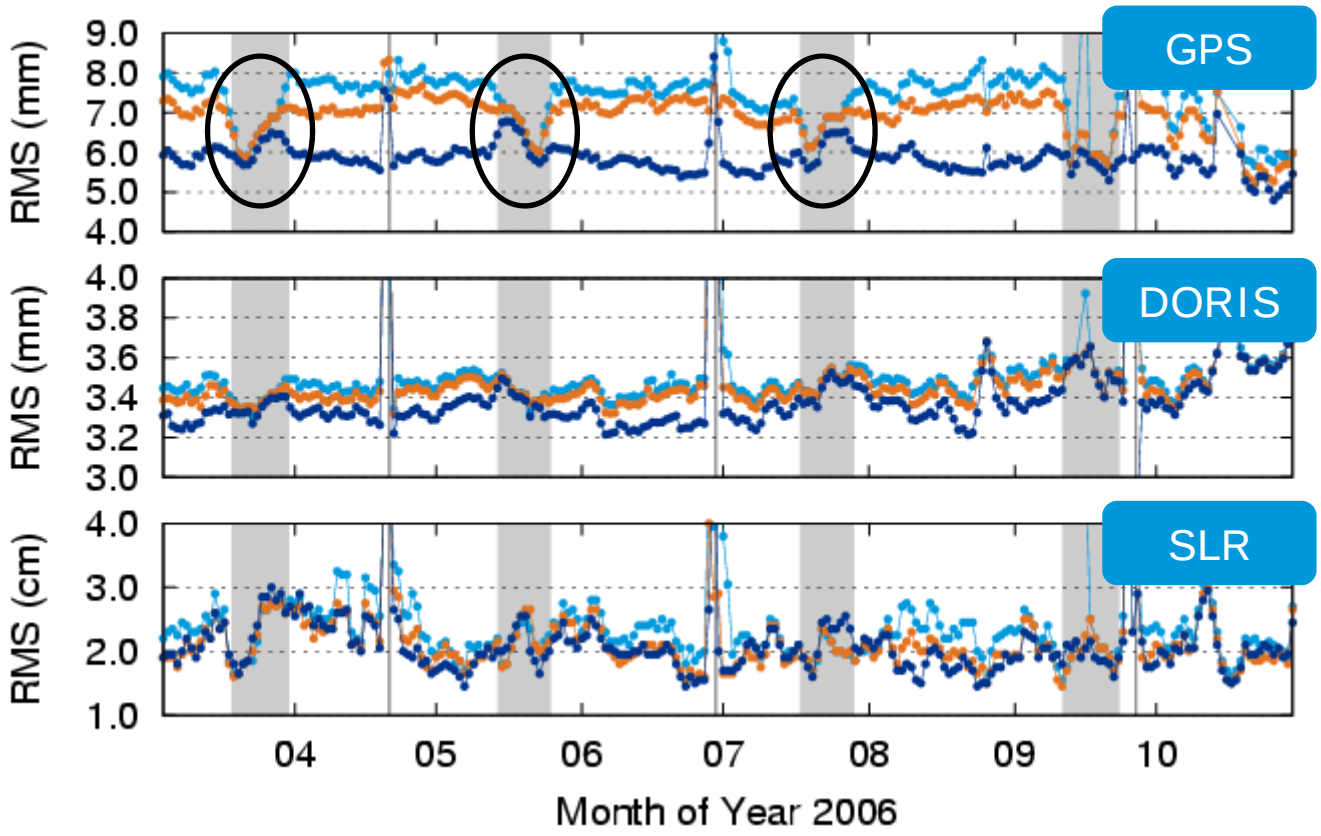
Jason-1



55.7° full Sun

RMS of observation residuals

Jason-1 (GDS3)



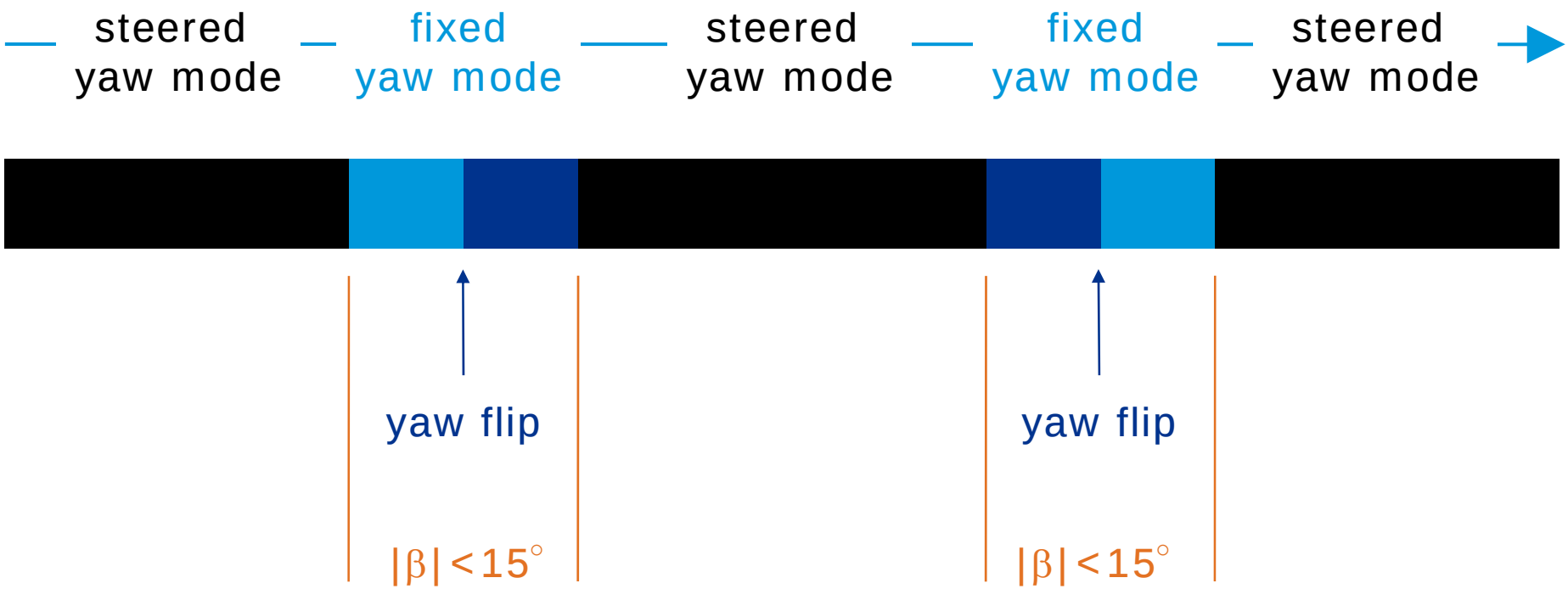
Attitude model + PCO

Quaternions + PCO

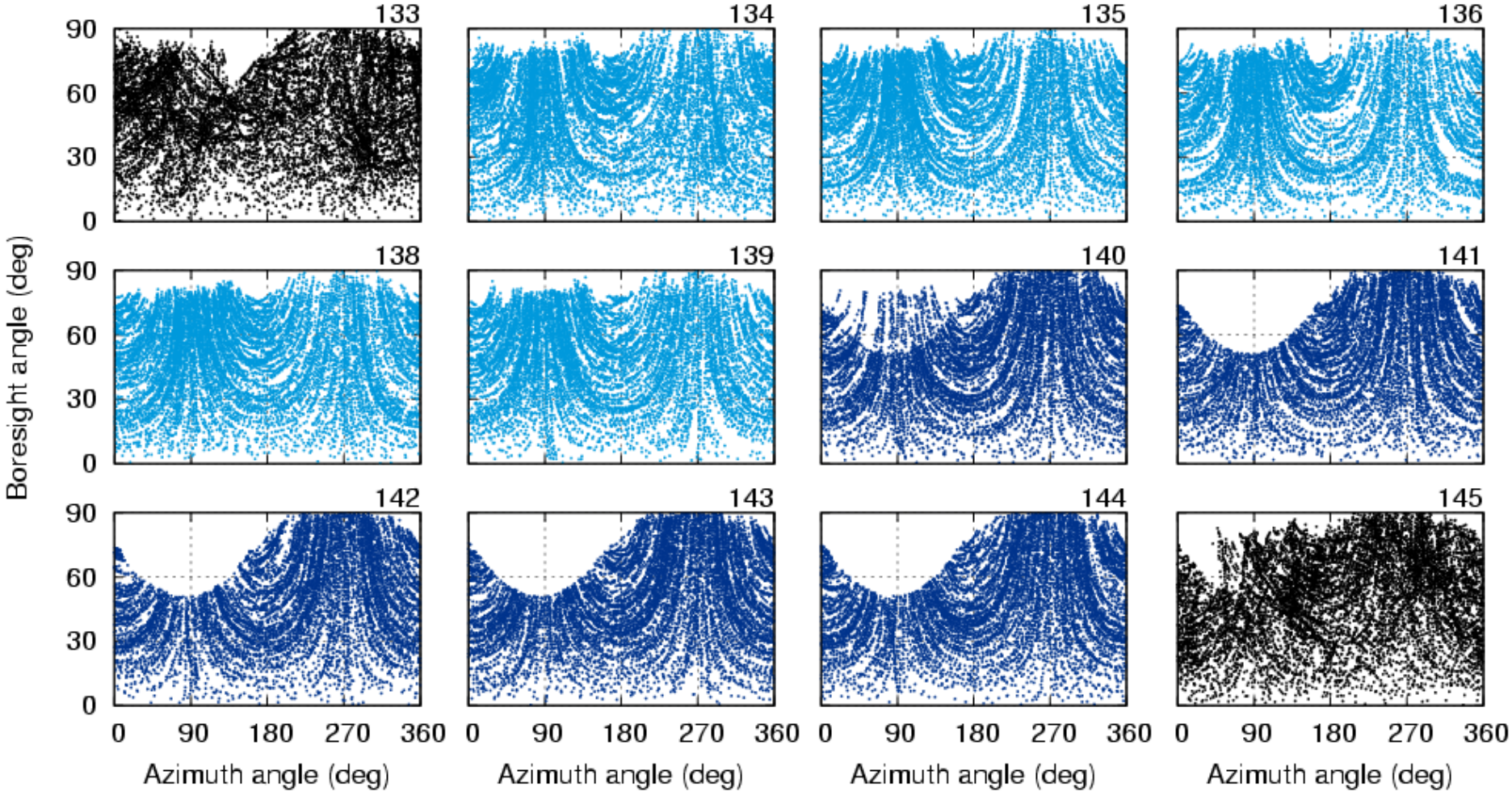
Quaternions + PCO/PCV from calibration

Yaw modes

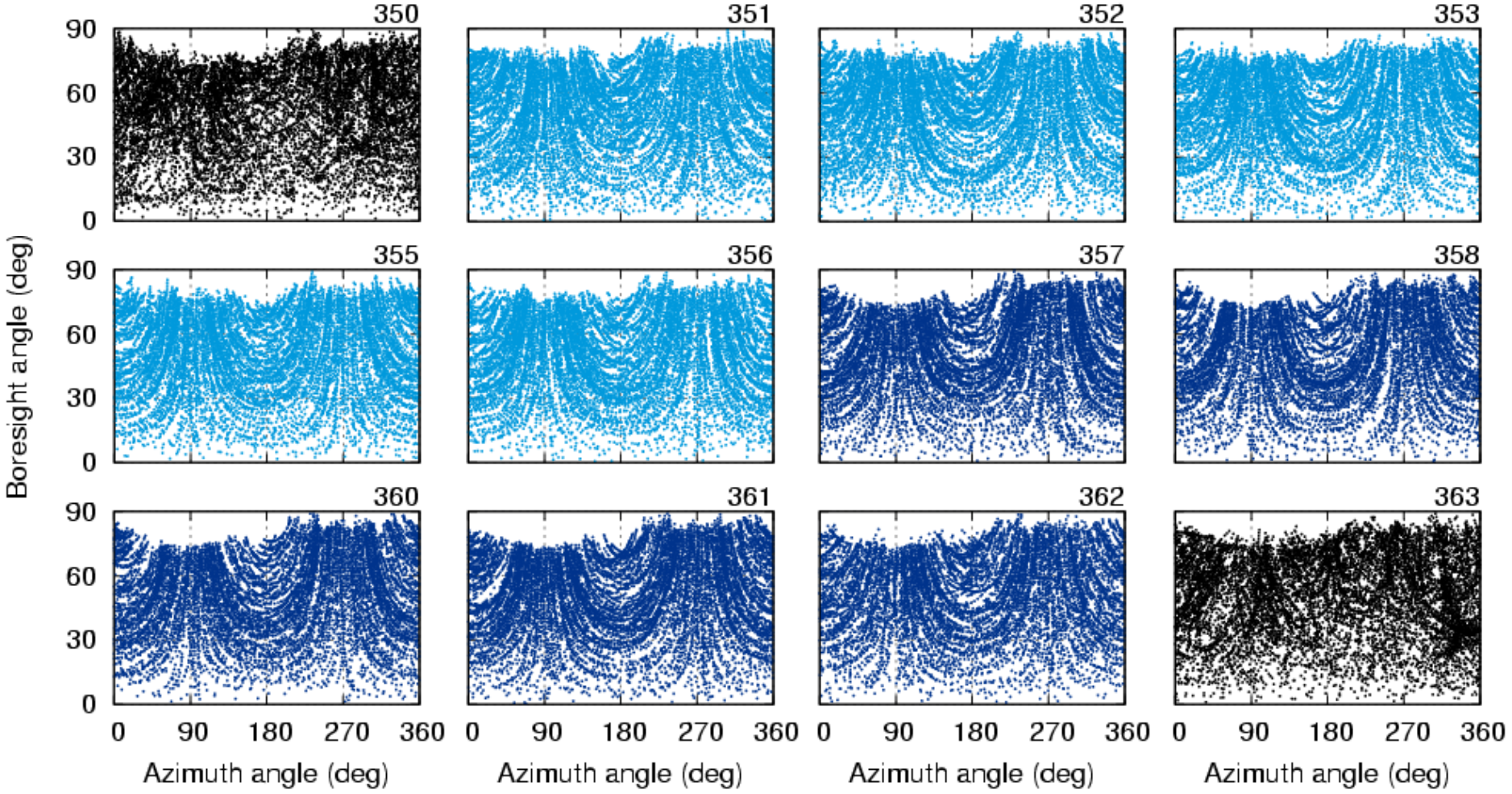
Yaw = Rotation around Z-axis



GPS data acquisition of Jason-1 antenna



GPS data acquisition of Jason-2 antenna



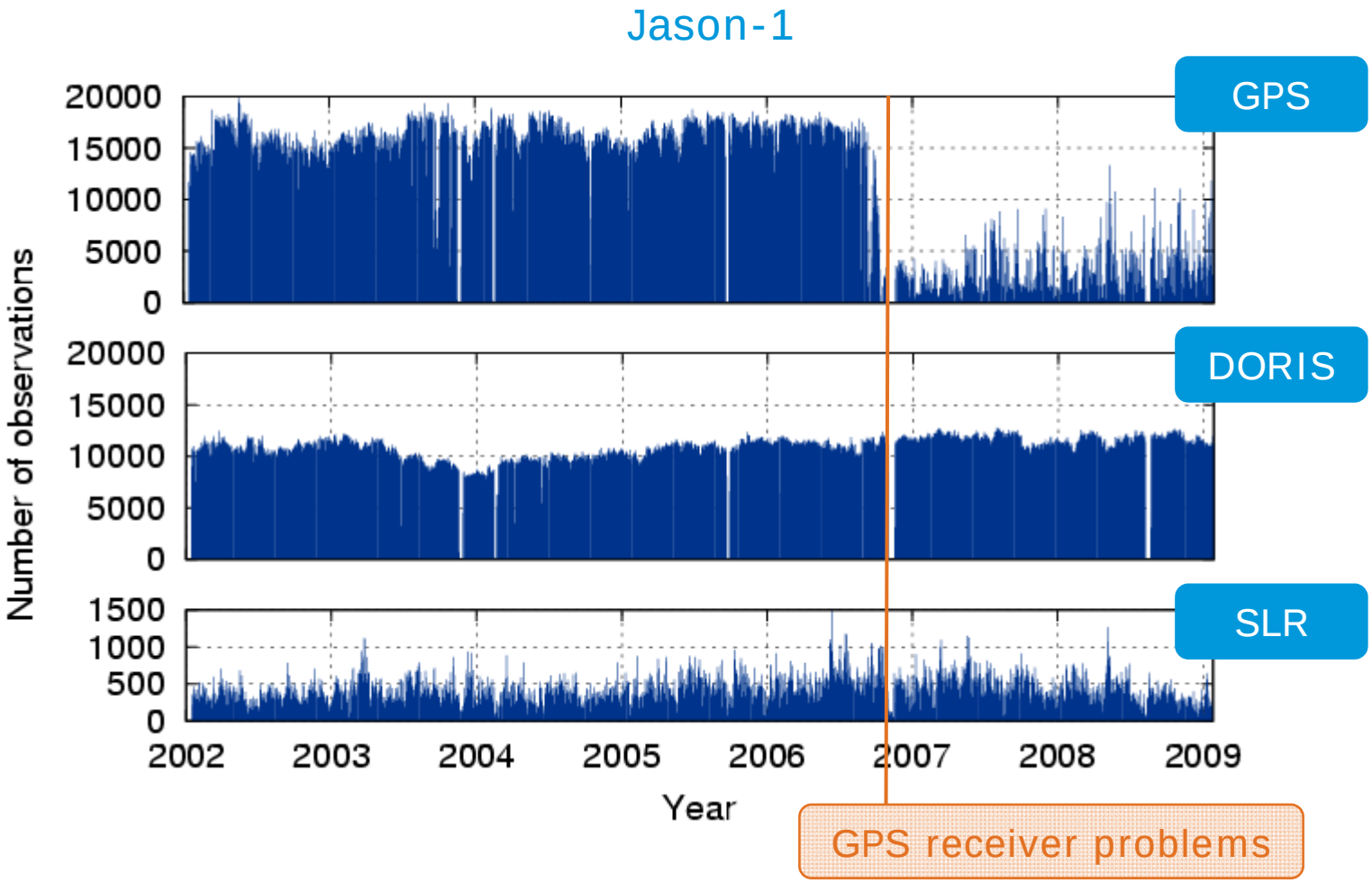
Modelling for final POD solution

Jason-1/2

- Scaling of solar radiation pressure model
  - Jason-1: 0.96
  - Jason-2: 0.98
- Macro model for box-wing (modelling of surface forces)
  - Jason-1 ESOC
- GPS antenna phase centre modelling
  - Phase centre maps (PCO+PCV) from robotic calibration (IfE)
- Attitude modelling
  - Quaternions, or if missing
  - Nominal attitude model (with attitude event file)

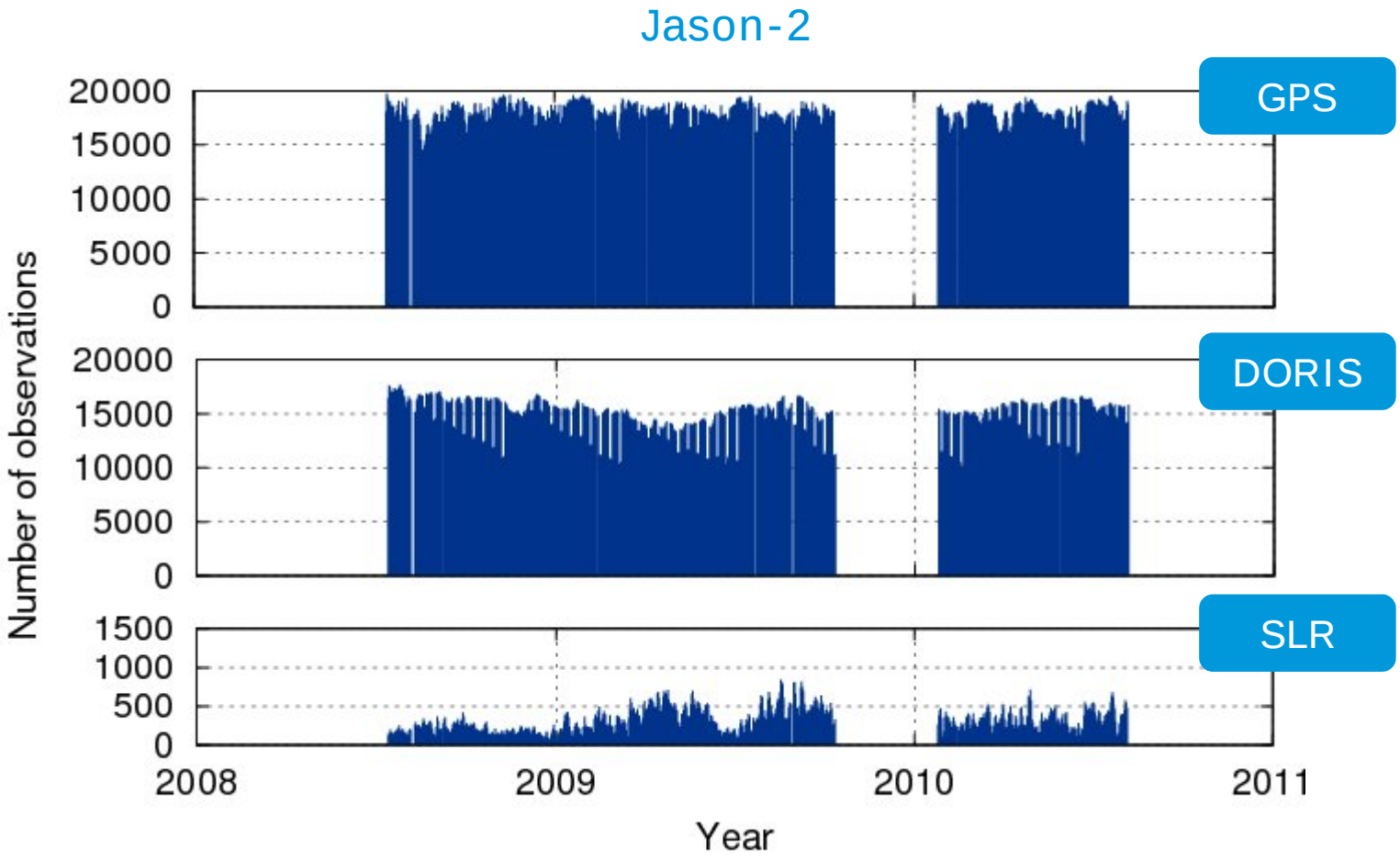
Observation data Jason-1

From 1 day arcs



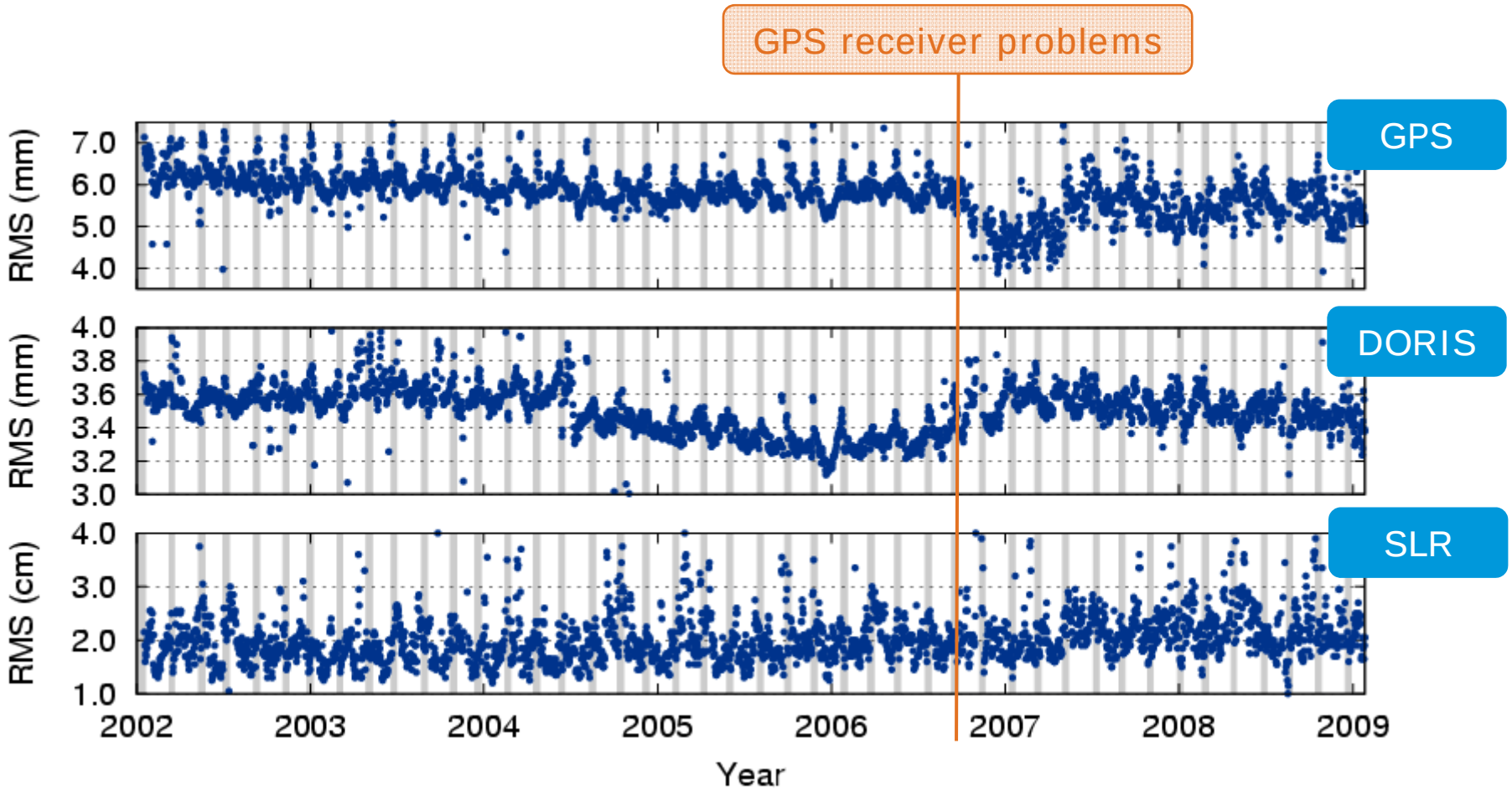
Observation data Jason-2

From 1 day arcs



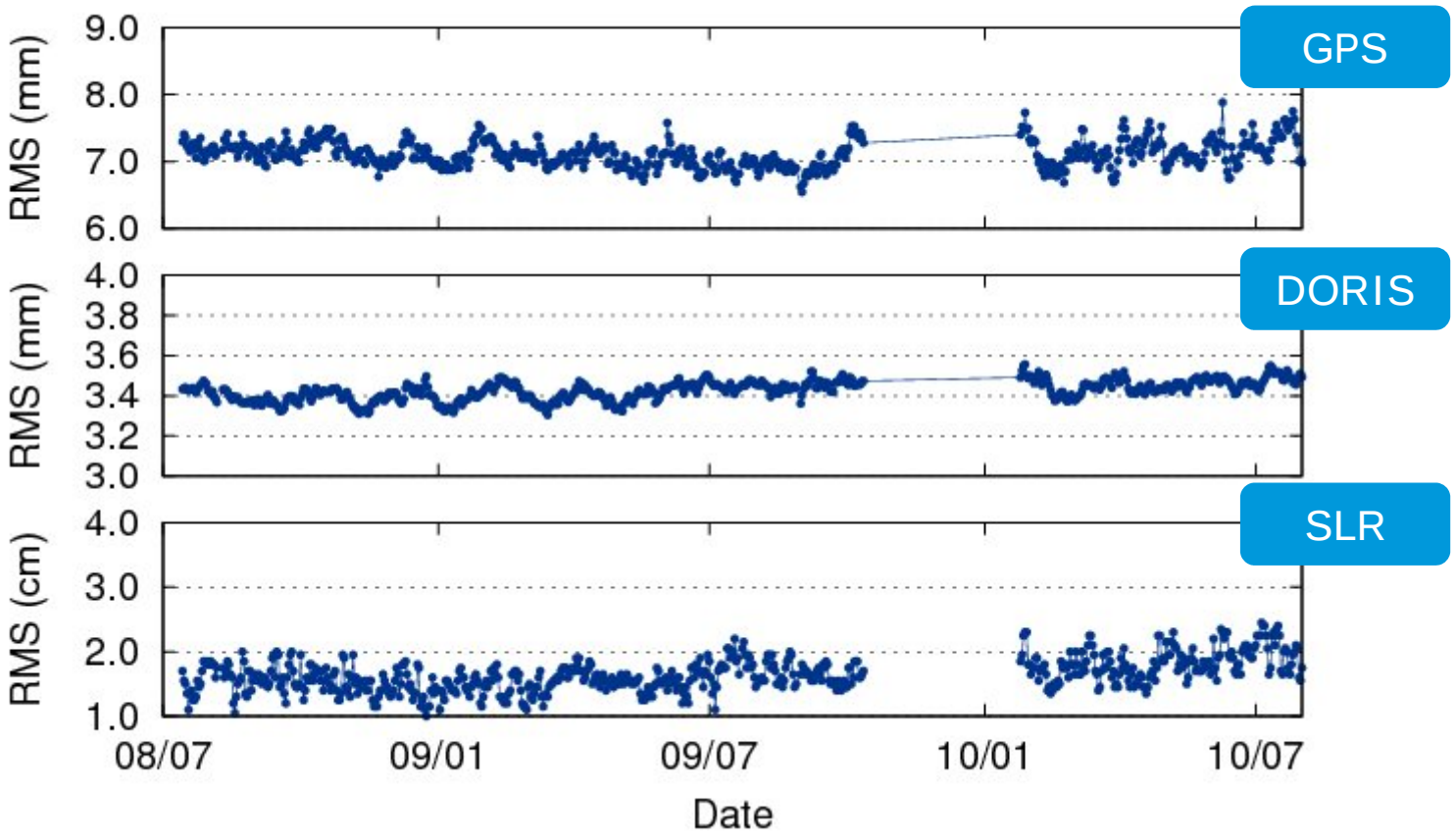
RMS of observation residuals

Jason-1



RMS of observation residuals

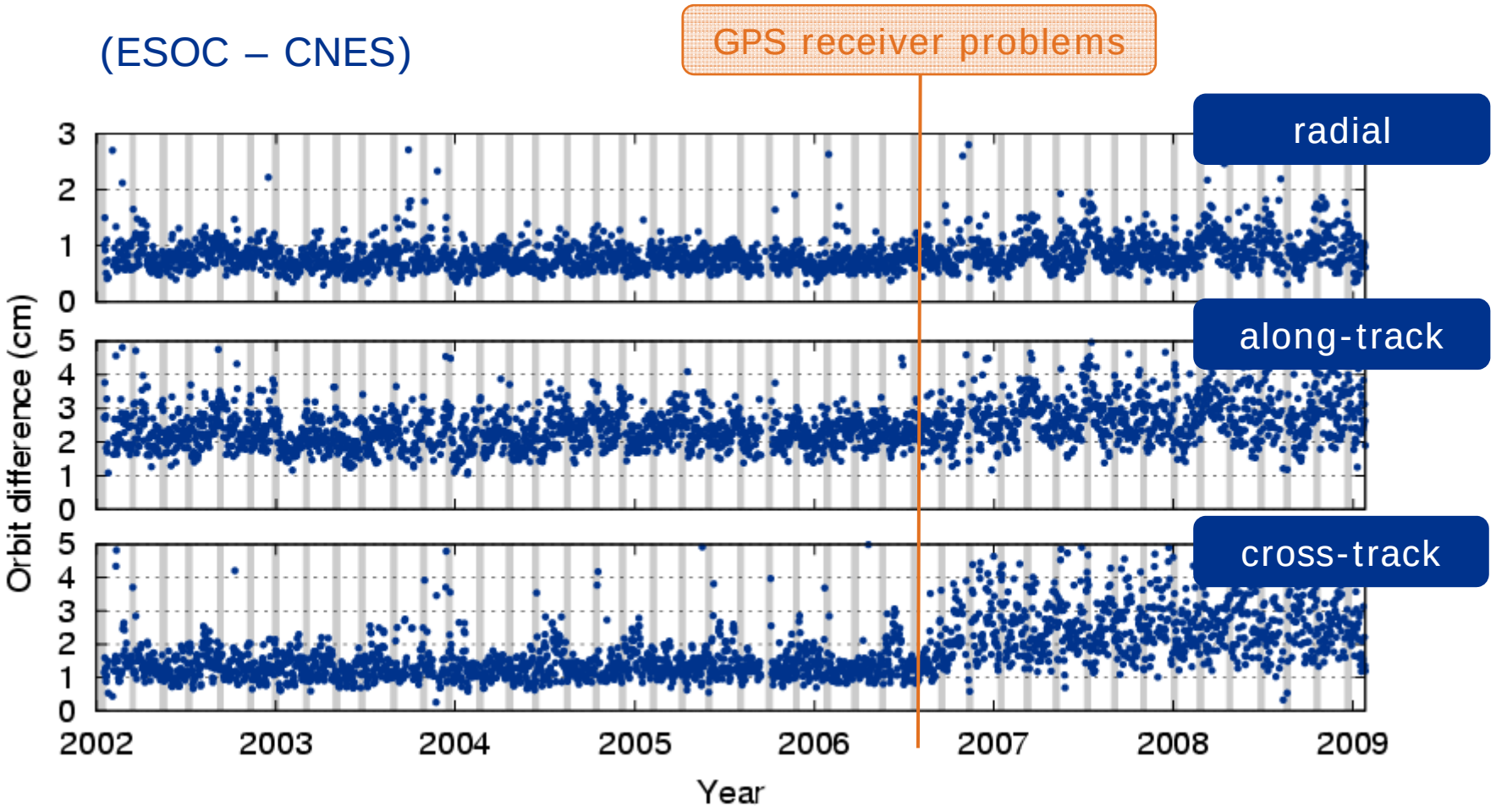
Jason-2



Daily RMS of orbit differences

Jason-1

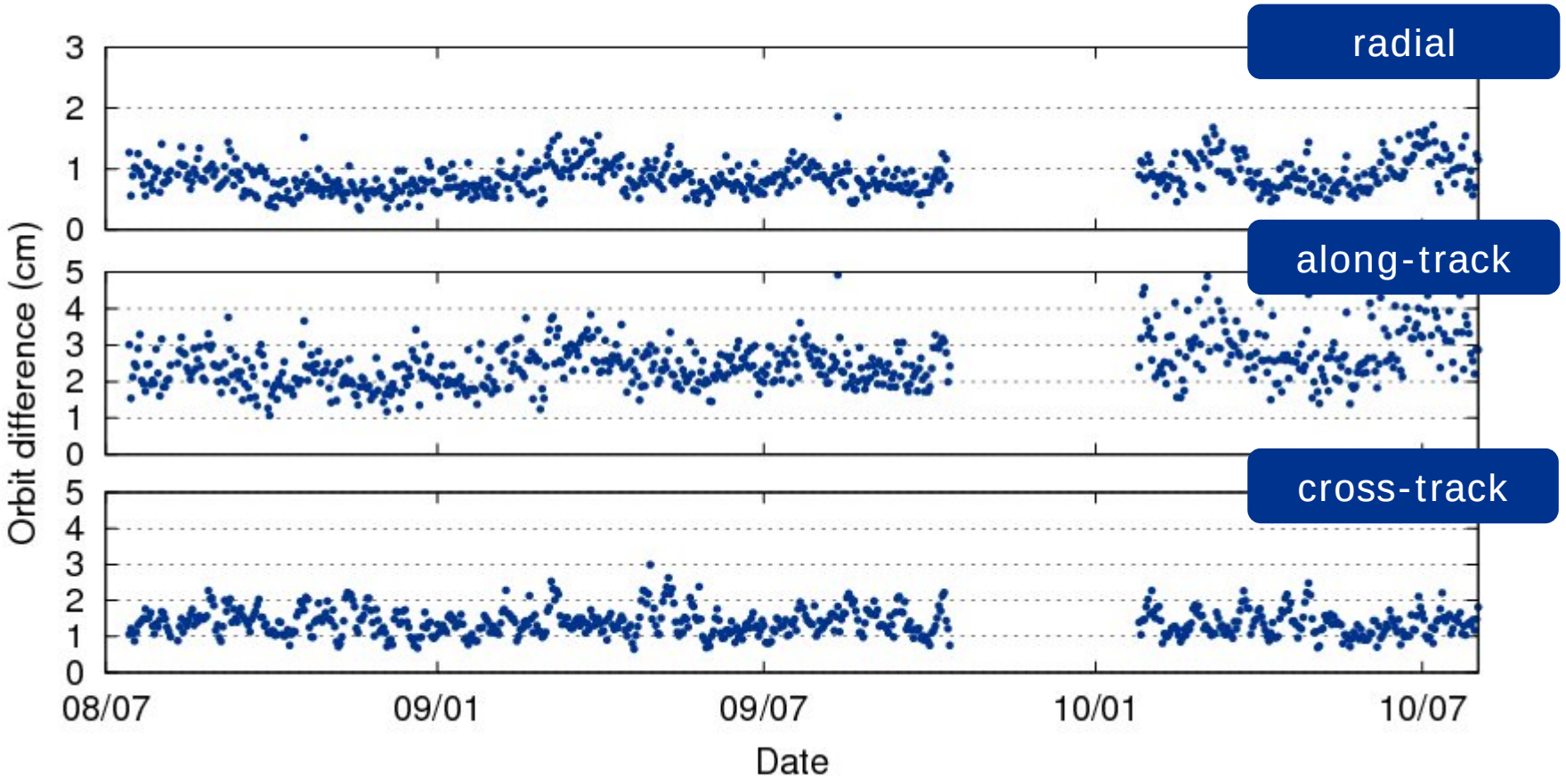
(ESOC – CNES)



Daily RMS of orbit differences

Jason-2

(ESOC – CNES)



Summary (1)

- The Navigation Support Office at ESOC is able to process in an homogeneous way with a single software Jason-1 and Jason-2 in addition to the existing processing of the ESA altimeter missions: ERS-1/2,Envisat and Cryosat-2
- All geodetic tracking techniques can be processed and we are not depend on external GPS products e.g., orbits or clocks.
- good agreement of solutions, no systematic bias between tracking techniques
- good agreement with independent orbit solutions (CNES, LCA, JPL)

Summary (2)

- Final orbit solutions will be made soon available on our ftp server
  - ftp://dgn6.esoc.esa.int
  - as a service to the altimetry community
  - extension/update of time series planed
- We will extend our processing depending on staffing availability with Topex/Poseidon.
- We will keep updating our processing with newer models when they become available e.g., ITRF2008, GOCE derived gravity field models.

Thank you

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