Coastalt product validation at the Cascais tide gauge

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1. Introduction

Validation is a crucial activity in the framework of development of satellite altimetry products for the coastal area. This work shows the latest validation results for the final CGDR product resulting from the ESA-funded COASTALT project. The analysis focus on the 18Hz data from ENVISAT passes 1 and 160 along the west Iberian margin, in the coastal area near the Cascais tide gauge, southern Portugal (Fig. 1).

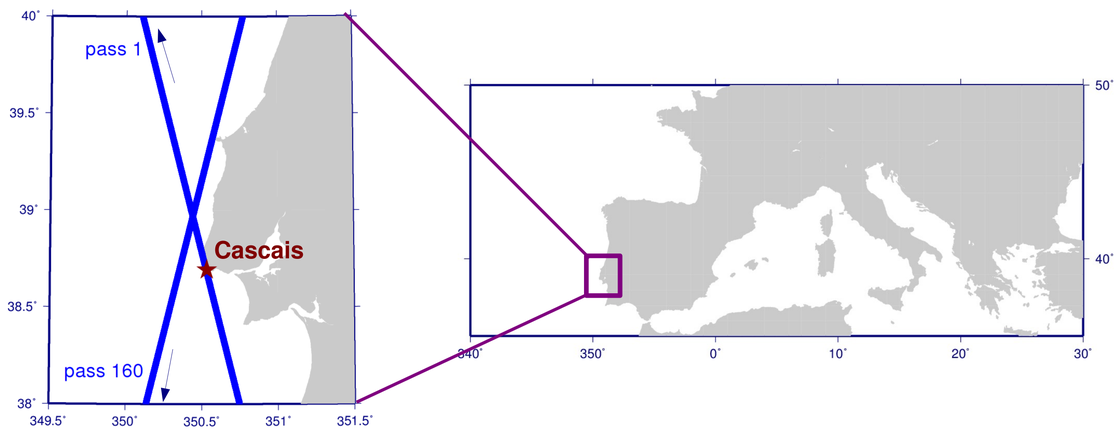

Fig. 1: Validation area near the Cascais tide gauge, west Iberia.

2. Retracked heights

Retracked heights at 18Hz (Fig. 2) are computed from the coastalt product as

orbit – (range + uso)

where orbit is the ellipsoidal height, range is the Ku-band range from the coastalt brown retracker and uso is the USO correction. Problematic retracked heights are mostly found within 10km of the coast, but also occur, though less frequently, up to 20 km from the coast.

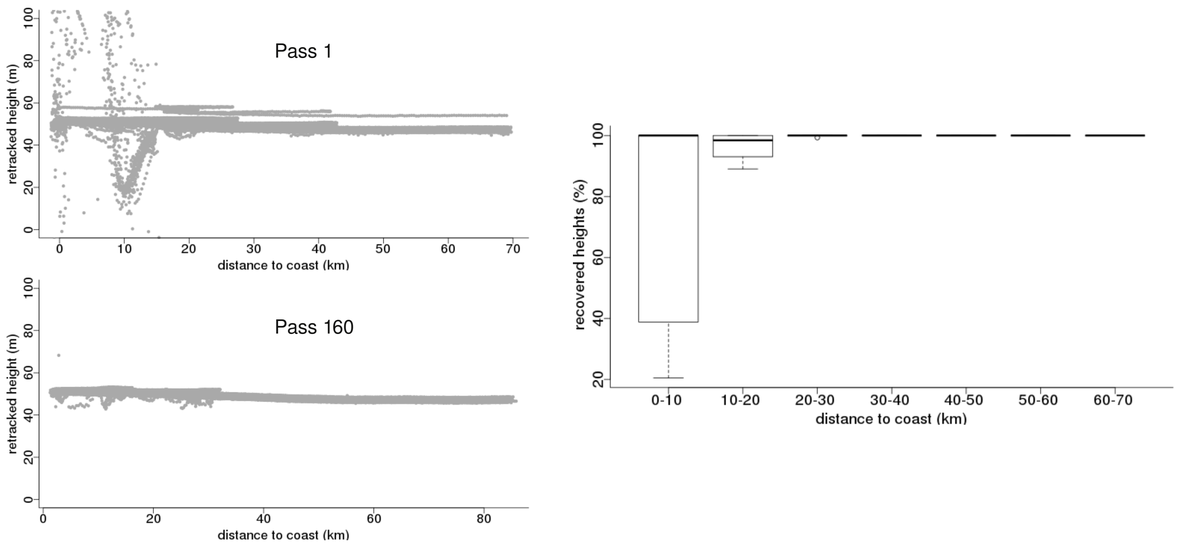

Fig. 2: Retracked heights (left) and % of correctly retrieved heights (right).

3. Geophysical corrections

The space-time variability of geophysical corrections is summarised as a function of the distance to the coast by means of an Empirical Orthogonal Function (EOF) analysis of the corresponding along-track values (Fig. 3 – 5).

3.1. Wet troposphere

Fig. 3 shows the 1st EOF mode for the wet troposphere correction derived from the DLM method (—), the ECMWF model (—), and GPD (—).

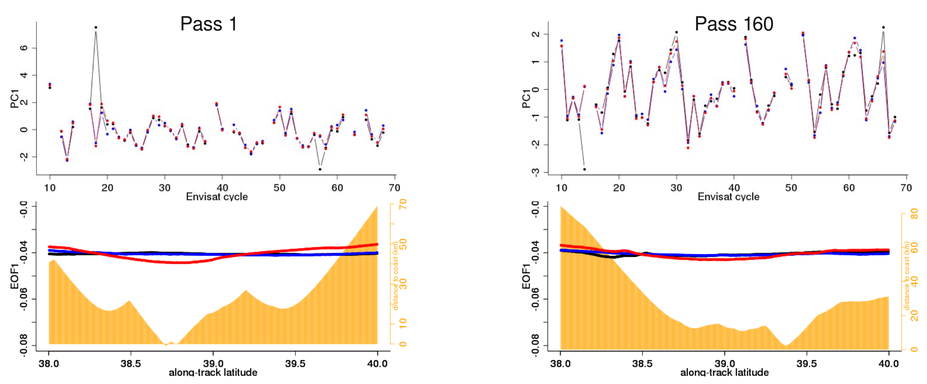

Fig. 3: 1st EOF mode of along-track wet troposphere correction.

3.2. Sea state bias (SSB)

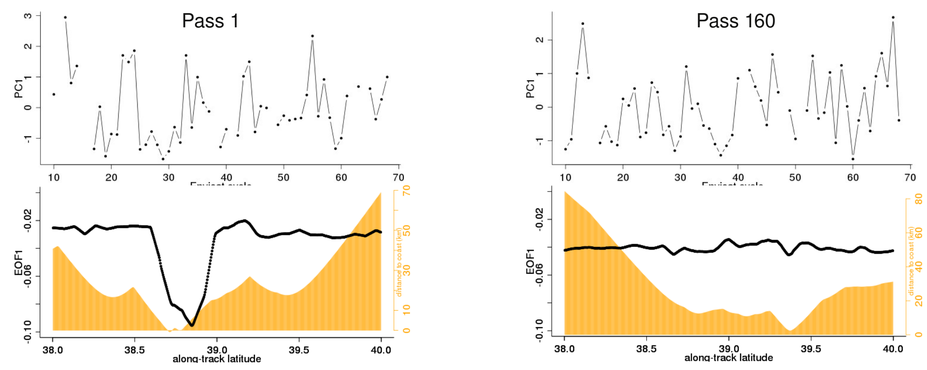

Fig. 4: 1st EOF mode of along-track SSB correction.

3.3. Ionosphere

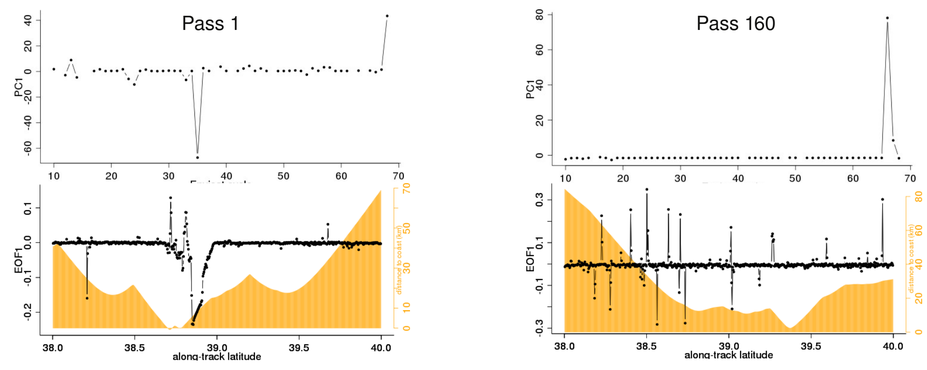

Fig. 5: 1st EOF mode of along-track ionosphere correction.

4. Sea-level anomalies

Time series of sea level anomalies (SLAs) are derived from the coastalt product as

SLA=[orbit – (range + corrections)] - MSS

As quality-control procedures, SLAs outside the range]-2,2[m and exceeding 2.5 times the standard deviation of the series over the whole period are excluded. Fig. 6 shows the % of valid SLAs and the standard deviation of the resulting series.

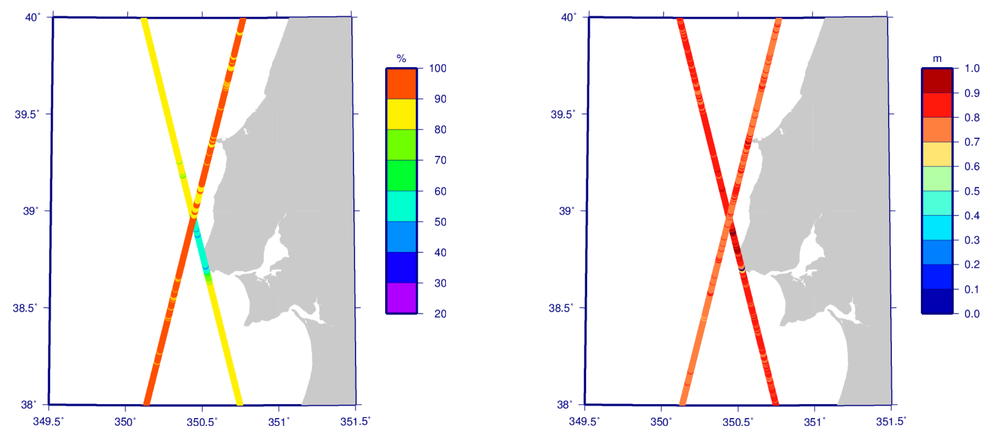

Fig. 6: % of valid SLAs (left) and standard deviation (right) after application of QC procedures.

Concurrent time series of SLAs and tide gauge heights are obtained by linear interpolation of hourly tide gauge observations to the satellite passage times. Fig. 7 (left) shows the root mean squared error (RMSE) of the differences between coastalt SLAs and tide gauge heights. The RMSE of the differences is higher close to the coast and after crossing land. Figure 7 (right) displays the (Spearman) correlation coefficient between coastalt and tide gauge anomalies. The correlation decreases when approaching land and is lower for the descending track (pass 160).

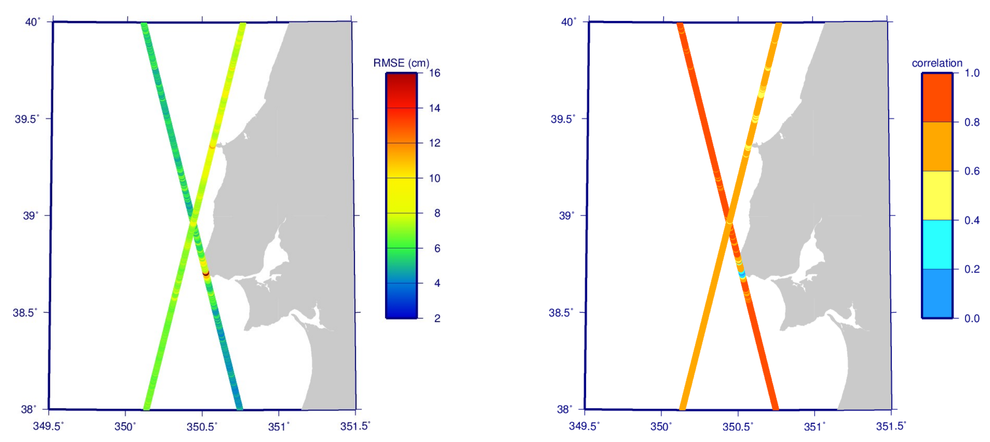

Fig. 7: Comparison of SLAs and tide gauge values: RMSE (left) and correlation coefficient (right).

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