Jason-2 GDR-F mission performances over ocean

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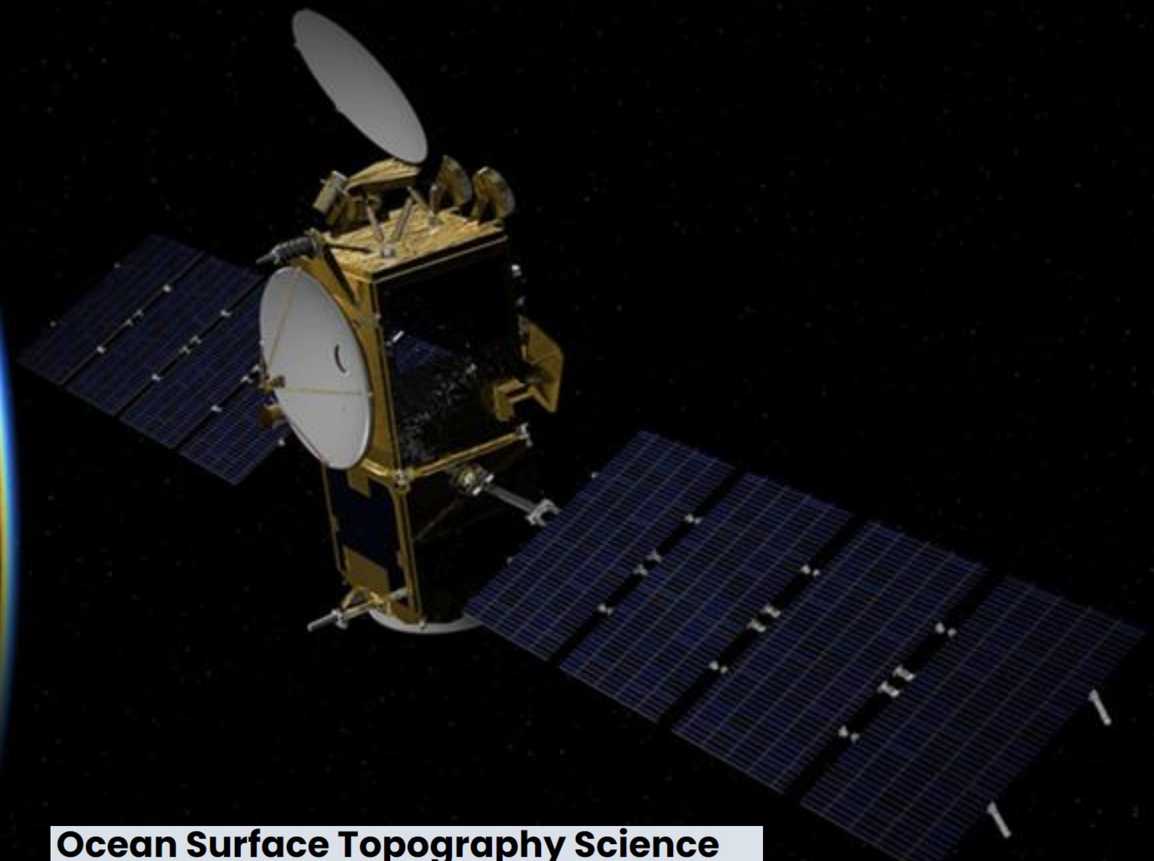

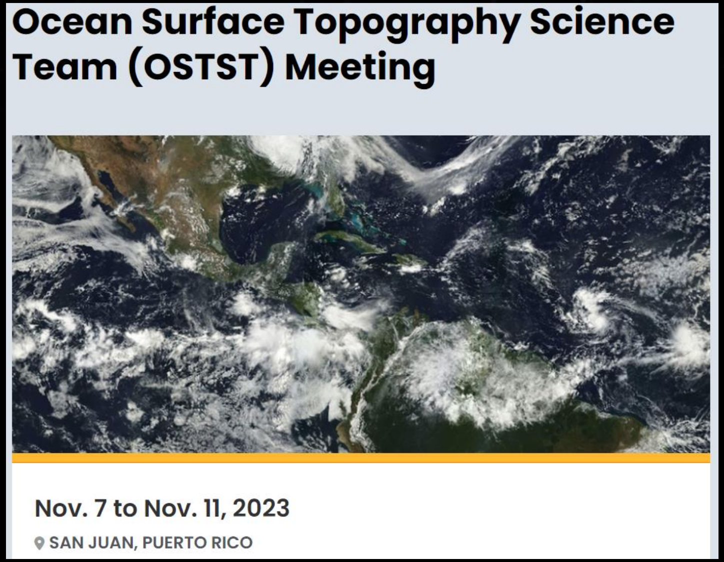

Regional and Global CAL/VAL for Assembling a Climate Data Record

Introduction

- Jason-2 L2 data reprocessed in standard GDR-F by CNES in 2022 and 2023 over the whole mission.
  - CLS involved in the assessment over ocean of this new dataset under SALP contract supported by CNES

- Jason-2 GDR-F products are similar to Jason-3's.
  - In particular, the adaptive retracker outputs are also included (a dedicated part of this presentation)

- This presentation deals with the Jason-2 mission until 2017, thanks to comparison with previous Jason-2 GDR-D standard for the same period.
  - Note that during analysis in 2023, an anomaly was detected, leading to a re-reprocess for years 2017 to 2019 : validation is still on going : **results could be modified**

1. GDR-F mission performances over ocean

2. GDR-F adaptive retracker outputs vs MLE4

3. Ongoing work on improvements and conclusions

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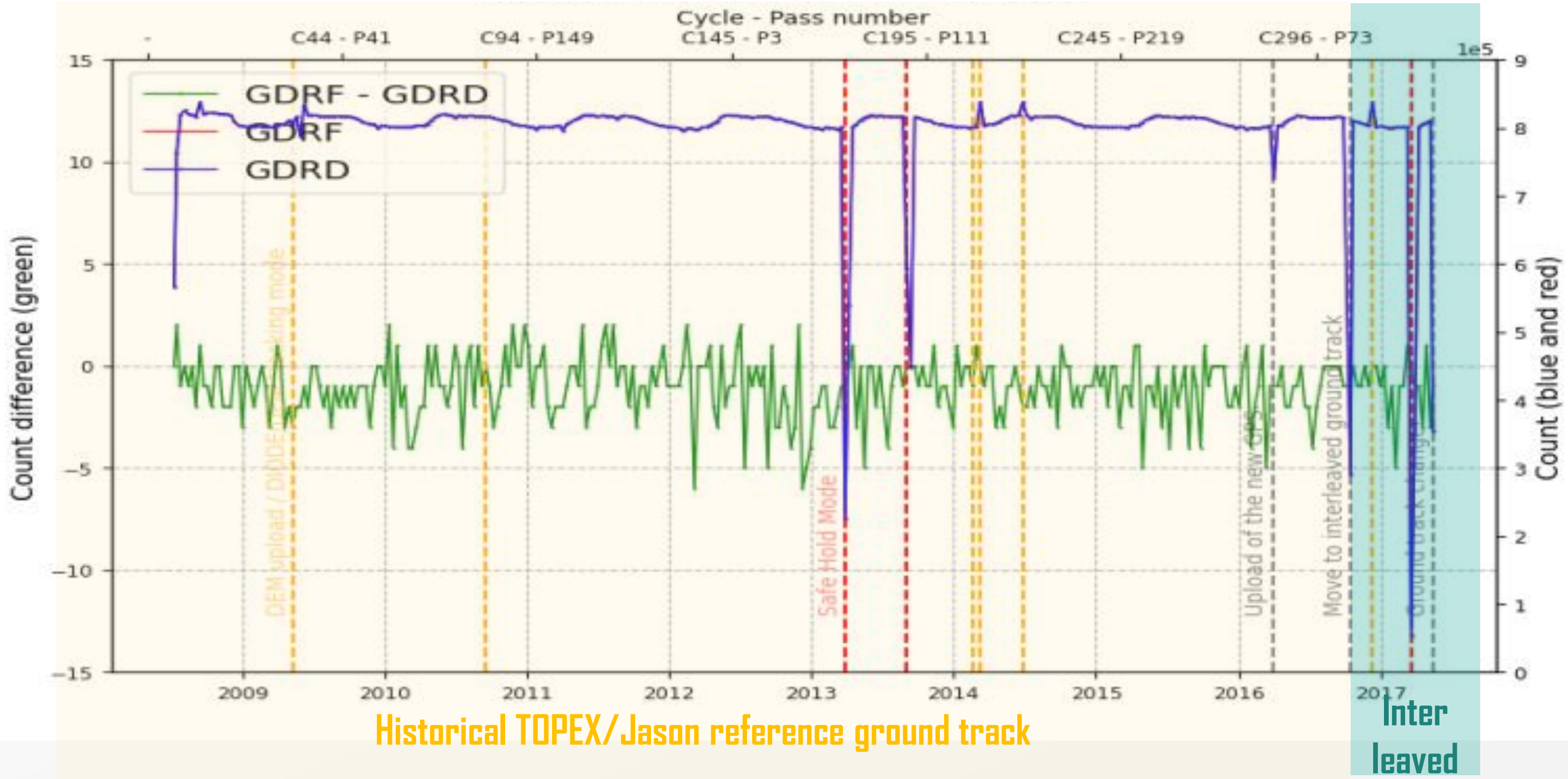
Data availability at 1Hz

The reprocessed GDR-F data are globally as available as GDR-D with less than 6 available points difference

Jason-2 GDR-F vs GDR-D number of 1Hz points (ocean + land)



Main events available in Jason-2 validation and cross calibration activities (End of mission 2019) report:
https://www.aviso.altimetry. fr/fileadmin/documents/calval/validation_report/J2/SALP-RP-MA-EA-23540-CLS_EndOfLife_J2_ CalVal_2019_v1-2.pdf

Sea Level Performances at 1Hz

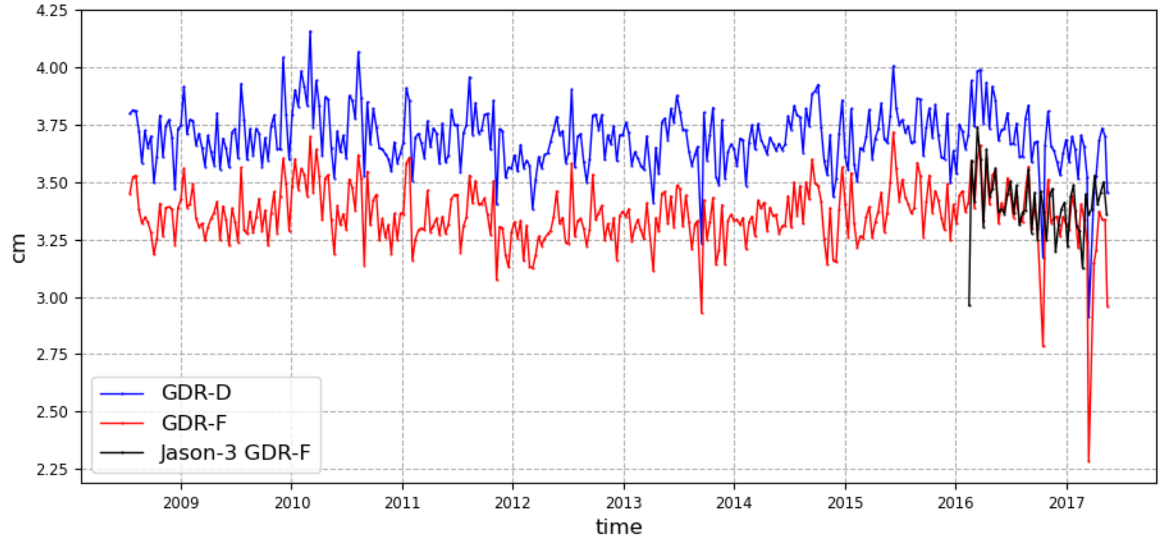
SSH error is deduced from crossovers analyses using radiometer data (selecting |latitudes| < 50°, bathy<-1000m, oceanic variability < 20 cm) :

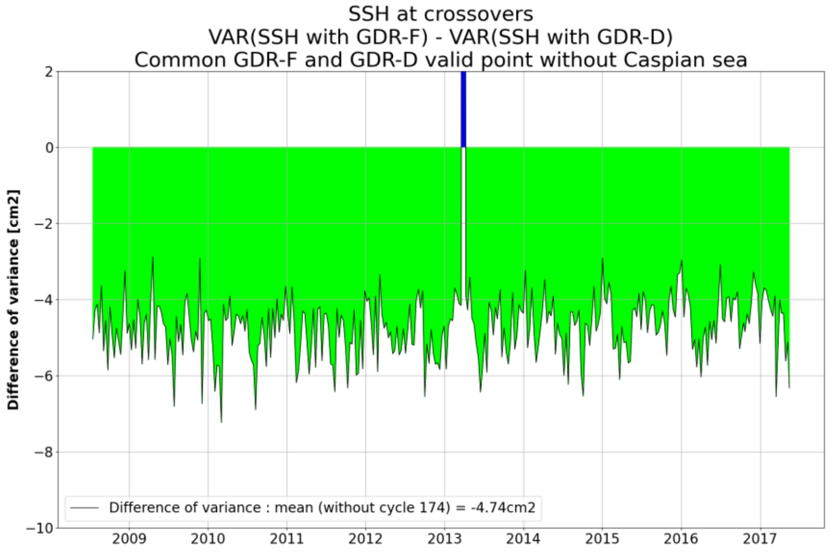
➔ reduction from **3,7cm with GDR-D** to **3,4cm with GDR-F** (= variance reduction of **-4,74 cm²**)

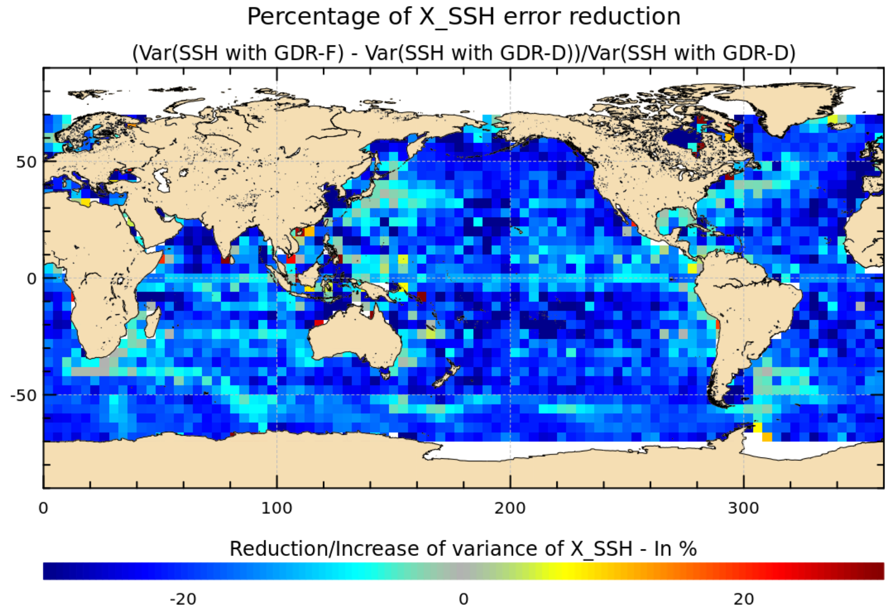
➔ Equivalent to Jason-3 GDR-F

Error of SSH at crossovers
Common GDR-F and GDR-D valid point without Caspian sea
Without cycle 174 for Jason-2

	nbr	min	mean	med	max	std
GDR-D	325	2.914	3.692	3.696	4.159	0.1328
GDR-F	325	2.284	3.356	3.346	3.719	0.1356
Jason-3 GDR-F	47	2.963	3.401	3.403	3.74	0.1337

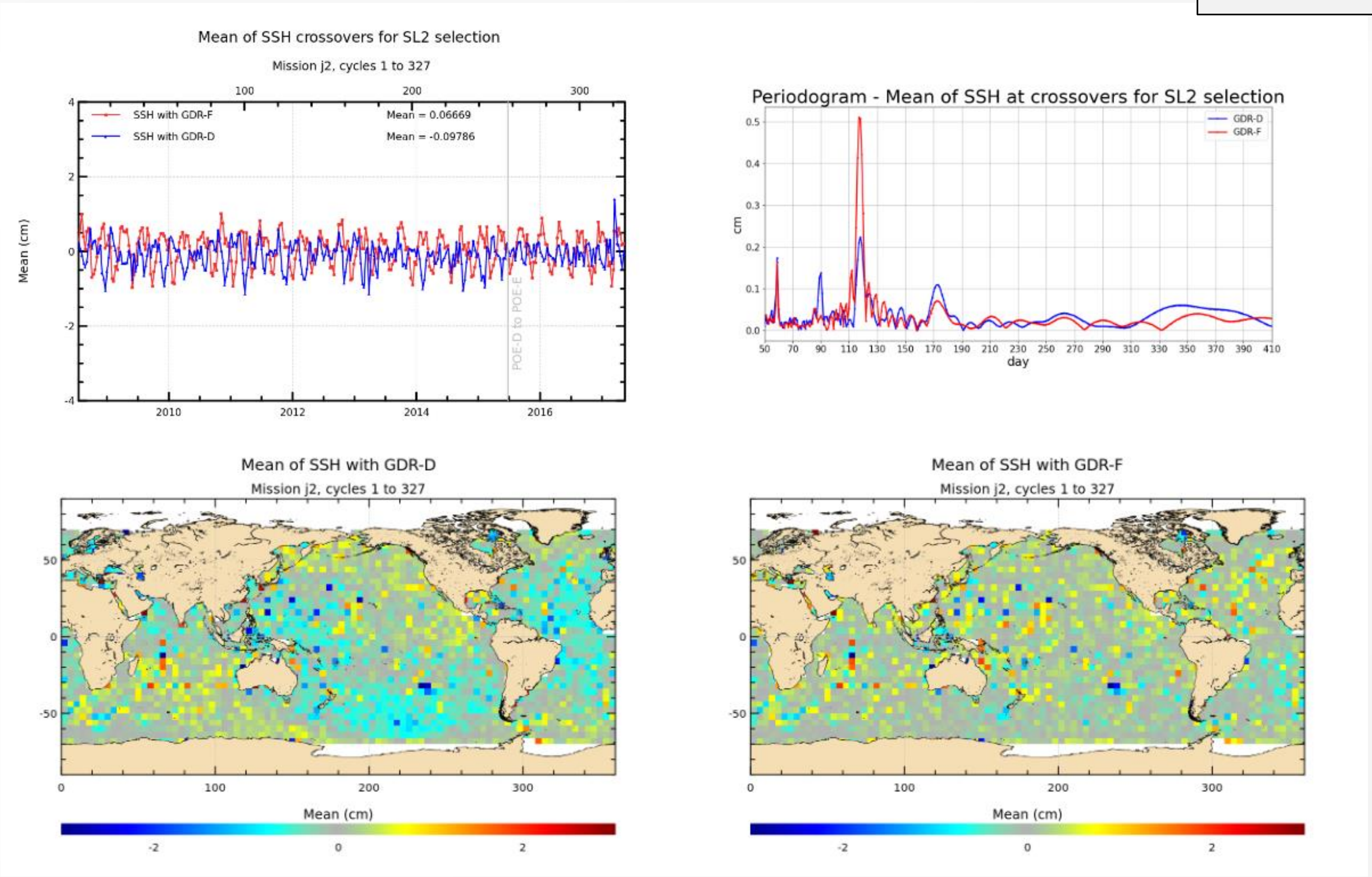






SSH differences at crossovers at 1Hz

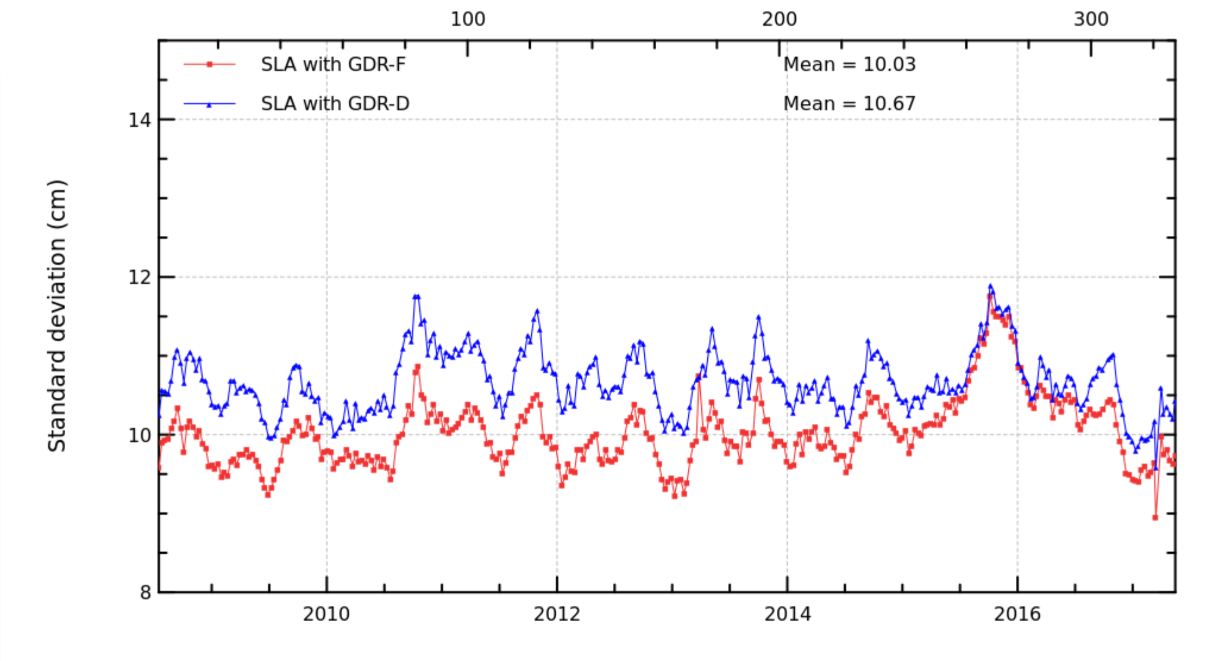
Very close to zero in average
Equivalent **with GDR-D** and **with GDR-F**
Small 120 days signal at crossovers

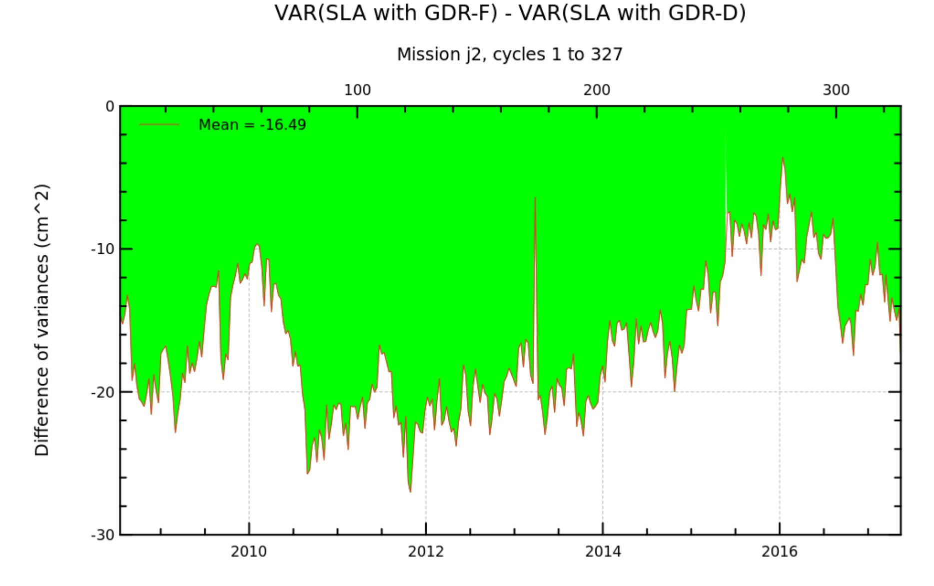


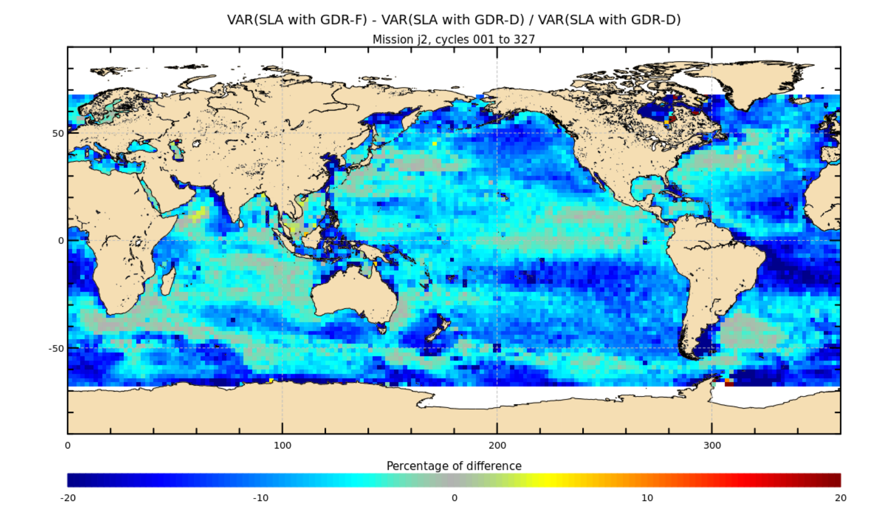
Along-track performances of SLA

Along track sea level anomaly standard deviation reduced by **0.6cm** with **GDR-F** compared to **GDR-D**

The variance of the SLA is lower for **GDR-F** than **GDR-D** (**-16.5 cm²** with GDR-F, caspian sea included)





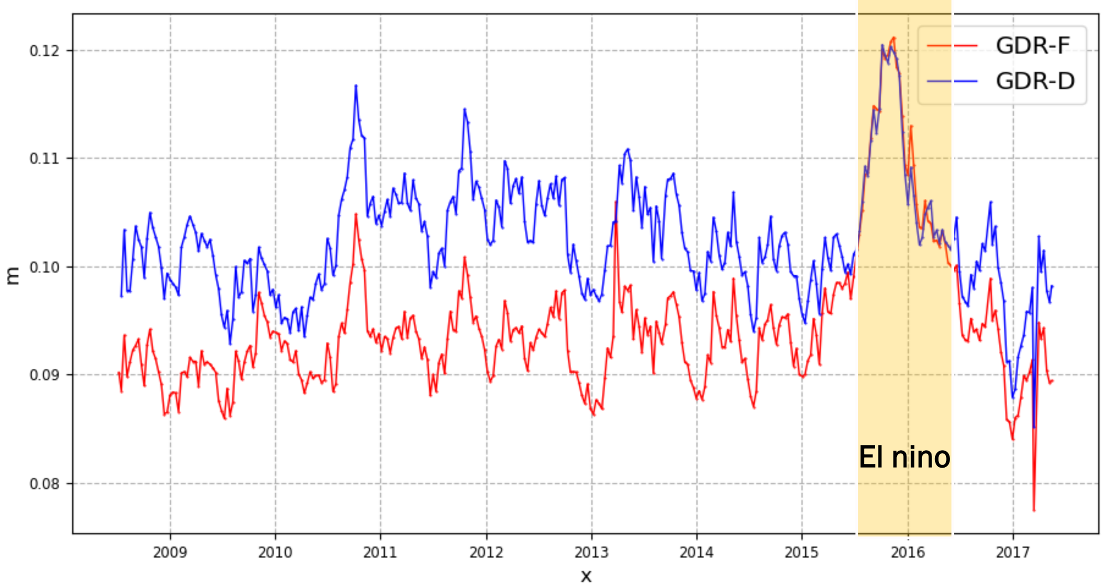


Along-track performances of SLA

Along track sea level anomaly standard deviation at the same level with **GDR-F** compared to **GDR-D** during el nino event.

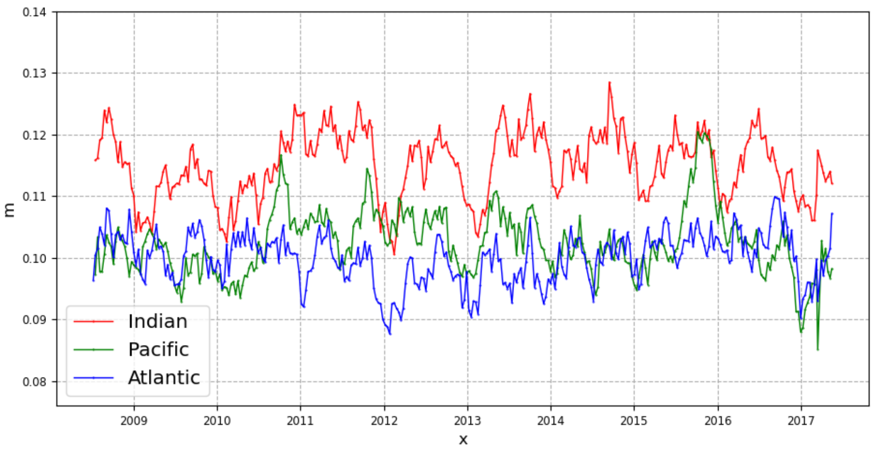
Along-track of SLA RMS over pacific ocean

	nbr	min	mean	med	max	std
GDR-F	327	0.07755	0.09443	0.09329	0.1211	0.006442
GDR-D	326	0.08518	0.1024	0.102	0.1204	0.005399



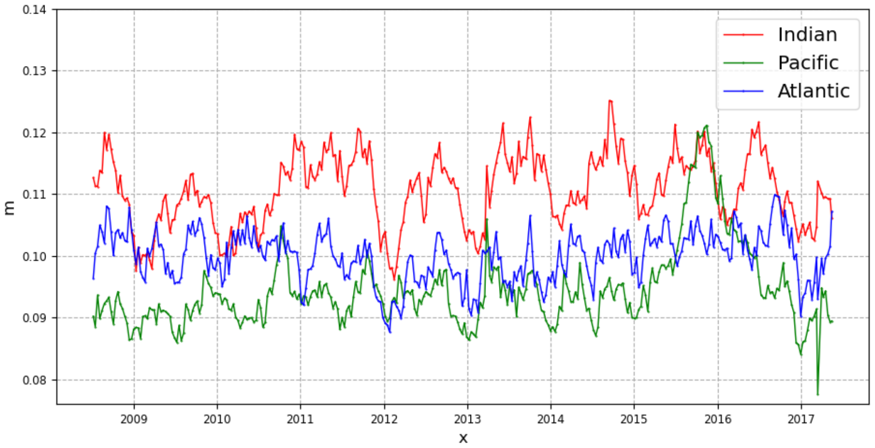
Along-track of SLA RMS by oceanic bassin - GDR-D

	nbr	min	mean	med	max	std
Indian	326	0.1005	0.1151	0.1156	0.1285	0.005407
Pacific	326	0.08518	0.1024	0.102	0.1204	0.005399
Atlantic	327	0.08761	0.09989	0.1004	0.1099	0.00409



Along-track of SLA RMS by oceanic bassin - GDR-F

	nbr	min	mean	med	max	std
Indian	327	0.09618	0.1107	0.1107	0.1251	0.005691
Pacific	327	0.07755	0.09443	0.09329	0.1211	0.006442
Atlantic	327	0.08761	0.09989	0.1004	0.1099	0.00409



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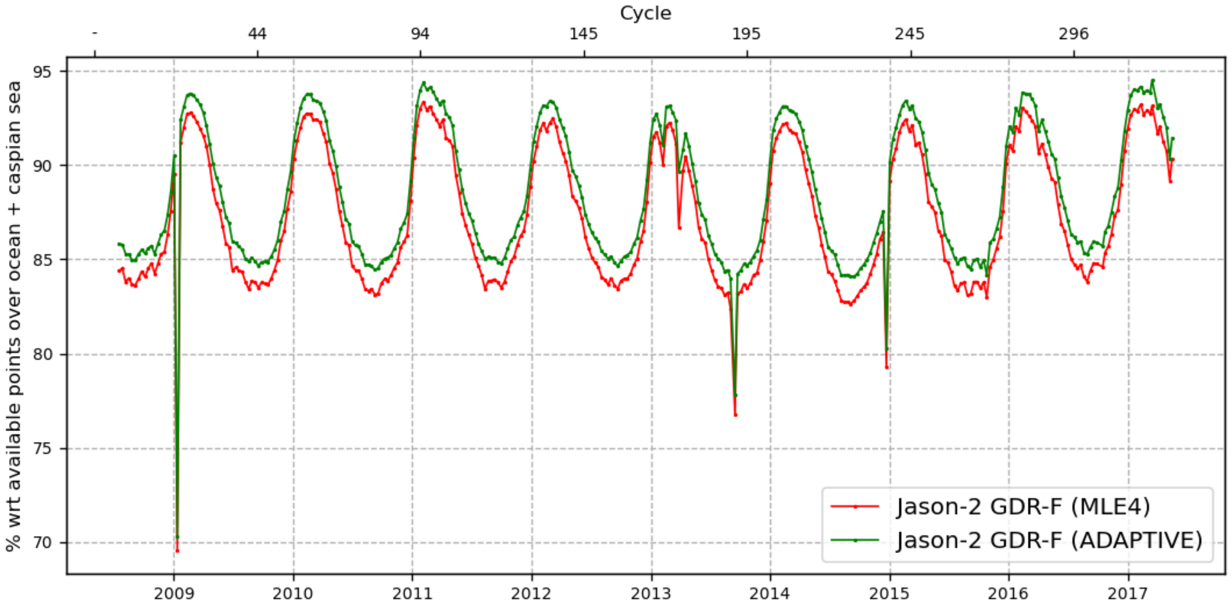
1Hz data selection

Global valid data rate from GDR-F dataset against retracking solution (same thresholds applied to both solutions).

The level of valid data over ocean with adaptive retracking outputs (88,5%) is slightly higher than mle4 rate (87,3%).

Percentage of valid data by cycle
wrt available points over ocean + caspian sea

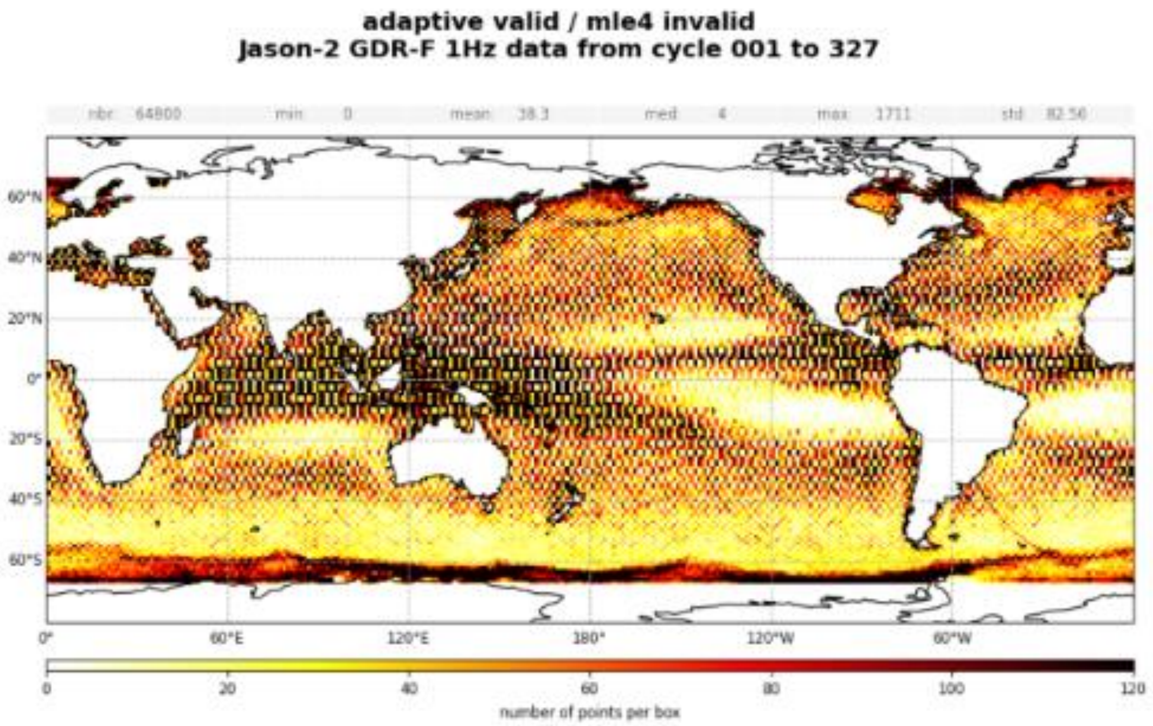
	nbr	min	mean	med	max	std
Jason-2 GDR-F (MLE4)	326	69.59	87.3	86.39	93.37	3.595
Jason-2 GDR-F (ADAPTIVE)	326	70.32	88.48	87.52	94.51	3.544

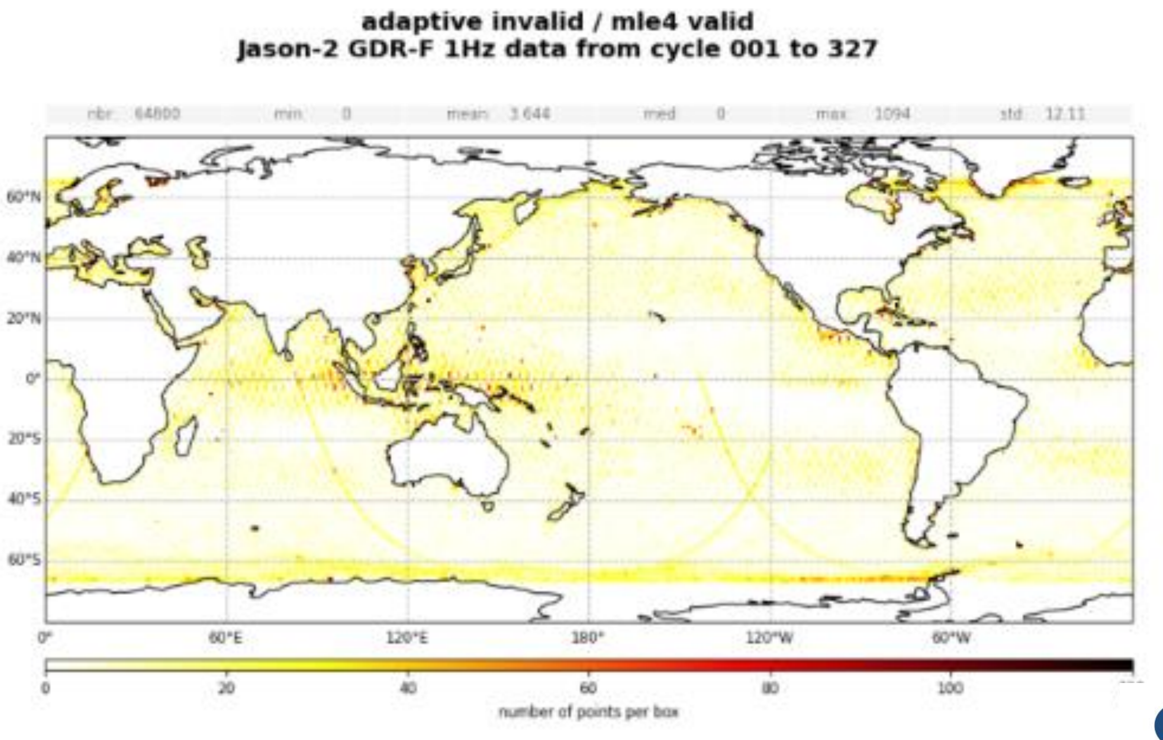


1Hz data selection

Difference in rejected points from GDR-F adaptive SLA vs MLE4 SLA over the historical ground track:

MLE4 data are globally more rejected than adaptive data over low swh and rain areas (mainly thanks to sigma0_rms decrease with adaptive wrt mle4)





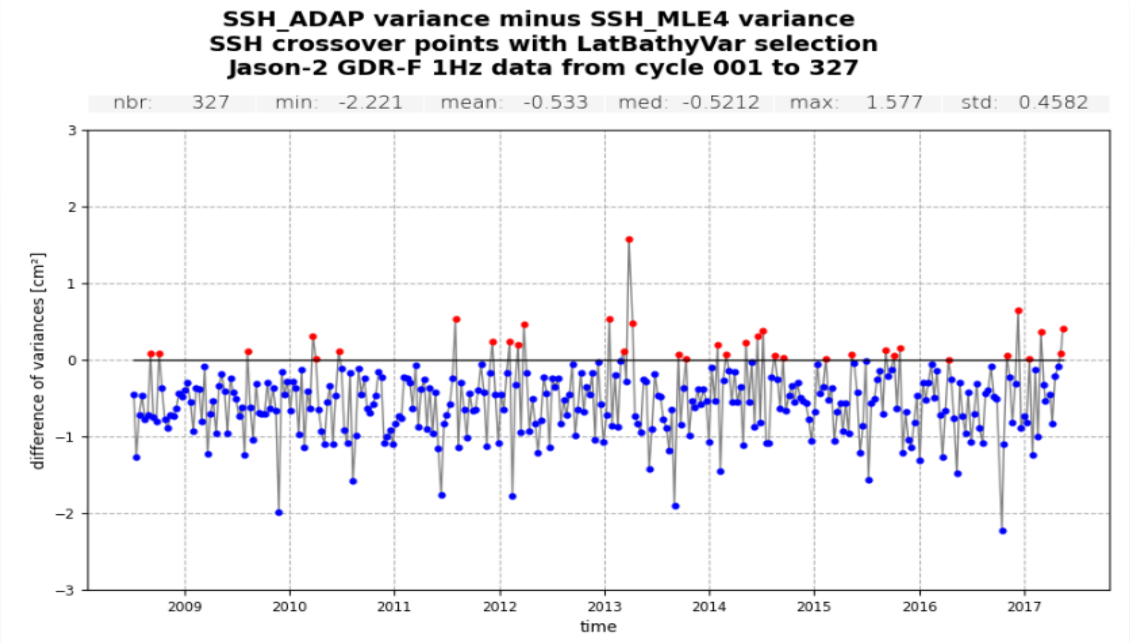
Mesoscale performance (analysis at 1Hz crossover points)

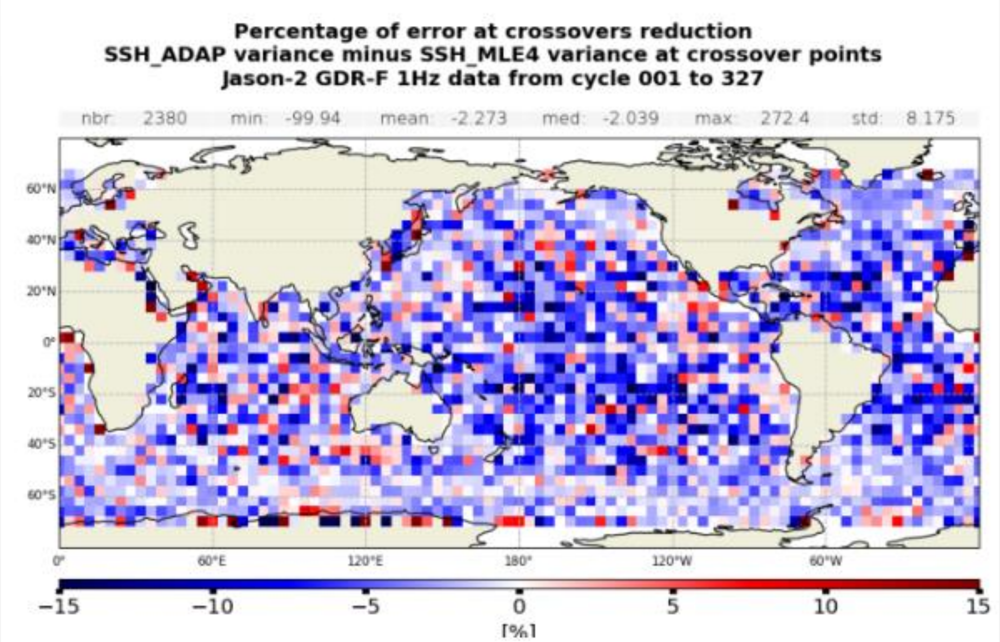
➔ Mean and variance of SSH difference at crossover points

(selection on |latitude|<50°, oceanic_variability<20cm and bathymetry<-1000m, + common valid points only)

Global variance of SSH difference at crossovers is reduced by 0,53cm² in average with adaptive retracker compared to MLE4

blue boxes :
geographic percentage of variance of SSH difference at crossovers reduction using adaptive outputs instead of MLE4

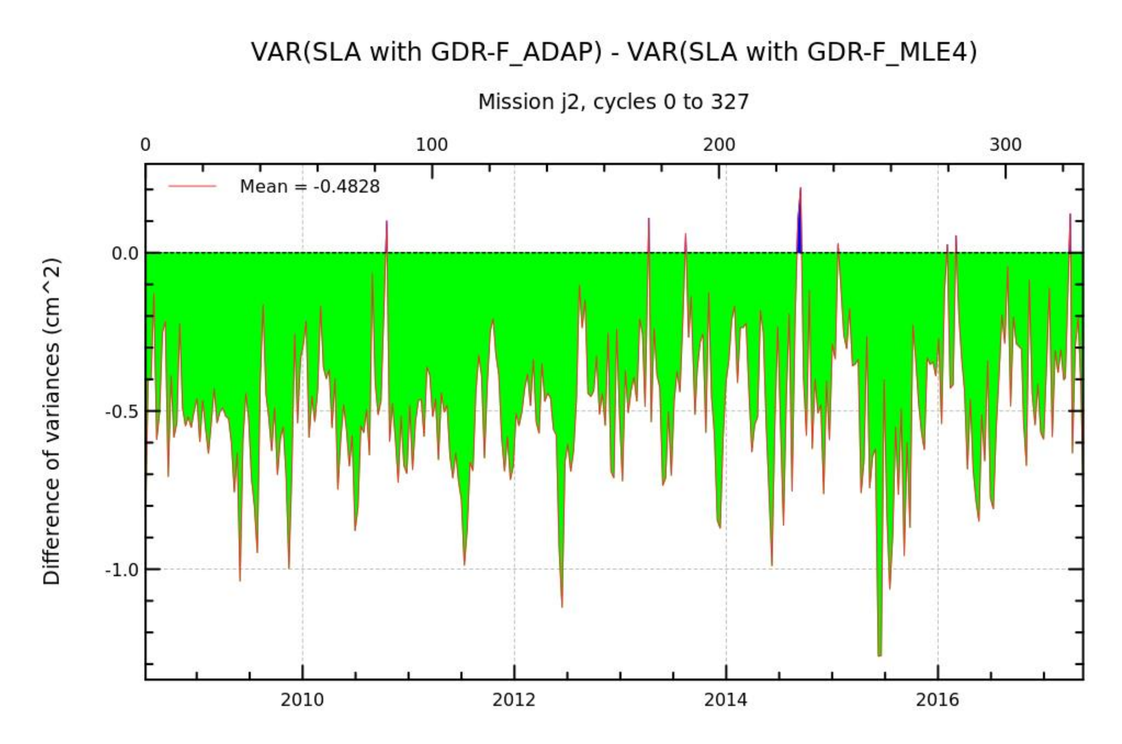




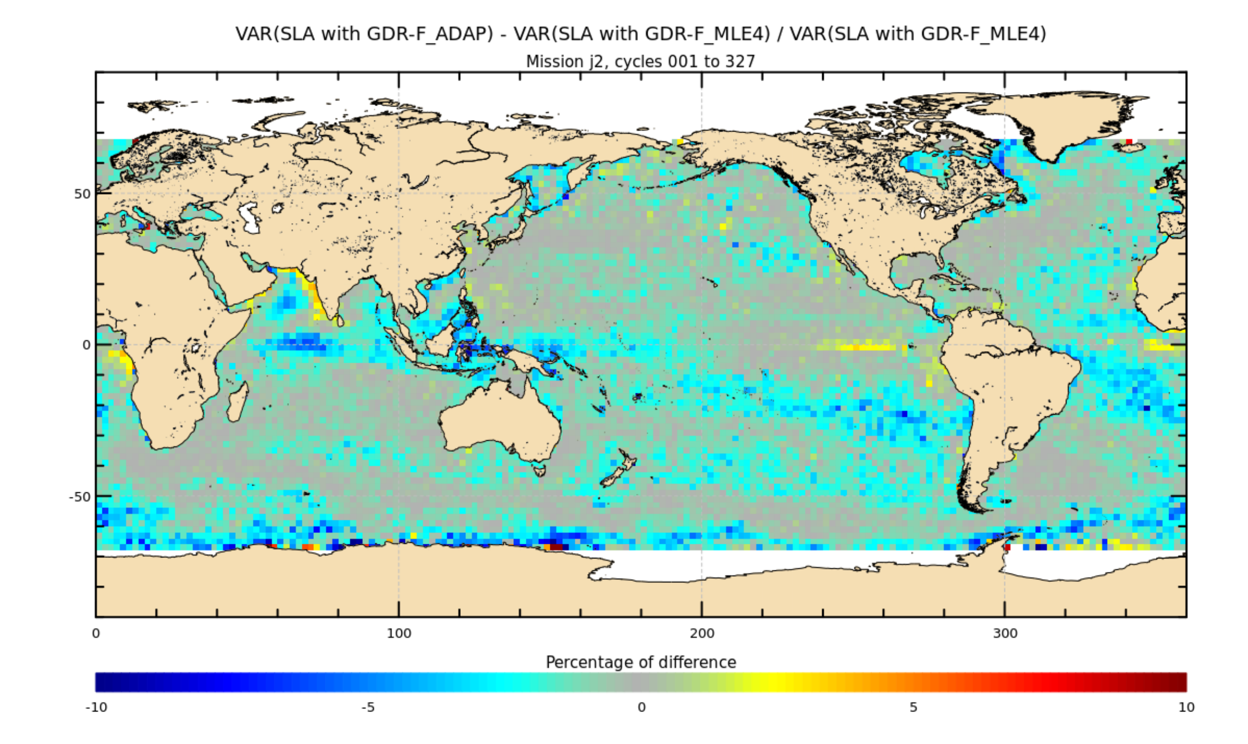
Note that on points that are valid with both solutions are used to compute this analysis

Along-track SLA performance

SLA variance reduction

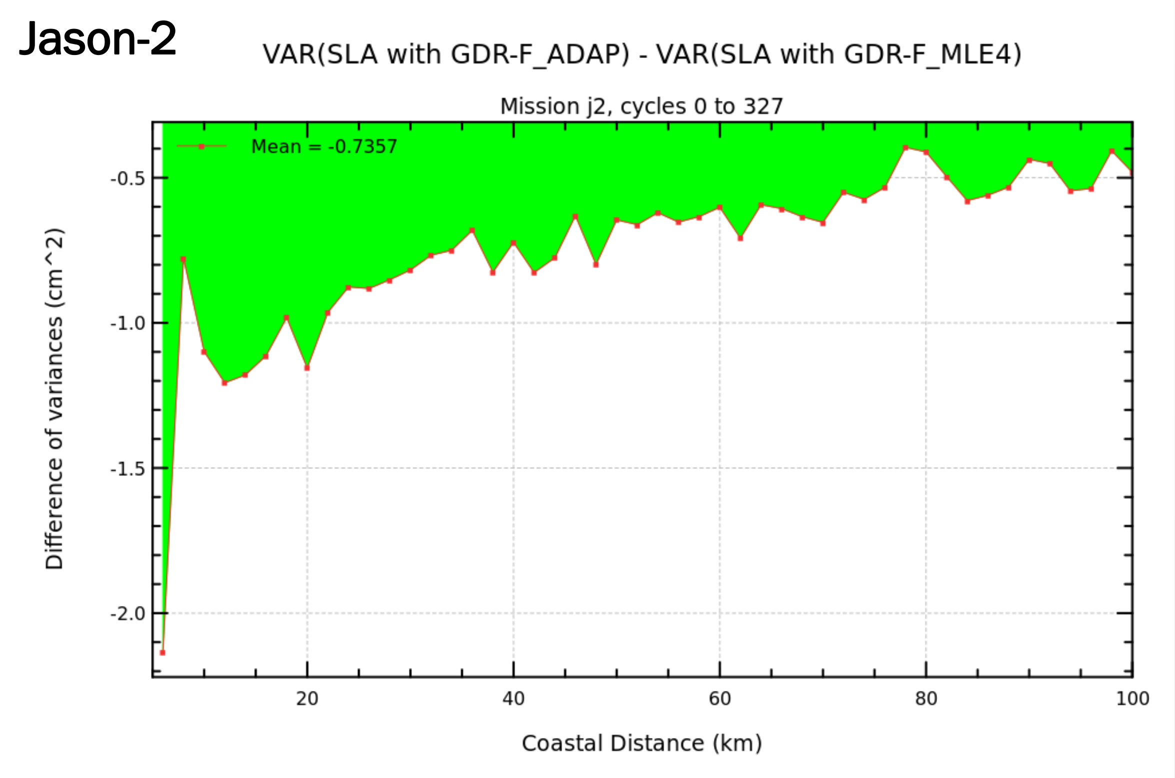


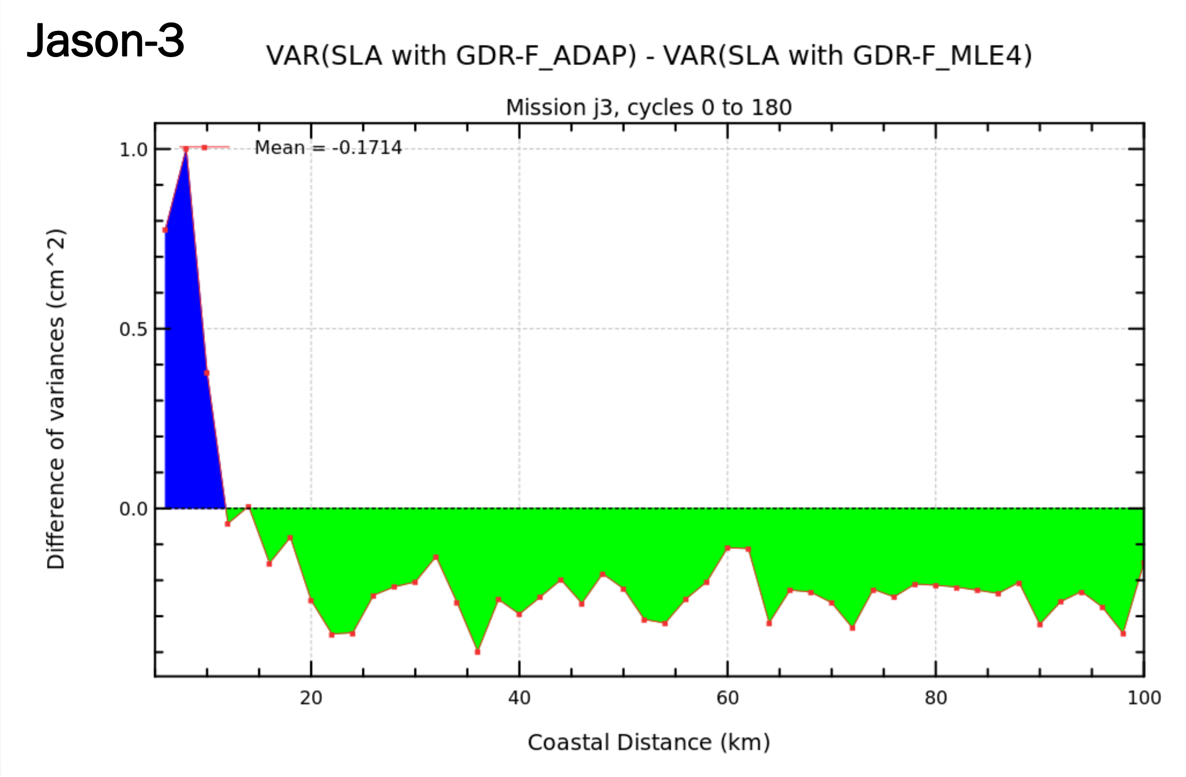
Regional SLA variance reduction rate (blue) from MLE4 to adaptive (wrt variance of SLA with GDR-F MLE4)



Along-track SLA performance

Better results near coasts for Jason-2 adaptive compared to Jason-3 reprocessing campaign analysis (linked to change between Jason-3 GDR-F adaptive and Jason-2 GDR-F adaptive, available in Jason-3 GDR-F from cycle 317 onwards)





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Ongoing work

- Wet tropospheric correction from AMR reprocessing data analysis
- LRO and iLRO assessment over ocean
- GMSL long term monitoring
- Comparisons to Jason-1 GDR-E and Jason-3 GDR-F

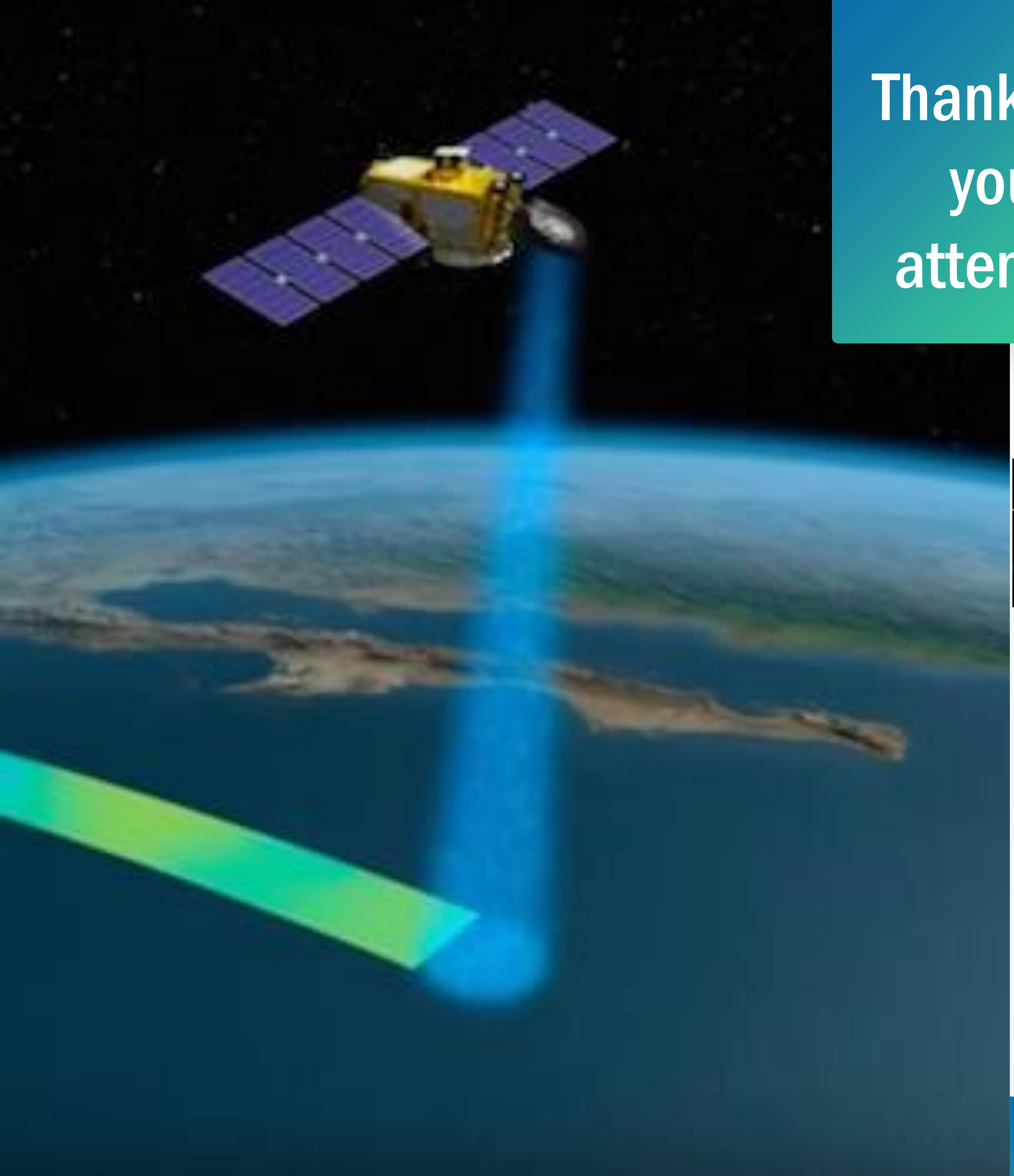
Conclusions

Very good performances of reference MLE4 Jason-2 GDR-F SLA

Improvements are allowed using adaptive retracker outputs

- ❑ SLA ADAPTIVE data are globally more valid than SLA MLE4 data (using recommended in handbook procedure)

- ❑ Taking into account valid in both datasets points, performances are better with adaptive solution than with MLE4 :
  - ✓ variance of SSH difference at crossovers is reduced by -0,5cm²
  - ✓ variance of along-track 1Hz SLA is reduced by -0,7cm²



Thanks for your attention

Questions ?

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