Recent improvements in DORIS data processing at IGN : corrections for Cryosat-2 and inclusion of HY-2A data

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Summary

- **Cryosat-2 physical models**
  - Problem detected earlier by Frank Lemoine (empirical accelerations)

- **HY-2A Precise Orbit Determination**
  - Newly available DORIS data (old format)
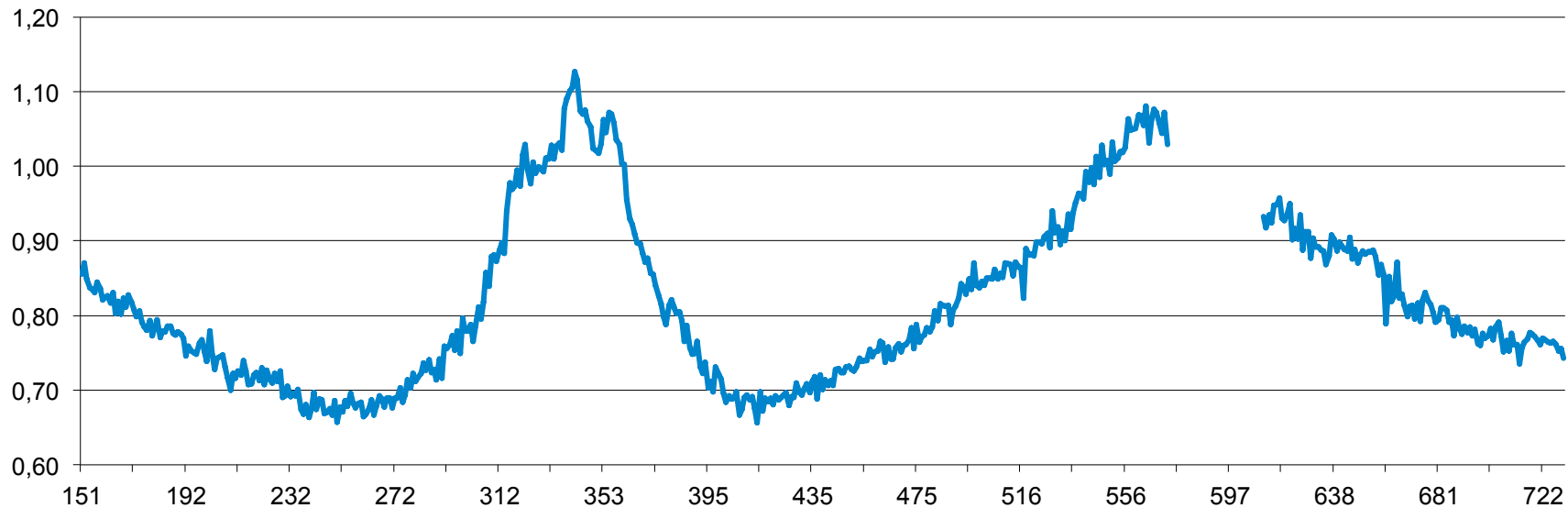
Cryosat-2 physical models (1)

Once-per-revolution empirical acceleration amplitudes
Cryosat 2, 2010

Doris Center	No. of accels	Alg (avg/median) x 1e09	Crs (avg/median) x 1e09	Adjust period (days)
GSC	208	3.61 / 3.54	2.57 / 2.48	1
ESA	217	2.79 / 2.68	2.92 / 2.77	1
GAU	193	3.51 / 3.43	2.97 / 2.81	1
IGN	214	12.94 / 14.03	7.00 / 5.75	1
INA	214	13.92 / 13.86	6.93 / 4.86	1
LCA	58	9.42 / 7.61	3.41 / 2.76	3.5
CNES POD	247	4.81 / 4.83	3.01 / 2.74	1

Frank G. LEMOINE, OPR Summaries by Satellite

Cryosat-2 physical models (2)

SRP coefficient
Cryosat-2, 2010-2011

Avg = 0.82 (too far away from 1.0)

Stdev = 0.11 (signal still present)

Cryosat-2 physical models (3)

SRP models available for Cryosat-2

7-face model = CNES
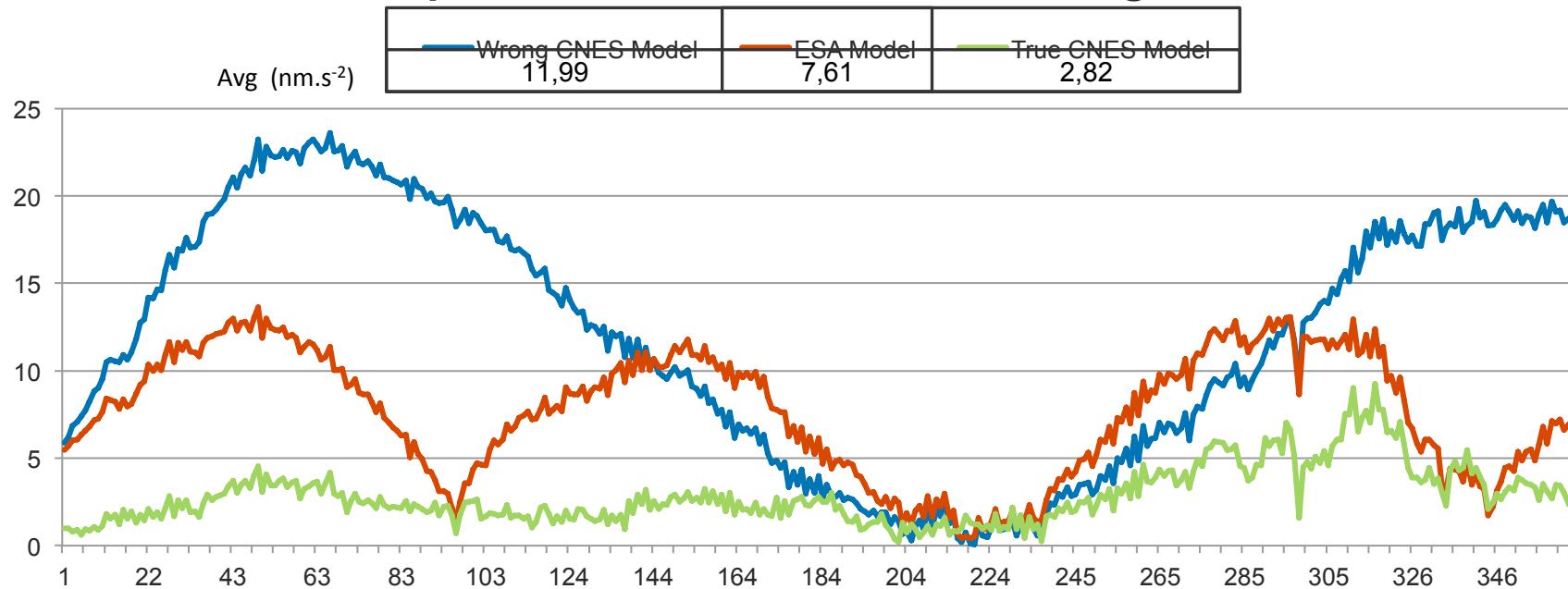
6-face model = ESA

Both implemented in GIPSY/OASIS

Cryosat-2 physical models (4)

Error found in satellite orientation (fortran namelist, sign error nadir/zenith)

--> single-satellite reprocessing

Cryosat-2 physical models (5)
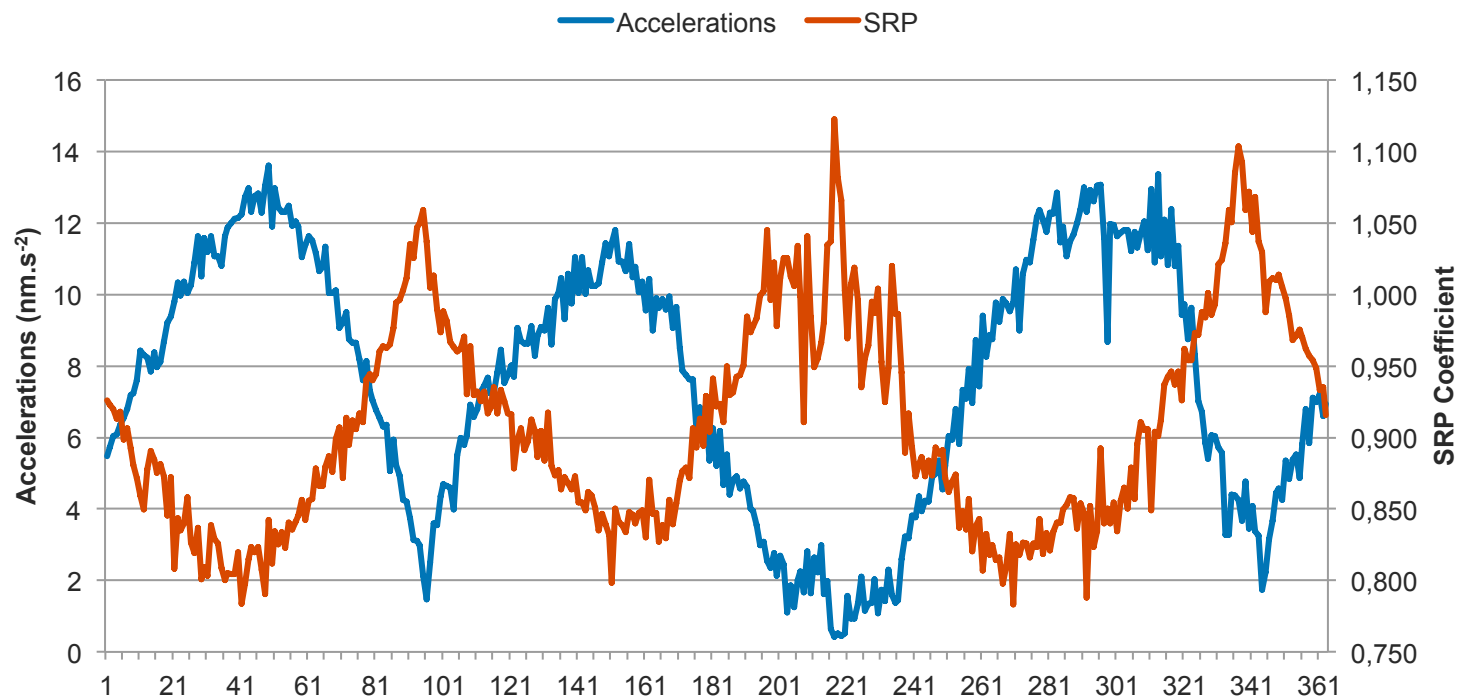

Empirical accelerations – 2011 - Long track

| Wrong CNES Model 11,99 | ESA Model 7,61 | True CNES Model 2,82 |

Avg (nm.s^{-2})

2 signals : 120 and 240 days

Cryosat-2 beta-prime period : 480 days

Cryosat-2 physical models (6)

Correlation between long-track accelerations and SRP coefficient (ESA Model)

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Cryosat-2 physical models (7)

- Improvements :
  - Long-track accelerations reduced (Avg : 11.99 -> 2.82)
  - SRP coefficient close to 1 (Avg : 0.82 --> 1.05)

- Cross-track accelerations still too large

  (Avg : 6.36)

- No significant effect on orbit overlap and geodetic solutions (station coordinates and polar motion)

HY-2A Precise Orbit Determination (1)
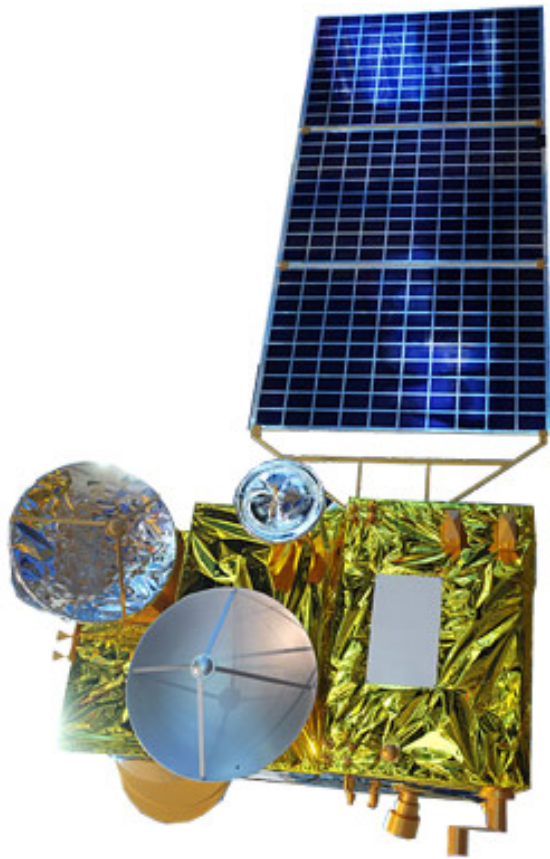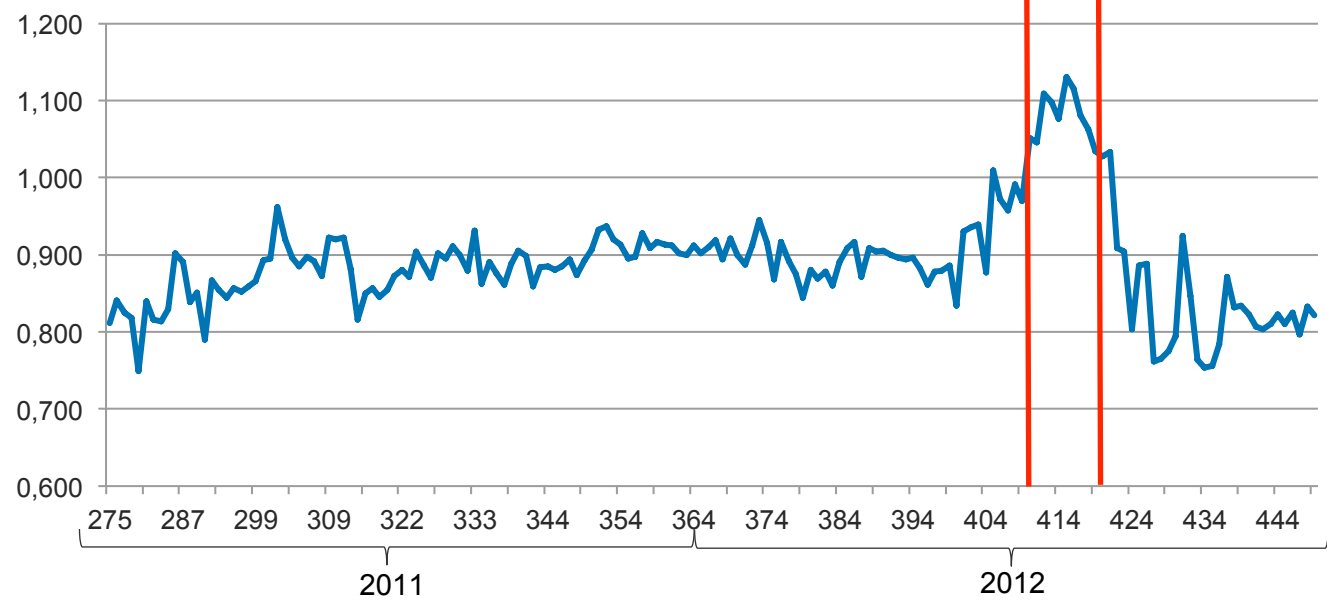

Altitude : 971 km

Inclination : 99.3°

Macro model : 6 faces

Empirical drag parameter reset each hour

HY-2A Precise Orbit Determination (2)
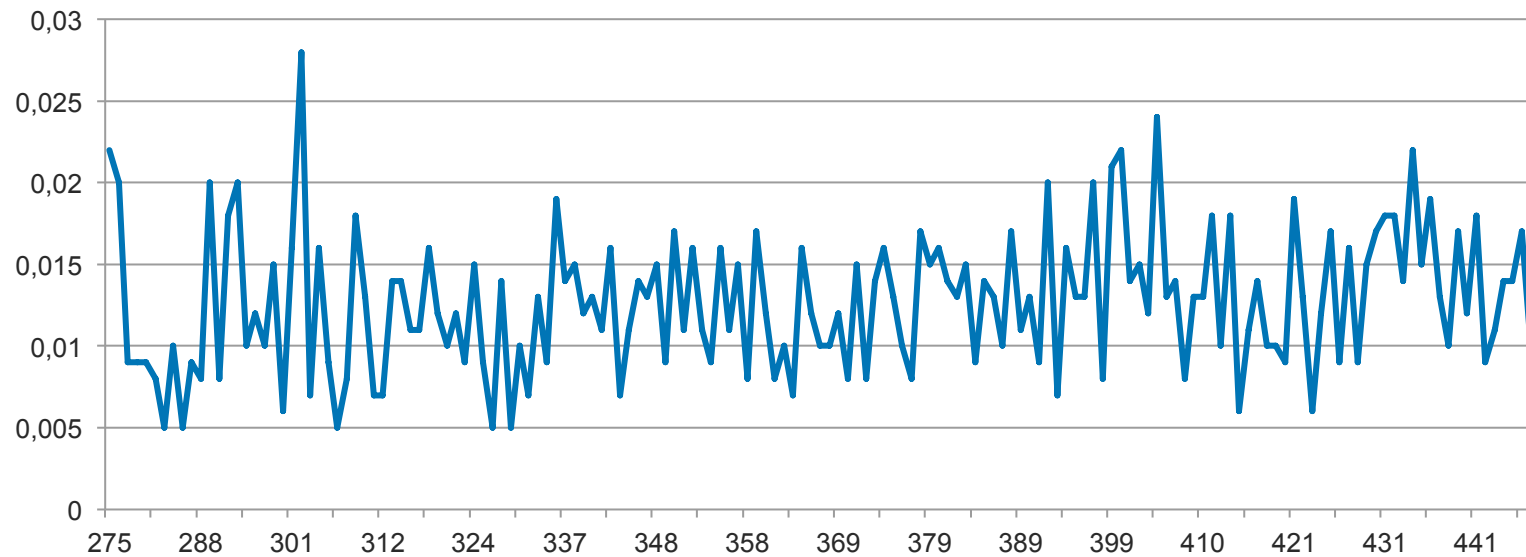

SRP Coefficient

Avg = 0.89

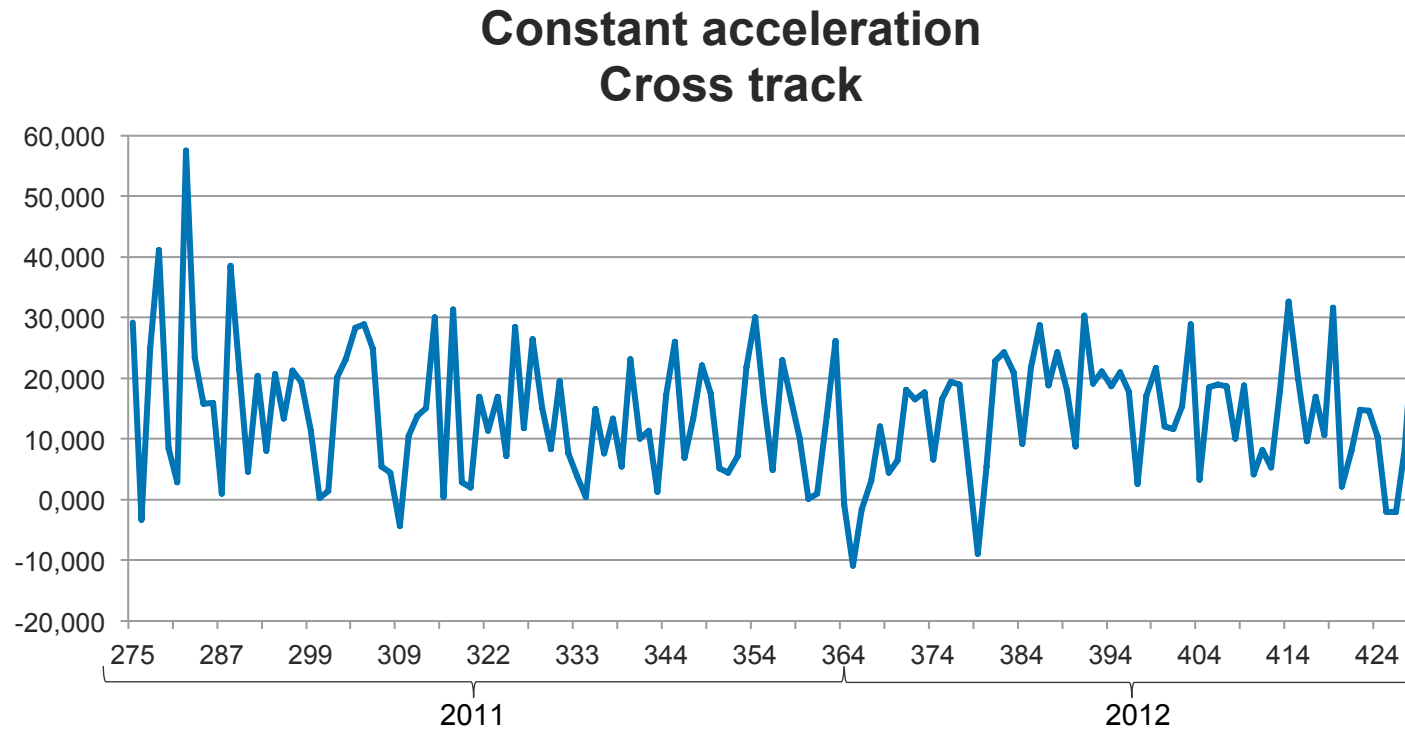—— Orbit Maneuver : 2012/02/14 ; 2012/02/24

HY-2A Precise Orbit Determination (3)
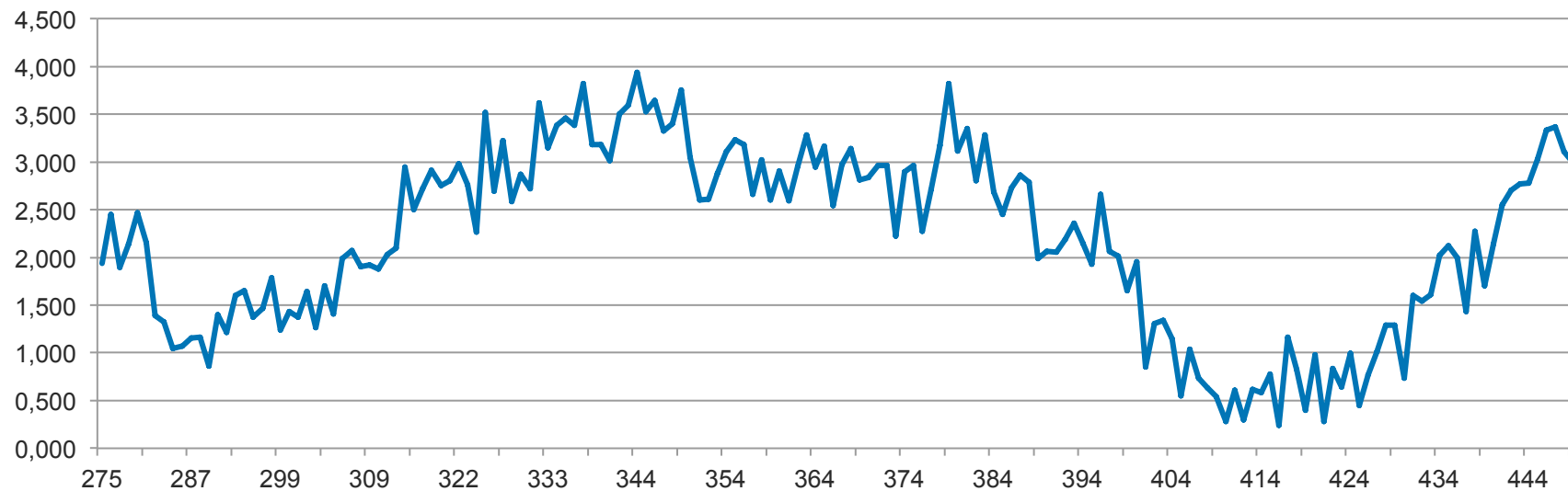
Radial overlap (m)

Avg = 1.27 cm

**Constant acceleration
Cross track**

Add a constant term on the cross-track acceleration
CONST_ACC_C = 17 nm.s^{-2}

HY-2A Precise Orbit Determination (5)

Empirical accelerations
Long track

Avg = 2.19 nm.s^{-2}

Conclusions

Cryosat-2

problem understood
but cross-track opr still too large
-> other problem to be solved?

HY2A

first results are encouraging
multi-satellite results still under
investigation