



Sentinel-3 SEOM study 2 “Ocean and Coasts”

SCOOP

WP4000: Coastal Processing:

Phase 2

isardSAT[®]



- Background and Methodology
- AoI & dataset
- Results
- Conclusions

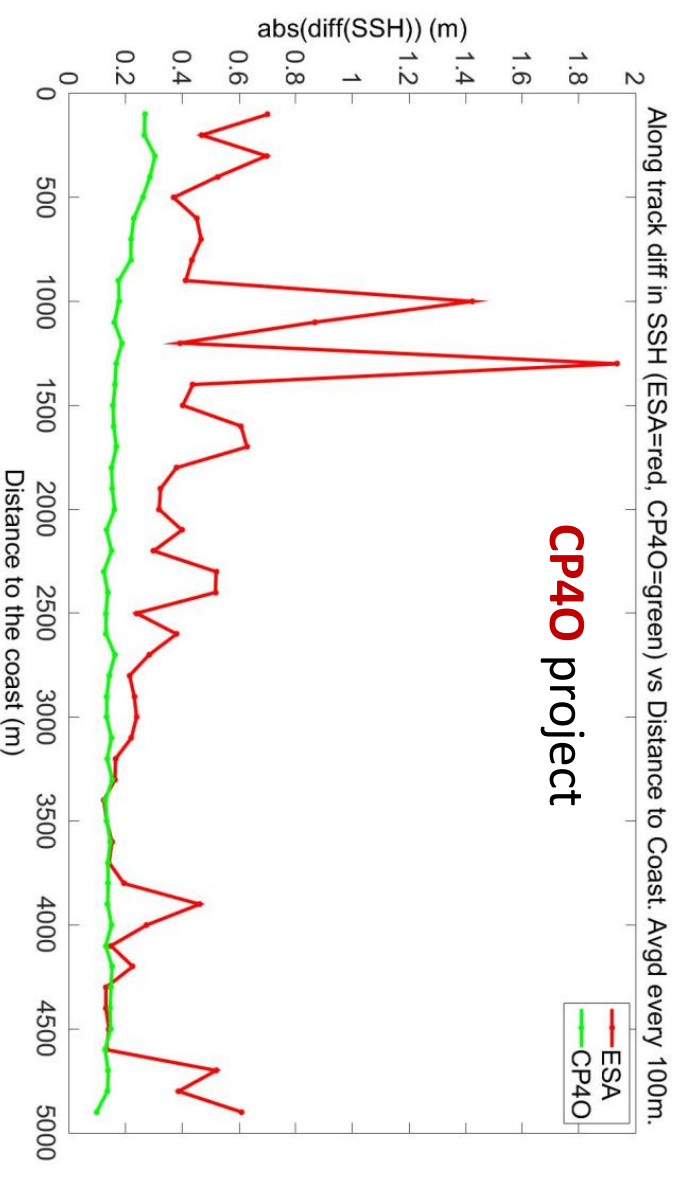
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Coastal Altimetry studies were developed in the **CP40** project.
SSH retrieval in coastal areas were to be improved.
One year (full cycle) of CS2 SARin data was processed.

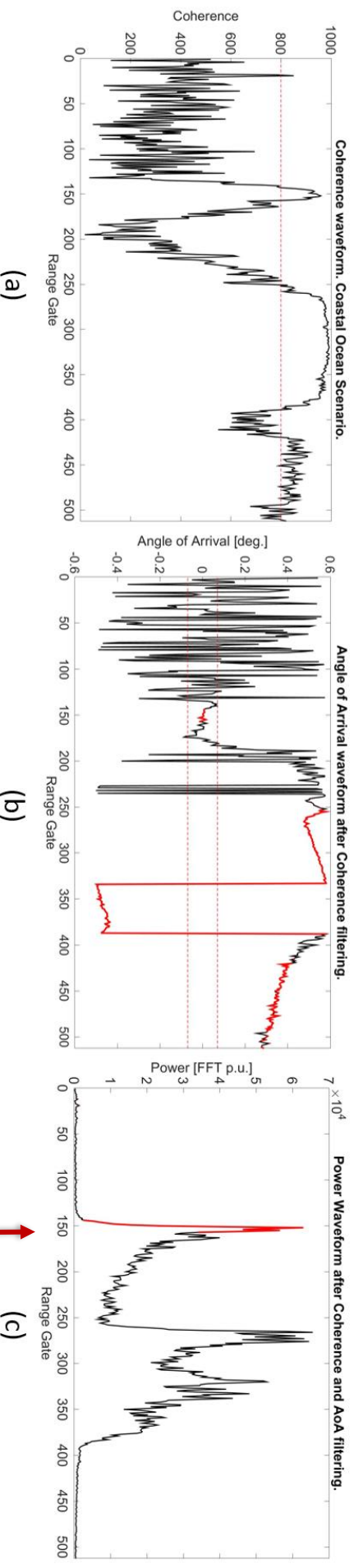
CP40 project



Area of interest



The Coastal processing from CS2 SARin data was based in the AoA information for determining the Nadir section of the waveform.



A waveform section around the Nadir location is selected for the retracking processing, avoiding possible echo coastal contamination (land, specular waters, etc).

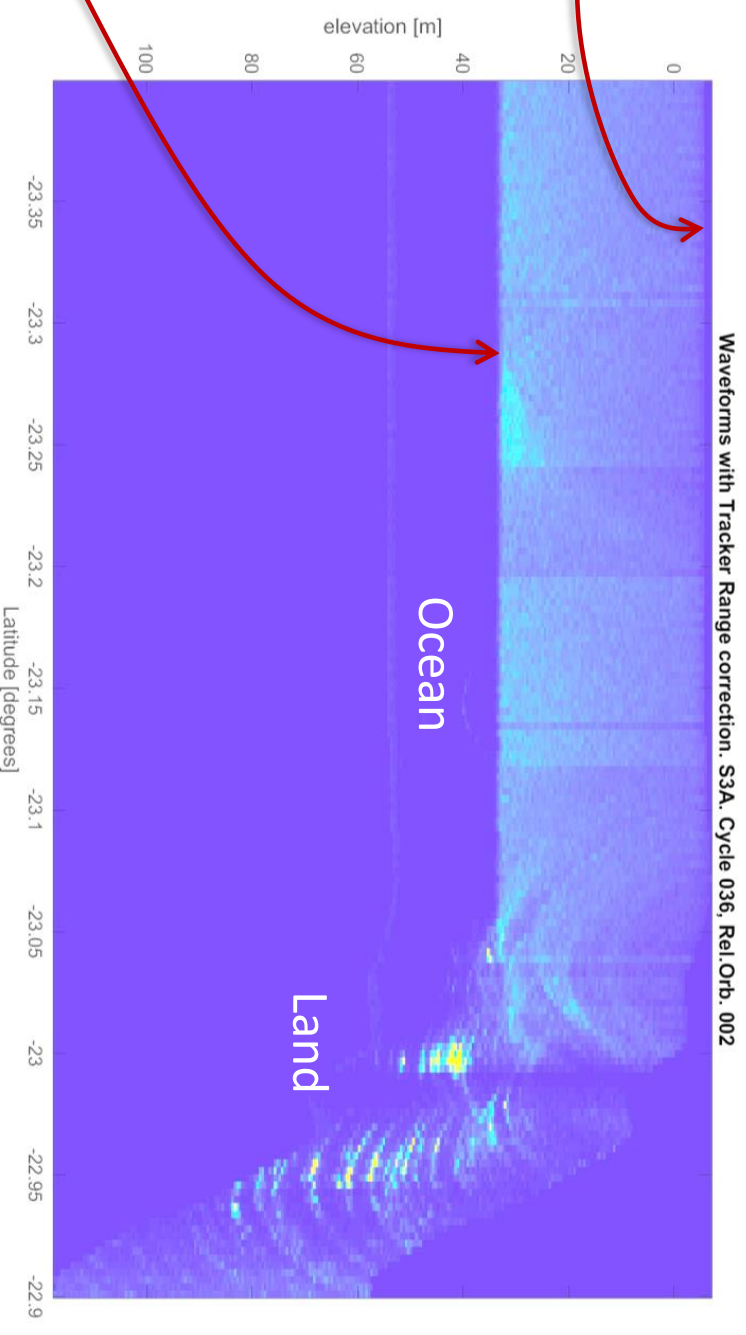
Section of the waveform
to be retracked



A second solution was designed based in the Window Delay (WD is a variable which is available in any altimetry mission).

A WD series along a track over the ocean presents a smooth behaviour following the ocean surface elevation. The Closed Loop on-board tracking mode controls the tracking window positioning (WD).

Any WD jump can be detected out of the expected ocean smooth behaviour, and eventually corrected for a correct LEP location.



The LEP position is used for the **waveform cut** and as a seed for the **retracking processing**.

The WD solution is adopted for this SCOOP study.

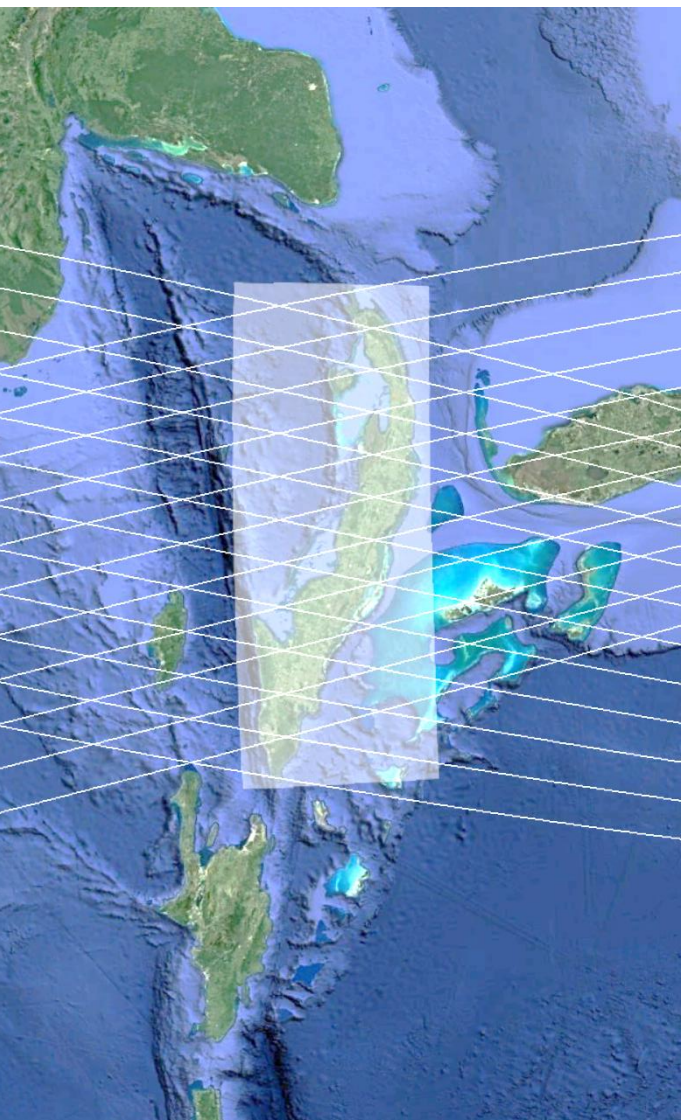
Instead of smoothing the WD series along a track in order to detect the WD jumps, we use the MSS2 variable (MSS DTU 15 solution), unbiased with respect to the WD. The two fit very well over open ocean.

The LEP is located in the expected Nadir Ocean return location within the waveform, and a number of range bins around the LEP are cut out and sent to the retracking processing, with the intention of avoiding contamination.

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Sentinel-3B Closed Loop data has been gathered for this study, from cycles 11 and 12 (one full cycle from 2018/08/10 to 2018/09/05).

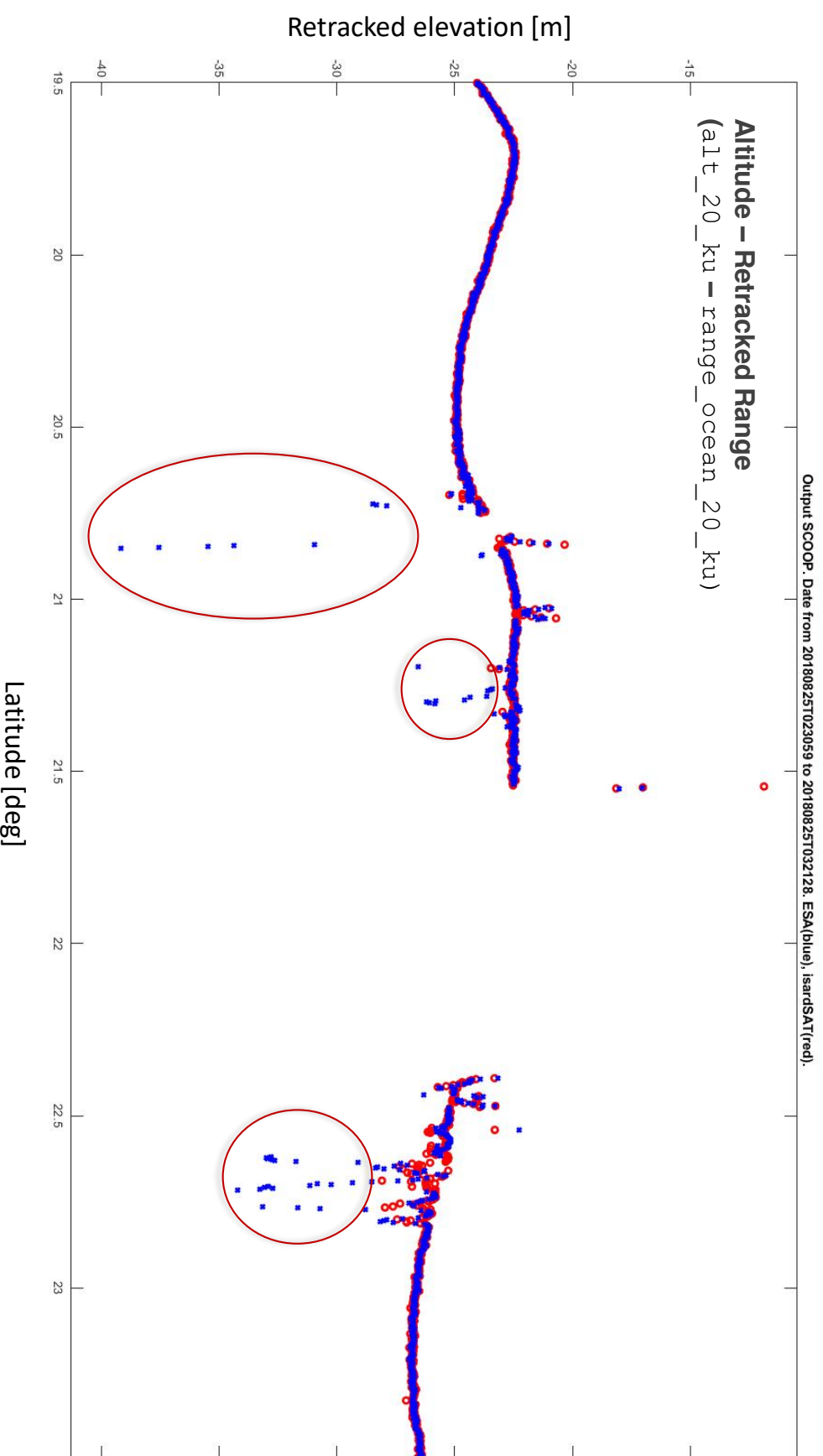
Cuba presents an interesting complex coastal topography, with cays, low land areas, reefs.



Area of interest and selected tracks

- Background and Methodology
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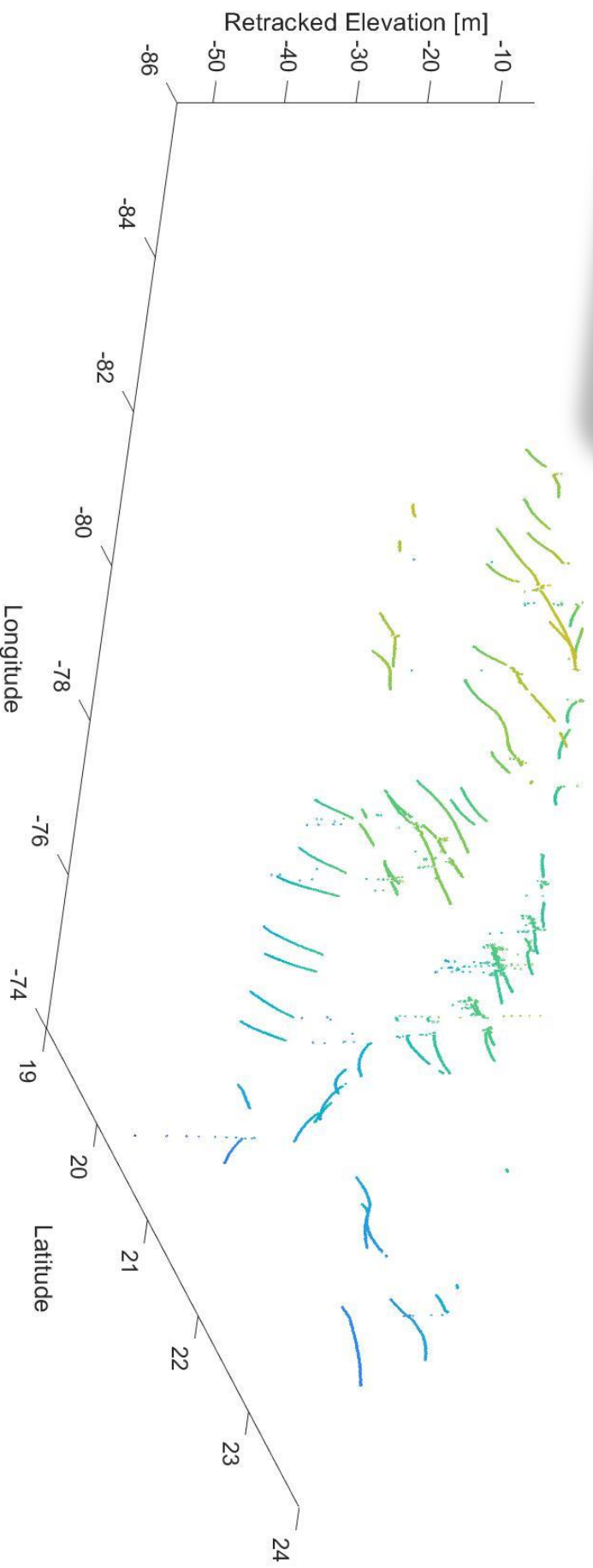
Figure showing one track with ESA (blue) and isardSAT (red) Retracked Elevation.



Figures show coastal tracks (ocean, up to 30Km from the coast).



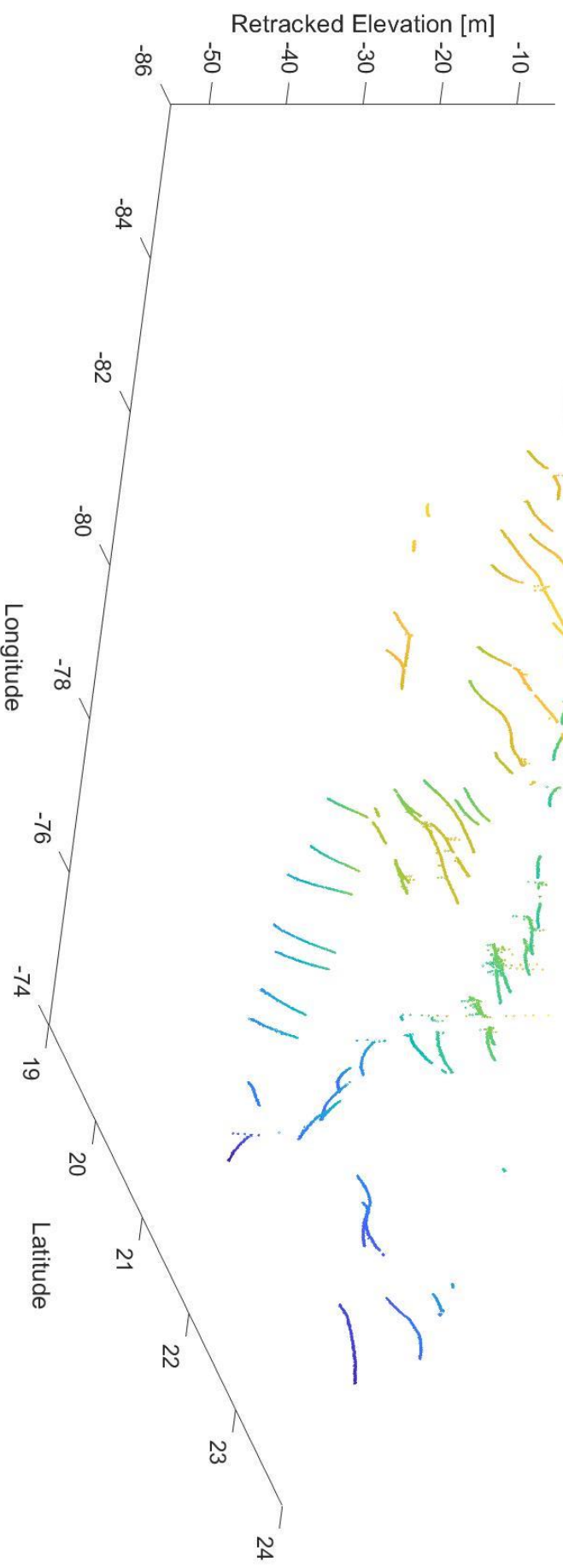
$$\text{ESA Retracked Elevation} = \text{Altitude} - \text{Retracked Range} \\ = \text{alt_20_ku} - \text{range_ocean_20_ku}$$



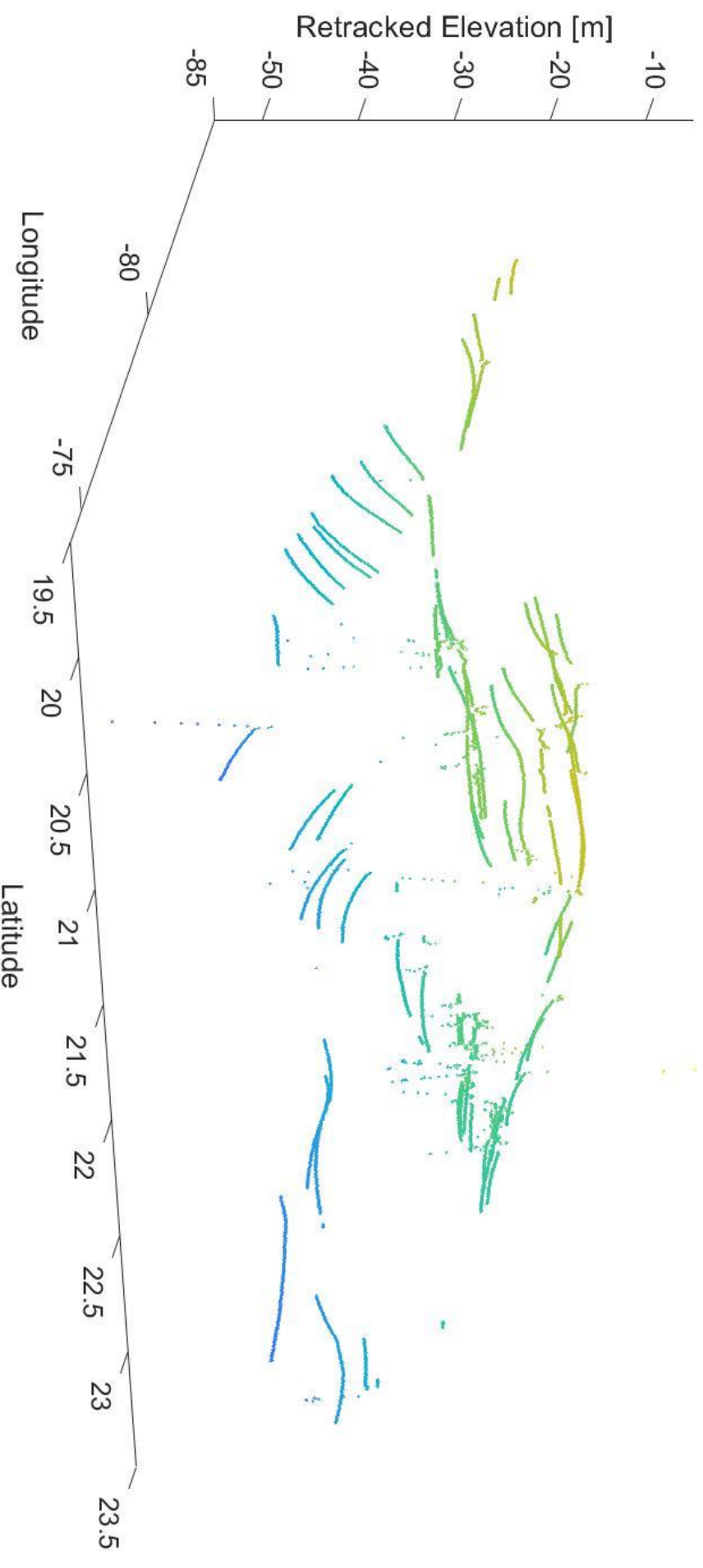
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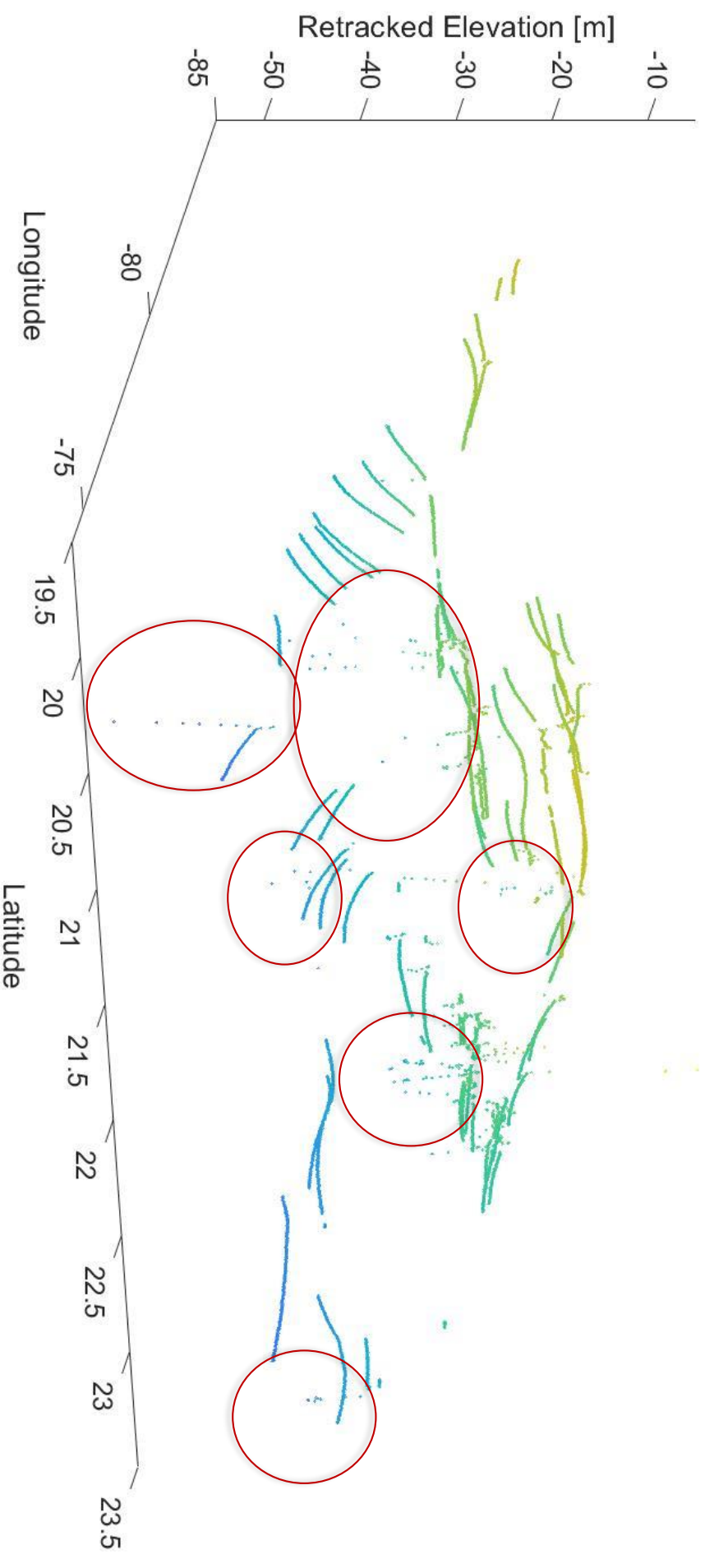
isardSAT Retracked Elevation



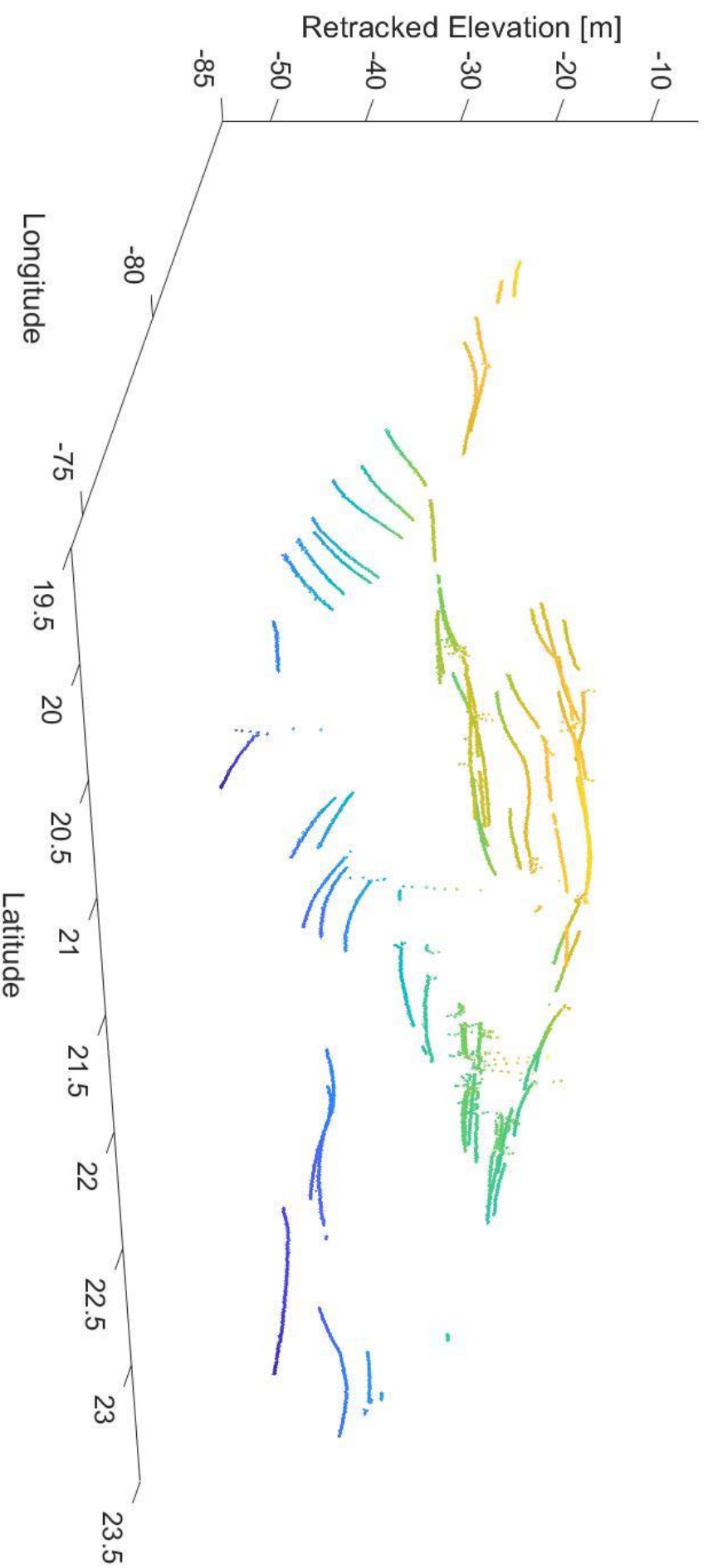
ESA Retracked Elevation



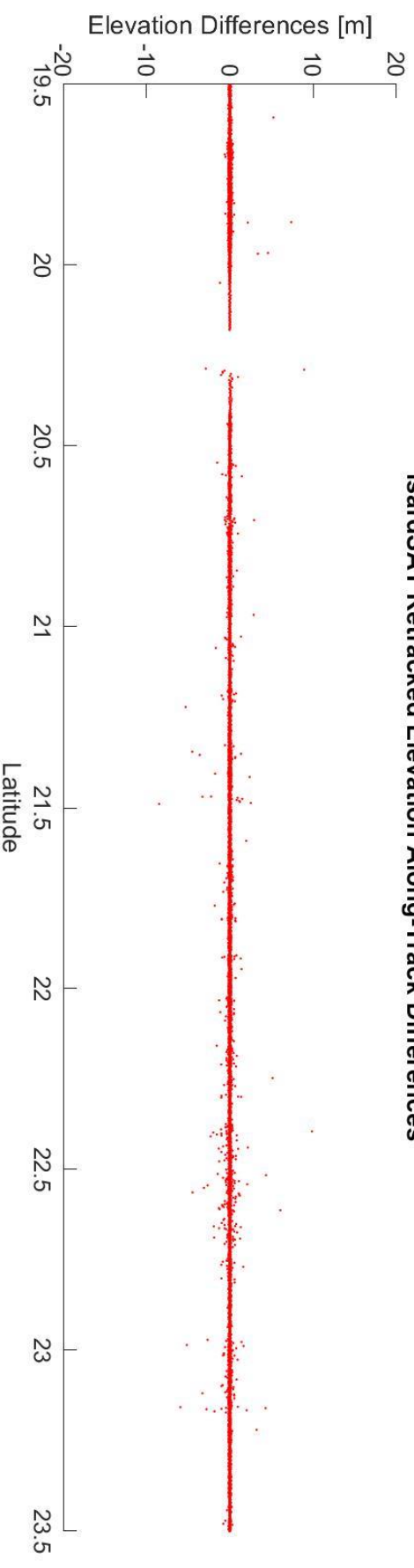
ESA Retracked Elevation



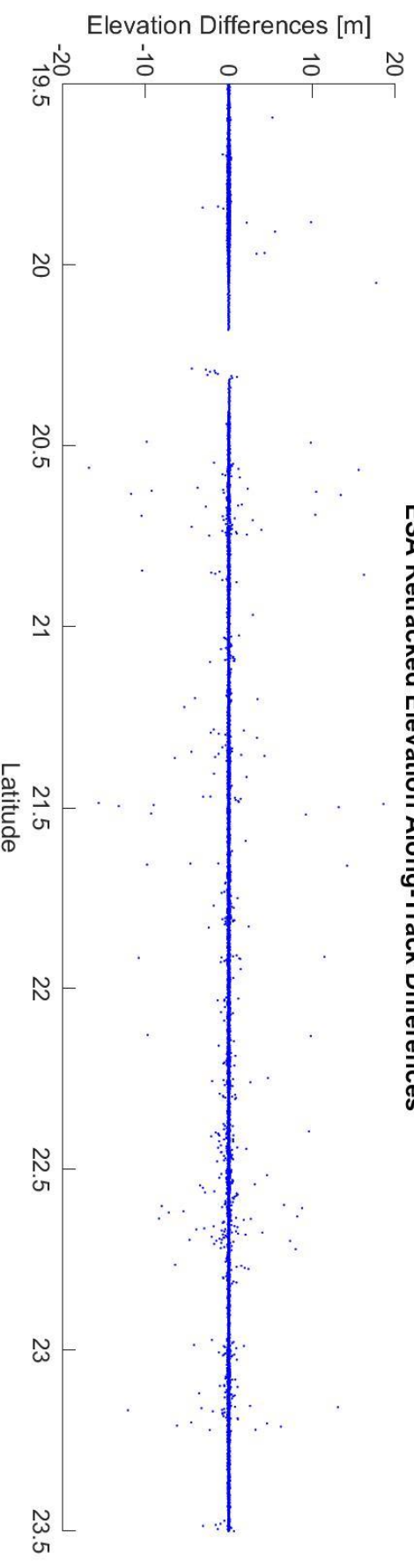
isardSAT Retracked Elevation



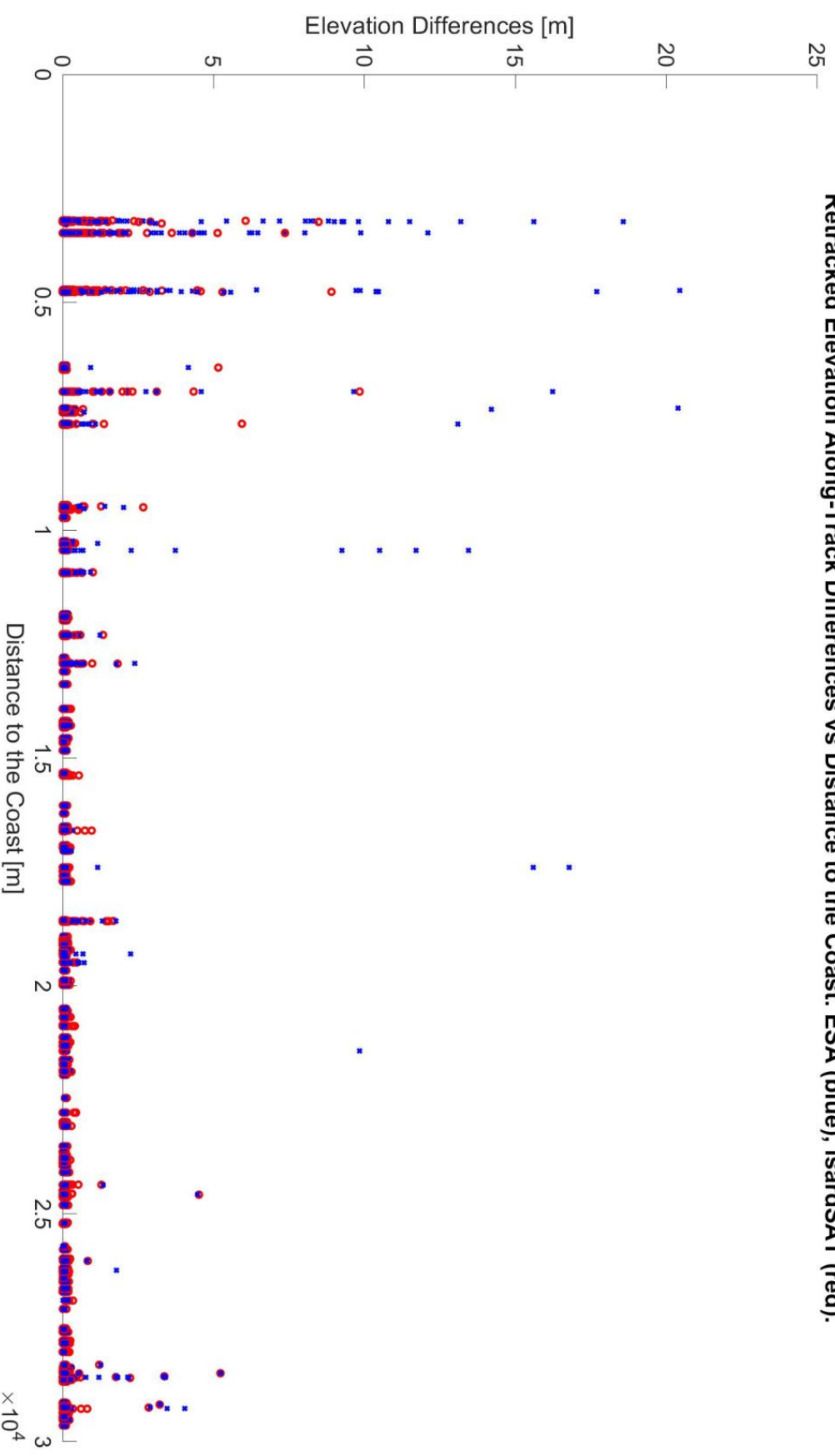
isardSAT Retracked Elevation Along-Track Differences



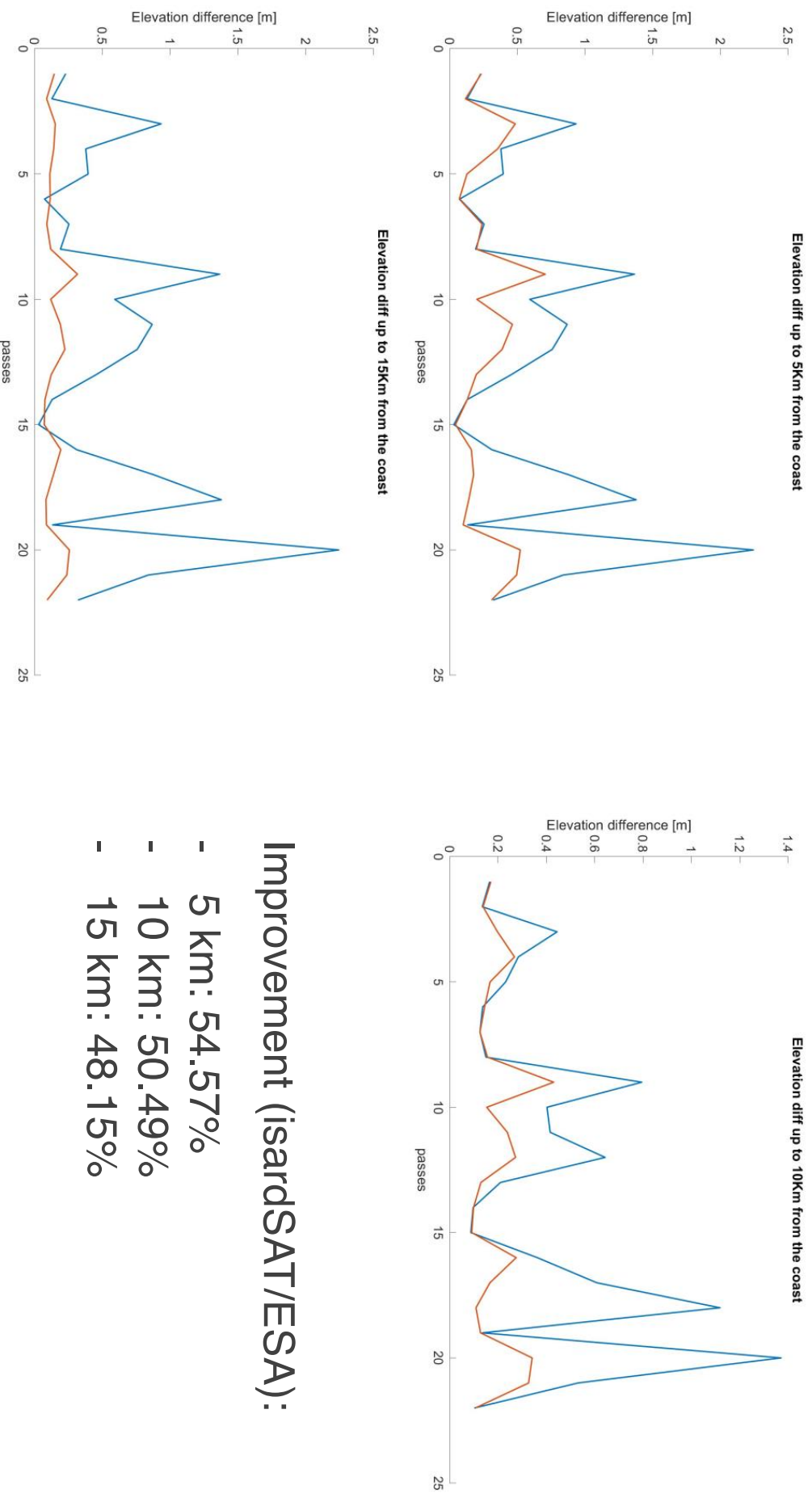
ESA Retracked Elevation Along-Track Differences



Retracked Elevation Along-Track Differences vs Distance to the Coast. ESA (blue), isardSAT (red).



Averaging all records within a stripe along the coast.



Improvement (isardSAT/ESA):

- 5 km: 54.57%
- 10 km: 50.49%
- 15 km: 48.15%

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- A solution for improving the Coastal Ocean SSH has been adapted from the CP40 project.
- It is based in the information of the WD. The On-board Tracker could follow a specular (non Nadir Ocean) target, making the WD elevation to jump from the expected smooth series. The amount of this jump is used to go back and determine the Nadir Ocean position (LEP). A waveform section around the LEP is retracked.
- The MSS2 L2 variable is used instead of a smoothed WD.
- Sentinel-3B data from cycles 11-12 is used, which is Closed Loop tracking mode.
- The Area of Interest is the Cuba archipelago, a complex coastal topography area.
- The results of the study show an improvement in the stability (along track SSH differences) of around 50%, reducing the impact of the coastal echoes contamination in the final geophysical retrieval.
- Future studies could be developed also for the SWH and wind retrieval, adapting the retracker processing to deal with this need.



THANK YOU !!

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