CNES Reprocessing Plans for the Next POD Standards

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GDR-D -> GDR-E

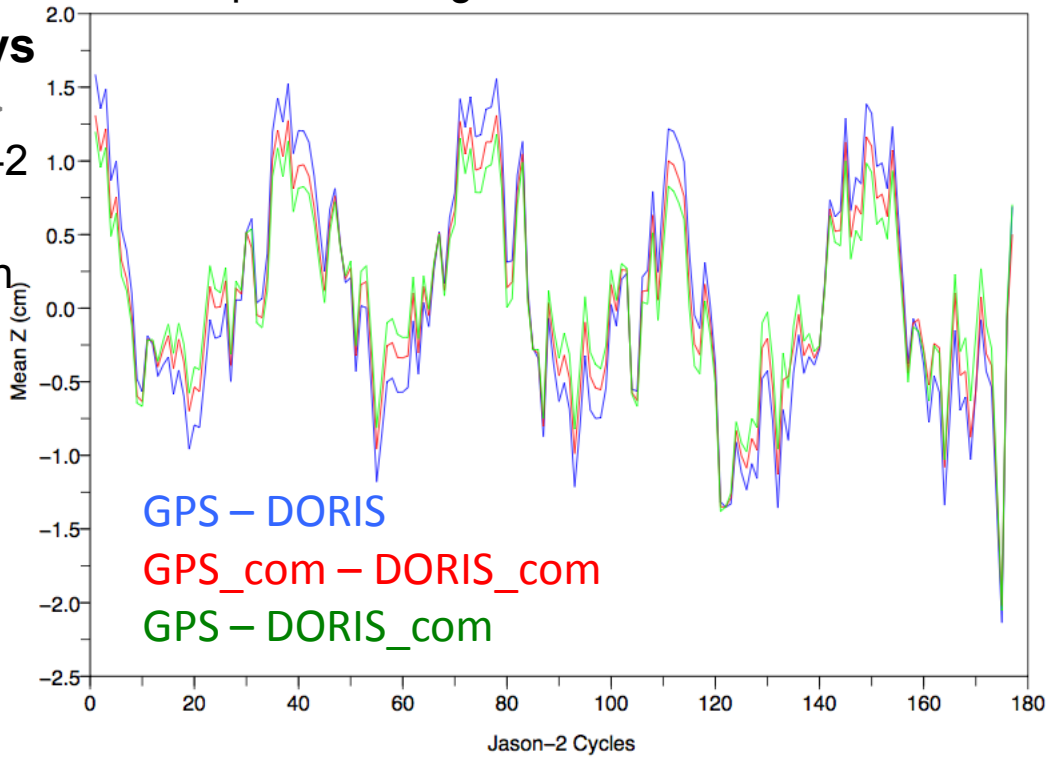
Measurement models

- Since 2011: GDR-D are the currently adopted POD standards
  - An estimated radial orbit error budget for the Jason series GDR-D solutions is given in Jason POD Team paper *Towards the 1 mm/y Stability of the Radial Orbit Error at Regional Scales*, submitted to ASR
- 2014 (TBD): GDR-E standards (currently being defined)
- **Terrestrial Reference Frame and Earth Orientation**
  - ITRF2013 based (DORIS: DPOD2008 -> DPOD2013, SLR: ITRF2008 -> ITRF2013, GPS: IGS08 -> IGS13?)
  - Earth orientation: IERS2010/ITRF2008 -> IERS2010/ITRF2013
- **Displacements of reference points**
  - Ocean loading (FES2004 -> FES2012)
  - S1-S2 atmospheric pressure loading, implementation of Ray & Ponte (2003) by van Dam

GDR-D -> GDR-E

Measurement models

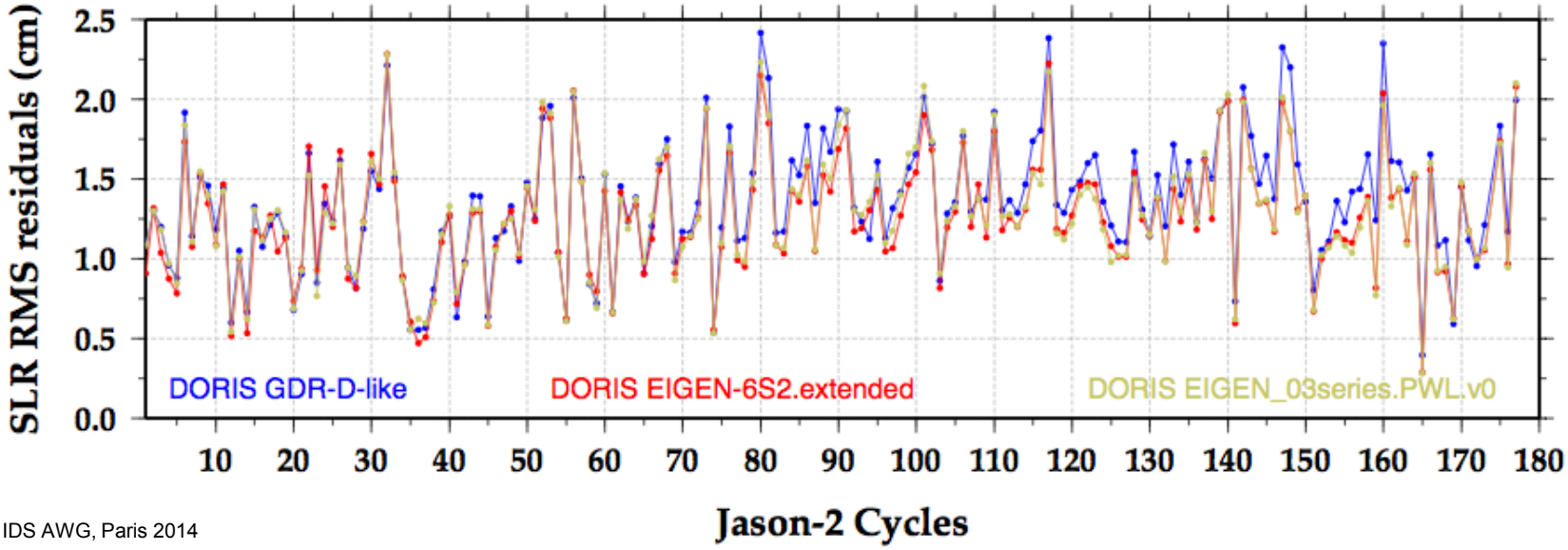
- **Orbits around the center-of-mass of the total Earth system**
  - Seasonal non-tidal geocenter motion ("Climatological model" SLR-only; from J. Ries)
  - Ocean tidal geocenter motion + S1-S2 atmospheric tidal geocenter motion
- **Models for propagation delays**
  - GPS PCO/PCV maps: JPL11a -> JPL13a maps for Jason-1/Jason-2 receivers
  - DORIS beacons phase correction
- **Weight of tracking data**
  - Increase weights of Jason-1 SAA DORIS stations (0.1 -> 0.6)



GDR-D -> GDR-E

Dynamic models

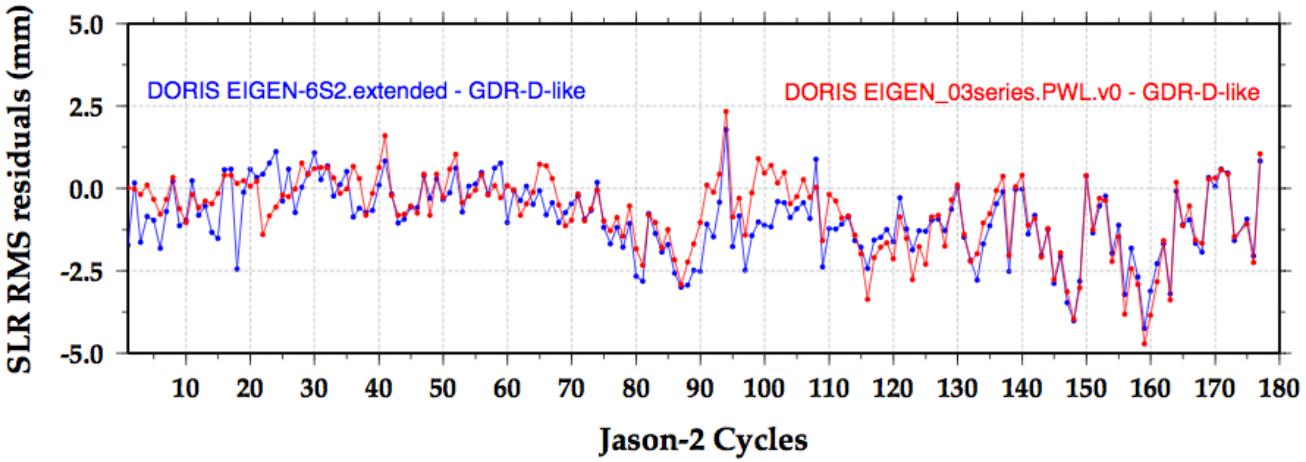
- **Geopotential**
  - EIGEN-GRGS.RL02bis.MEAN-FIELD (based on 8 years of GRACE/LAGEOS RL02 data, static field, time-variable terms up to degree and order 50: annual, semi-annual and drift terms) -> EIGEN_03series (based on 11 years of GRACE/LAGEOS RL03 data, GRACE+GOCE static field, time-variable terms up to degree and order 80: annual, semi-annual terms, one bias and drift for each year) => accounts for interannual variability)



GDR-D -> GDR-E

Dynamic models

- **Geopotential**



  - C21/S21 modelled according to the IERS 2010 Conventions
  - Ocean tides: FES2004 -> FES2012
  - C31/S31 adjusted during the orbit determination process
- **Surface forces**
  - Calibrated semi-empirical solar radiation pressure models
  - Drag from atmospheric density model: DTM-94 -> DTM-2013
- **Estimated dynamical parameters**
  - Tuning of empirical accelerations and 1st order Markov process

Orbits Reprocessing

Tentative schedule

- **Beginning of June:** Jason-1 orbits will be reprocessed to a preliminary version of the GDR-E standards
- **End of July:**
  - GDR-E standards are finalized and implemented in CNES POD software
  - Operational orbits remain in GDR-D standards
  - GDR-E reprocessing will start at the same time
- **October:**
  - Results obtained using the available GDR-E orbits are presented at next OSTST, a change towards the GDR-E standards will be proposed to the science community
- **December:**
  - Operational orbits switch to GDR-E, reprocessed GDR-E orbits are made available, GDR-D standards are abandoned

ESTIMATION OF THE INITIAL POSITION OF JASON 1 CENTRE OF MASS :

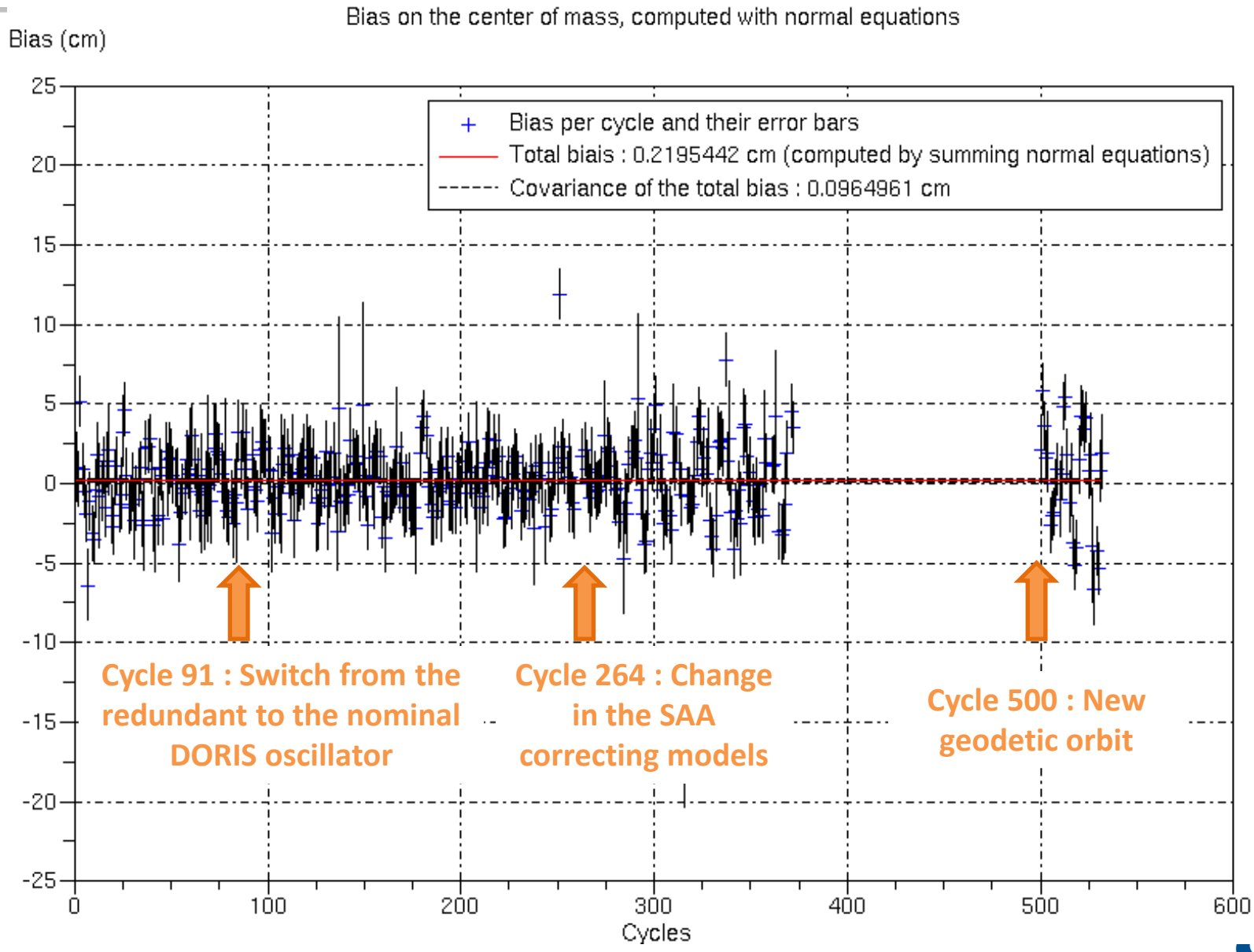
Context :

- JASON1 prime contractor estimated the initial center of mass position to be [0.935, 0, 0] in the body frame.
- In the early life of JASON1, CNES estimated the initial center of mass position to be [0.955, 0, 0] in the body frame (relative to measurement's reference point).
- Which value fits the reality better ?

Methodology :

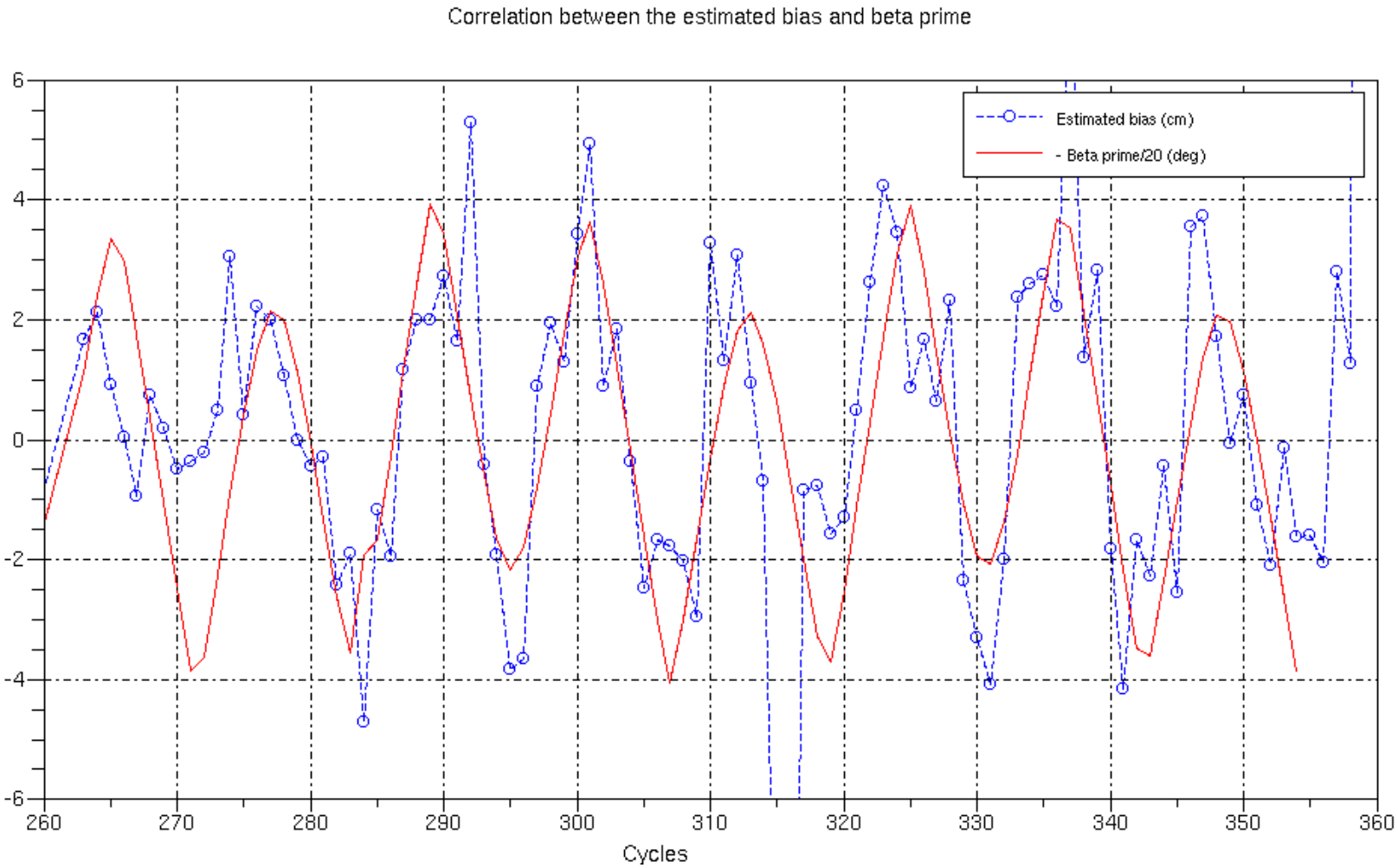
- Estimation of an offset along the X – axis of the body frame.
- Initial value used : [0.955, 0, 0].
- A bias is estimated for each cycle using DORIS measurements. Normal equations are used to compute a unique bias over JASON1 lifetime.

ESTIMATION OF JASON 1 INITIAL CENTRE OF MASS : RESULTS



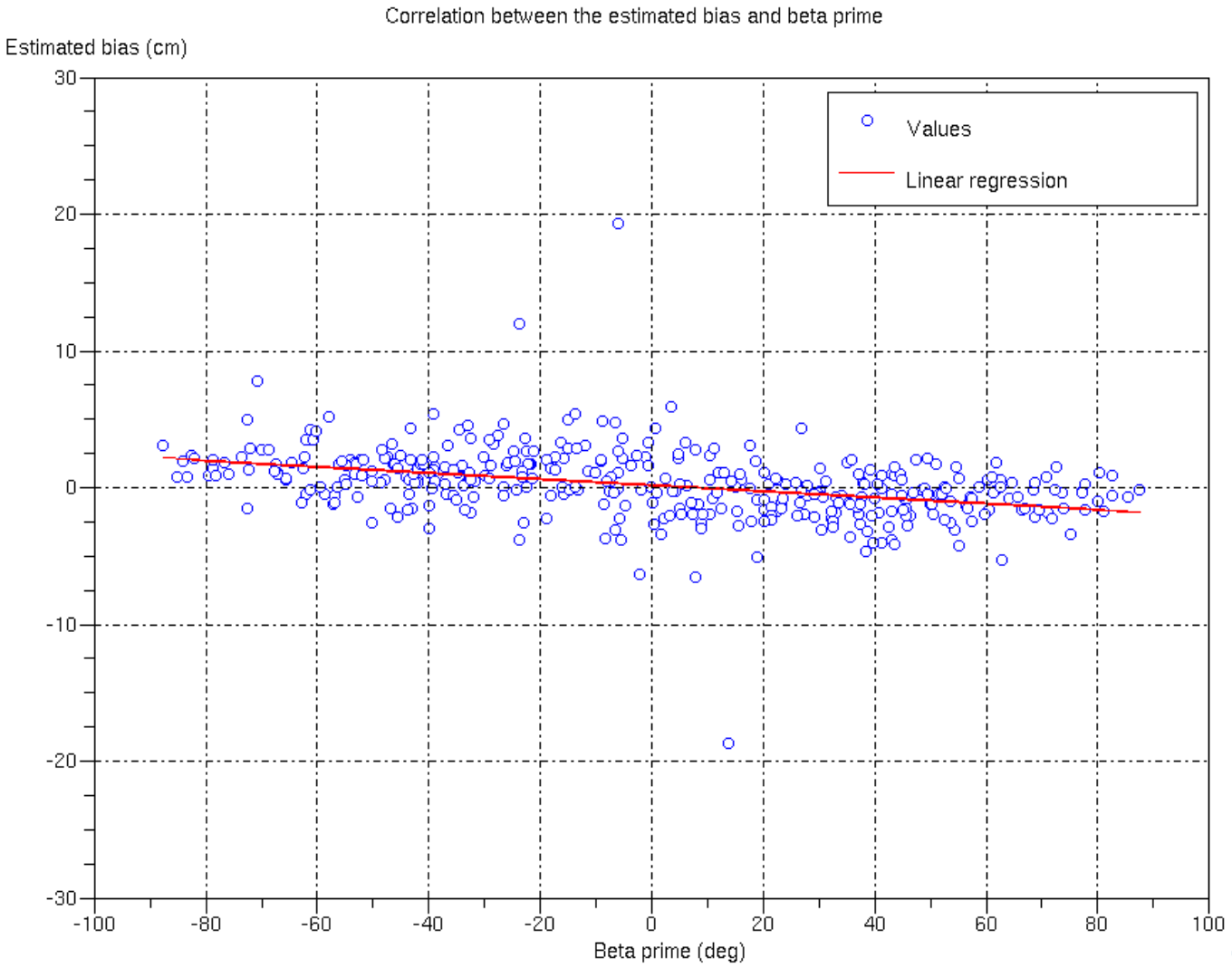
ESTIMATION OF JASON 1 INITIAL CENTRE OF MASS : CORRELATION WITH BETA PRIME

A 120-day period signal can be observed on the estimated bias



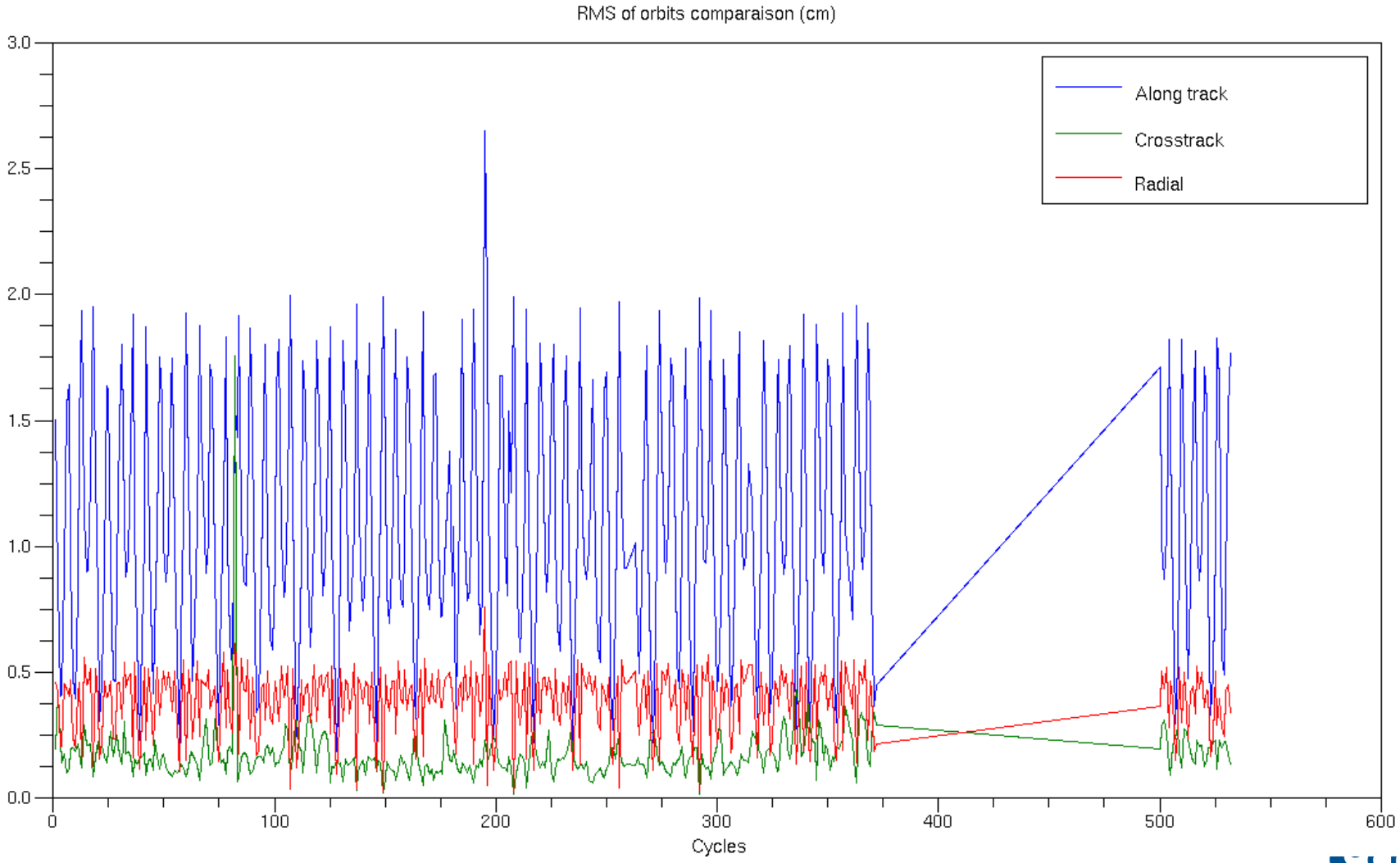
ESTIMATION OF JASON 1 INITIAL CENTRE OF MASS : CORRELATION WITH BETA PRIME

Correlation graph



ESTIMATION OF THE INITIAL POSITION OF JASON 1 CENTRE OF MASS : IMPACT OF A 2CM BIAS

Impact of a 2cm bias on the body frame X axis



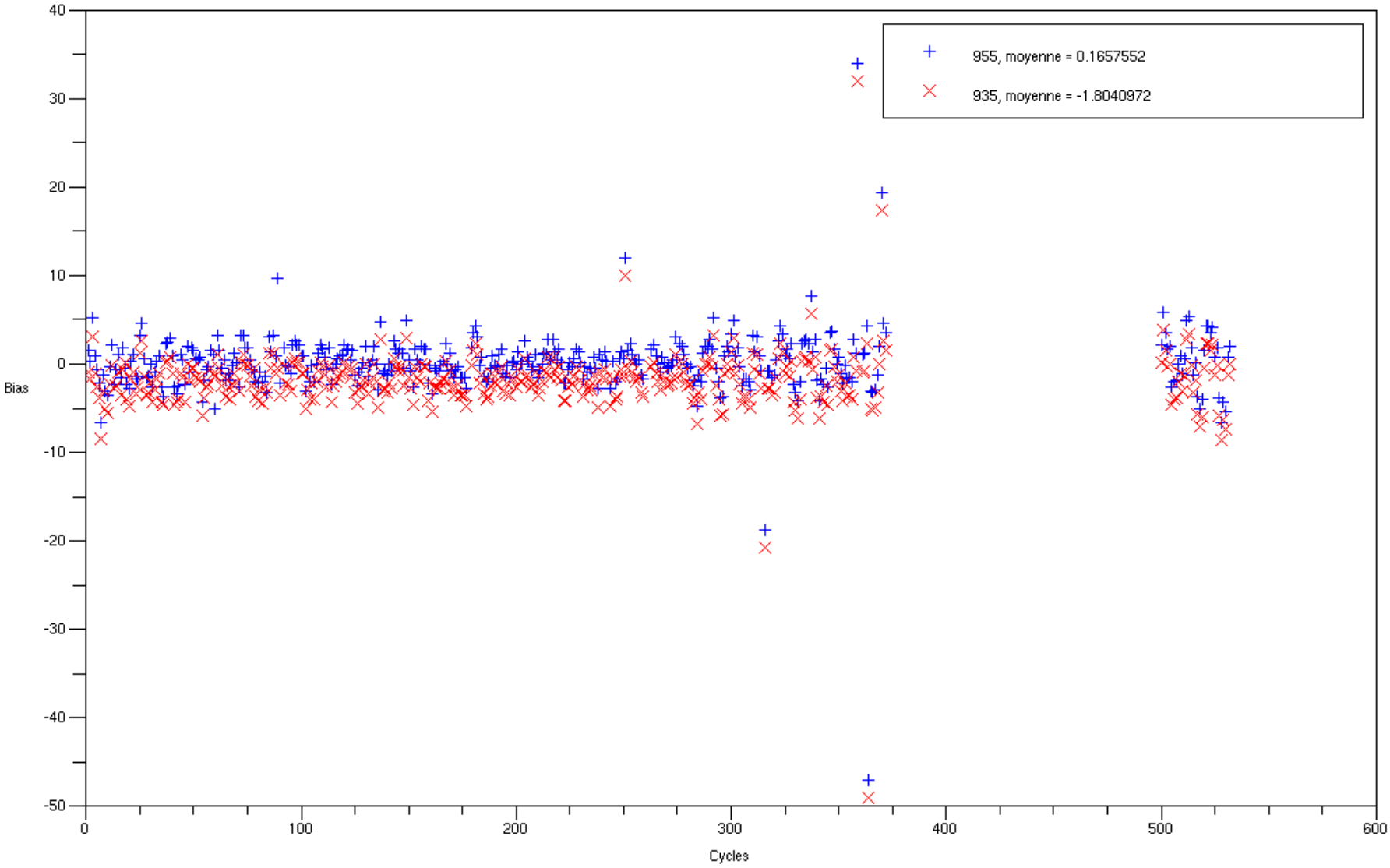
ESTIMATION OF JASON 1 INITIAL CENTRE OF MASS : CONCLUSION

- The estimated offset is about 2 mm, relative to the recommended value
- Correlation observed with beta prime, but not linked with center of mass real behavior
- Maximum observed radial sensitivity of the orbit is 5mm rms for a 2cm bias, i.e. 0,25 mm/mm

BACK UP SLIDES

ESTIMATION OF JASON 1 INITIAL POSITION OF THE CENTRE OF MASS

WHEN MOVING THE INITIAL CENTER OF MASS BY 2 CM ON THE X AXIS, THE ESTIMATED BIAIS IS ALSO MOVED BY 2 CM



ESTIMATION OF JASON 1 INITIAL POSITION OF THE CENTRE OF MASS : METHODOLOGY

Methodology :

Estimation of a bias along the DORIS antenna X – axis

- Estimating a bias in the antenna frame = estimating a bias on the DORIS center of phase
- The transition matrix between the body frame and the antenna frame is the identity matrix
- The DORIS center of phase is geometrically linked to JASON1 initial center of mass

- Therefore : by estimating a bias along the antenna X-axis is equivalent to estimating a bias on JASON1 initial center of mass.

- A bias is estimated for each cycle. Normal equations are used to computed a total bias on JASON1 lifetime.