

IGN-IPGP AC Status



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Outline

- Data & Models
- Mono-satellite results
- Multi-satellite results
- Conclusion

Thanks to Guilhem Moreaux, Hugues Capdeville and Paul Rebischung

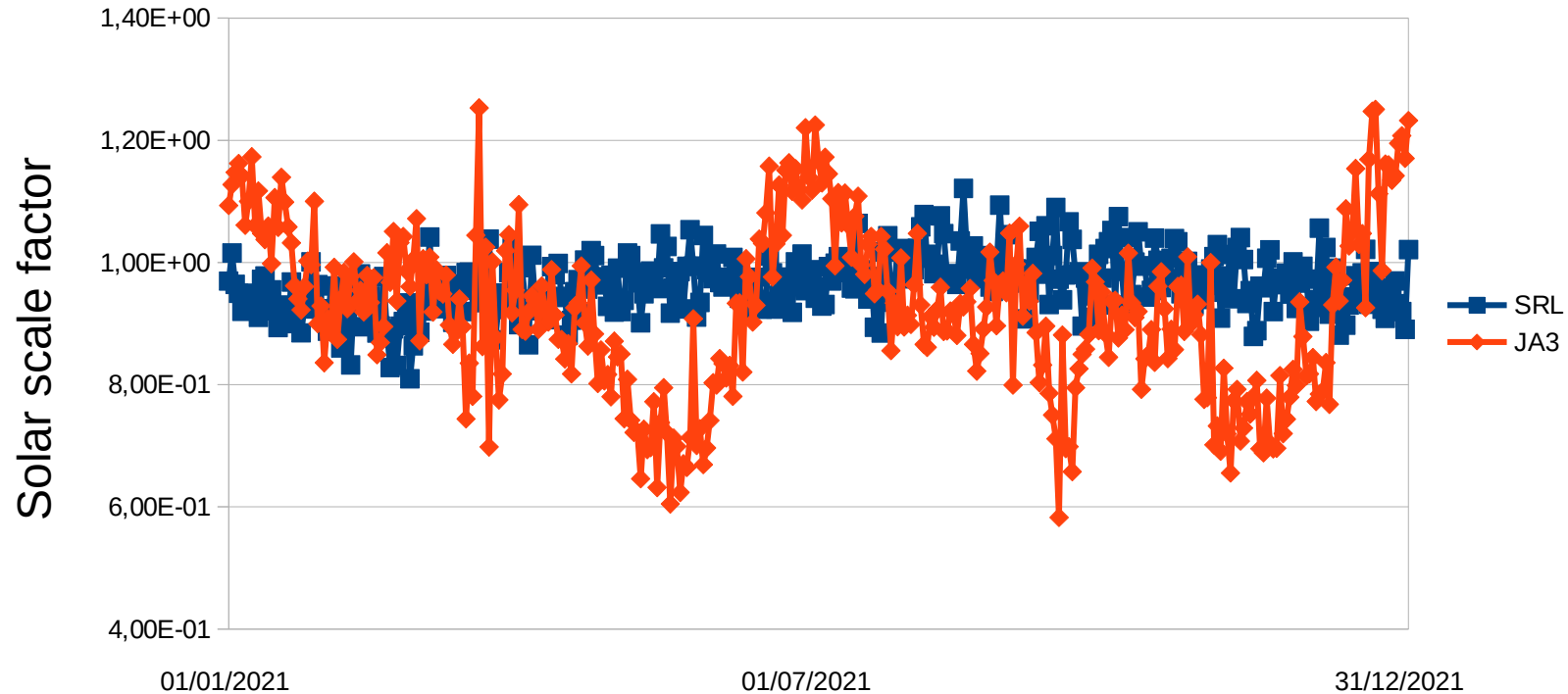
Data & Models

Theme	Sept. 2021 Submitted Solution	New Version
Attitude law	Quaternions for JA3	
CoM position	Nominal	CNES Shift for SRL
Gravity models	EIGEN-GRG-RL04 + A0D1B RL06	
Ocean tides	FES2014b	
Elevation cut-off and data weighting	Cut-off : 7° Weighting : Sin(elev)	
Troposphere	VMF	
Atmospheric drag model	DTM2000	
Antenna models	Alcatel and starec antex files	

Data & Models

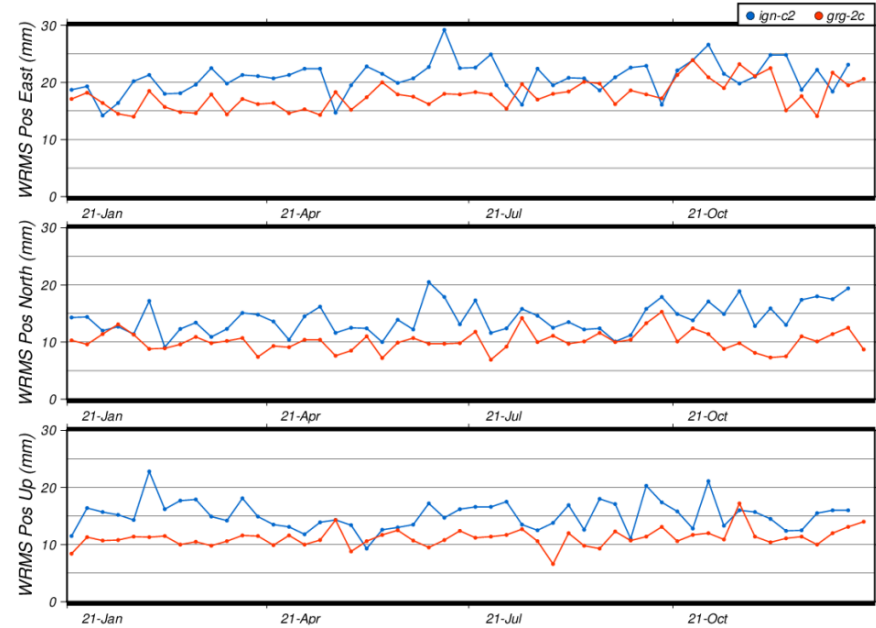
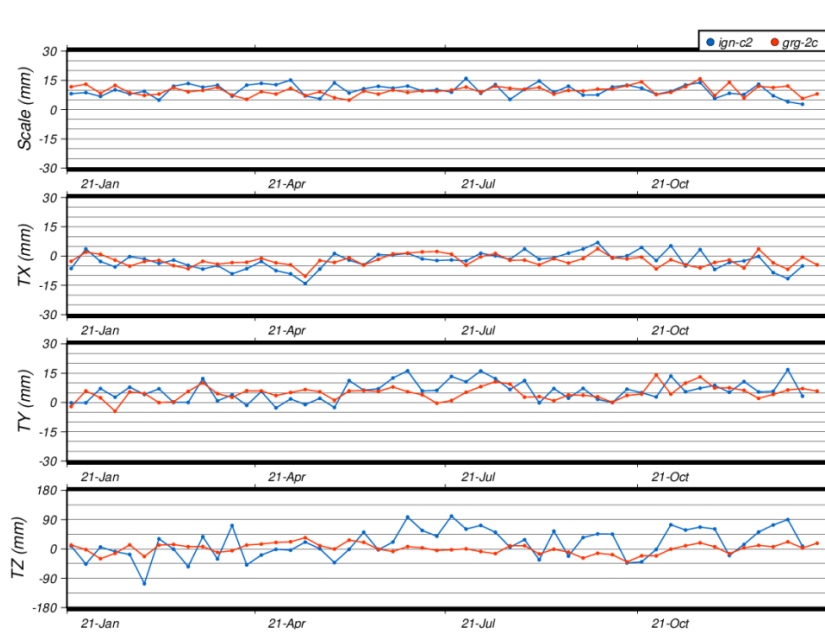
Theme	Sept. 2021 Submitted Solution	New Version
Solar Radiation pressure Scale factor	Satellite dependent : - Estimated over one year and fixed for CS2, S3A, S3B and SRL - Estimated per day for JA3 and S6A	
Estimated clock parameters	One drift per station and per pass SAA stations removed for JA3, S6A A priori satellite clk : offset, drift and acc estimated from rnx per day and per sat	One drift per station and per pass SAA stations removed for JA3, S6A A priori satellite clk : offset and drift estimated from rnx per day and per sat
Estimated troposphere parameters	One ZWD per station and per pass One gradient East and North per day	
Orbit parameters	Initial position per day 1 drag coefficient per 8h and per sat Along and cross-track per-rev empirical acceleration	
Stations and EOPs	Station position per week, Pole coordinate per day	

Data & Models – Solar Scale



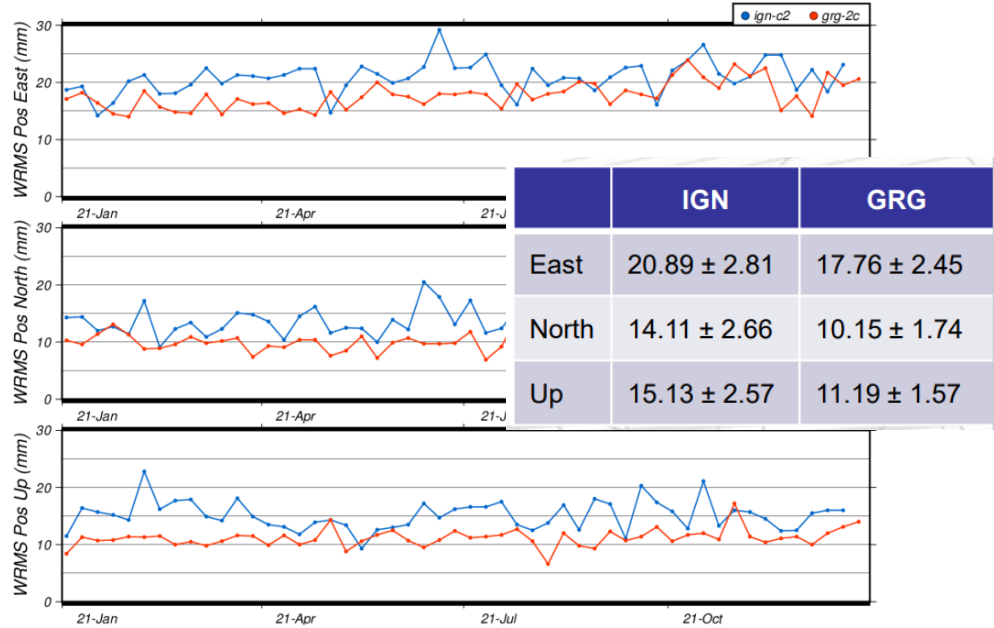
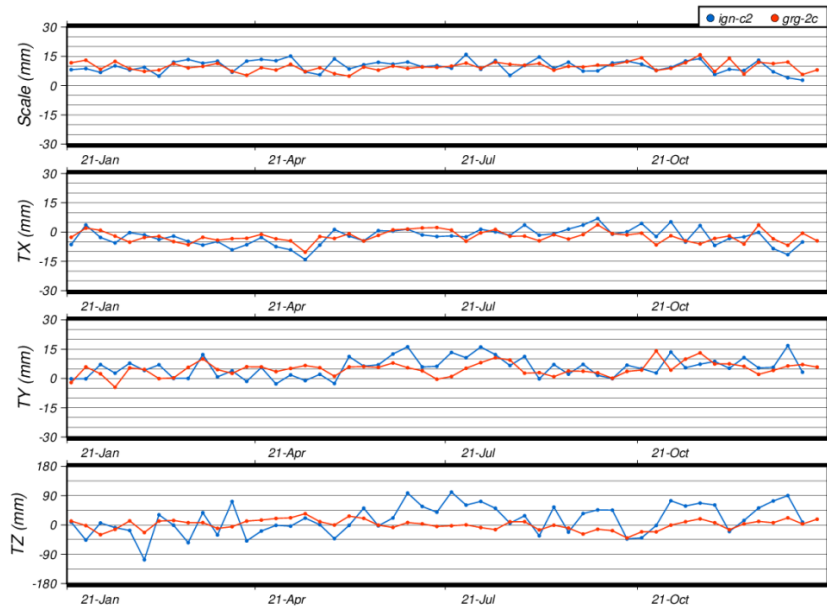
Mono-satellite Results

Cryosat-2



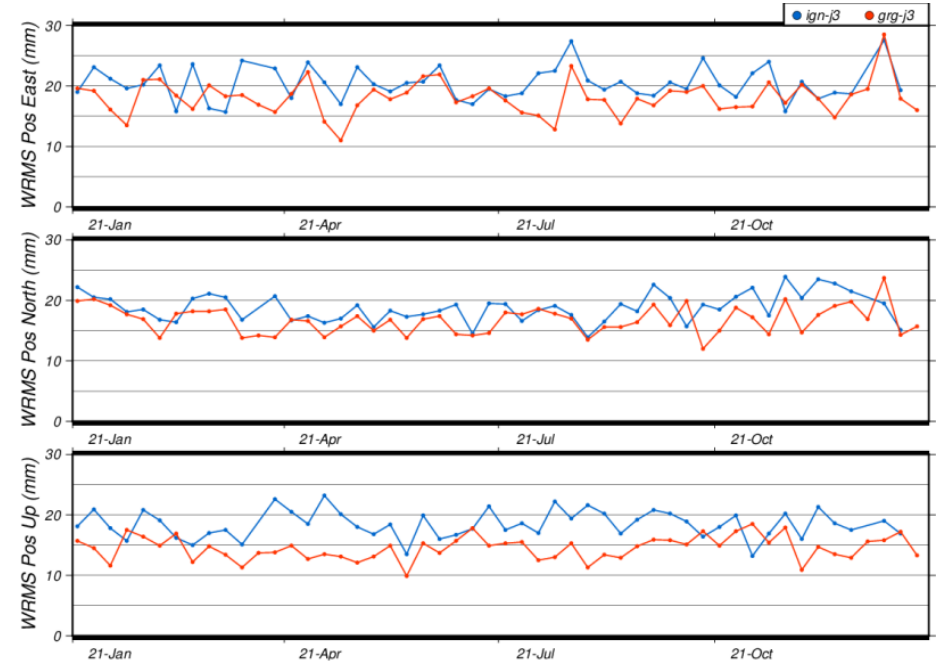
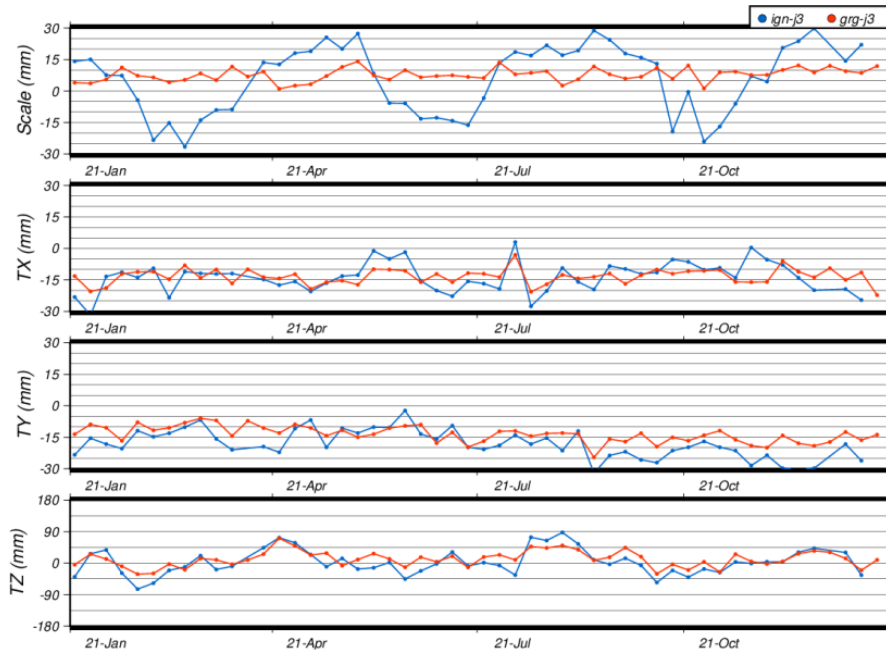
Good agreement in TX / TY wrt ITRF2020 between IGN and GRG
Tz more scattered
Station WRMS higher per component than GRG

Cryosat-2



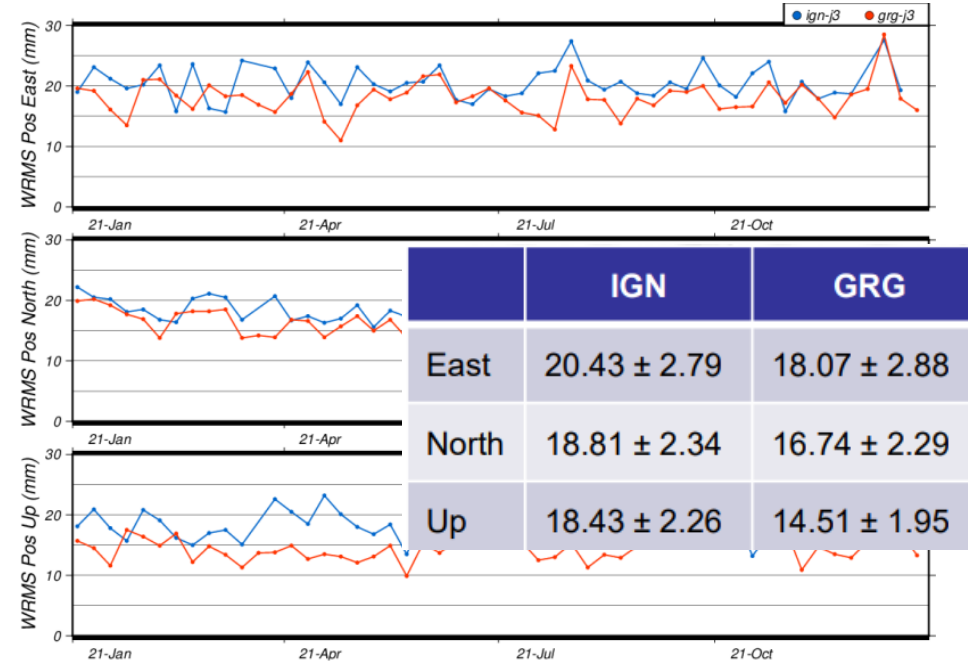
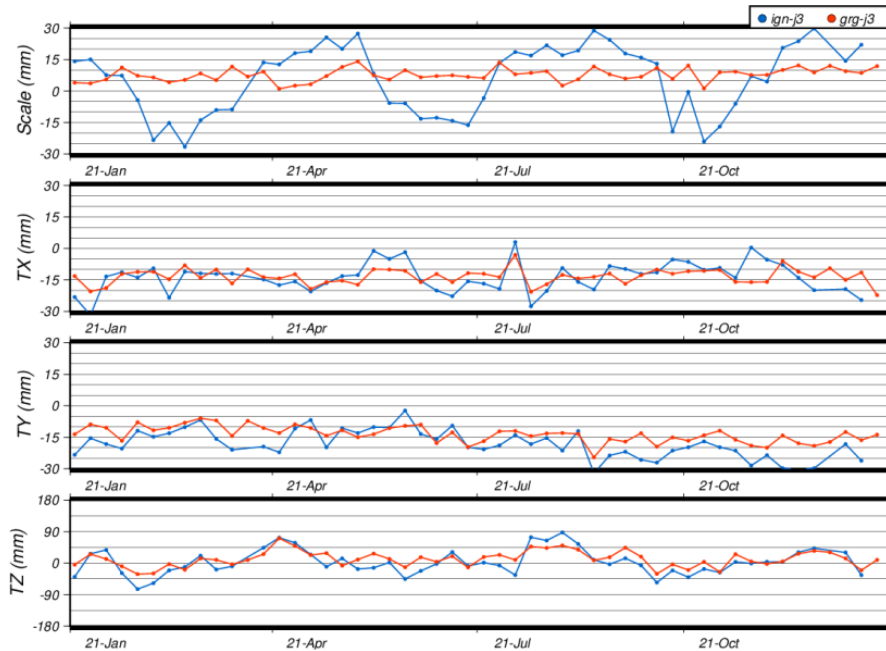
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Jason-3



High draconitic signal in scale ! Same results for Sentinel-6A !

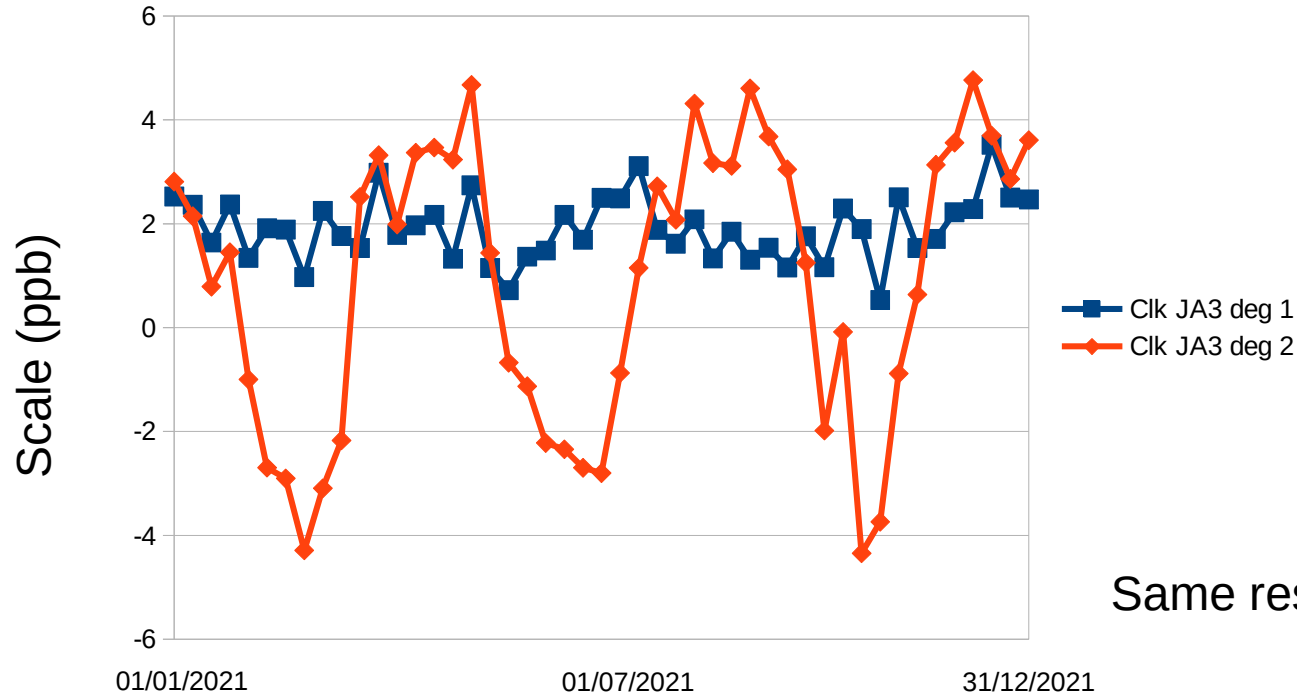
Jason-3



High draconitic signal in scale ! Same results for Sentinel-6A !

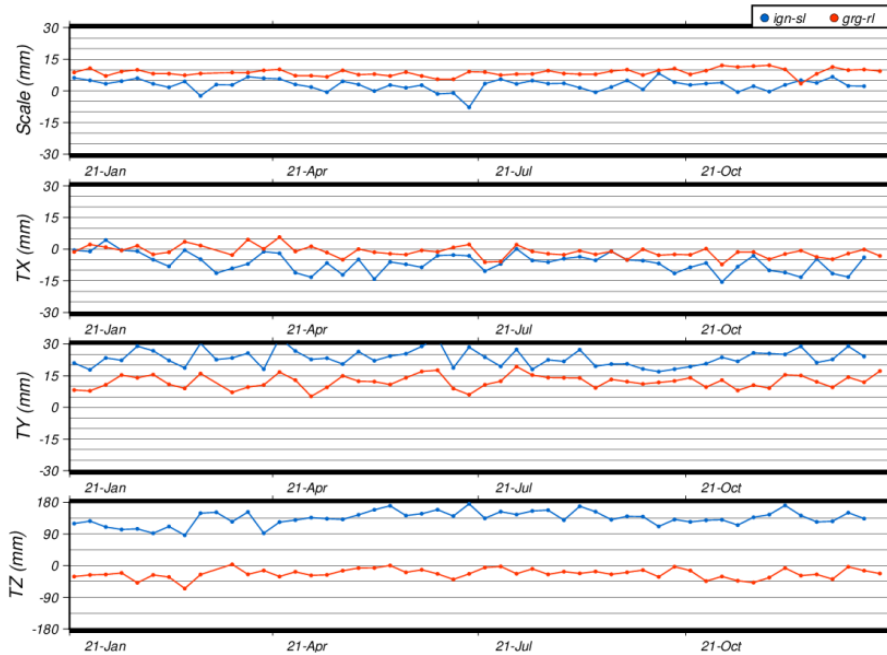
Jason-3

A priori satellite clk : From **Bias + Drift + Acc** a priori value estimated from rnx
To **Bias + Drift only**



Same results for S6A

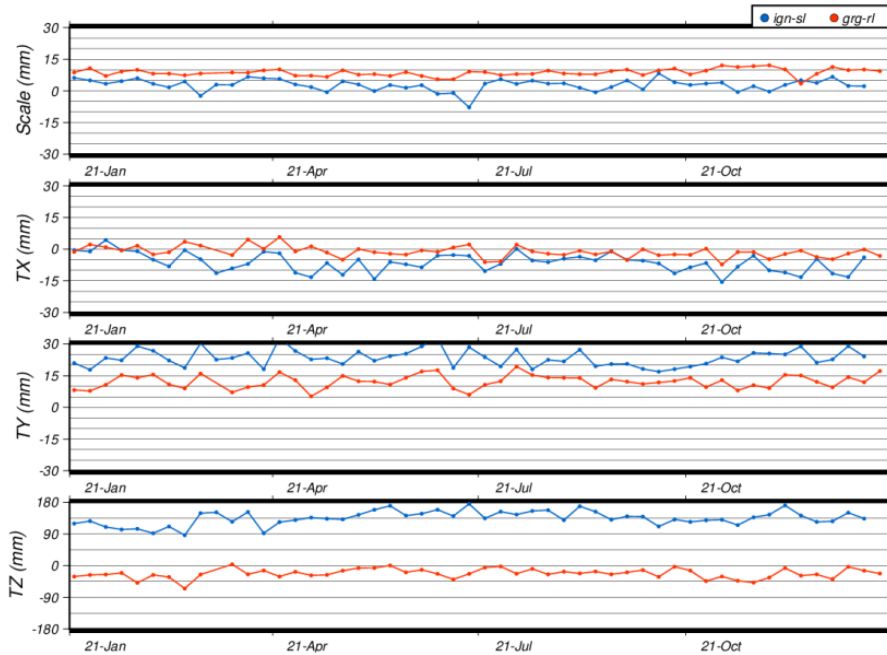
SARAL



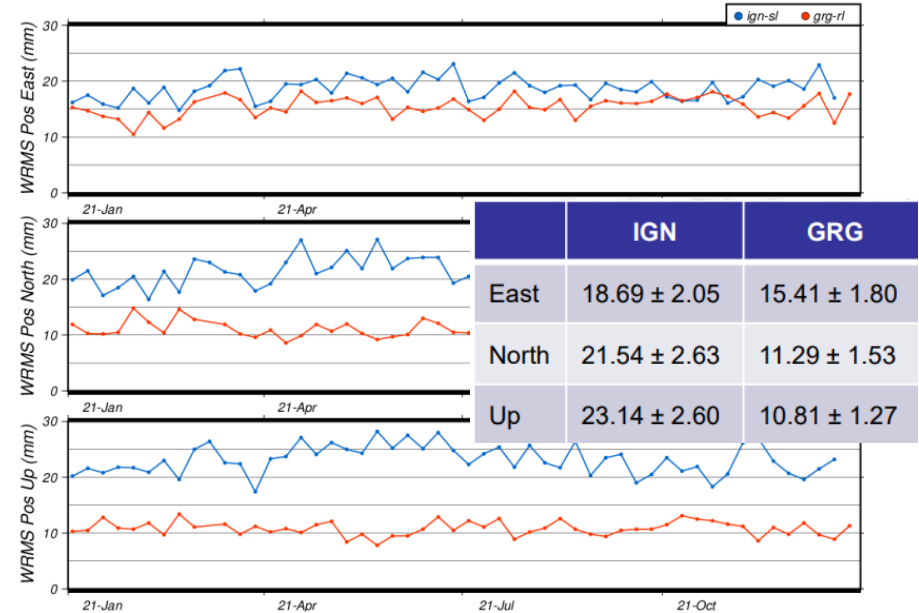
Tx and scale : good agreement with GRG solution
Ty : higher bias
Tz : large bias

WRMS : large differences
(especially Noth and Up)

SARAL



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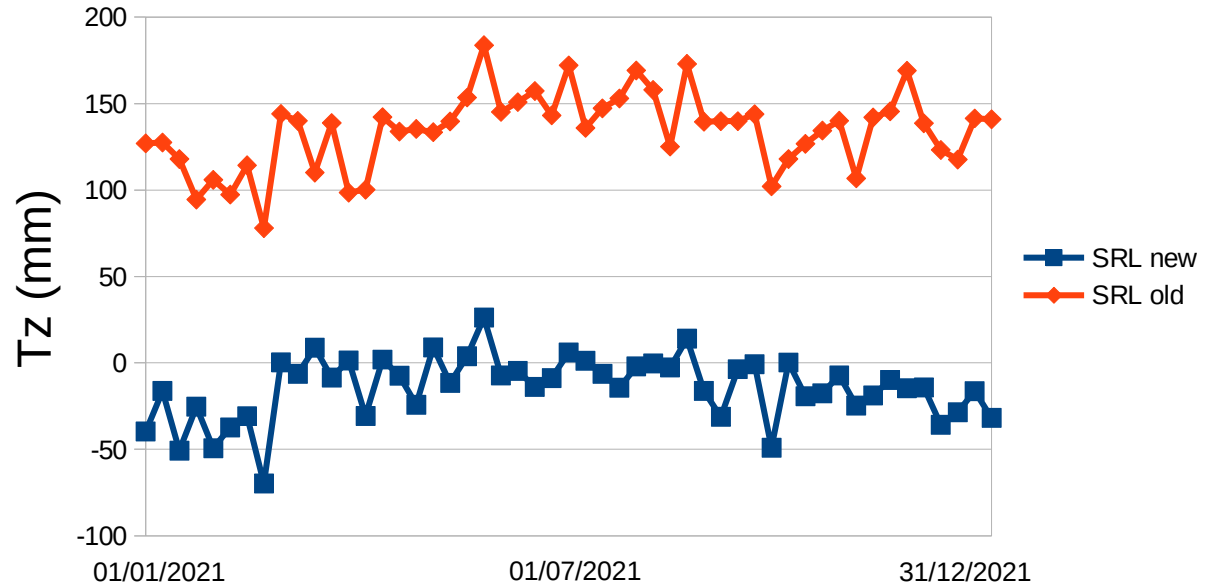
WRMS : large differences
 (especially Noth and Up)

SARAL

New solution :

deg 1 a priori clk satellite model (instead of deg 2) + CoM correction used by CNES

- 1- The estimated solar scale estimated over the year solution change form **1.16** to **0.96** !
- 2- Tz bias wrt ITRF2020 from around **135 mm** to around **-15 mm** , TY bias around **15mm**



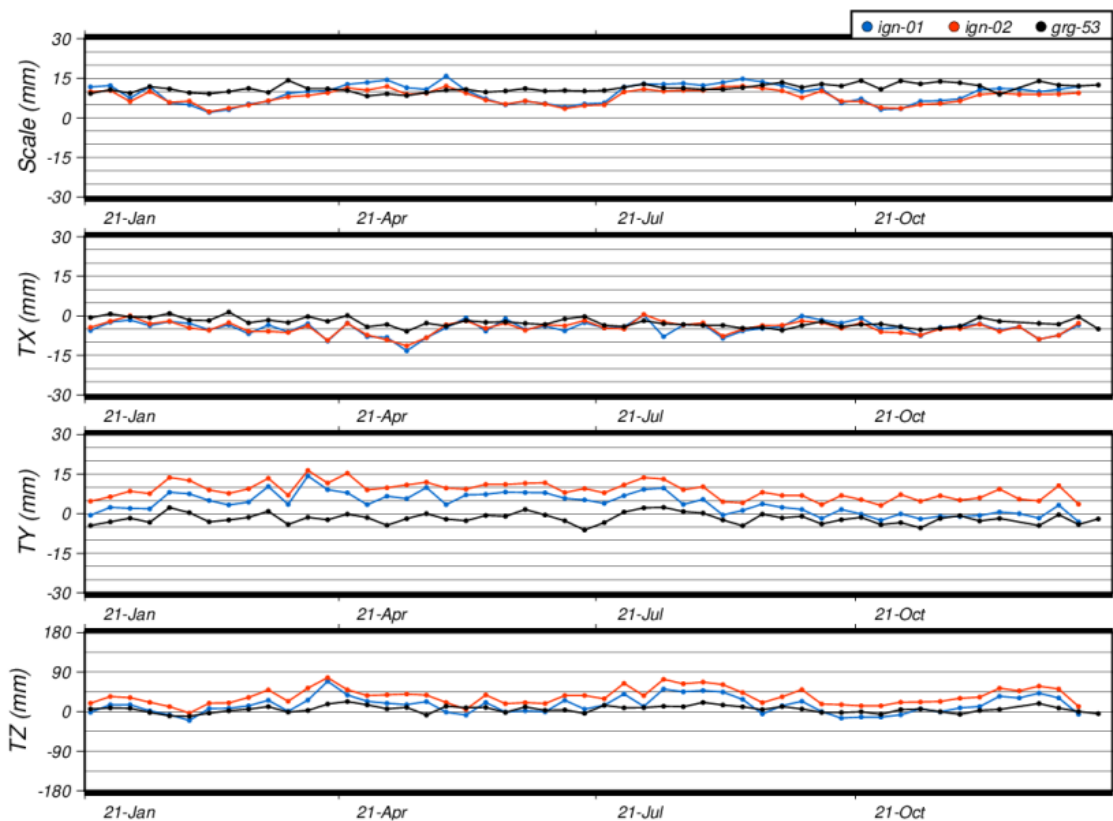
Sentinel 3A & 3B

Large TZ bias for S3A (around 94.2 mm) and S3B (around 48.7 mm)

But CNES propose change for the antenna positionning on-board.
(Need to be tested with the addition of the change of the a priori clk model and the re-estimation of the solar scale)

Multi-satellite Results

Multi-satellite Results



IGN 01 :

CS2 + JA3 + S3A + S3B + S6A

IGN 02 :

CS2 + JA3 + S3A + S3B + S6A + **SRL**

As expected, signal on scale
(reduced when adding SRL)

Adding SARAL reduce the std of all
parameters but increase the bias on
Ty and Tz.

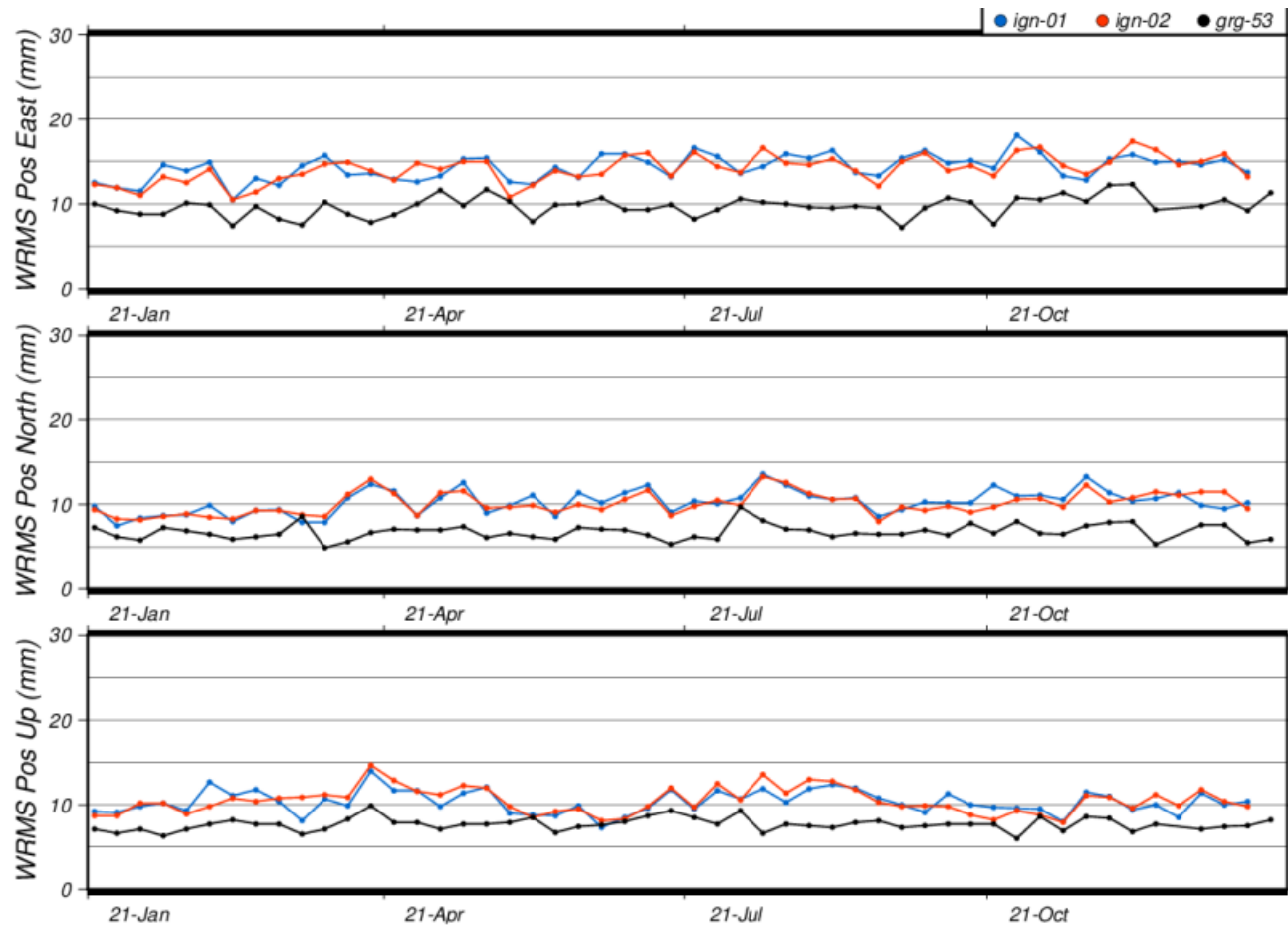
New solution :

Tx : $-3 \text{ mm} \pm 2.5 \text{ mm}$

Ty : $4.7 \text{ mm} \pm 3.3 \text{ mm}$

Tz : $1.1 \text{ mm} \pm 43 \text{ mm}$

Multi-satellite Results



Old solution :

	IGN 02	GRG 53
East	14.11 ± 1.59	9.70 ± 1.18
North	10.12 ± 1.30	6.76 ± 0.90
Up	10.48 ± 1.52	7.68 ± 0.77

Improvement with the new solution but a priori still higher than GRG :
WRMS on all stations (SAA included)

East : 12.7 mm
North : 9.0 mm
Up : 10.6 mm

Conclusion

Before the end of the year :

- Using EIGEN-GRG-RL05
- Checking the observation weight method of GipsyX
- S3A & S3B to be tested with the antenna positions coming from CNES POD
- Tz std on CS2 under investigation (use of quaternions?)
- Improvement of the error detection in our process

Next year :

- Weekly satellite arc (an up-to-date atmospheric drag model is probably needed in GipsyX)
 - Multi-satellite solution via direct computation in GipsyX (we currently combine the weekly mono-satellite SNX via pytrf software of P. Rebischung to produce the multi-satellite SNX)
- ...



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