OIC CleanSweep data processing of Niku VII Sidescan data on Bluefin AUV

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The July 15th data of EdgeTech Sidescan sonar on Bluefin 21 AUV from Niku VII survey was processed with OIC's post-processing software, CleanSweep 3. The issue we encountered during the data processing revealed that the finding in the report might have been led by misinterpretation of the sidescan data.

As seen in the report as well as in CleanSweep's waterfall view, the anomaly appears to have broken segments (Figure 1).

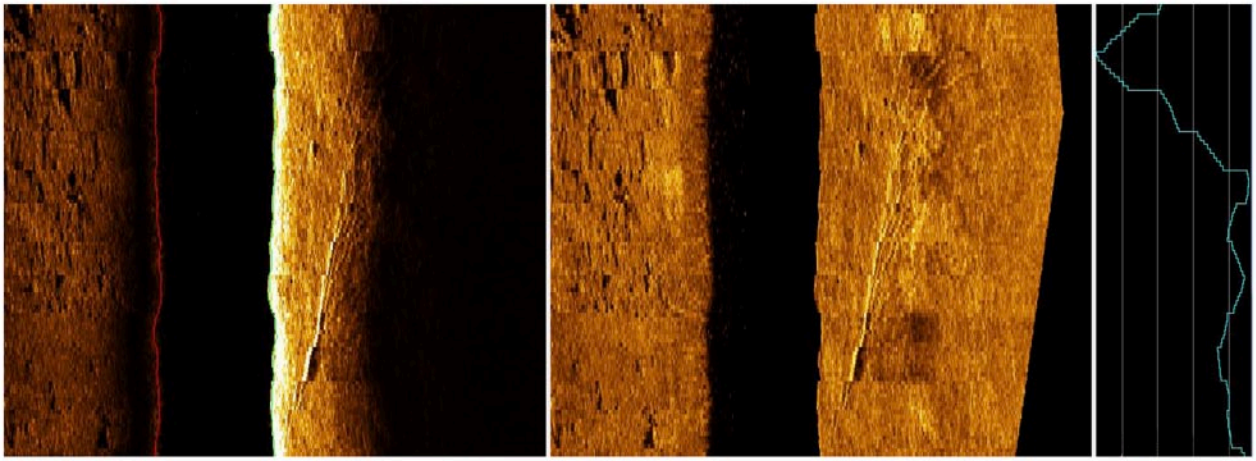

Figure 1. Raw data (left) and processed data (right) with pitch data (far right)

However, pitch data displayed next to the waterfall indicates that sonar data is not continuous. Since waterfall view stacks pings consecutively, it may not be trivial to tell if data is really time-continuous. On the other hand, pitch data is time-series data and should be smooth but it is not the case in this dataset. The pitch data jumps up and down at almost constant intervals (Figure 2).

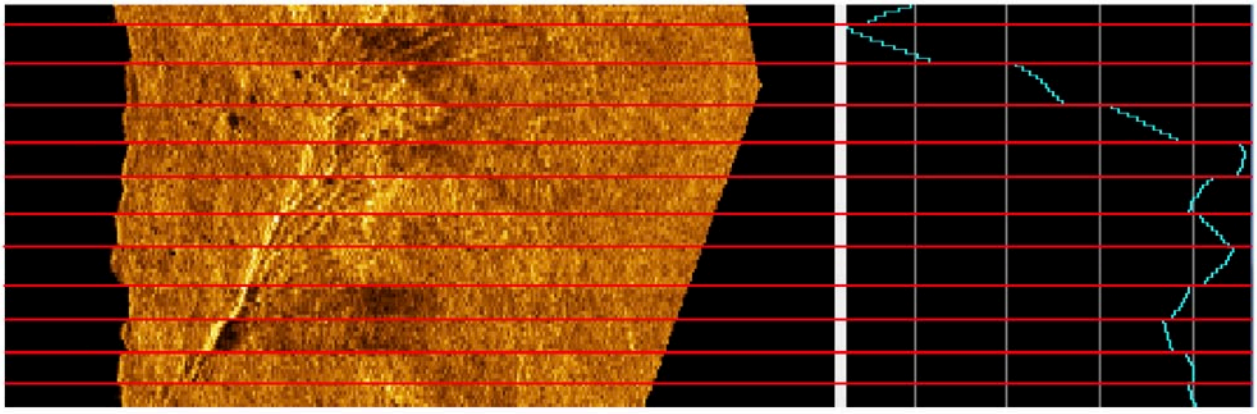

Figure 2. Data discontinuity seen in sonar data and time-series data (pitch)

This implies "ping drop", a symptom that sonar pings are not continuously recorded by the acquisition system due to reasons such as CPU's inability to keep up with computation, overflow of network bandwidth and non-optimal system configurations.

Exported navigation data (time, x position, y position) confirmed that ping drops occurred every 5 to 10 pings and lasted for 1-2 seconds, which resulted in as much as 3 m gaps in the data (Table 1).

ping/nav time	x position	y position		delta t	delta xy
1342355765.838990	772106.186898	9483845.550794		1.138990	0.261227
1342355766.069000	772106.741303	9483845.364454		0.230010	0.584882
1342355766.289000	772106.926319	9483845.363843		0.220000	0.185017
1342355766.519000	772107.110695	9483845.178785		0.230000	0.261230
1342355766.750000	772107.480725	9483845.177503		0.231000	0.370032
1342355768.500000	772109.329605	9483844.802259		1.750000	1.886575
1342355768.720000	772109.514622	9483844.801587		0.220000	0.185018
1342355768.950000	772109.700279	9483844.985364		0.230000	0.261233
1342355769.180000	772110.255329	9483844.983411		0.230000	0.555053
1342355769.400000	772110.440346	9483844.982801		0.220000	0.185018
1342355769.858990	772110.995392	9483844.980848		0.458990	0.555049
1342355770.088990	772111.181053	9483845.164624		0.230000	0.261235
1342355770.309000	772111.551083	9483845.163343		0.220010	0.370032
1342355770.549000	772111.921761	9483845.346448		0.240000	0.413436
1342355771.450000	772112.291792	9483845.345105		0.901000	0.370033
1342355772.519000	772113.588833	9483845.893811		1.069000	1.408330
1342355772.740000	772113.774491	9483846.077588		0.221000	0.261233
1342355772.970000	772114.145167	9483846.260694		0.230000	0.413435
1342355773.200000	772114.330826	9483846.444410		0.230000	0.261191
1342355773.430000	772114.701500	9483846.627515		0.230000	0.413433
1342355773.650000	772114.887160	9483846.811292		0.220000	0.261235
1342355773.880000	772115.072817	9483846.995008		0.230000	0.261190
1342355774.108990	772115.257834	9483846.994397		0.228990	0.185018
1342355774.338990	772115.444136	9483847.362561		0.230000	0.412617
1342355775.240000	772115.630436	9483847.730664		0.901010	0.412562
1342355776.500000	772116.745032	9483849.017591		1.260000	1.702500
1342355776.730000	772116.931332	9483849.385755		0.230000	0.412617
1342355776.960000	772116.931975	9483849.570142		0.230000	0.184388
1342355777.180000	772117.118277	9483849.938306		0.220000	0.412617
1342355777.410000	772117.118918	9483850.122693		0.230000	0.184388

Table 1. Partial view of the exported navigation data from 2012-07-15-12-36-03_bluefin.0000000.jsf file and difference in time and distance between adjacent data points

Because of the ping drops, gaps are clearly visible in sidescan mosaic data (Figure 3).

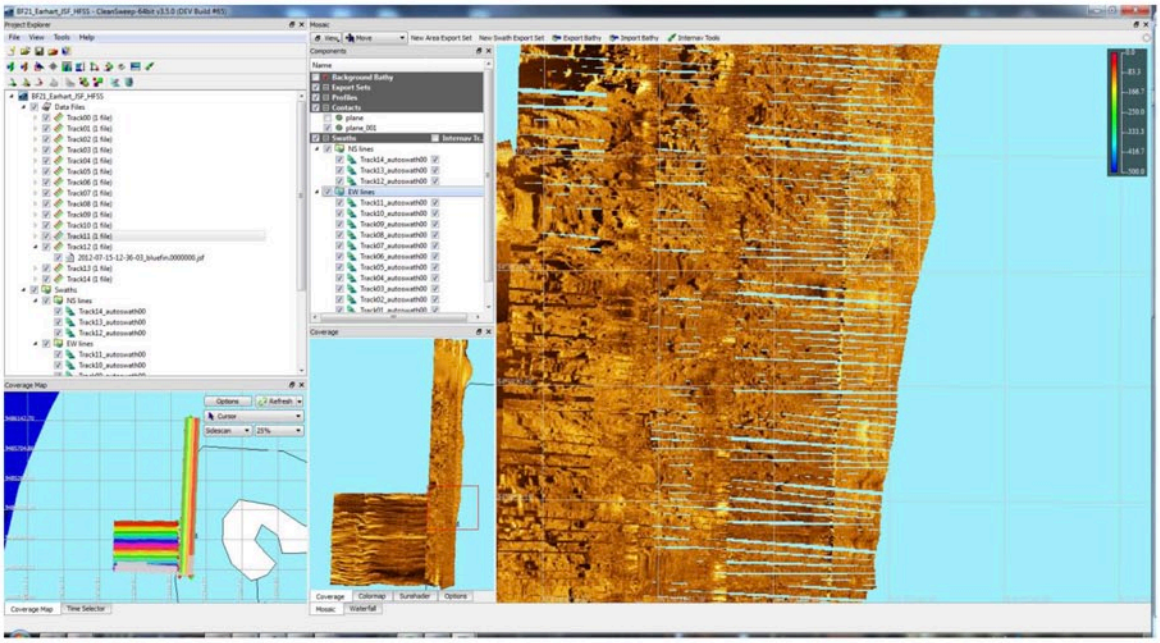

Figure 3. HFSS mosaic view of the July 15 data

If you closely look at the anomaly with correct positioning of the sonar pings after ping drops and pitch motion are taken into account, it appears to be a linear feature without apparent breaks as pointed out in the report (Figure 4).

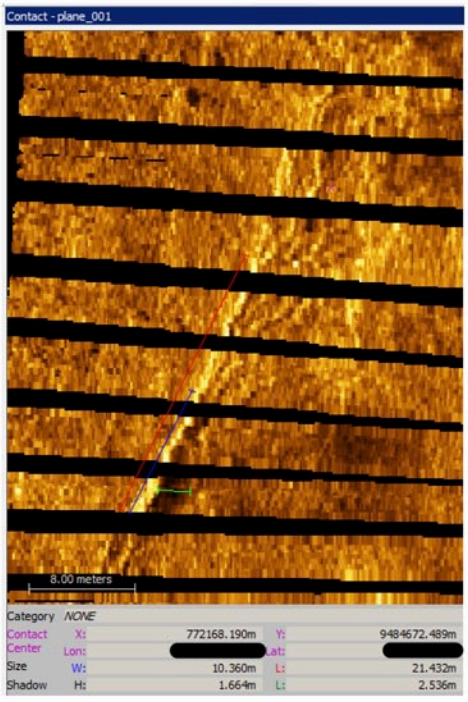

Figure 4. Contact view of the anomaly

The most prominent part of the anomaly spans about 20 m. This is double the size in the report, which means it is too large to be the Electra fuselage. However, the part casting strong shadow is about 10 m. Therefore, it is still possible this to be the wreck. Shadow measurement suggests the target height about 1.7m; however, this does not consider that shadow casts to the upslope direction.

The processing steps include bottom tracking, imagery enhancement (contrast stretching and beam pattern correction/normalization), edge/nadir trimming, and pitch correction. Each survey line of the July 15 dataset was mosaicked at 20 cm (Figure 5).

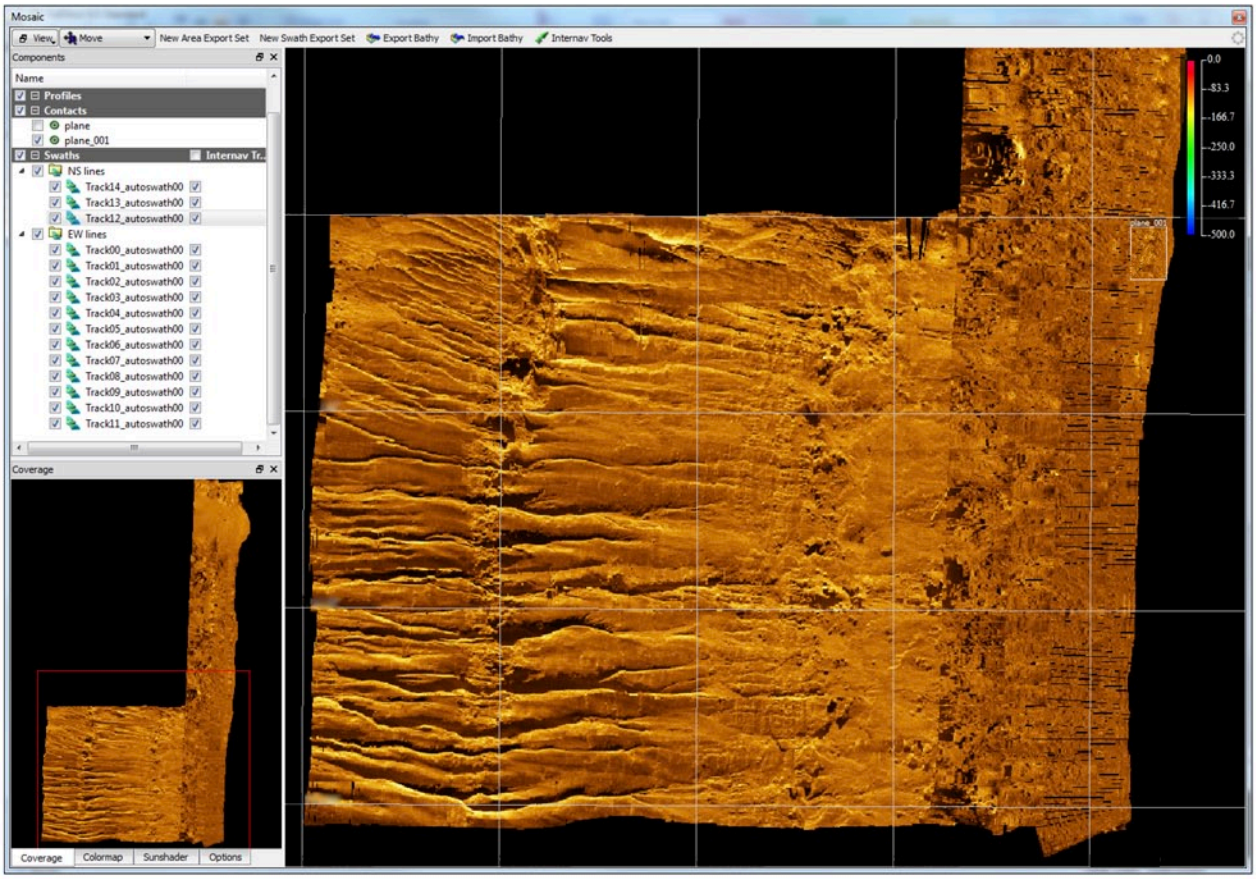

Figure 5. CleanSweep interactive mosaic view of the July 15 HFSS data

The mosaic data was exported to Google Earth format at 50 cm resolution (Figure 6).

Figure 6. 50cm HFSS mosaic imagery in Google Earth

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