DATA QUALITY ASSESSMENT OF THE SARAL/ALTIKA KA-BAND MISSION

Picot, Nicolas[1]; Guillot, Amandine[1]; Sengenes, Pierre[1]; Noubel, Jocelyne[1]; Steunou, Nathalie[1]

Philipps, Sabine[2]; Prandi, Pierre[2]; Valladeau, Guillaume[2]; Ablain, Michael[2]

S. Desai[3]; B. Haines[3]

S. Fleury[4];

[1]CNES, France; [2]CLS, France; [3]JPL, USA; [4]LEGOS, France

SOMMAIRE

1. Main activities during inflight assessment phase

2. CalVal analysis on CNES&CLS side :

    - Level2 data coverage and data editing

    - Performances at Xover, SLA,

    - Spectrum analysis

3. CalVal analysis on JPL side (see poster):

    - SWH analysis

    - SSB and SSHA

4. CalVal analysis on LEGOS side (see poster)

5. Conclusion

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SARAL mission : LEOP & In-FLight Assessment Major milestones

❑ **SARAL Launch on :**
  February 25th, 2013 @ 12:31:00

❑ **All PIM payload instruments ON within 12 hours from launch**

❑ **TM received during the 1st X-Band Polar Station data dump**

❑ **AltiKa data processing :**

- First OGDR processed by CNES on February, 26th early morning – just a few hours after launch
- March, 6th : first IGDR processed by CNES
- March, 19th : Automatic processing of OGDR at EUMETSAT and ISRO, IGDR at CNES
- July, 12th : Start of the GDR processing on after the integration of Patch V1.

- O/IGDRs products made available to all users beginning of July, just 4 months after launch !
- GDRs products made available to all users beginning of September
- **All products available on the AVISO ftp server : avisoftp.cnes.fr**
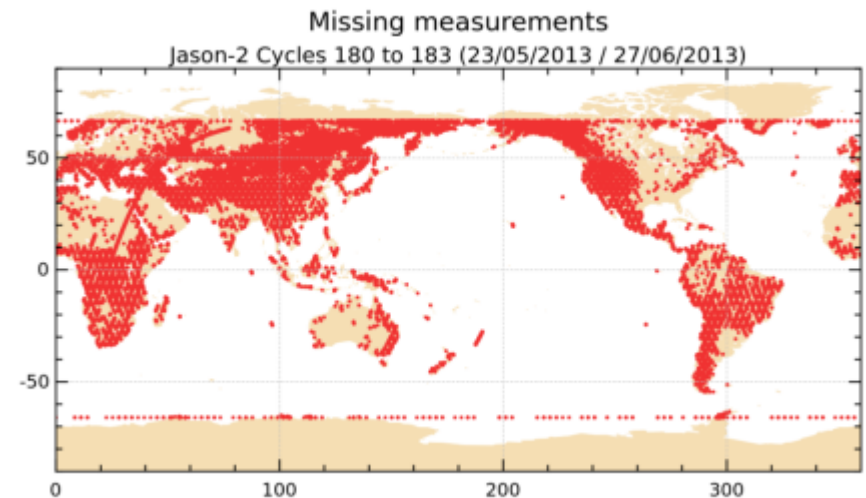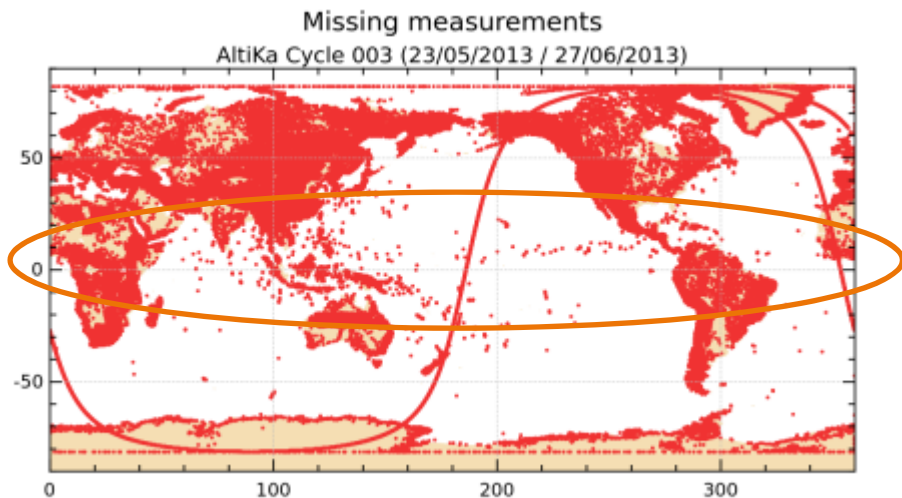
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CalVal analysis on CNES&CLS side : Missing measurements

Map below displays the missing measurements over cycle 003.

Saral has excellent data coverage: over-ocean: 99.9% (see next slide), if we remove the few Xband acquisition problems

SARAL has some missing data over ocean (likely due to rain -> Ka-band), but is less impacted than expected, due to excellent link budget (refer to N. Steunou presentation)

Missing measurements
AltiKa Cycle 003 (23/05/2013 / 27/06/2013)

Missing measurements
Jason-2 Cycles 180 to 183 (23/05/2013 / 27/06/2013)

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CalVal analysis on CNES&CLS side : Missing measurements

Daily monitoring over cycle 002 confirms the high data return.

Over ocean surfaces the number of missing data is about 0.1 %, slightly above the Jason-2 figure (in routine the Jason-2 figure is about 0.02%).
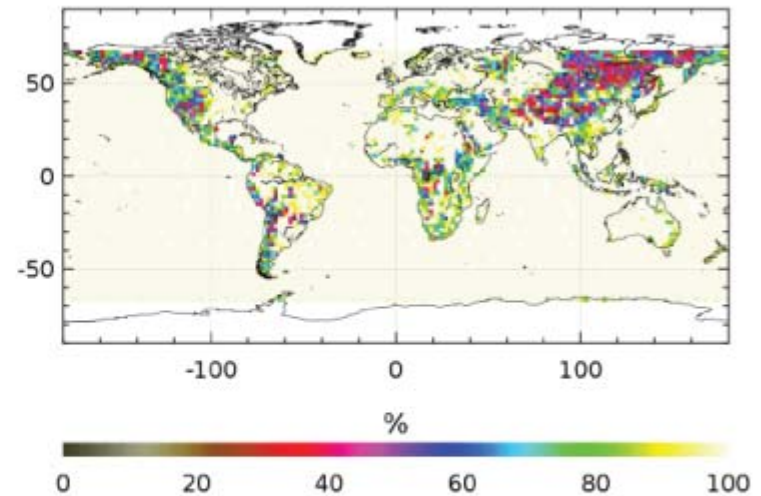

Missing data per day (%)
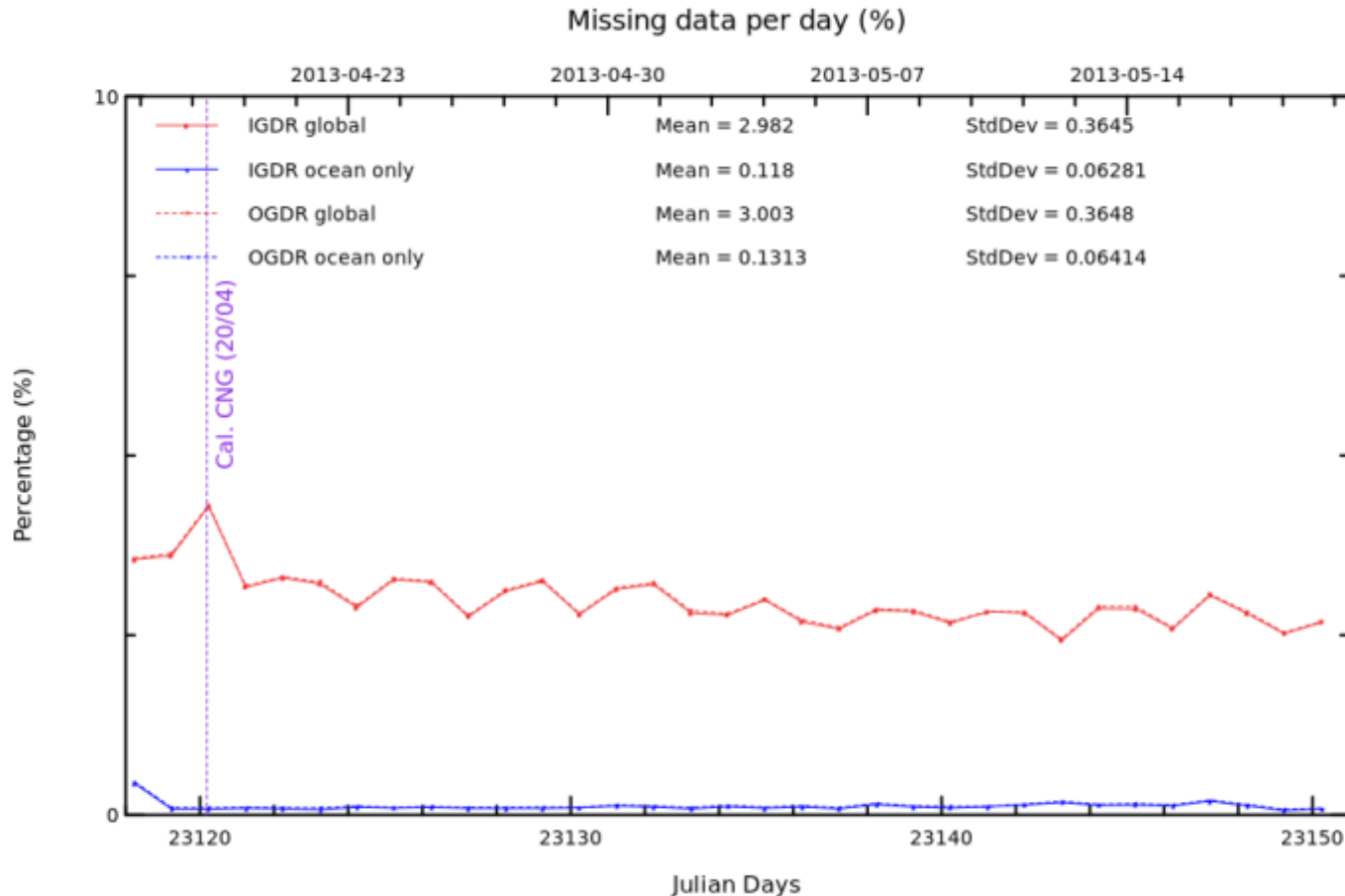
CalVal analysis on CNES&CLS side :
Missing measurements

Over land surfaces the SARAL data return exceeds the one of Jason-2 (3% of missing data for SARAL over all surfaces, 4.1% for JA2).

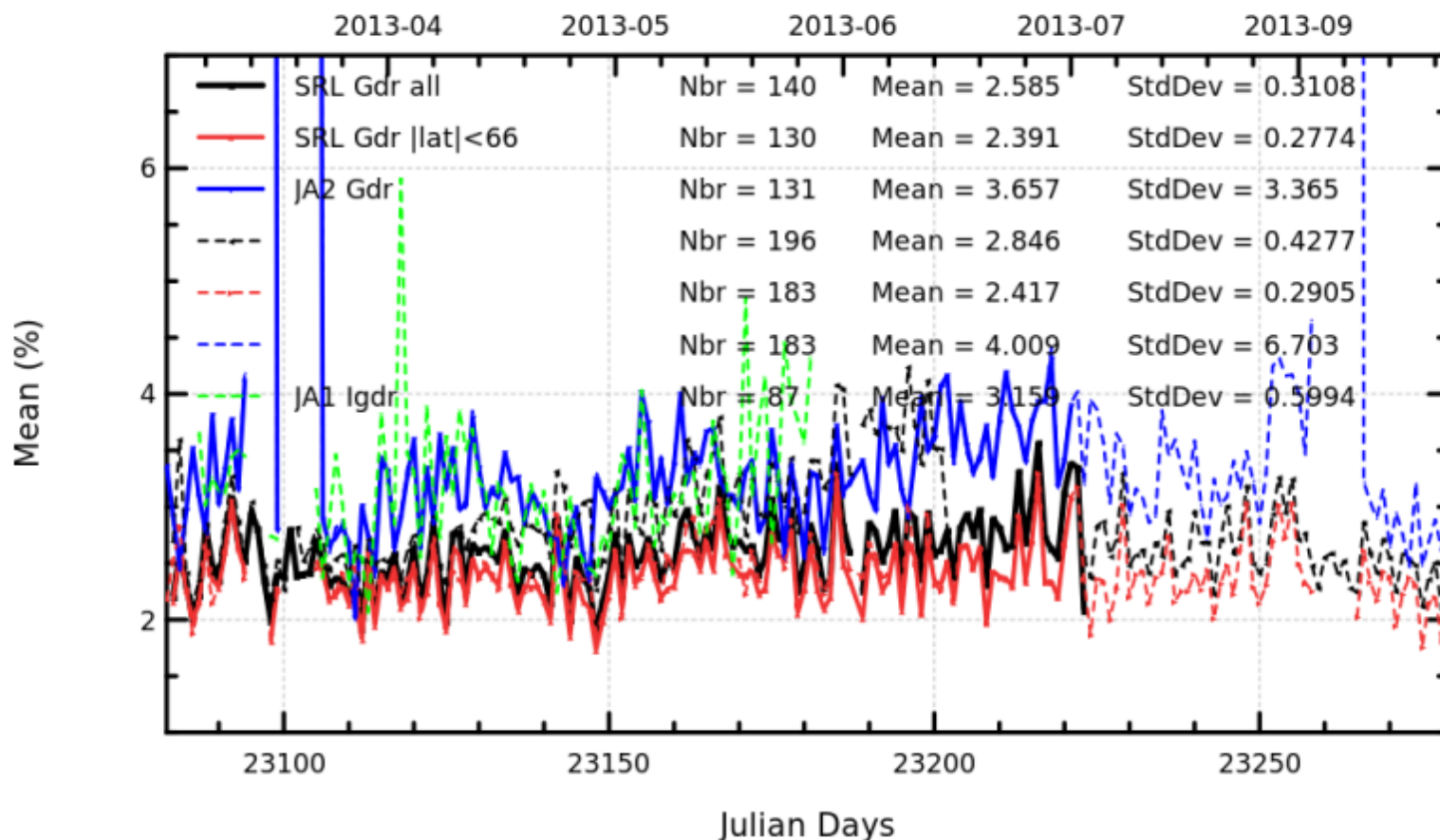Likely due to the smaller footprint.
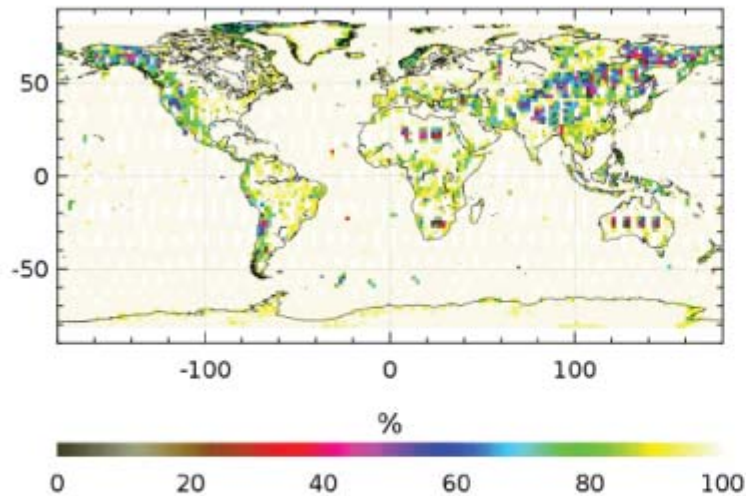
AltiKa

Jason-2

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CalVal analysis on CNES&CLS side : Data editing

Using the editing criteria mentioned in the user Handbook : less edited data on SARAL than on Jason-2.

% of edited points by thresholds

Mean per day

|	Nbr	Mean	StdDev
SRL Gdr all	140	2.585	0.3108
SRL Gdr |lat|<66	130	2.391	0.2774
JA2 Gdr	131	3.657	3.365
	196	2.846	0.4277
	183	2.417	0.2905
	183	4.009	6.703
JA1 Igdr	87	3.159	0.5994

CalVal analysis on CNES&CLS side : Data editing

Compared with Jason-2 and ENVISAT we can notice :

- More valid data than Jason-2 in the Western Pacific

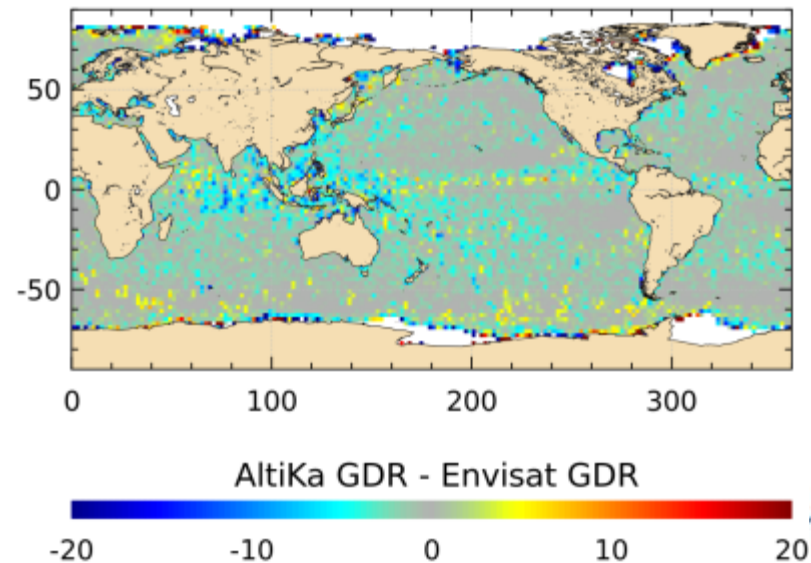- Less valid data than Envisat (in rain cell areas)

Comparison to Jason-2
(over the same period)
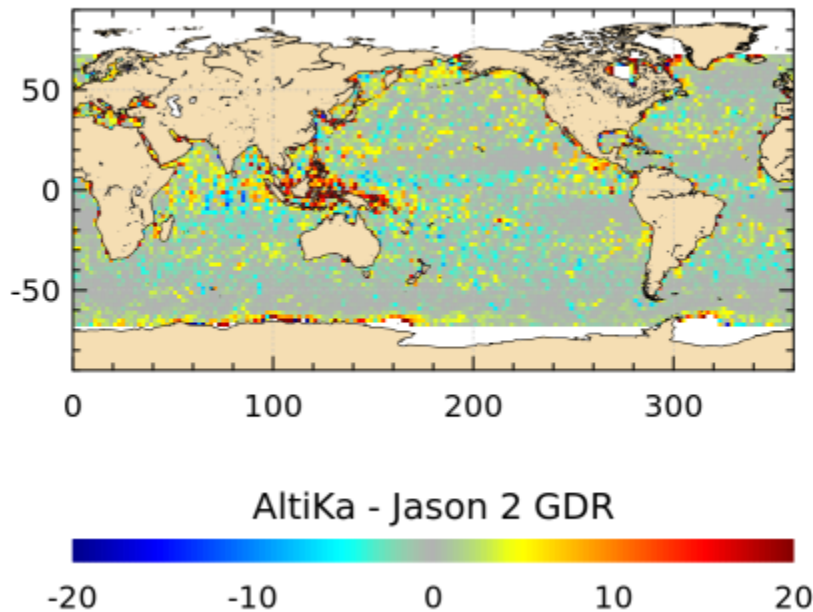
Comparison to Envisat
(three years ago)

% of data valid on thresholds

AltiKa - Jason 2 GDR

% of data valid on thresholds

AltiKa GDR - Envisat GDR
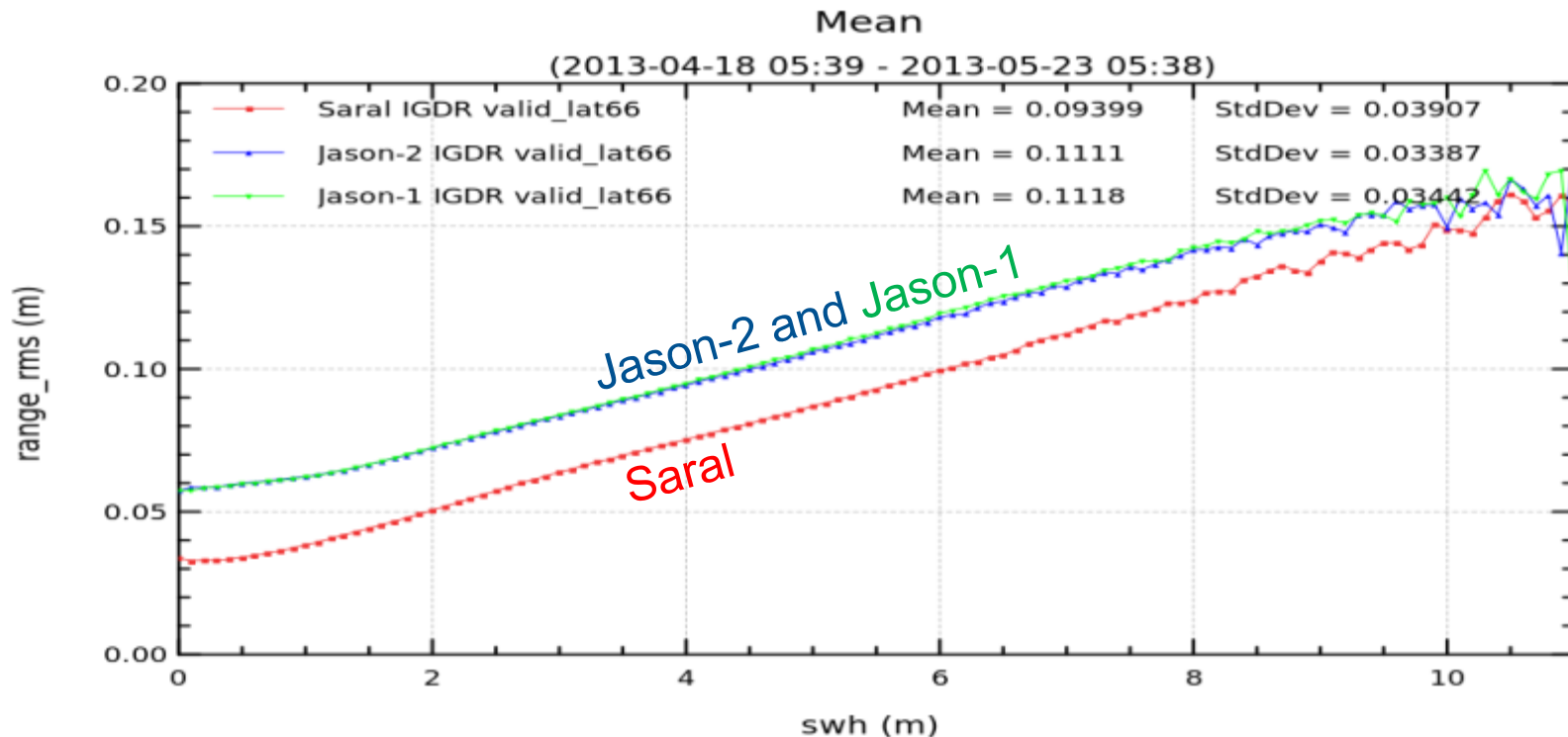
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CalVal analysis on CNES&CLS side : Range noise

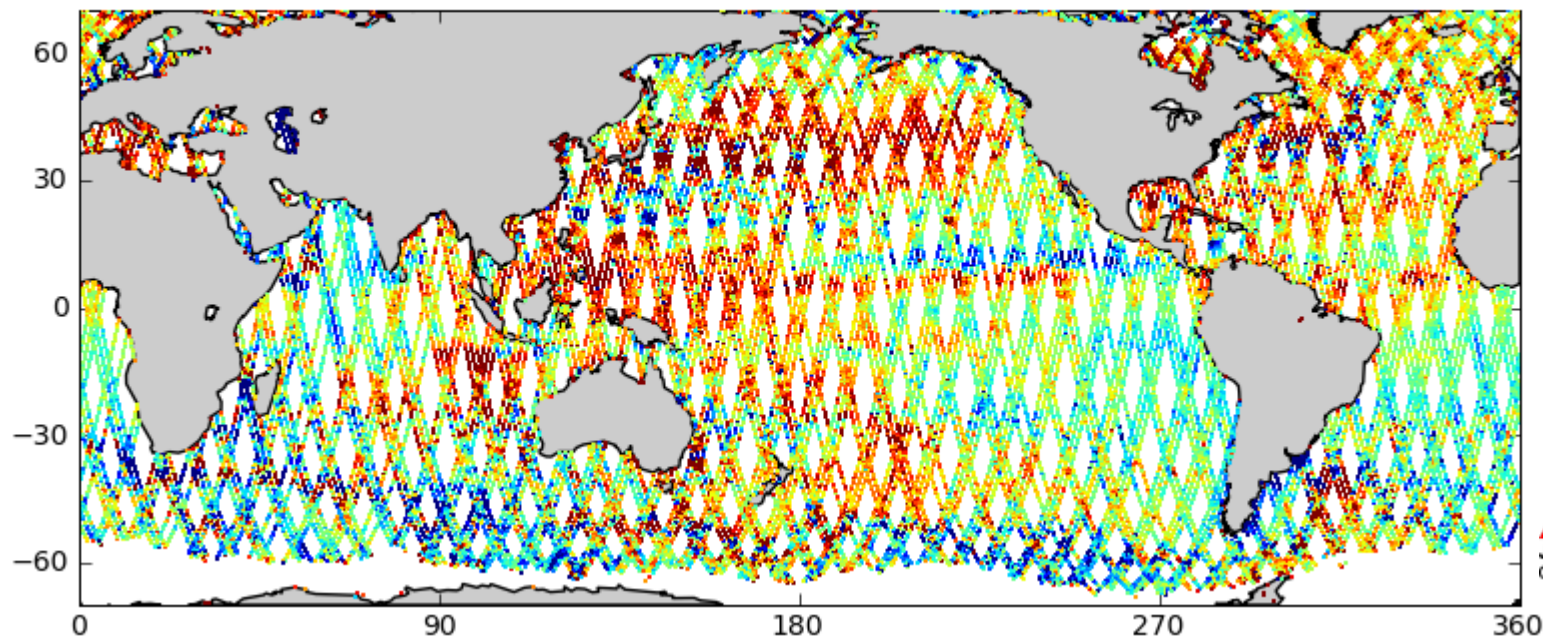At SWH=2m, range_rms (40Hz for Saral, 20 Hz for JA2/JA1) is:

- Saral: 5.1 cm → 0.8 cms at 1Hz

- JA2/JA1: 7.2 cm → 1.6 cms at 1Hz

Mean
(2013-04-18 05:39 - 2013-05-23 05:38)

	Mean	StdDev
Saral IGDR valid_lat66	Mean = 0.09399	StdDev = 0.03907
Jason-2 IGDR valid_lat66	Mean = 0.1111	StdDev = 0.03387
Jason-1 IGDR valid_lat66	Mean = 0.1118	StdDev = 0.03442

CalVal analysis on CNES&CLS side : Sea Level Anomalies

Maps of SLA (orbit – range – corrections - MSS) are very similar for Saral and Jason-2, with rms values as low as the one on Jason-2 mission

SARAL: Last available measurement 28.88 hrs ago.

|	Mean (Ogdr)	Mean (Igdr)	Mean (Gdr)	Std (Ogdr)	Std (Igdr)	Std (Gdr)
Saral	-3.2 cm	-2.1	-2.1	9.84 cm	9.46	9.56
Jason-2	4.7 cm	4.4	4.3	9.95 cm	9.57	9.65

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Mono mission Xover (SSH differences at crossovers limited to 10 day time differences) depicts that the performance is comparable to Jason-2 mission.

There is however works to do on the radiometer wet tropospheric correction

SSH at XOvers
Std per cycle (|lat|<50, bathy < -1000 m, ocean var < 0.2 m)

SRL Gdr mod	Nbr = 14	Mean = 0.05224	StdDev = 0.002994
JA2 Gdr mod	Nbr = 14	Mean = 0.05144	StdDev = 0.002506
SRL Gdr rad	Nbr = 14	Mean = 0.05207	StdDev = 0.003285
JA2 Gdr rad	Nbr = 14	Mean = 0.04897	StdDev = 0.002742
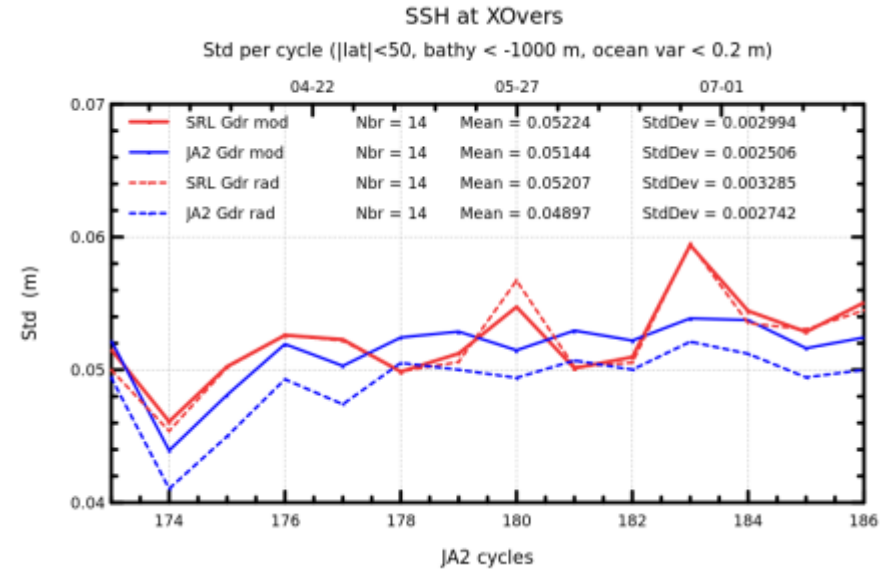
AL/AL Crossover mean differences (using radiometer wet tropo
GDR valid data, (Saral cycle 1 - 3)

Mean (cm) (mean= -0.26, median= -0.35, std= 2.59)
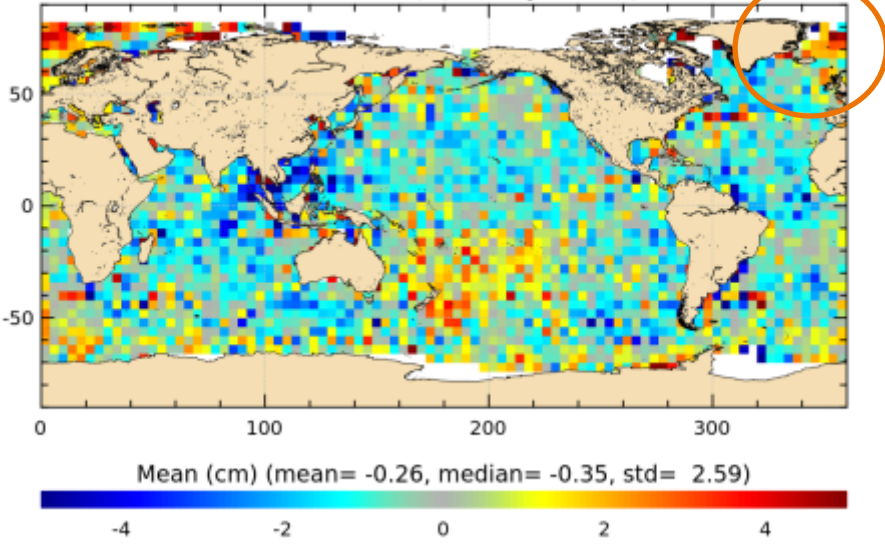
J2/J2 Crossover mean differences (using radiometer)
valid data, |lat| < 66 (JA2 cycle 173 - 183)

Mean (cm) (mean= -0.12, median= -0.11, std= 1.58)
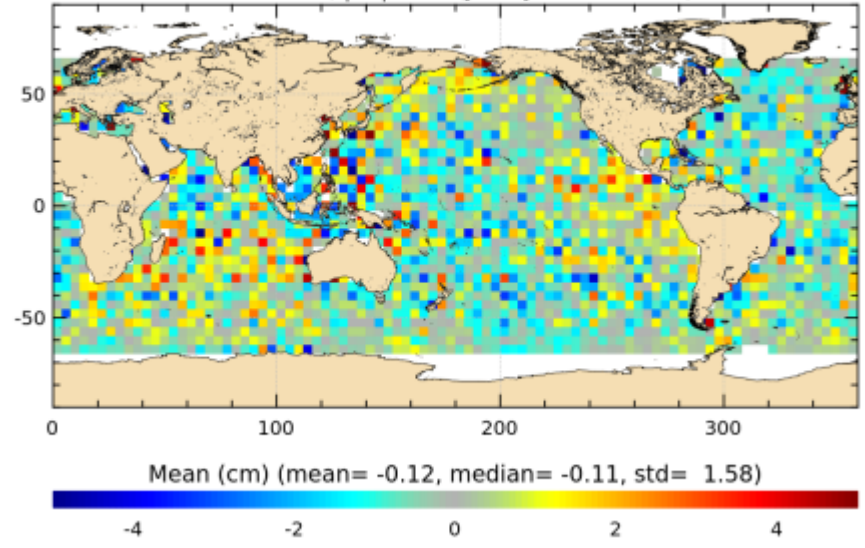
The mean at Jason-2/Saral Xovers is already very low, which is a very good results just a few months after launch.

This will be improved in the coming months by the update of the orbit, SSB, radiometer wet tropospheric correction, …
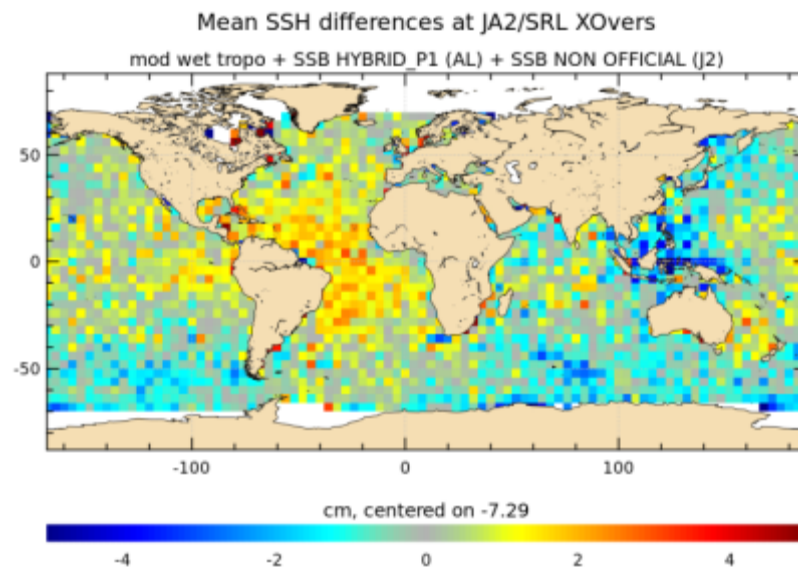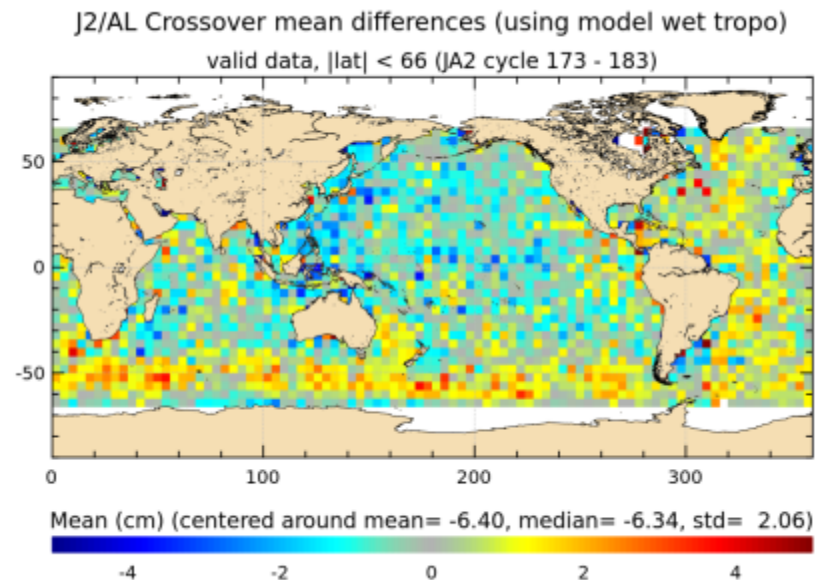
J2/AL Crossover mean differences (using model wet tropo)

valid data, |lat| < 66 (JA2 cycle 173 - 183)

Mean (cm) (centered around mean= -6.40, median= -6.34, std= 2.06)

Mean SSH differences at JA2/SRL XOvers

mod wet tropo + SSB HYBRID_P1 (AL) + SSB NON OFFICIAL (J2)

cm, centered on -7.29

The SLA spectrum is again similar for Jason-2:

- SLA spectral hump is still present on AltiKa but shifted to shorter scales (mainly due to the smaller waveform footprint). This will allow to reduce the filtering performed to derive geostrophic current. Notice that this hump can be reduced by an appropriate editing and/or more clever processing technic.

- AltiKa SLA spectrum content is closer to the theoretical ocean one's for wavelength between 90 to 50 km

SLA Spectrum Jason-2/AltiKa - Cycle 998 pass 175 to 289
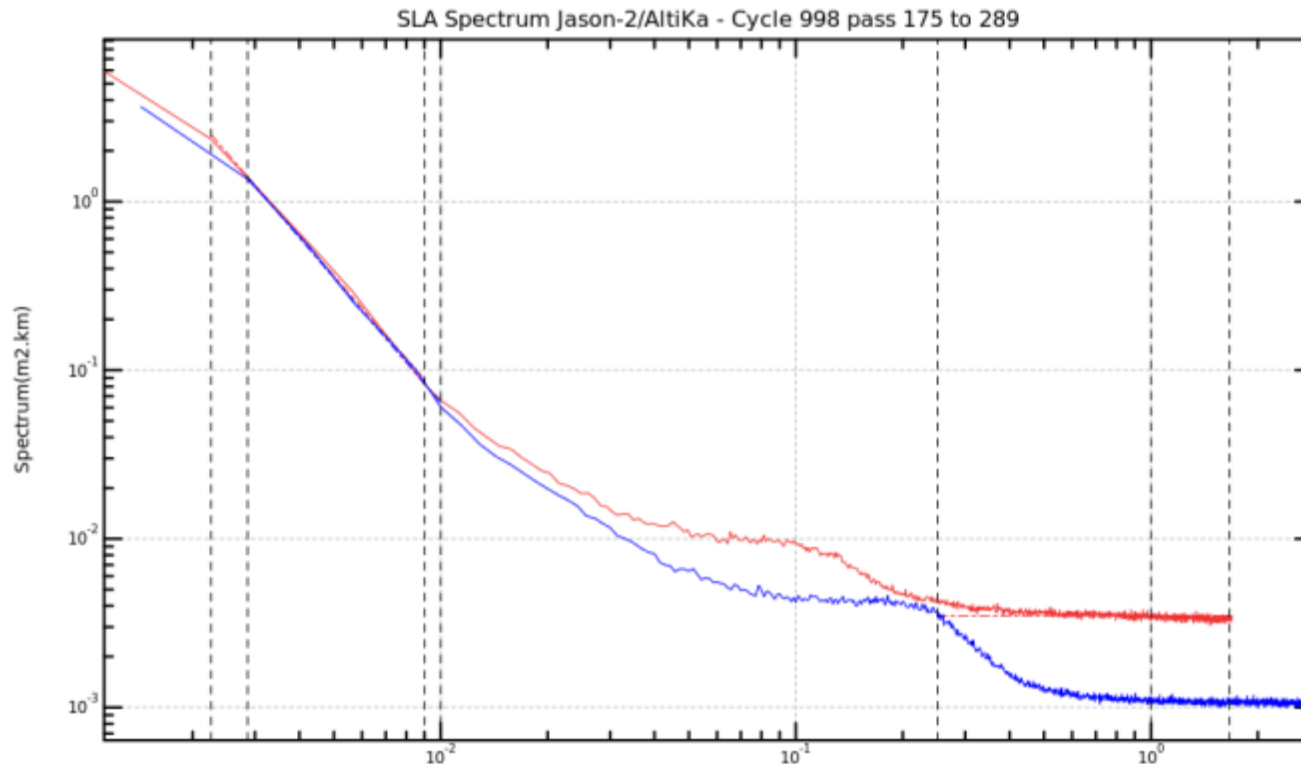
Using JA2/SARAL Cross overs points the standard deviation of differences between SARAL and Jason-2 is <10 cm.

Using measurements < 6 hours apart, and weighted fit as a function of delta_time to scatter, **SARAL SWH biased by + 8 cm relative to Jason-2, with > 99% correlation.**
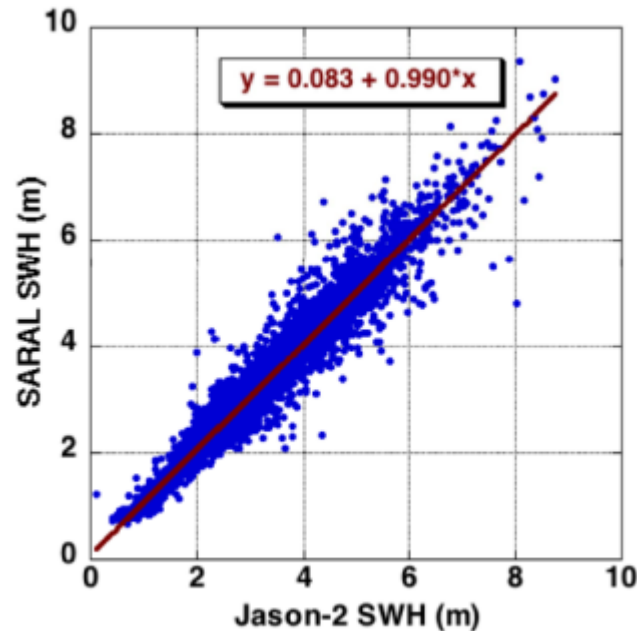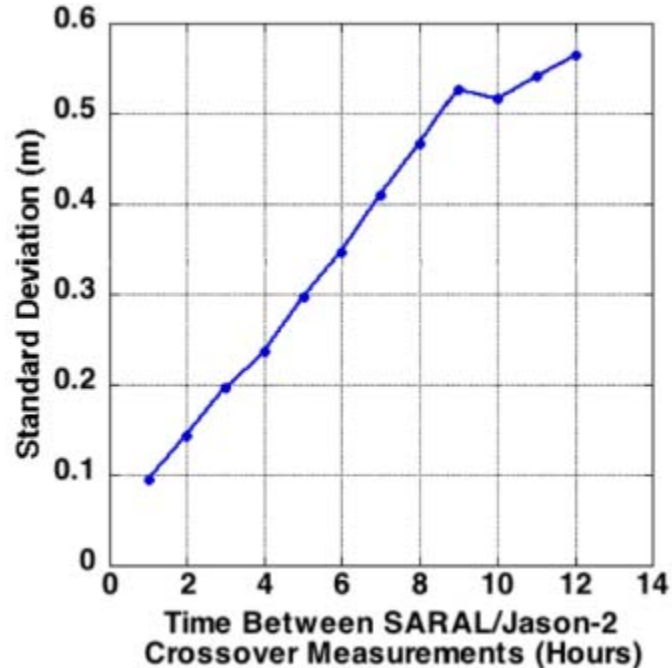
Using JA2/SARAL Cross overs points the SSHA with the SARAL GDR SSB model depicts a SWH dependency

Then JPL has computed an empirical SSB solution that allows to reduce this effect and that increases the coherence with Jason-2 and decrease the Xover stdev
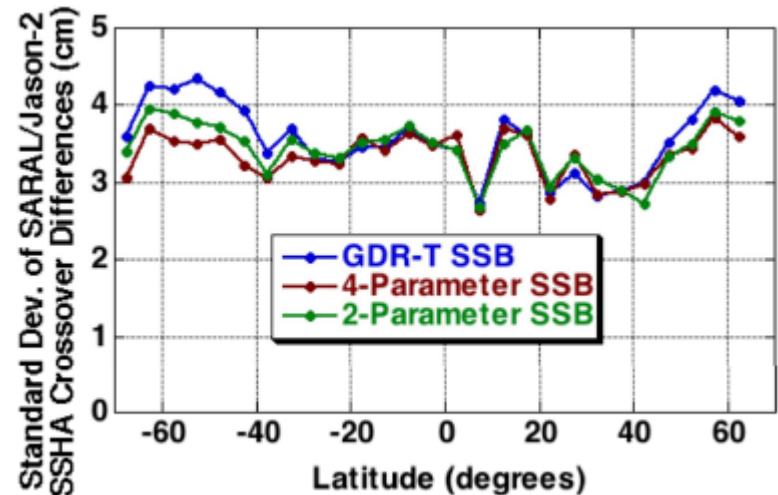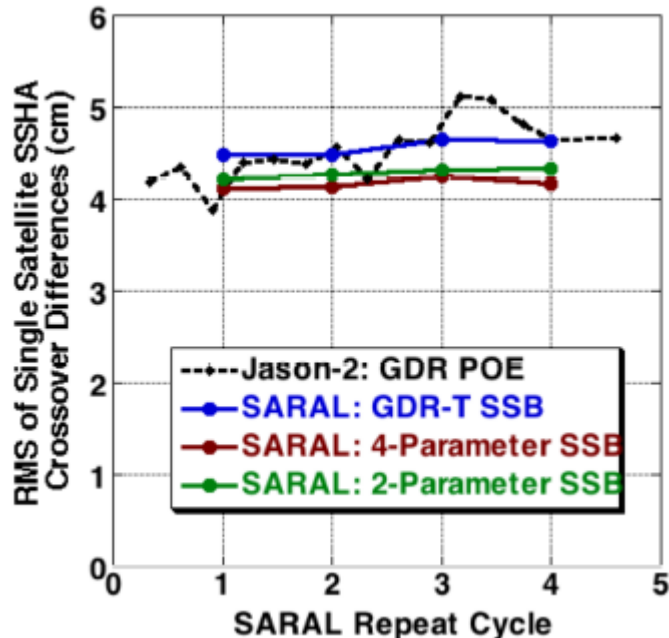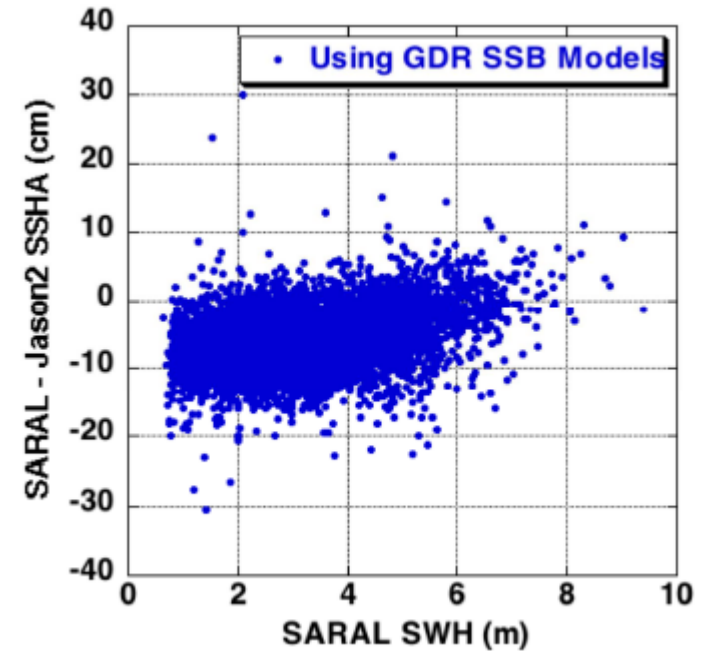
SARAL was not exactly on the expected ground track (ENVISAT repetitive cycle). Several inclination manoeuvers have been recently performed to correct for this. An analysis conducted by LEGOS/S. Fleury just confirmed that SARAL is now exactly on the expected inclination value :
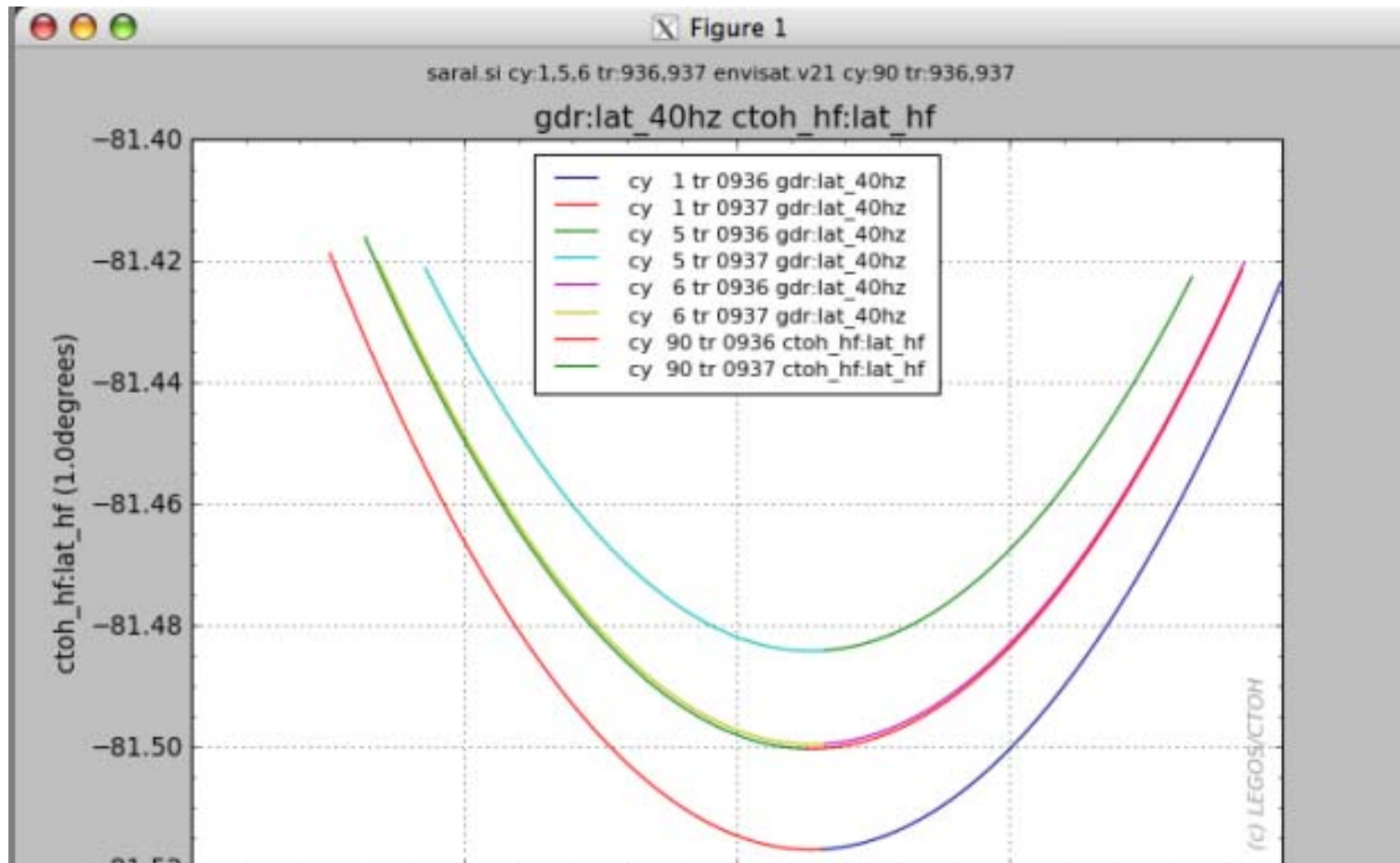
Conclusion

- SARAL/AltiKa is working properly and all products data quality are inline with mission requirement. CalVal analysis confirms the very high data quality of Ka band, of the order of Jason-2 mission.

- All products available on the AVISO ftp server : **avisoftp.cnes.fr**

- Ongoing actions as part of CNES PEACHI prototype to further improve the processing algorithms, including the computation of SSB table, the analysis of the impact of rain cells, the ice retracking algorithm, the calibration of wind speed, …

- Update of the processing baseline is already ongoing – Patch 2 will be implemented early 2014 to account for :

  - Wind and SSB from tables provided by NOAA Pis
  - Update of the radiometer neural network
  - Ice-2 algorithm updated to comply with Ka band data
  - FES 2012 tide model
  - Matching Pursuit algorithm update

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