Jason-3 GDR-F mission performances over ocean

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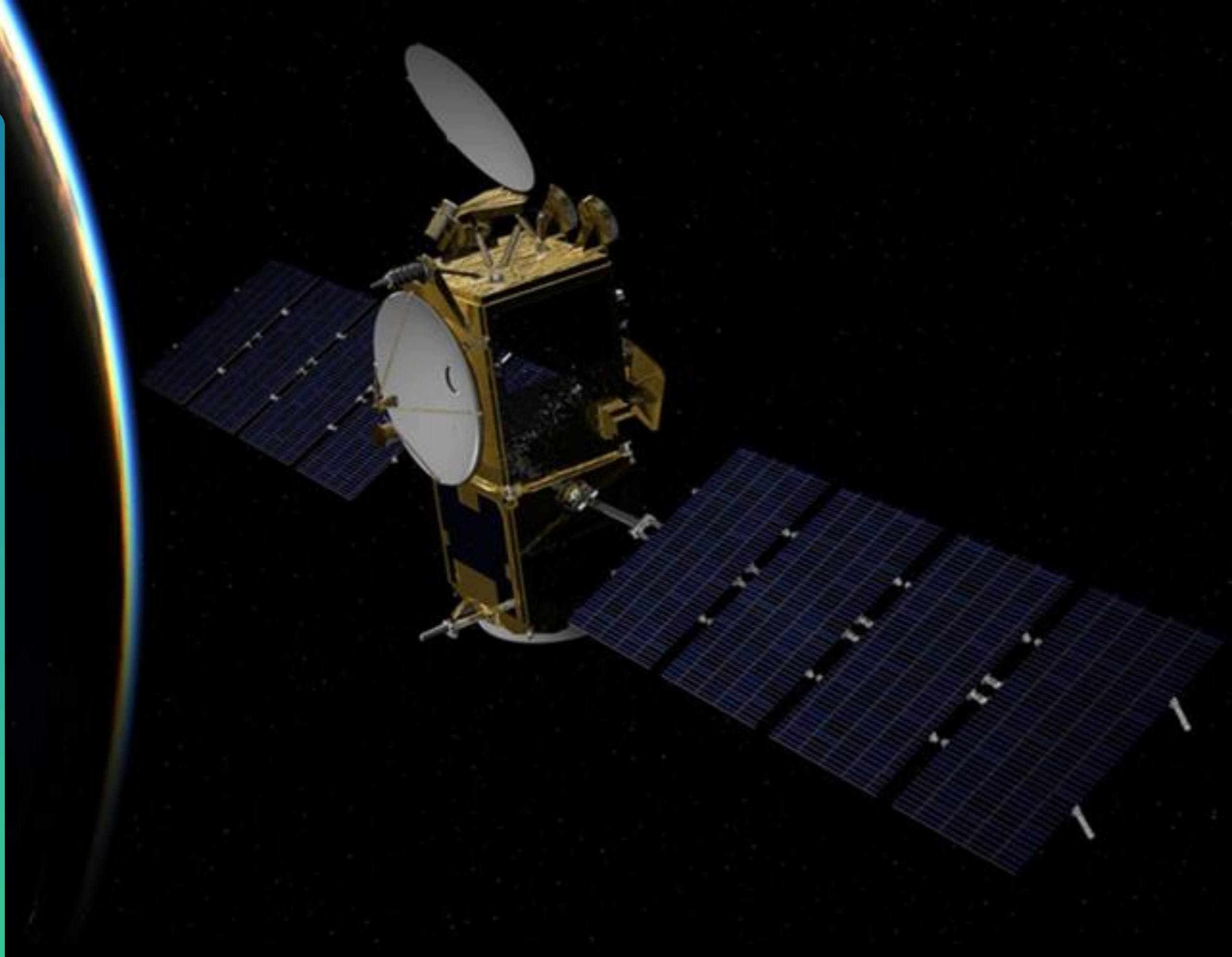

Regional and Global CAL/VAL for Assembling a Climate Data Record

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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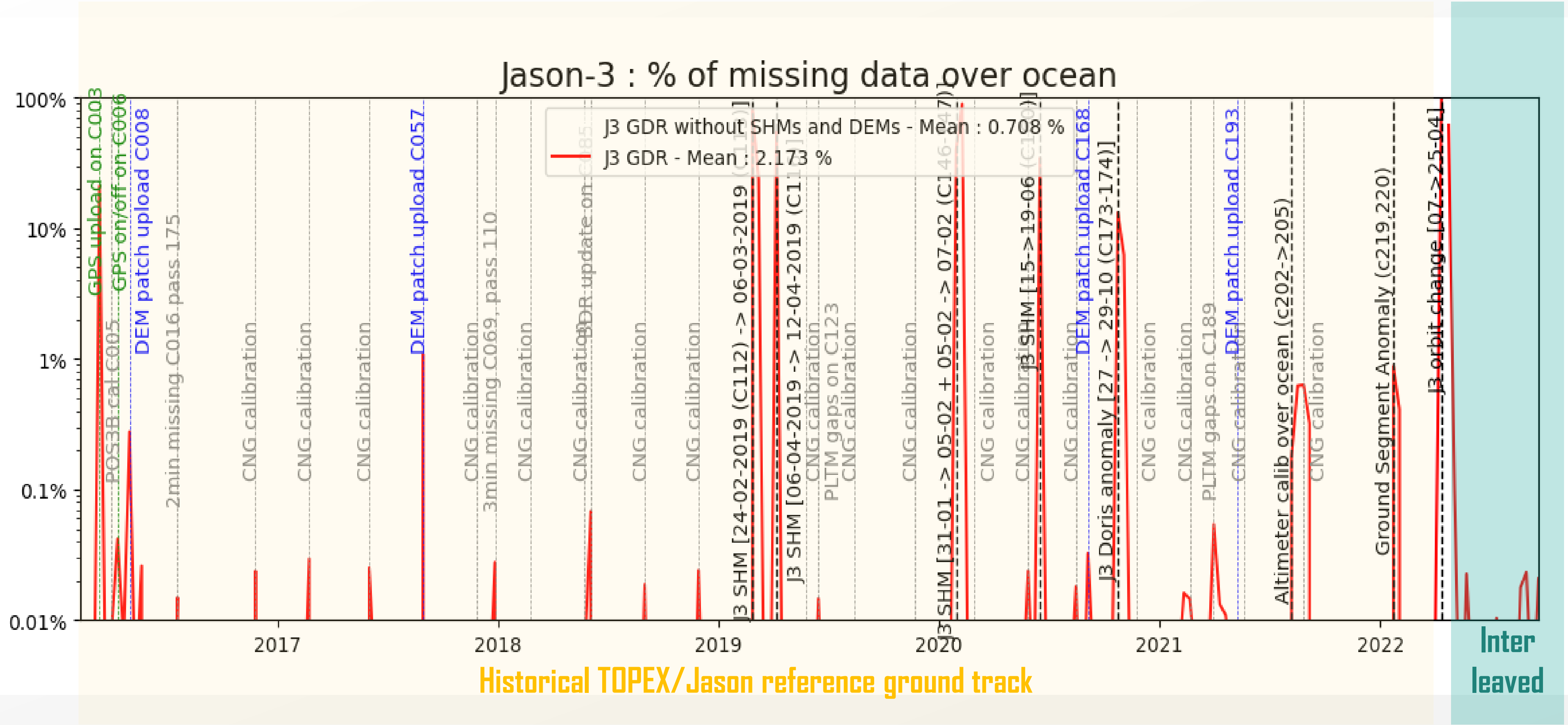
Data availability at 1Hz

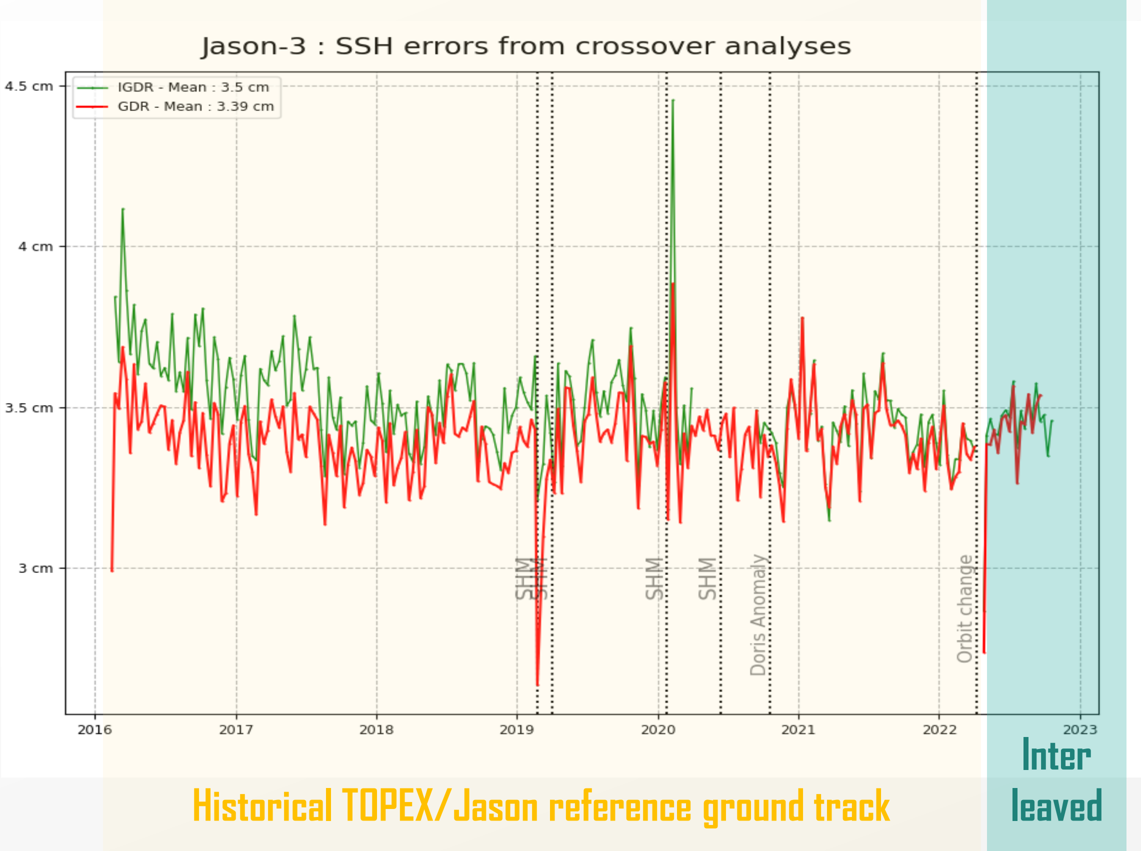
Very good data availability over ocean

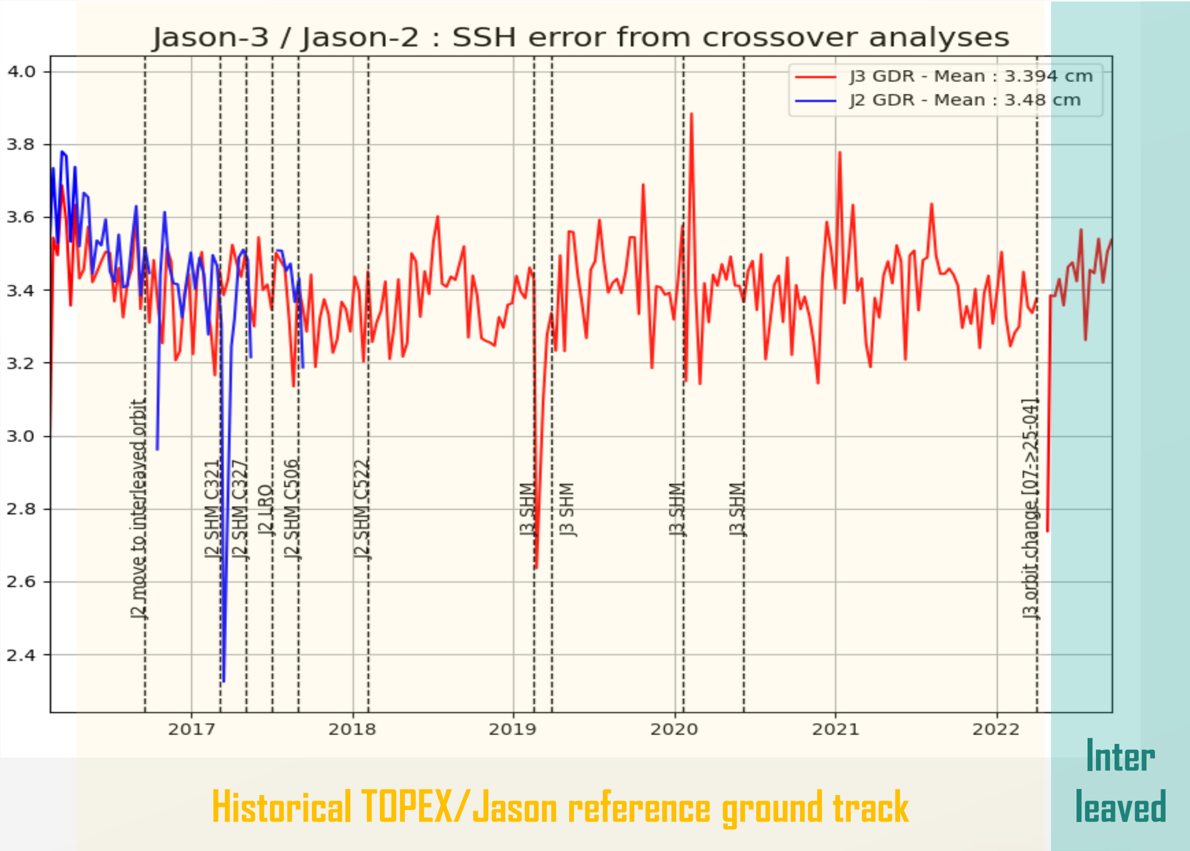
99.29 % calibrations included, without SHM and DEM patch uploads



Sea Level Performances at 1Hz

SSH error is deduced from crossovers analyses using radiometer data : **3,4cm**
selecting |latitudes| < 50°, bathy<-1000m, oceanic variability < 20 cm

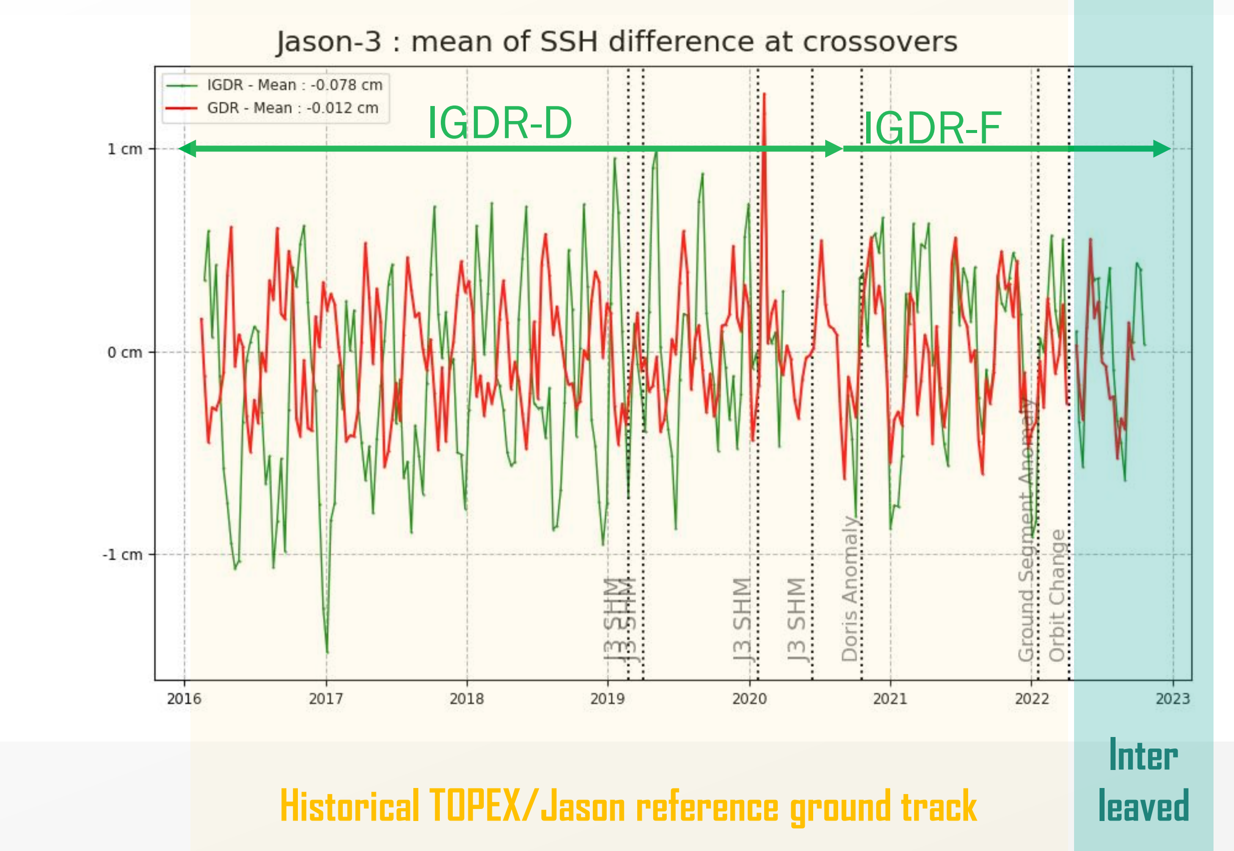


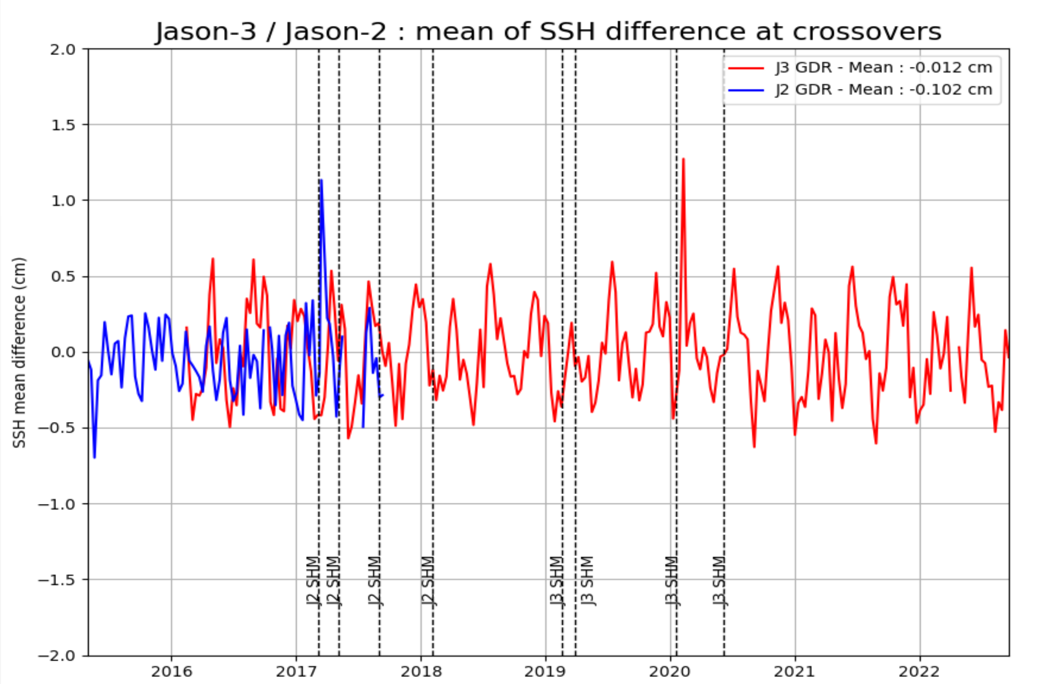


SSH differences at crossovers at 1Hz

Very close to zero in average

Small 120 days signal at crossovers (higher than for Jason-2, but reduced from GDR-D to GDR-F)



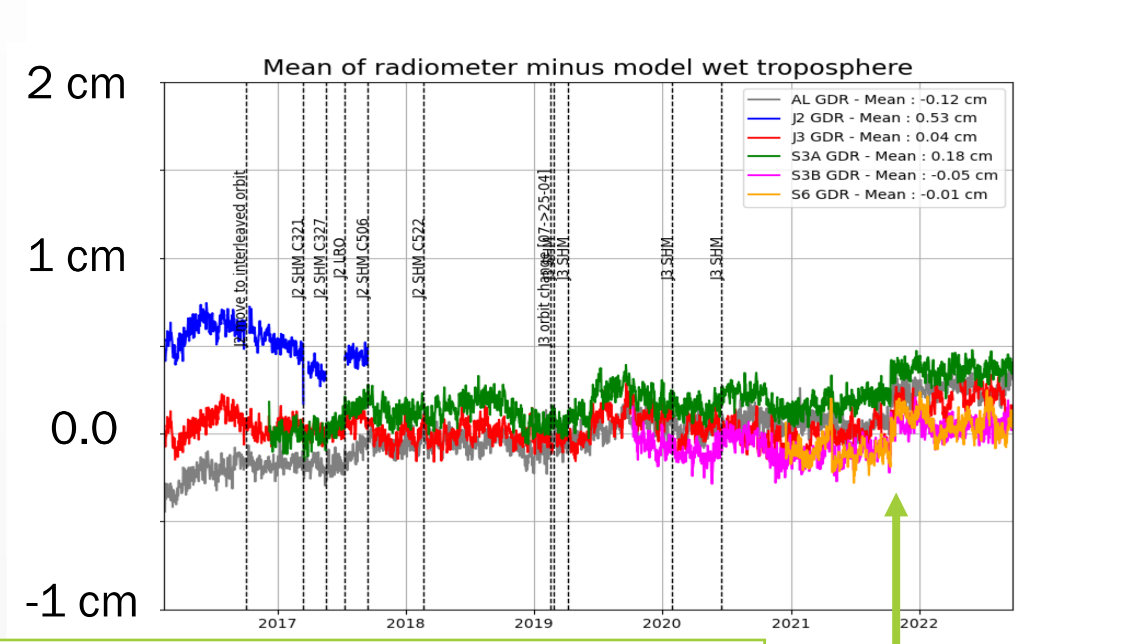


AMR monitoring (Jason-3 in red)

Good stability of radiometer minus ECMWF model WTC

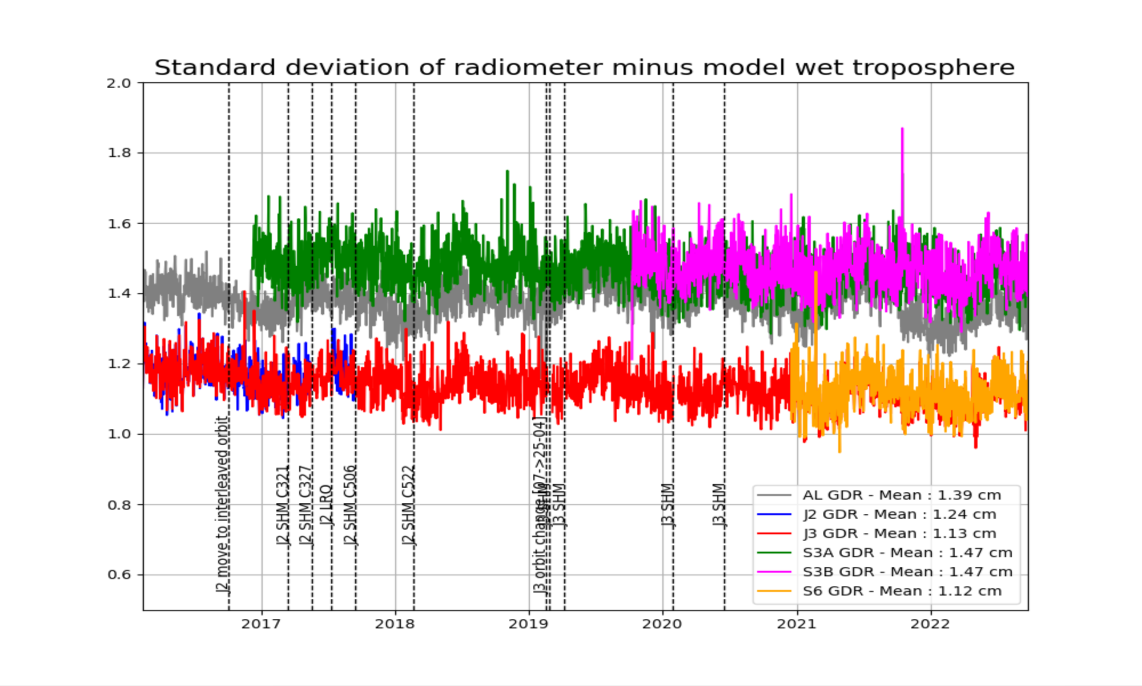
But some analysis seem to show that there could be a radiometer WTC drift **(~ -0,5mm/yr)**
→ investigations ongoing

See Anne Barnoud's presentation



12/10/2021 : new version of ECMWF model.
+2mm seen on other altimeters data too.

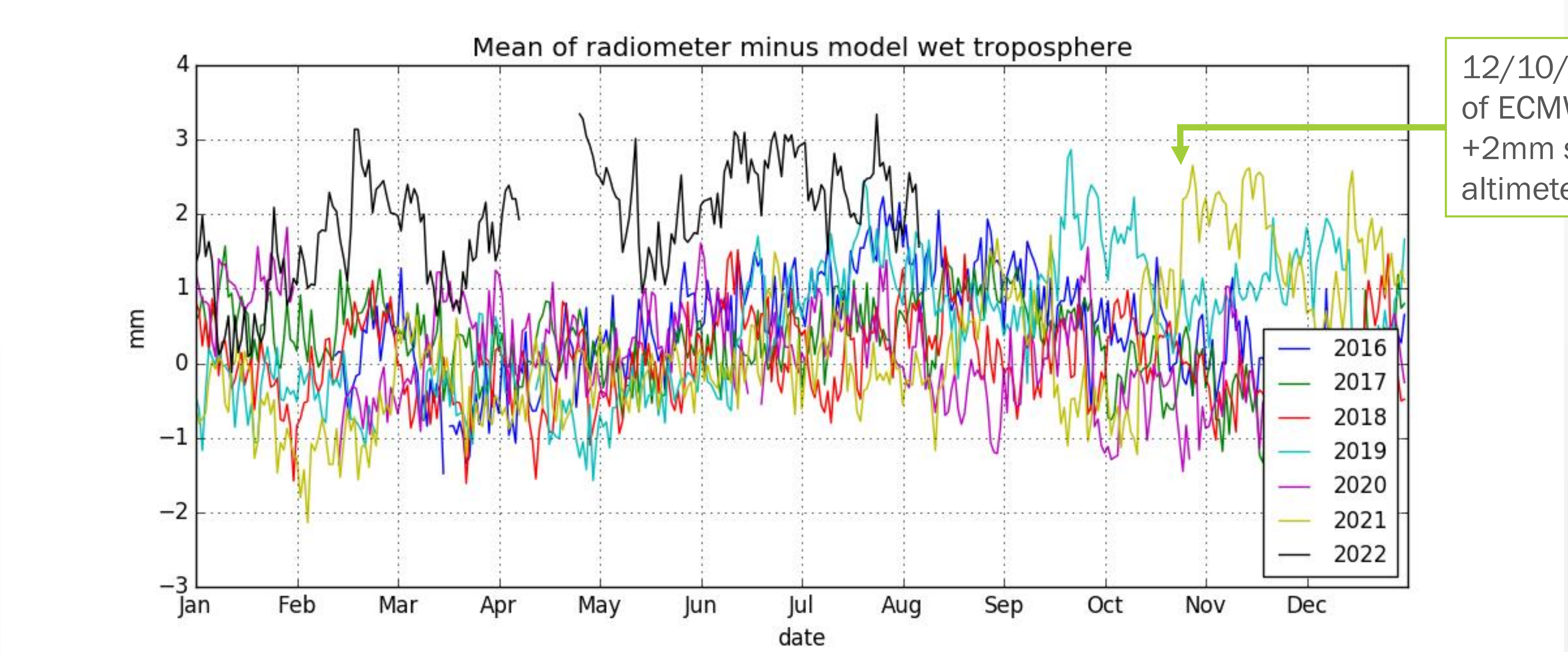
Good stability of radiometer minus ECMWF model WTC standard deviation



AMR monitoring

Good stability of radiometer minus ECMWF model WTC over 2016 to 2021 **but:**

- Higher than usual from beginning of 2022 (only linked to jump in model or more ?)
- some analysis, seem to show that there could be a radiometer WTC drift



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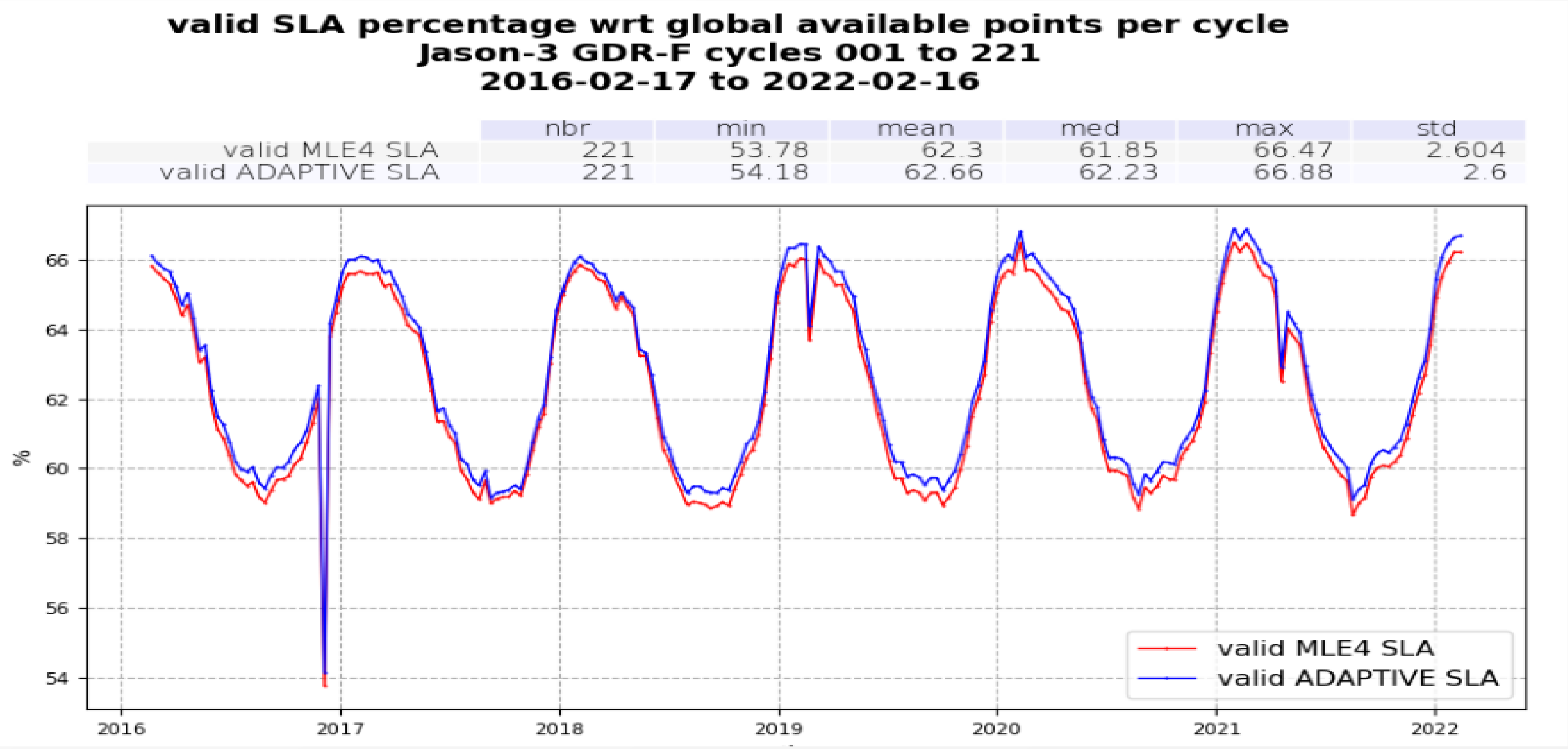
1Hz data selection

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

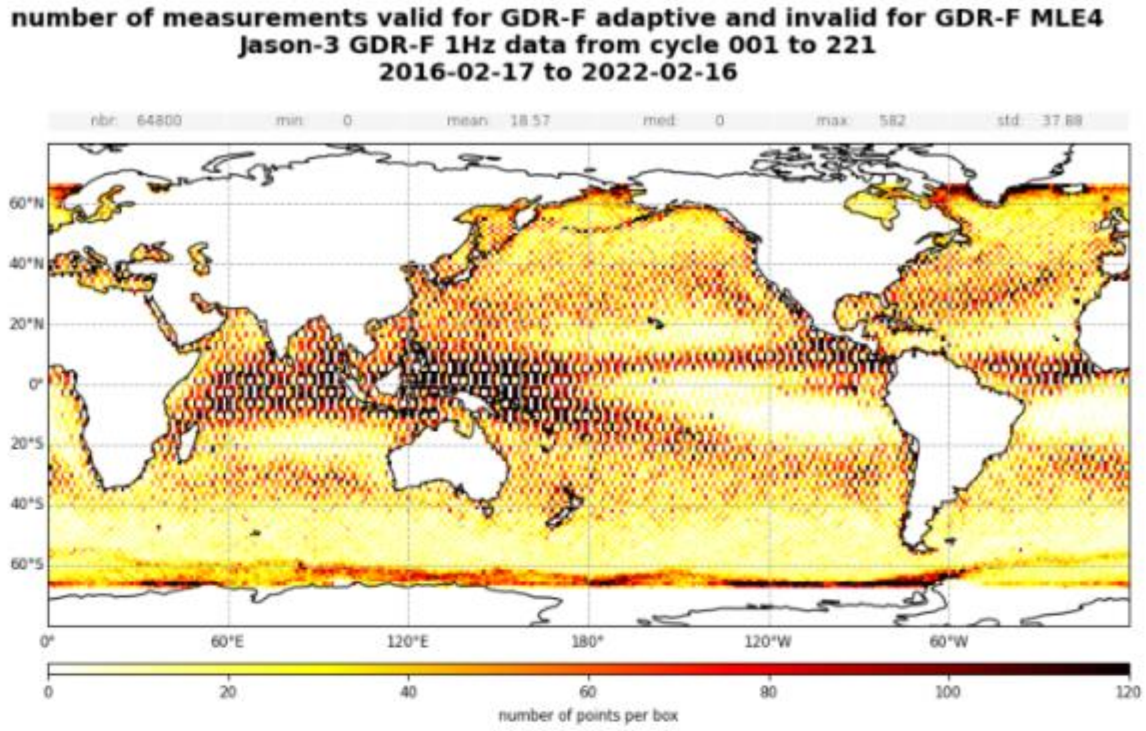
The level of valid data with adaptive retracking outputs (62,7%) is slightly higher than mle4 rate (62,3%) .

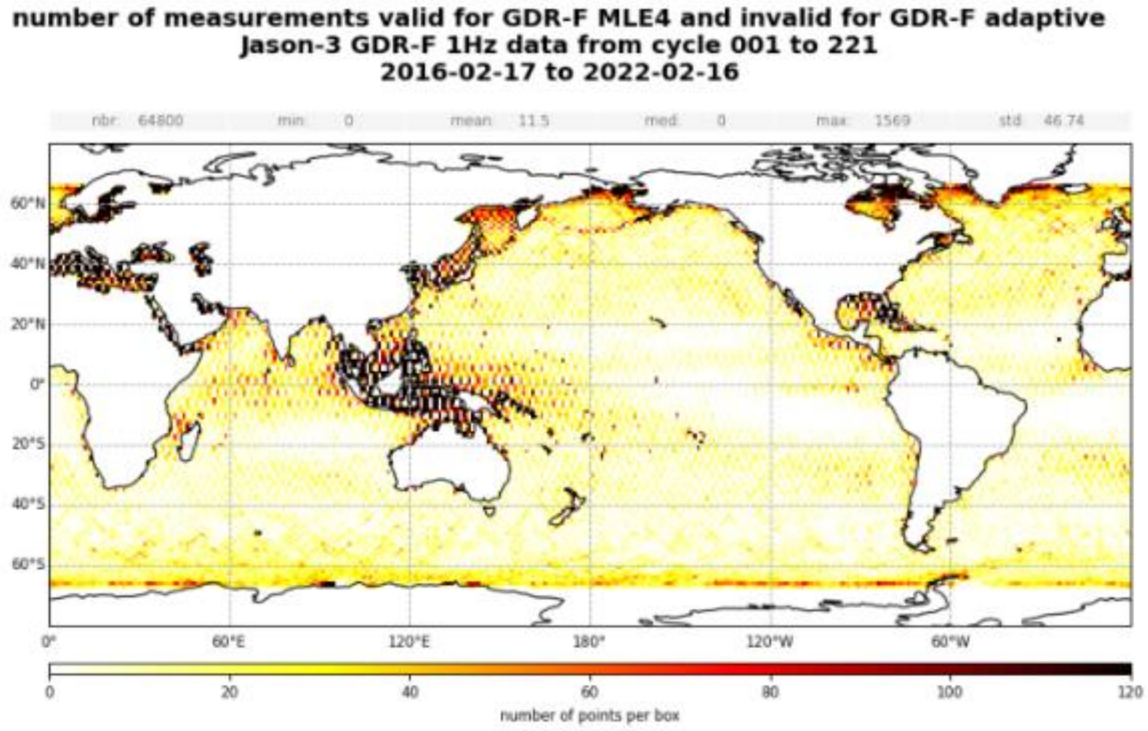


1Hz data selection

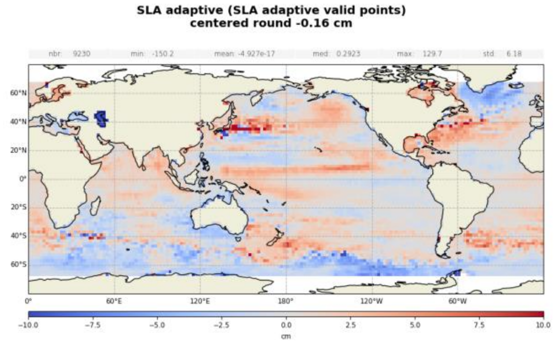
Difference in rejected points from GDR-F adaptive SLA vs MLE4 SLA over 6 years on historical ground track:

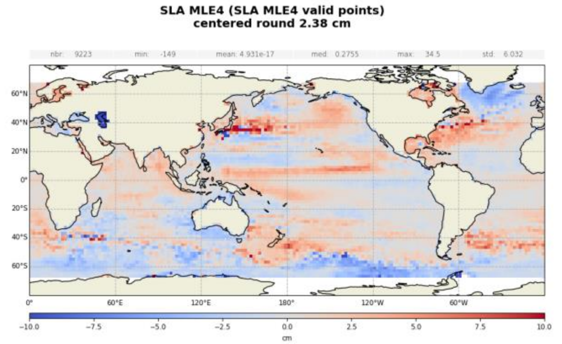
MLE4 data are globally more rejected than adaptive data over low swh and rain areas
(mainly thanks to sigma0_rms decrease with adaptive wrt mle4)





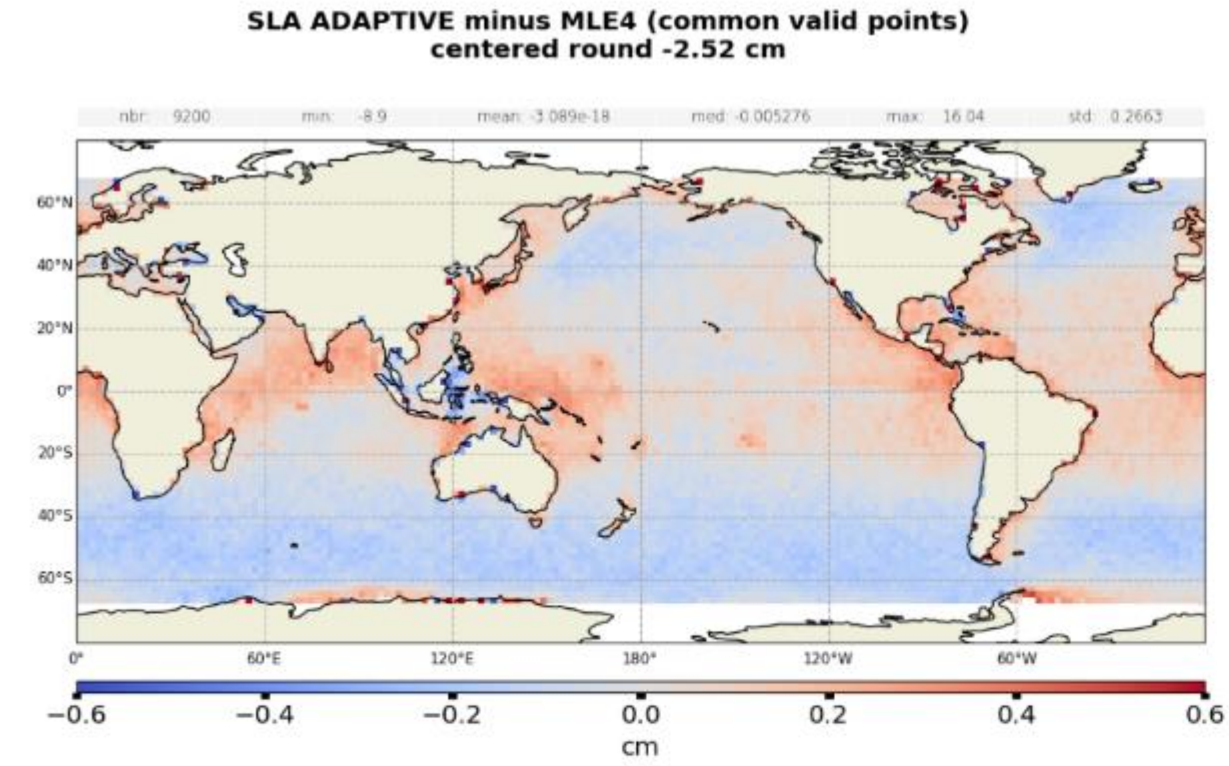
Adaptive / MLE4 SLA biais

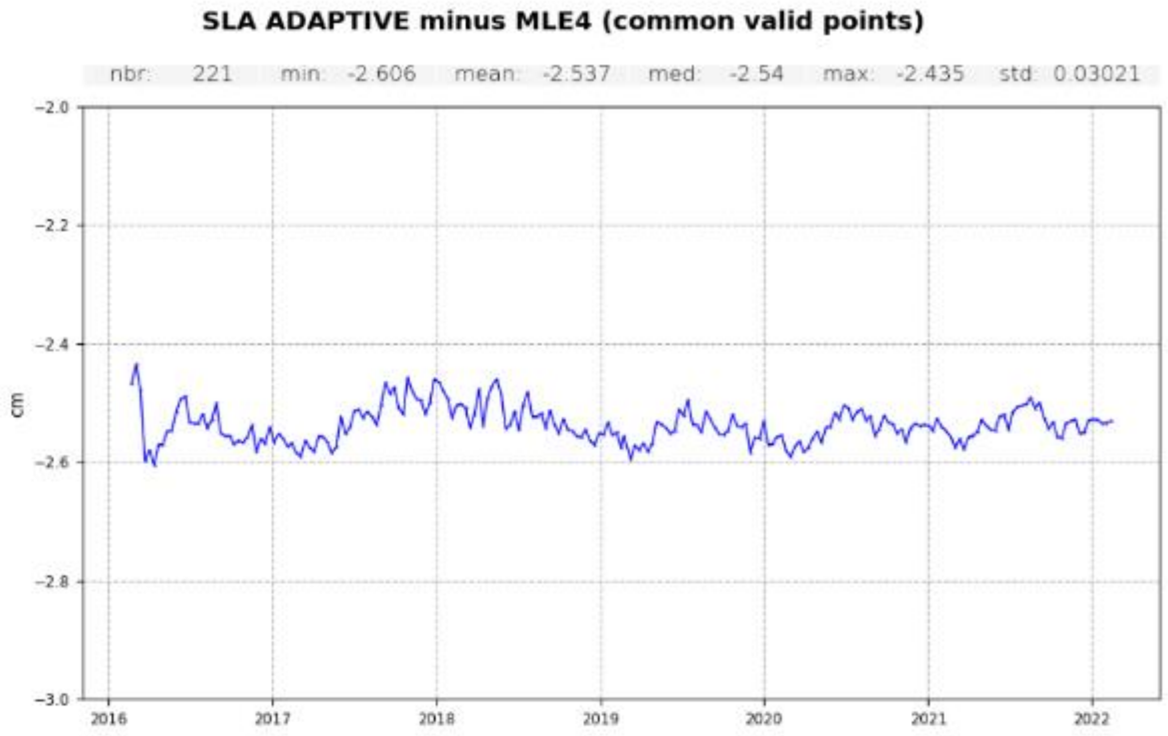




Global bias from MLE4 to adaptive SLA round -2.5 cm

Regional biases up to few mm





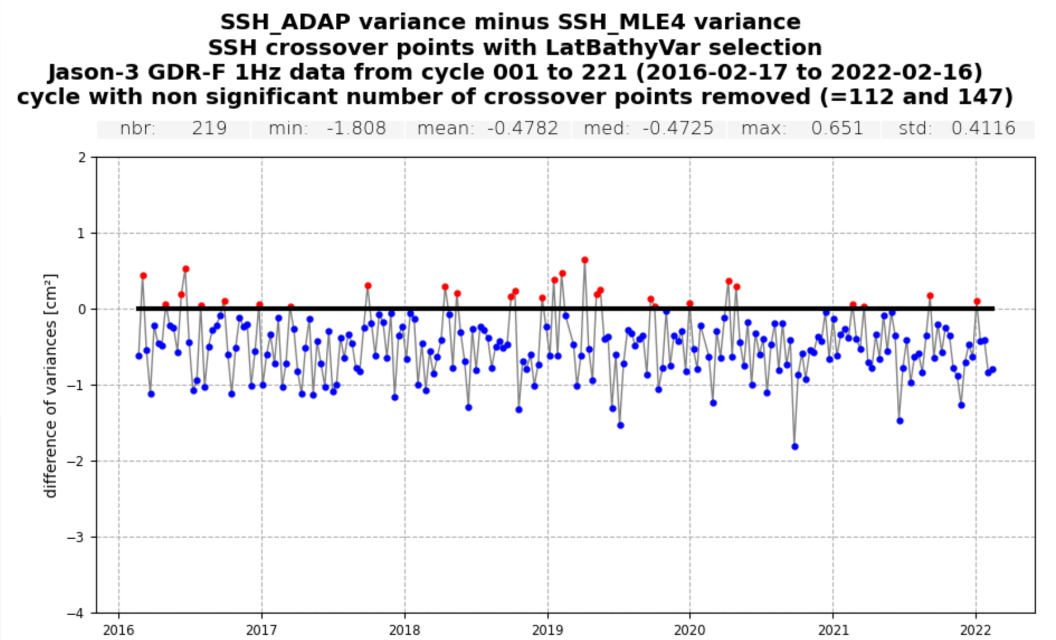
Mesoscale performance (analysis at 1Hz crossover points)

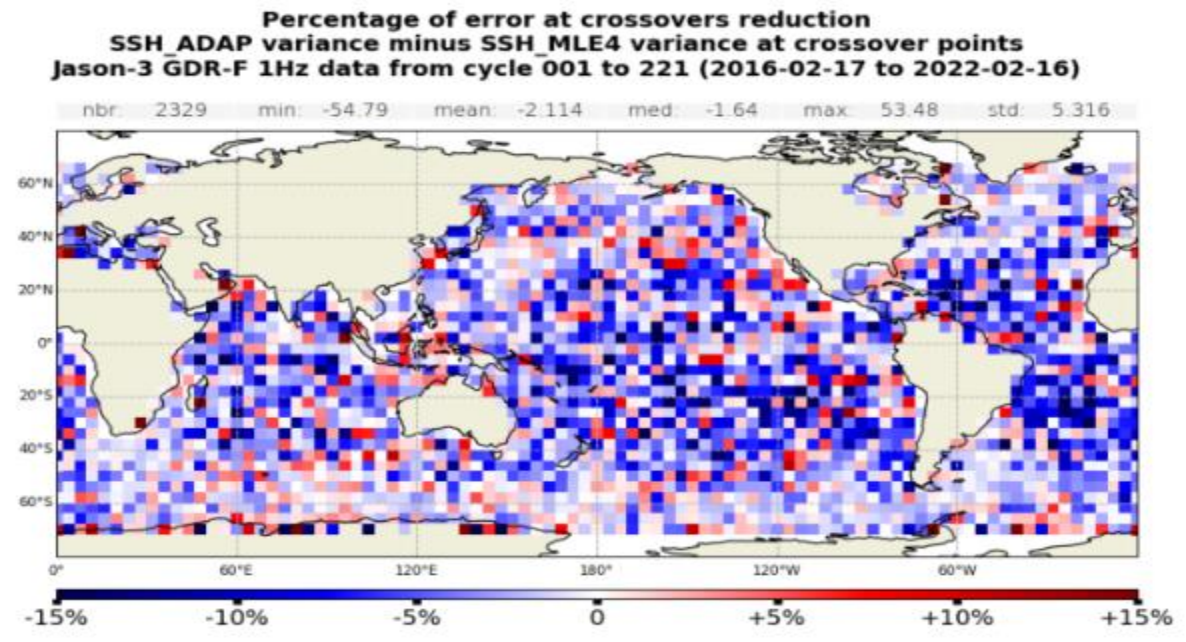
➔ Mean and variance of SSH difference at crossover points

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

Global variance of SSH difference at crossovers is reduced by 0,48cm² in average over 6 years with adaptive retracker compared to MLE4

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

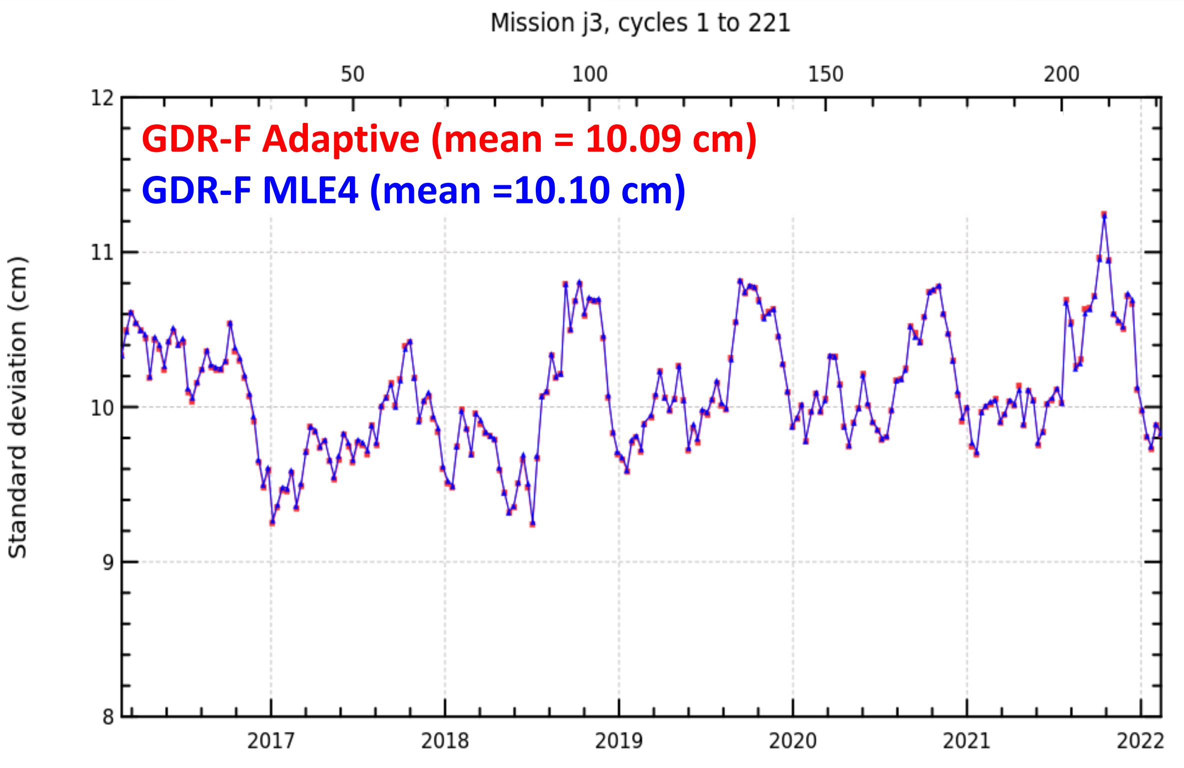


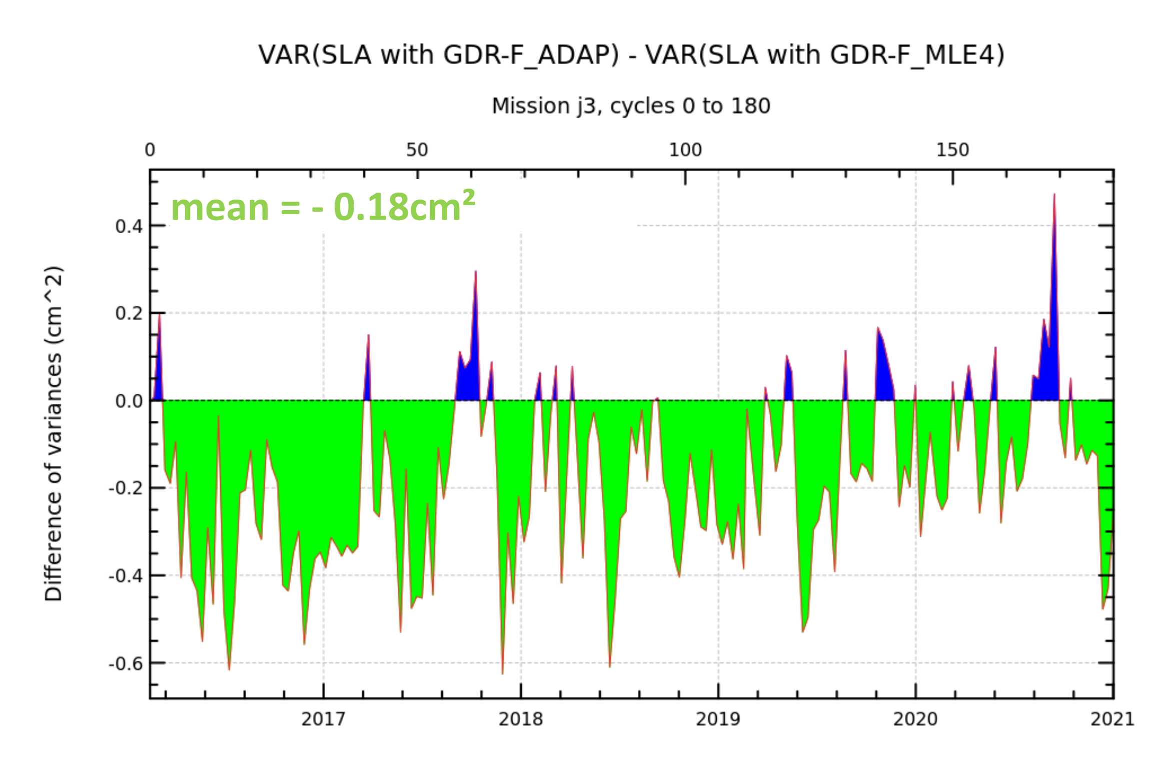


Note that on points that are valid with both solutions are used to compute this analysis

Along-track SLA performance

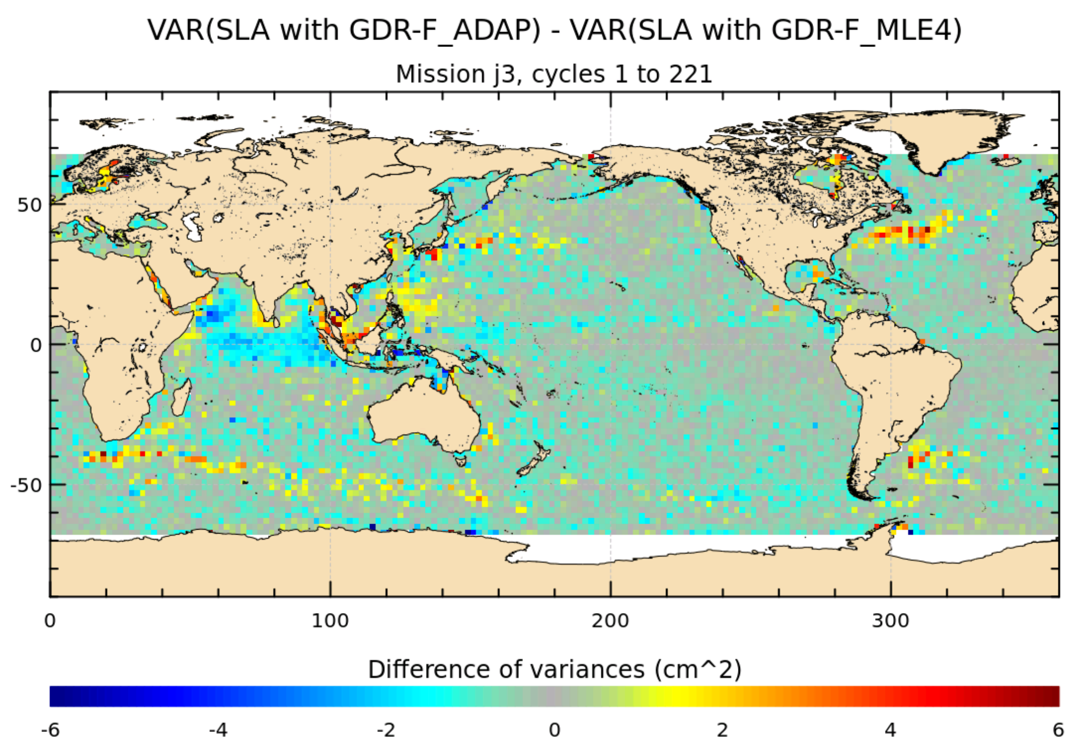
Variance of along track SLA is reduced by 0,18cm² with adaptive compared to MLE4



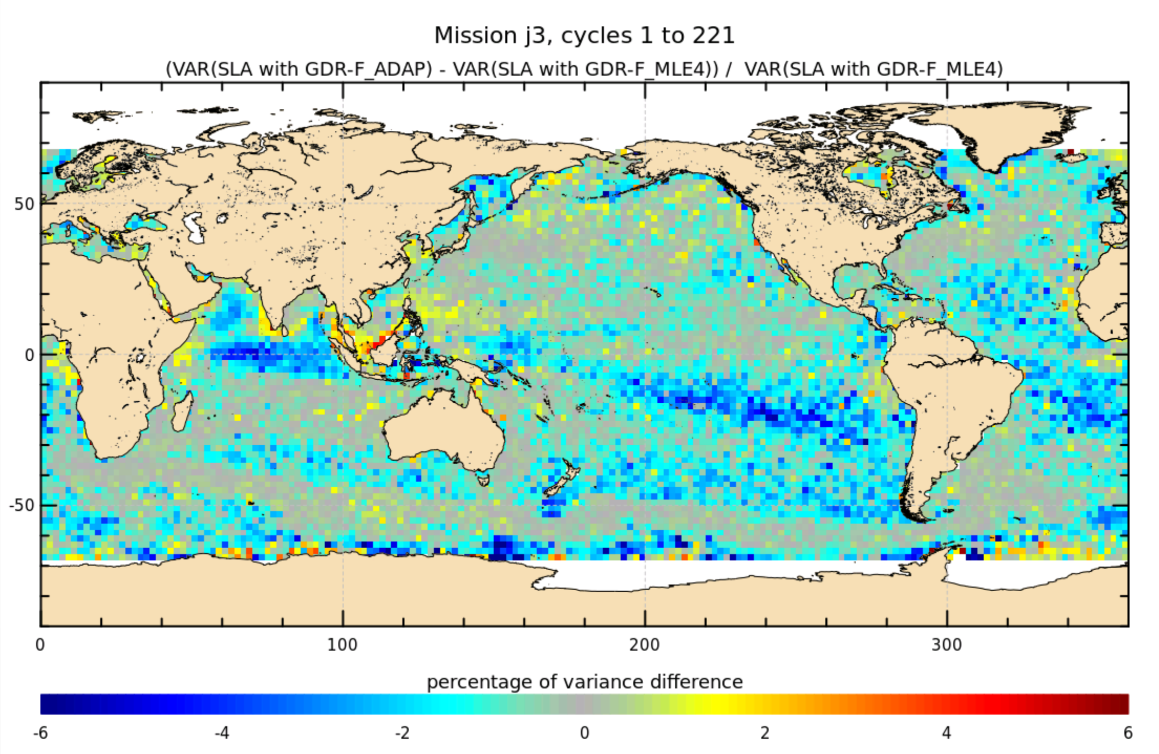


Along-track SLA performance

SLA variance difference visible over oceanic currents



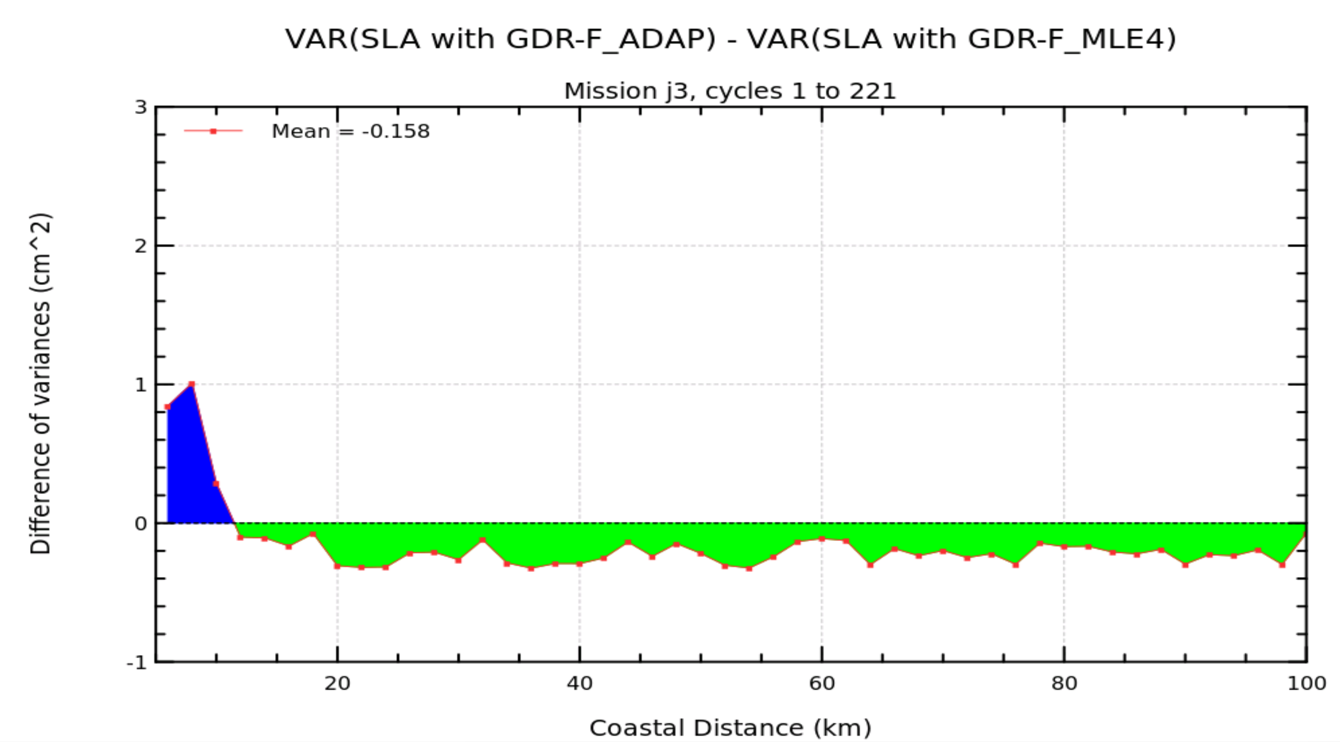
Regional SLA variance reduction rate (blue) from MLE4 to adaptive (wrt variance of SLA with GDR-F MLE4)



Along-track SLA performance

Variance of along track SLA is reduced near everywhere with adaptive compared to MLE4,

But near coasts (in the last 10km), the behavior is different:
Expected differences in retrackers performances in the last 3km that impact 1Hz data until 10km.

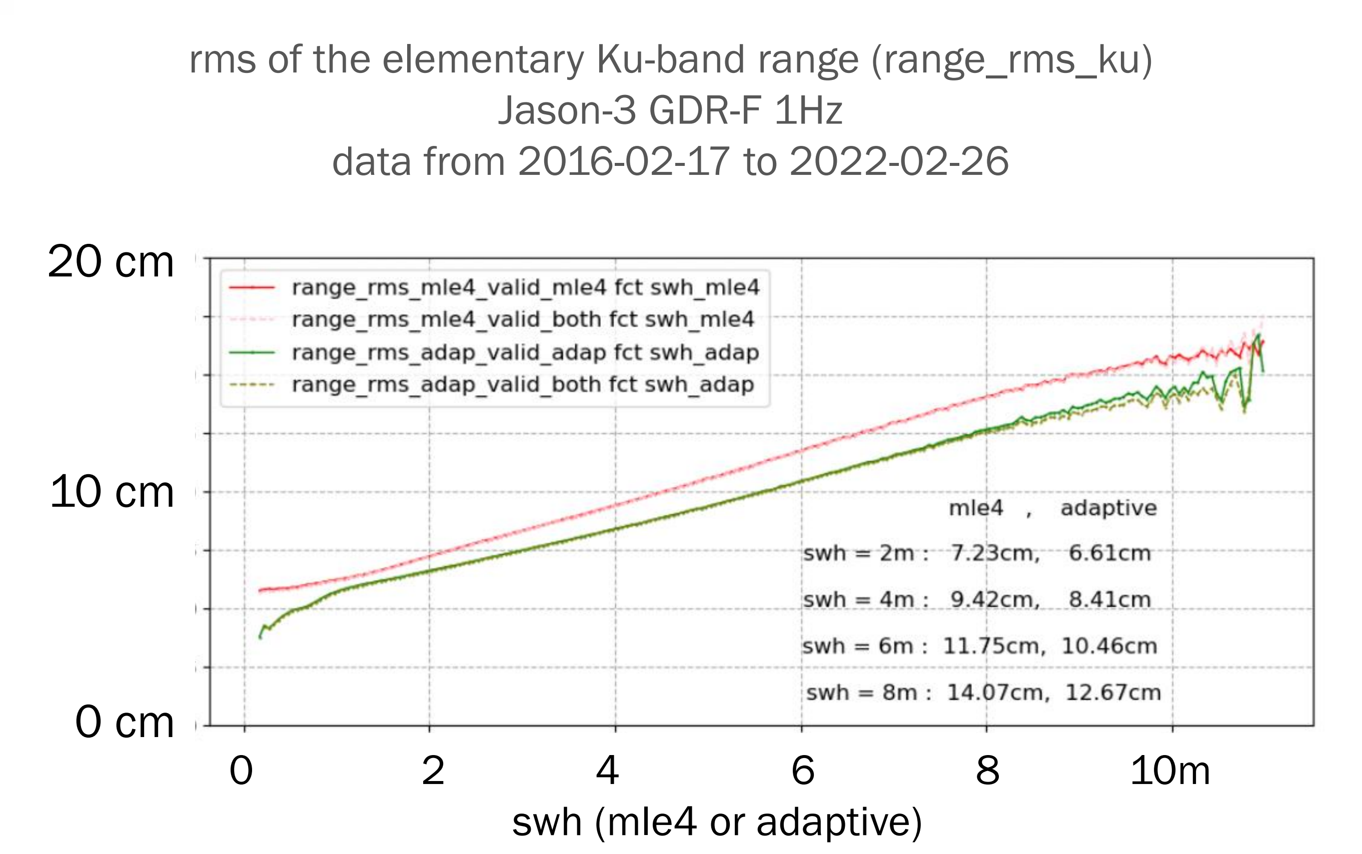


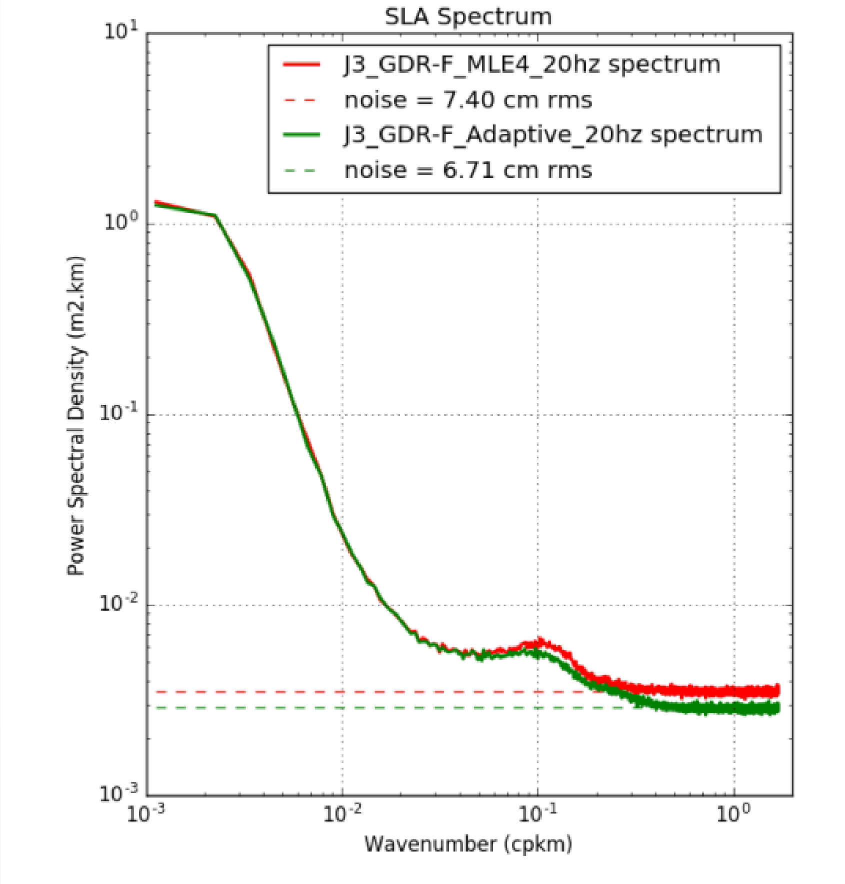
see [Birol et al]
in Wednesday Coastal
session for 20 Hz analysis

20 Hz noise

Range noise is significantly reduced with adaptive retracker outputs compared to MLE4

- ✓ -9,3% from spectrum analysis over one cycle.
- ✓ Small dependance of reduction rate among swh, but noise level with adaptive always under mle4





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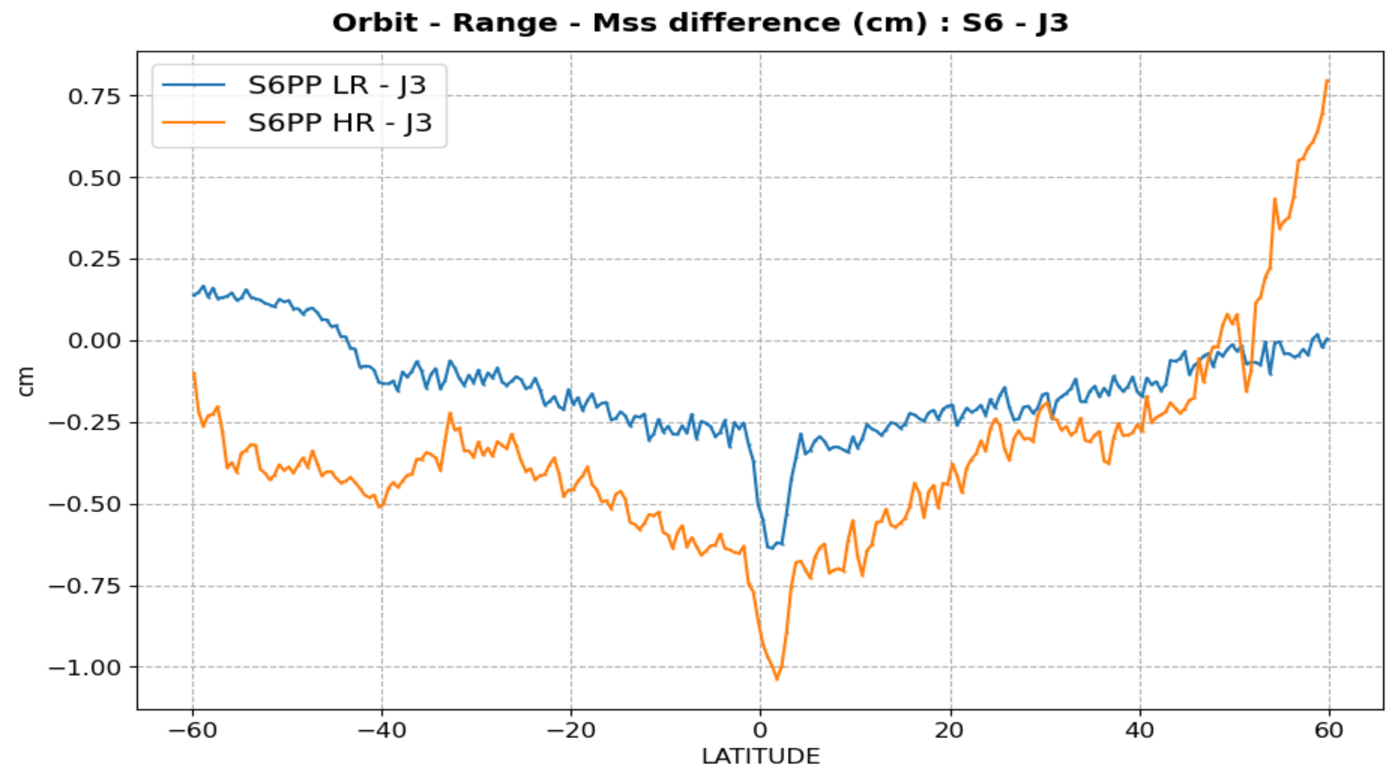
Ongoing work

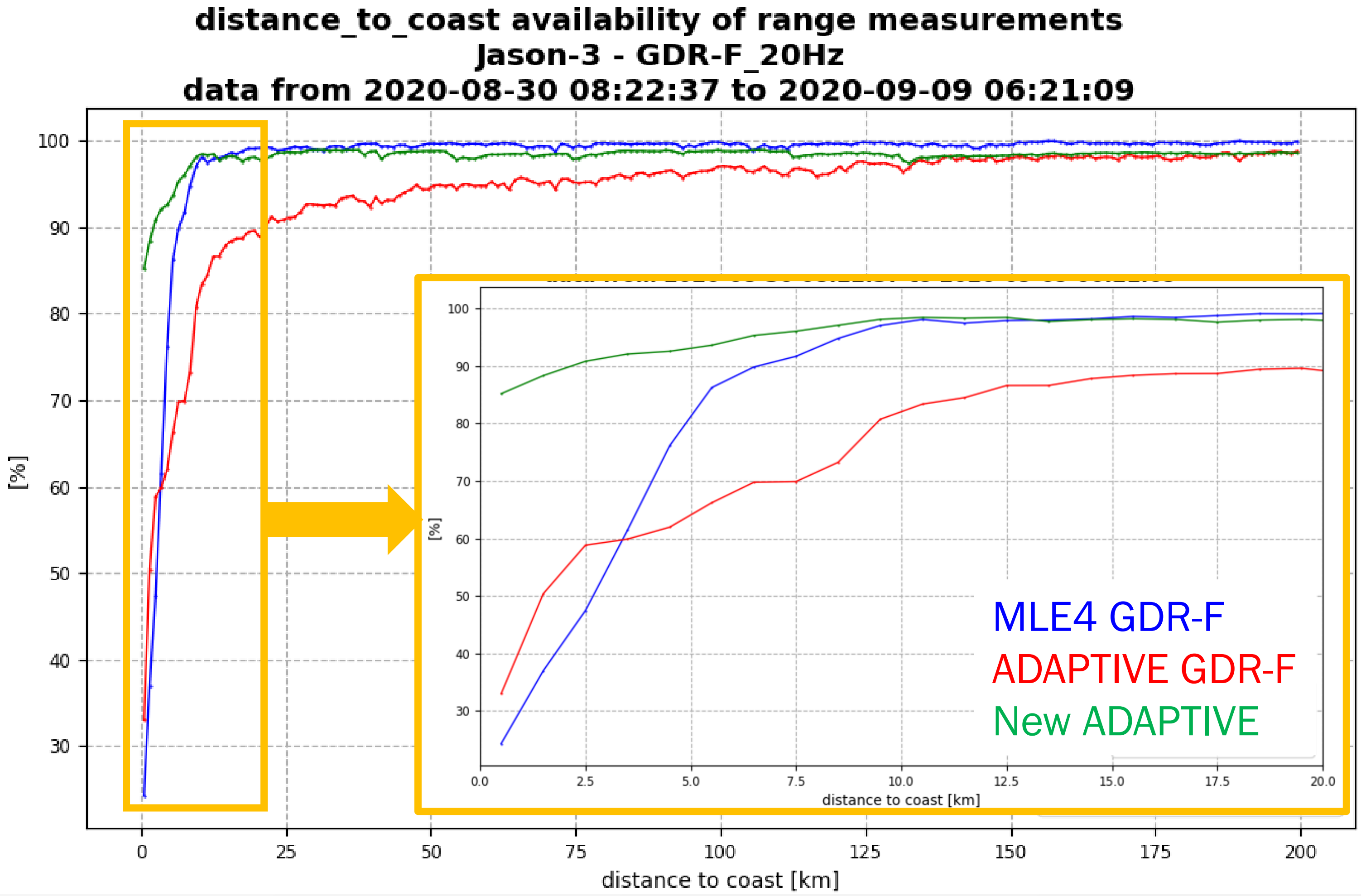
Behaviour at equator crossing



- Sentinel 6A / Jason 3 tandem phase allows to detect a 5 mm differences within a 4° large band at equator
- Investigations shows that J1/J2/J3 have the same behavior on one hand, and S6, S3, Altika, Topex on the other hand
- Root cause not yet identified, investigations are going on

Future improvements

New adaptive version in processing software baseline GDR-F V1.04

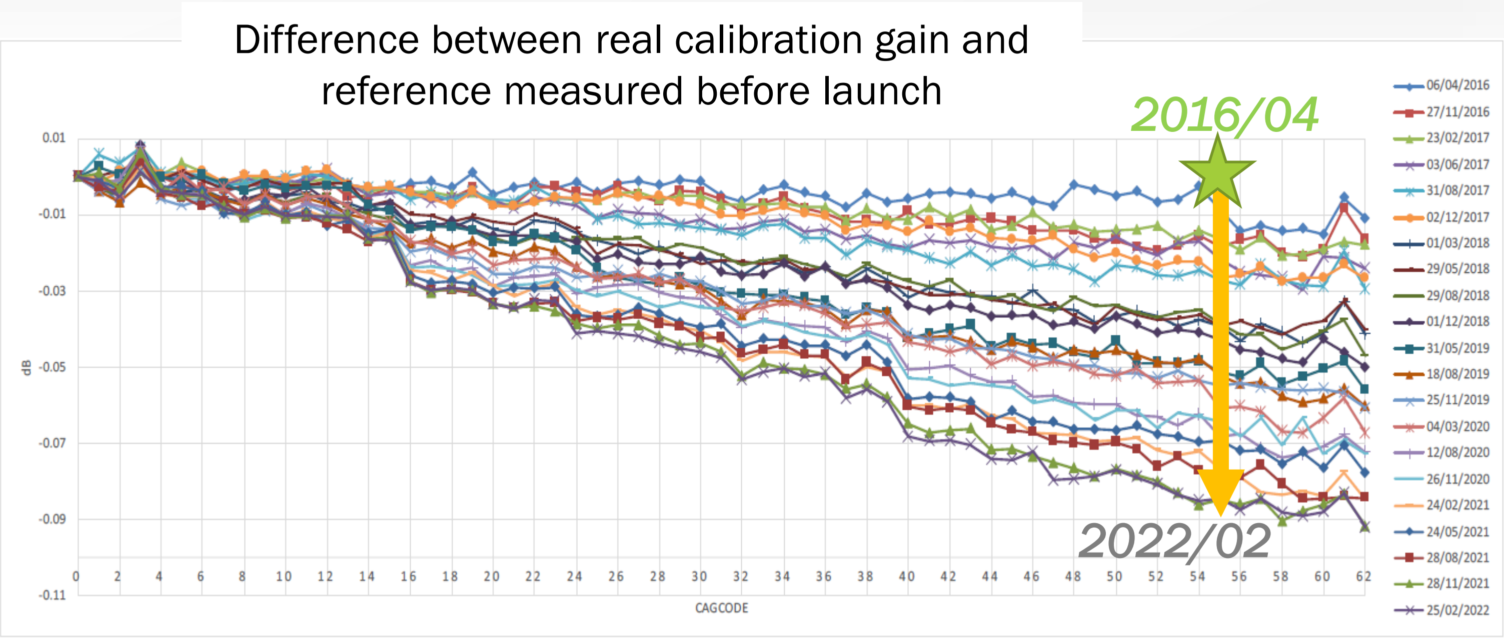


- Significant improvement on adaptive retracker outputs in official products near coasts
- Will be available in official GDR-F products soon

Future improvements

Every 3 months : CNG calibration check

CNG drift and impact on GMSL



- Jason-3 CNG drift ➔ σ0 drift of 0,007 dB/yr

  ➔ under requirements on σ0 measurement error (<0,05 dB)

- The ASELSU project demonstrated a 0,01dB/yr sigma0 drift → 0,1 mm/yr on SSH uncertainty

➔ CNES will implement a correction strategy for O/I/GDR on next GDR standard (GDR-G)

Conclusions

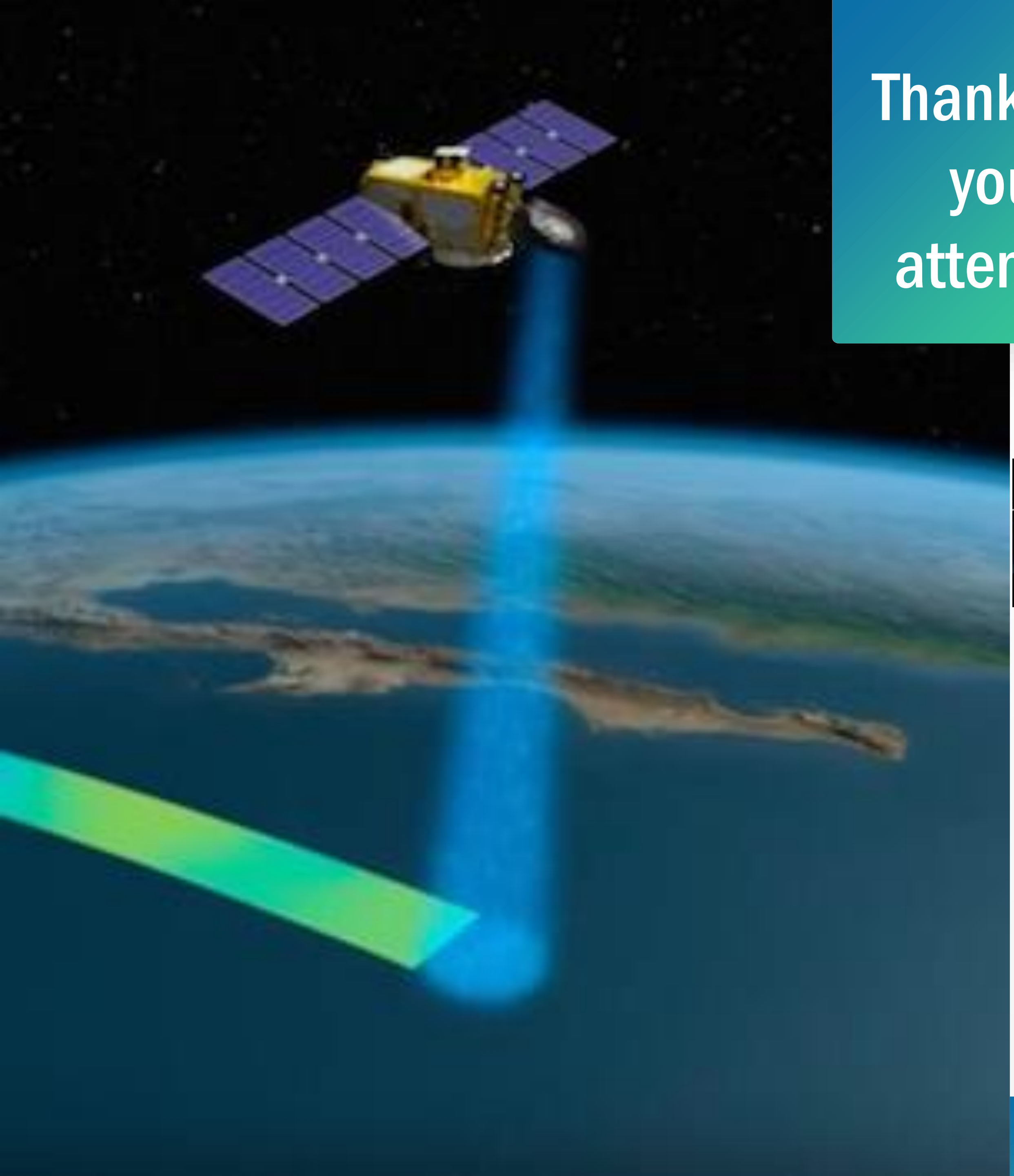
Very good performances of reference MLE4 Jason-3 GDR-F SLA

- ❑ no significant impact of move to interleaved ground-track

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, over 6 years (2016/02 to 2022/02) of data :
  - ✓ variance of SSH difference at crossovers is reduced by -0,48cm²
  - ✓ variance of along-track 1Hz SLA is reduced by -0,18cm² (except for coastal distance < 10km)



Thanks for your attention

Questions ?

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