Jason-2 GDR-D standards

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…..
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+ OSTST group to support SSB analysis

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CENTRE NATIONAL D'ÉTUDES SPATIALES

SALP
SERVICE ALTIMETRIE & LOCALISATION PRECISE

CLS
COLLECTE LOCALISATION SATELLITES

Plan

- Recall of OSTST 2010 recommendations
- Work performed to prepare the GDR_D Jason2 version
  - Absolute bias correction
  - Datation bias correction
  - Sigma0 analysis and SSB tables generation
- GDR_D implementation and early validation on 8 cycles
- MLE3 versus MLE4 ?

Jason-2 GDR-C – conclusion from last year meeting

- Implemented in GDR_C standard last year
  - New J2 AMR processing (coastal area + new flags) and updates to work around the 34 GHz VFC anomaly
  - Use of a null mispointing value in input of the C band retracking algorithm
  - Use of LTM information filtered over X days
  - New tide model (GOT00.2 ➔ GOT 4.7)
  - Polar tide anomaly correction
  - Long period non equilibrium tide anomaly correction
  - SSHA on OGDRs computed when meteo grid are extrapolated
  - NRT orbit quality flag in OGDR products
  - Some complementary evolutions (specifications updates + typos in the products + ...)
  - Update of the altimeter characterisation file and impacts
  - Ice Flag in SSHA products
  - New parameters in SGDR products (including all MLE3 derived parameters)

Jason-2 GDR-C – conclusion from last year meeting

• However, some additional evolutions should be implemented before Jason2 GDR_C processing start:

  • The wind is overestimated, and the SSB could/should be computed with a wind derived from MLE3 estimates.
  → N Tran has proposed a solution that will be reviewed by a dedicated sub group in the coming weeks to provide final advice to the project

  • The ionospheric correction is underestimated.
  → C band internal path delay will be reviewed to try to explain this bias. No artificial bias will be applied to align JA2 ionospheric correction to JA1

  • An additional correction to account for the pseudo datation bias will be implemented on JA2

  • MLE3 parameter estimates are required in the GDRs products

Jason-2
GDR-C tentative schedule

• Implement the above proposed additional evolutions in the coming weeks and start the processing early 2011. To be completed before summer 2011.

• Processing to be started with the JA1/JA2 tandem phase in order to derive relative bias estimates between both missions. This relative bias shall be widely published by all projects communication means (several users complain about the lack of available information on that topic)

Jason-2 GDR_D

- **The Jason-2 GDR_D standard has been implemented just before summer. Most of the delay is related to additional analysis on MLE3 sigma0 behaviors and definition of the product contents.**
- **In addition to the GDR_C evolutions we have also included:**
  - Absolute bias correction
  - Datation bias correction
  - Use of GOT 4.8 version instead of GOT 4.7
  - A new atmospheric correction algorithm provided by JPL
  - The MLE3 key parameters have been included in both GDRs and SGDRs datasets, following what has been implemented for MLE4
  - New LUT (altimeter instrumental corrections tables) have been generated and delivered after an anomaly discovered in the generation software, even if the impact was very small.
  - SSB tables were computed on a dedicated mockup during summer to anticipate the JA2 GDR_D products as much as possible
  - Cycles 1-8 were processed mid September for a first assessment of the software by 4 project partners.

Jason-2 GDR_D

- **Evolution on the product spec:**

S-GDR	GDR	SSHA
agc_20hz_c		
agc_20hz_ku		
agc_corr_20hz_c		
agc_corr_20hz_ku		
amplitude_20hz_ku_mle3		
epoch_20hz_ku_mle3		
		ice_flag
iono_corr_alt_ku_mle3	iono_corr_alt_ku_mle3	iono_corr_alt_ku_mle3
modeled_instr_corr_range_ku_mle3		
modeled_instr_corr_sig0_ku_mle3		
modeled_instr_corr_swh_ku_mle3		
mqe_20hz_ku_mle3	mqe_20hz_ku_mle3	
net_instr_corr_range_ku_mle3	net_instr_corr_range_ku_mle3	
net_instr_corr_sig0_ku_mle3	net_instr_corr_sig0_ku_mle3	
net_instr_corr_swh_ku_mle3	net_instr_corr_swh_ku_mle3	
number_of_iterations_ku_mle3	number_of_iterations_ku_mle3	
qual_alt_1hz_range_ku_mle3	qual_alt_1hz_range_ku_mle3	
qual_alt_1hz_sig0_ku_mle3	qual_alt_1hz_sig0_ku_mle3	
qual_alt_1hz_swh_ku_mle3	qual_alt_1hz_swh_ku_mle3	
qual_inst_corr_1hz_range_ku_mle3	qual_inst_corr_1hz_range_ku_mle3	
qual_inst_corr_1hz_sig0_ku_mle3	qual_inst_corr_1hz_sig0_ku_mle3	
qual_inst_corr_1hz_swh_ku_mle3	qual_inst_corr_1hz_swh_ku_mle3	

Jason-2 GDR_D

- **Evolution on the product spec:**

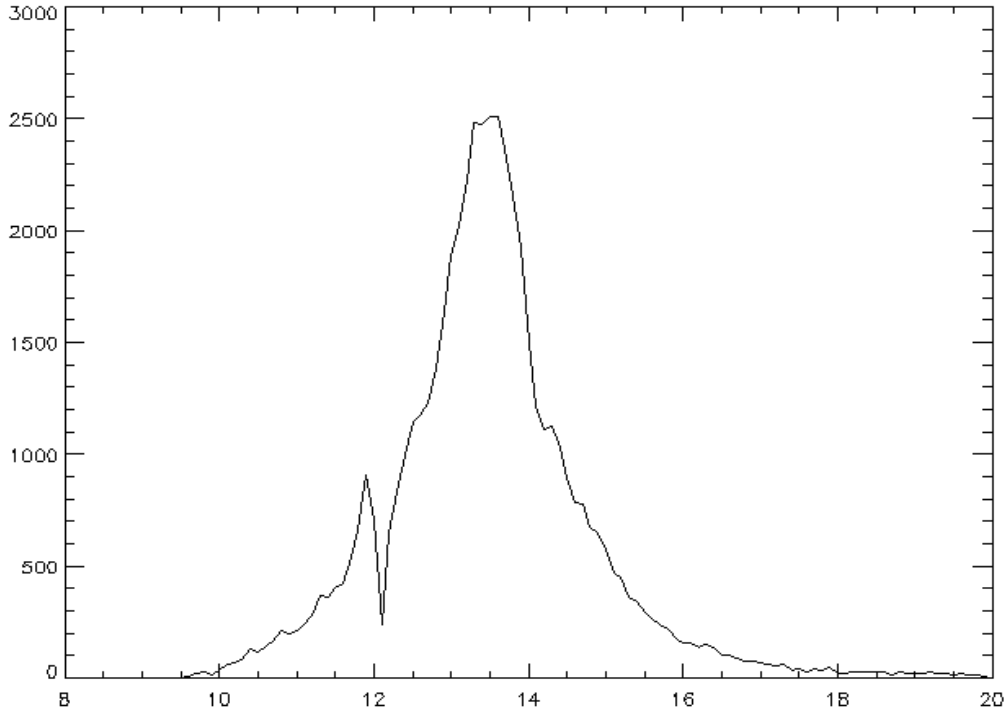
rad_averaging_flag	rad_averaging_flag	
rad_distance_to_land	rad_distance_to_land	
rad_land_frac_187	rad_land_frac_187	
rad_land_frac_238	rad_land_frac_238	
rad_land_frac_340	rad_land_frac_340	
rad_rain_flag	rad_rain_flag	rad_rain_flag
rad_sea_ice_flag	rad_sea_ice_flag	rad_sea_ice_flag
range_20hz_ku_mle3	range_20hz_ku_mle3	
range_ku_mle3	range_ku_mle3	range_ku_mle3
range_numval_ku_mle3	range_numval_ku_mle3	
range_rms_ku_mle3	range_rms_ku_mle3	
range_used_20hz_ku_mle3	range_used_20hz_ku_mle3	
sea_state_bias_ku_mle3	sea_state_bias_ku_mle3	sea_state_bias_ku_mle3
sig0_20hz_ku_mle3	sig0_20hz_ku_mle3	
sig0_ku_mle3	sig0_ku_mle3	sig0_ku_mle3
sig0_numval_ku_mle3	sig0_numval_ku_mle3	
sig0_rms_ku_mle3	sig0_rms_ku_mle3	
sig0_used_20hz_ku_mle3	sig0_used_20hz_ku_mle3	
ssha_mle3	ssha_mle3	ssha_mle3
		surface_type
swh_20hz_ku_mle3	swh_20hz_ku_mle3	
swh_ku_mle3	swh_ku_mle3	swh_ku_mle3
swh_numval_ku_mle3	swh_numval_ku_mle3	
swh_rms_ku_mle3	swh_rms_ku_mle3	
swh_used_20hz_ku_mle3	swh_used_20hz_ku_mle3	

- **Evolution on the product spec:**

ta_187		
ta_238		
ta_340		
tb_187_smoothed	tb_187_smoothed	
tb_238_smoothed	tb_238_smoothed	
tb_340_smoothed	tb_340_smoothed	
width_leading_edge_20hz_ku_mle3		
wind_speed_alt_mle3	wind_speed_alt_mle3	wind_speed_alt_mle3

Jason-2 GDR_D : SSB

- **Conclusion from the OSTST SSB tiger group: during its analysis the group noticed a weird behavior of the MLE3 sigma0. He has so recommended:**
  - GDR-C continue to use the Jason-2 wind speed (with appropriate biases) and SSB products developed using the MLE4 Ku-band sigma0 data. This will maintain heritage with Jason-2 to date and with Jason-1 for the time being.
  - Add all MLE3 parameters (including wind and SSB correction) in the GDR products



Jason-2 GDR_D : SSB

- **He has so recommended for the future :**
  - Going forward (not for the GDR-D), if the problem with the sigma0 data construction can be remedied or at least better understood and quantified, we would then recommend:
    - 5) Switching the wind speed output to one that is generated using the MLE3 Ku-band sigma0 in place of the MLE4. This would include appropriate bias adjustment at the 0.2 to 0.3 dB level as presented recently by N. Tran and others. The MLE3 Ku-band wind speed output is documented to be a more physically-robust product.
    - 6) The MLE3 Ku-band sigma0 would be the recommended science data product for Jason-2.
    - 7) It is highly recommended to compute a new SSB algorithm for Jason-2 if the best wind speed product differs from what has been used with J-2 to date. This change should not impact science uses of the range or SSHA data dramatically and it will likely be close to the Jason-1 model based on results shown on Lisbon (see N. Tran talk).
    - 8) It would be prudent to develop a new wind model for Jason-2 once the choice of optimal Jason-2 GDR-C Ku-band sigma0 is finalized.

Jason-2 absolute bias

- **Using in-situ calibration sites and the 2 Topex/JA1 and JA1/JA2 tandem phases the JA2 absolute bias value is of the order of 19 cms :**
  - **19.5 mm** for the **in-situ sites**
  - **186 mm** for the **Topex/Jason2 relative bias**

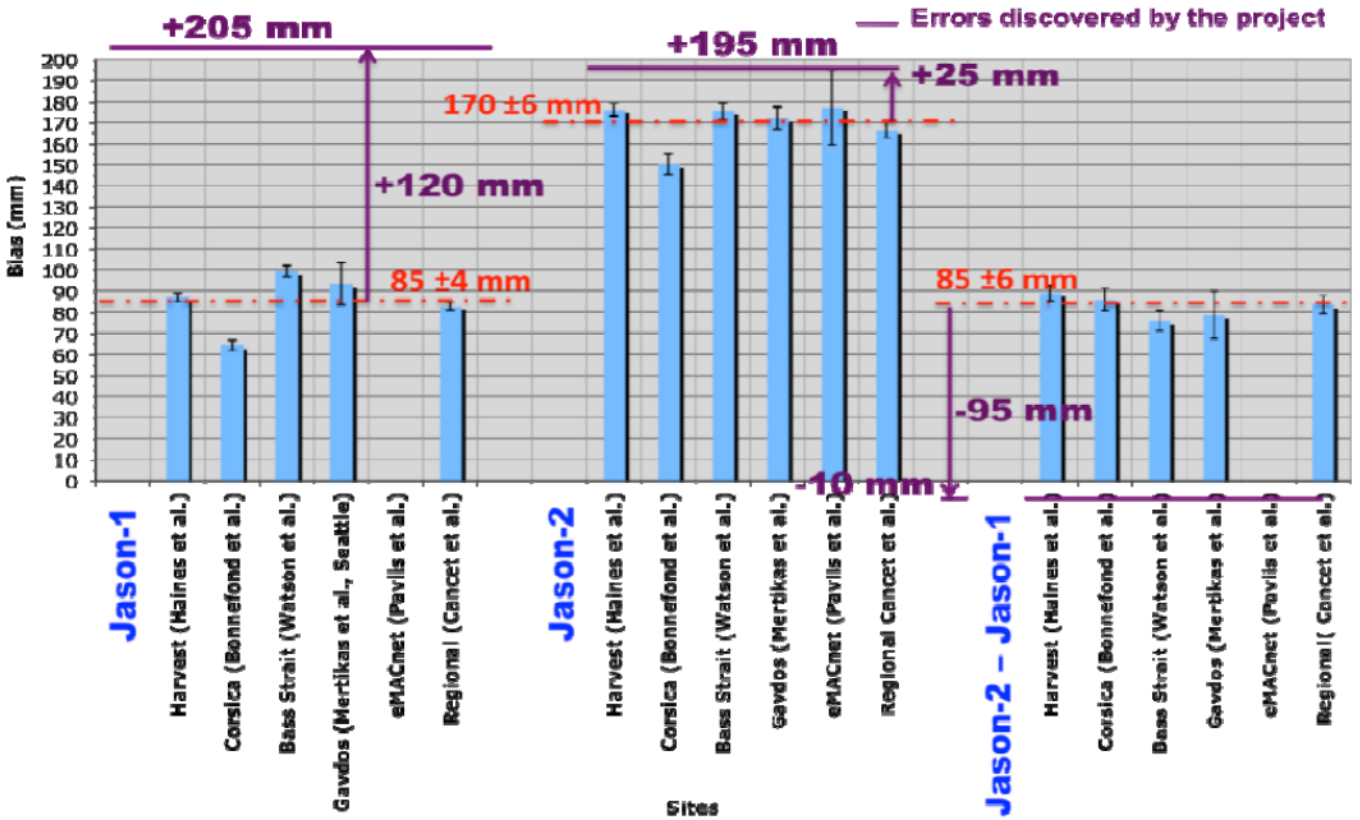
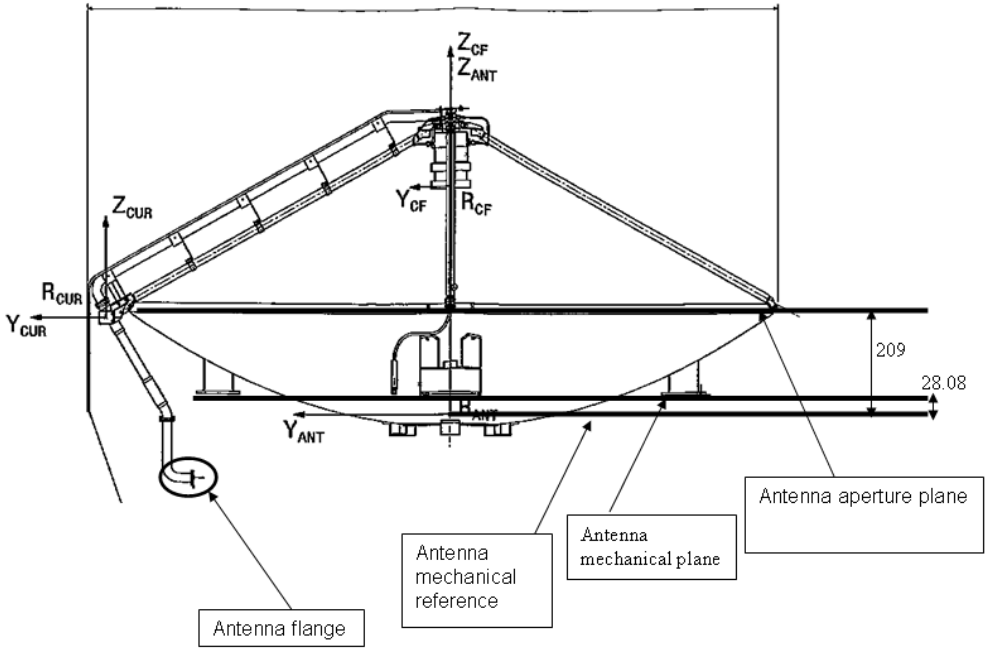


Figure 9.1.11. Absolute bias values for Jason-1 and Jason-2 from the different calibration sites. Red lines and associated numbers correspond to the average of all individual sites values. Purple lines and associated numbers correspond to the absolute biases if corrected from the error recently discovered by the project.

Jason-2 absolute bias

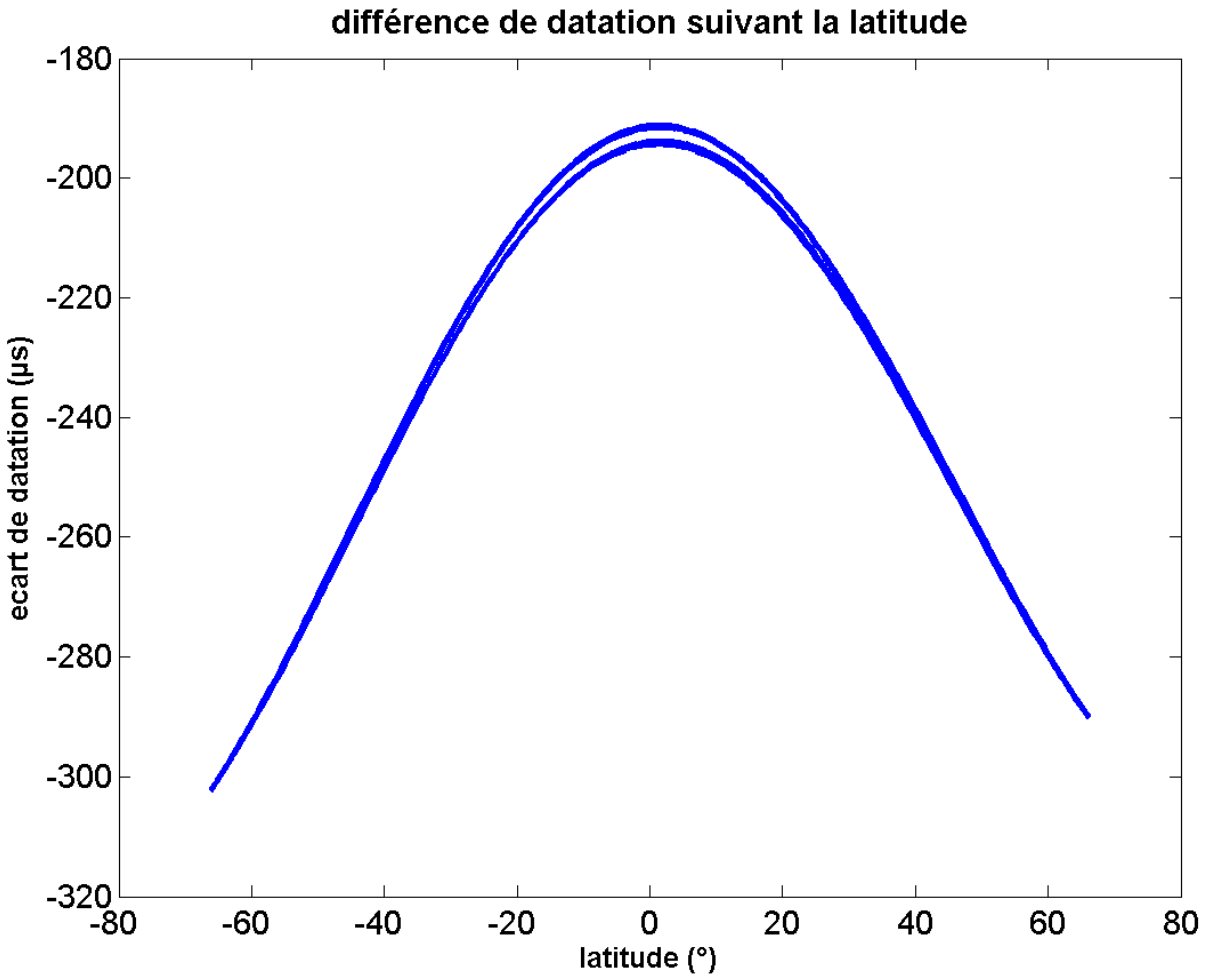
- **An anomaly was discovered end 2011 by CNES in the ground characterisation files :**
  - the altimeter internal path delay was determined by THALES ALENIA SPACE as part of the Poseidon-3 development contract managed by CNES. The reference plane corresponding to the **antenna aperture plane** was used to perform this determinati
  - However, the reference **plane** was used as the r determination. On the na

209-28.08 mm=**180.92 mm**



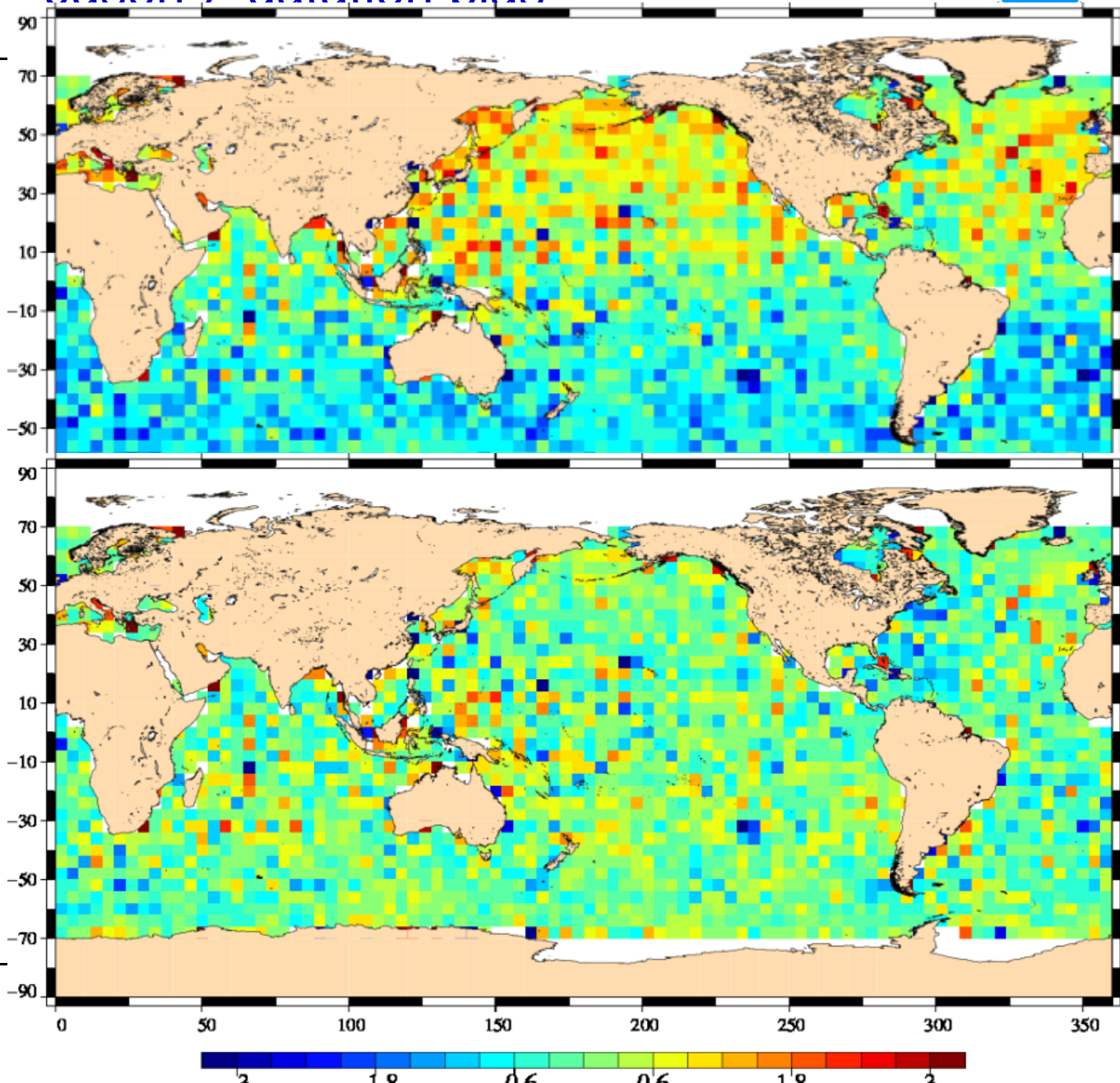
Jason-2 datation bias

- **An anomaly was discovered end 2011 by CNES in the ground processing software. This explain the ~ 250 micros seconds datation bias.**
  - in the telemetry emitted echo an
  - This is obvious l a few words : th receive the pow repetition interva information with interval. This tim compensate **mc**

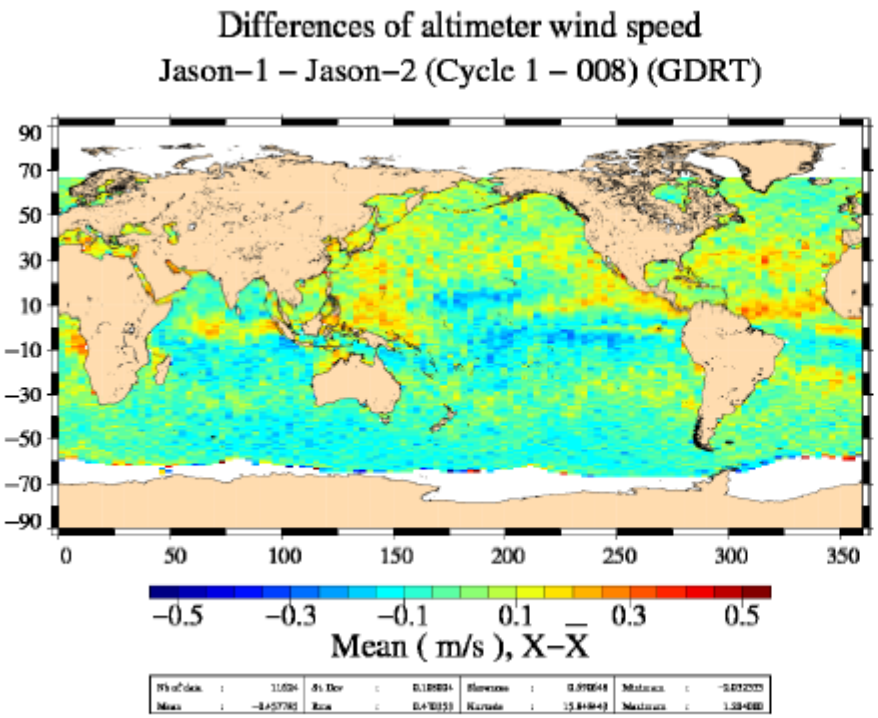


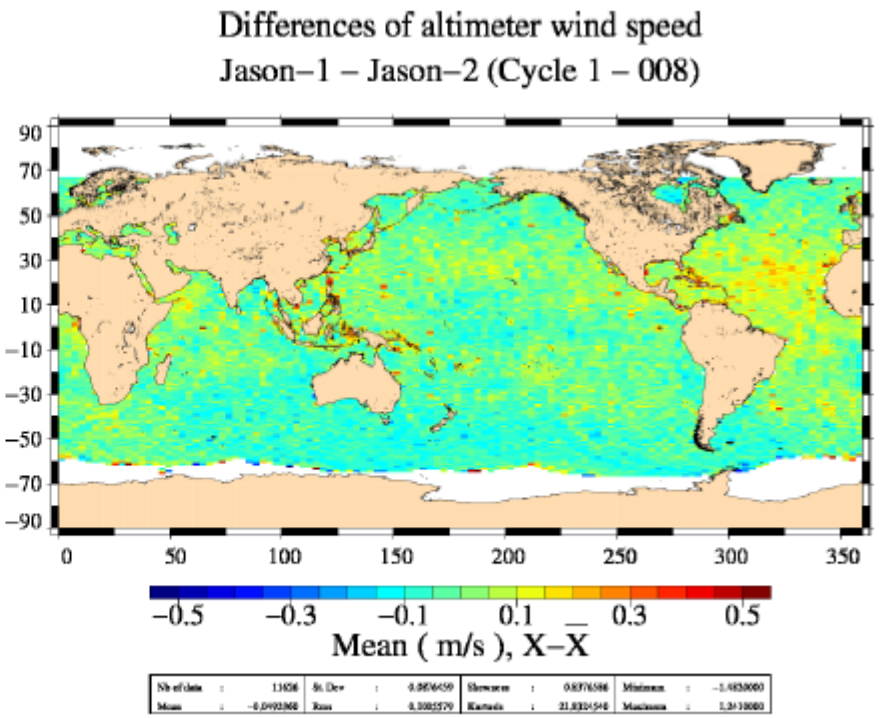
Jason-2 datation bias

- **Impact on the SSHA:**



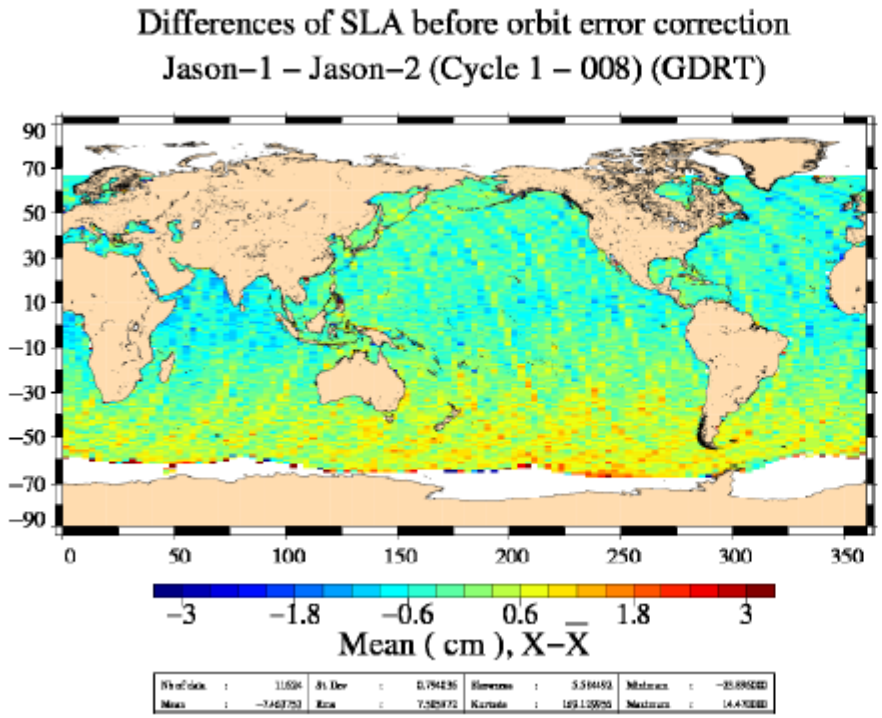
- **Wind differences:**

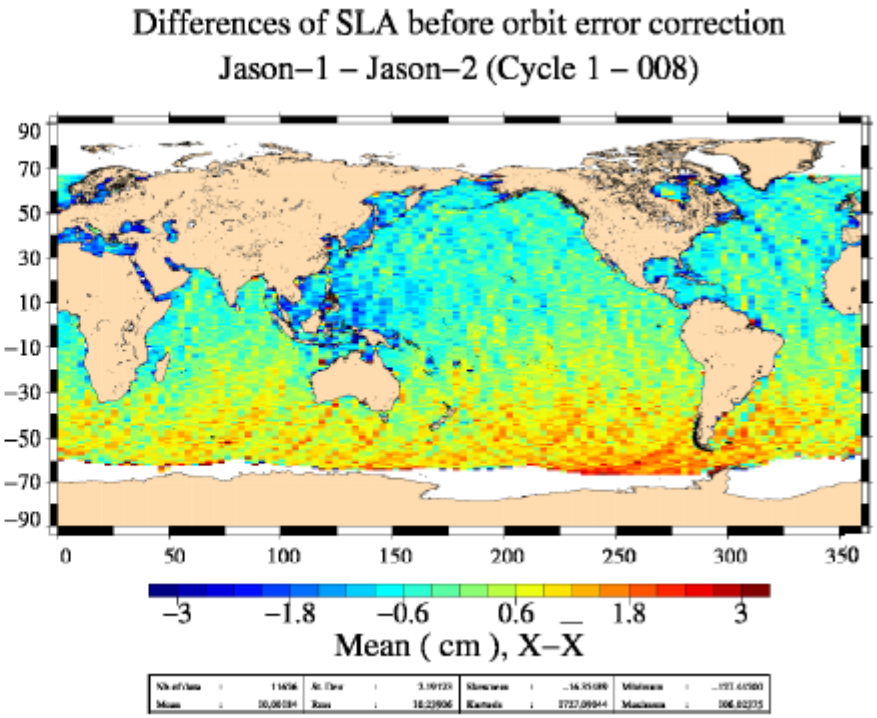




JA2 GDR_D results

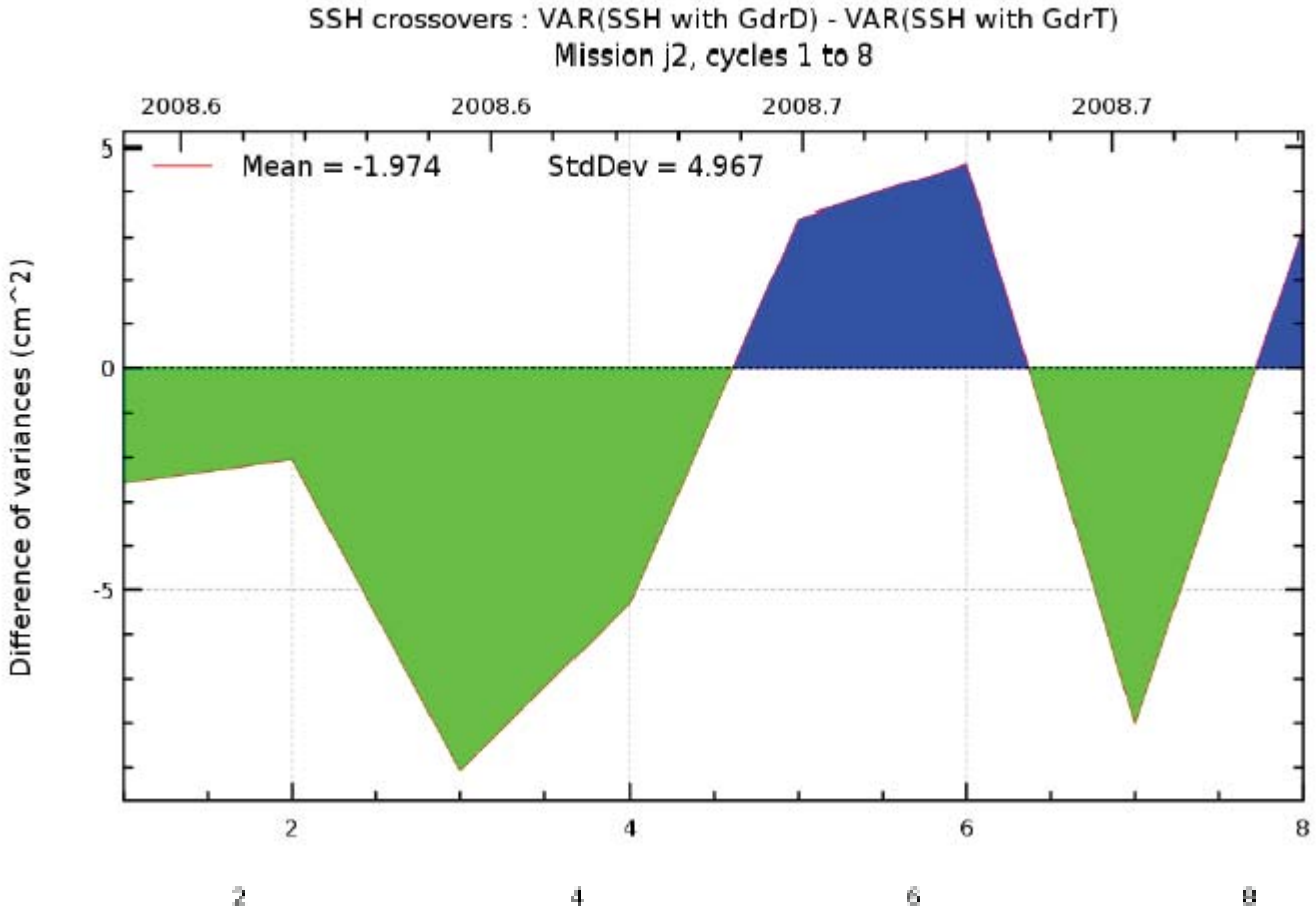
- **SLA differences:**





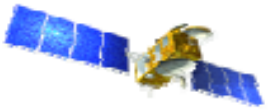
JA2 GDR_D results

- **Quality metrics**

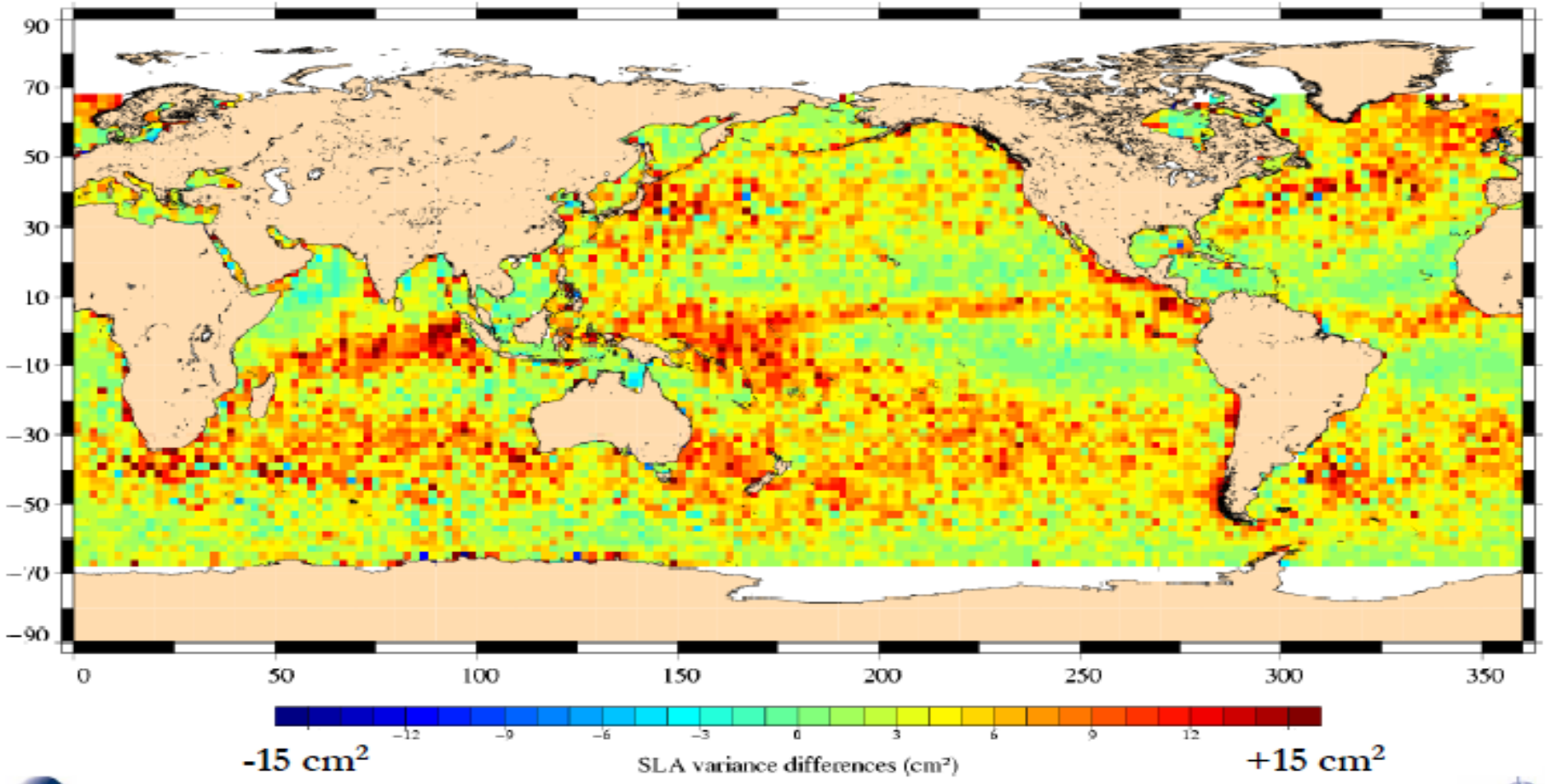


Variance reduction (between GDR 'B' and GDR 'A')

➔ Always positive



SLA variance differences



Conclusion

- **All GDR_D evolutions have been implemented and validated thanks to the processing of 8 cycles on the ops configuration.**
- **Major improvements are included in this version including:**
  - AMR new algorithms and new characterization file
  - Correction of the Absolute bias and Datation bias issues
  - Additional MLE3 retracking added
- **Remains to be done**
  - compute more precisely the relative sigma0 bias between JA1 and JA2 to compute the wind table and rain flag tables
  - Assess the slight dependency between JA1 and JA2 SLA for low winds/waves states