The ADAPTIVE products improve the coastal cover and reduce the noise level.

Jason-3: ALES vs ADAPTIVE vs MLE4, comparing the available products.

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BACKGROUND

The retracking method used in an altimetry mission converts the waveform measurements into range, wave height and wind speed.

The official retracking method for the Jason-3 mission is the MLE4. Yet, other methods have recently gained more visibility, in particular the ALES(*) (TUM/ESA) and the ADAPTIVE(**) (CNES/CLS) methods.

OBJECTIVE

The main objective of this study is to compare the performance of the three distributed products for retrieving valid measurements in coastal areas, without degrading the measurements' quality over ocean. This was done over 1Hz GDR-F Jason-3 data and ALES SSH data(*).

METHODS

The first step was the comparison of the available ALES data with regards to MLE4 and ADAPTIVE measurements in terms of quantity and quality.

Then, a common editing process was defined between the three solutions, which permitted an unbiased long-term and high scale comparison.

Finally, the noise level was compared by filtering the 1Hz Sea Level Anomaly to extract its random error (noted as HFSLA) and measuring its standard-deviation (std). The std from the 20Hz range (noted as range_std) was also compared as it was distributed in the TUM products.

(*) The ALES SSH data used were produced by DGFI-TUM and distributed via OpenADB (http://www.openadb.dgfi.tum.de). More details on the retracker and the product are available in Passaro et al. (2014, 2015, 2017).

(**) See Tourain C. et al. : Benefits of the Adaptive algorithm for retracking altimeter nadir echoes: results from simulations and CFOSAT/SWIM observations, Trans. on Geoscience and Remote Sensing Journal, 2020.

RESULTS : AVAILABILITY

The ADAPTIVE and the ALES products both increase the amount of valid coastal data by 25% and 16% compared to the reference MLE4 products (Figure 1).

The validity of the data is determined using surface and ice flags to only keep oceanic measurements with the calval editing criteria to remove the outliers in SLA, SWH and range_std measurements.

Figure 1 : Availability of the data as a function of the distance to coast.

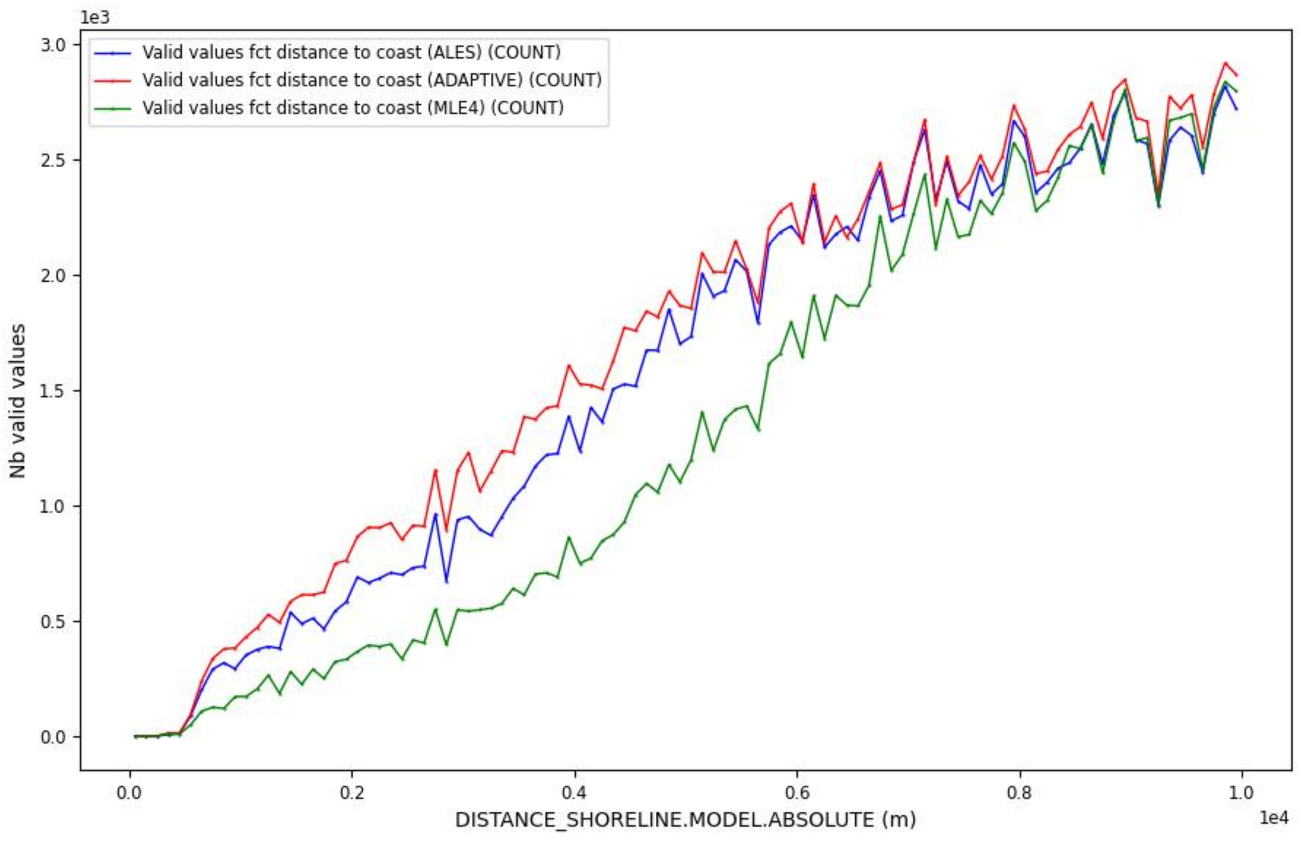
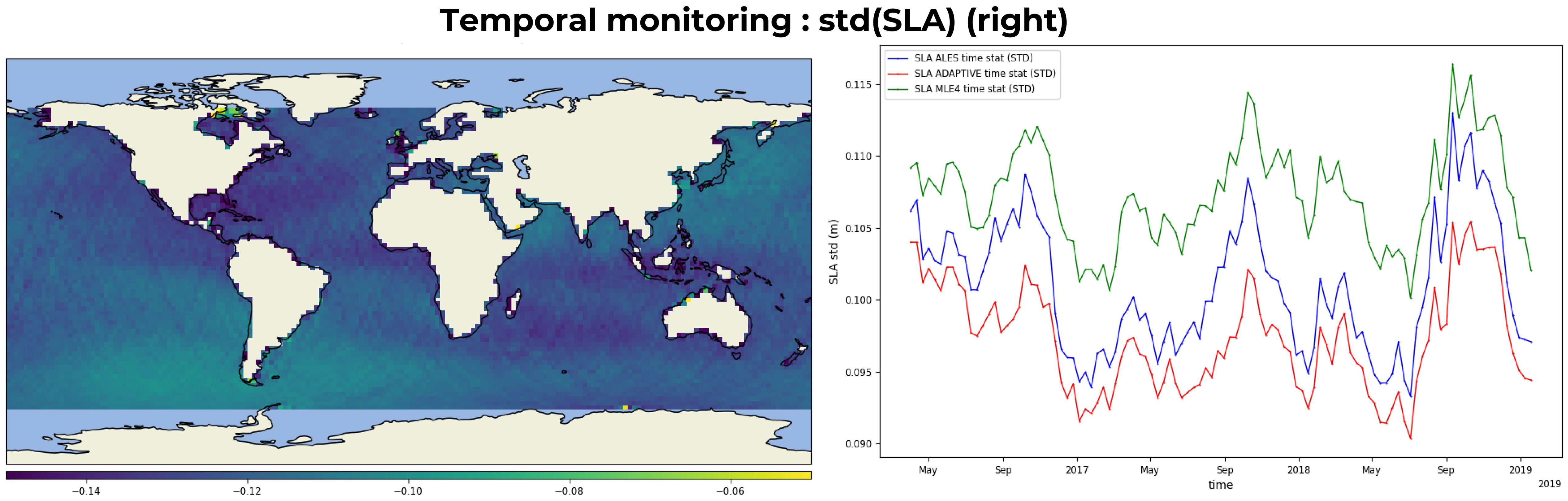


Figure 2 : Spatial stability : SLA(ADAPTIVE) – SLA(ALES) (left), Temporal monitoring : std(SLA) (right)



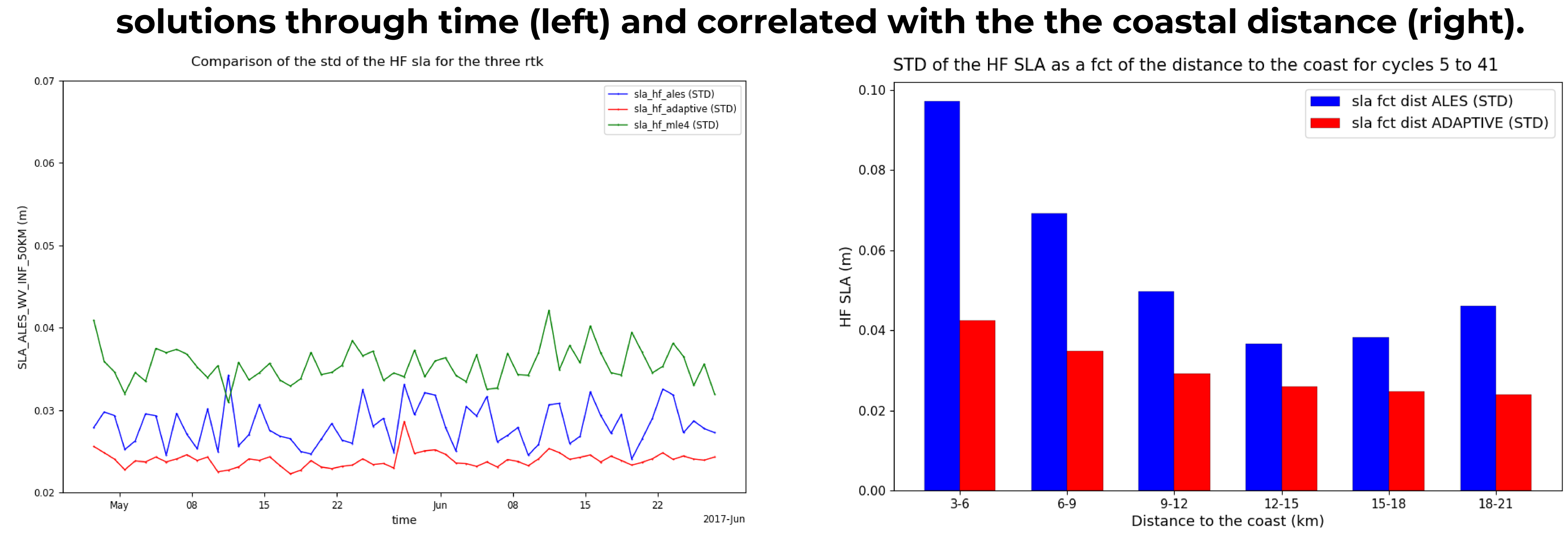
RESULTS : LONG-TERM TEMPORAL & SPATIAL STABILITY

The long-term temporal monitoring shows the same patterns, with a stronger winter pattern due to the processing of strong waves for MLE4 and ALES. The SLA difference between the ADAPTIVE and the ALES solutions is very slight and correlated with differences in the Sea State Bias used (Figure 2).

RESULTS : NOISE LEVEL

When comparing the range_std, the ADAPTIVE products show better performances than both others. Similarly, the observation of the HFSLA shows a significant noise reduction over all sea states when using the ADAPTIVE products (Figure 3). The ALES products also perform better than the MLE4 on this criterium. This result is both observed over ocean and in coastal areas.

Figure 3 : Noise level comparison (std(HFSLA), m) between the three retracking solutions through time (left) and correlated with the the coastal distance (right).



cnes

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