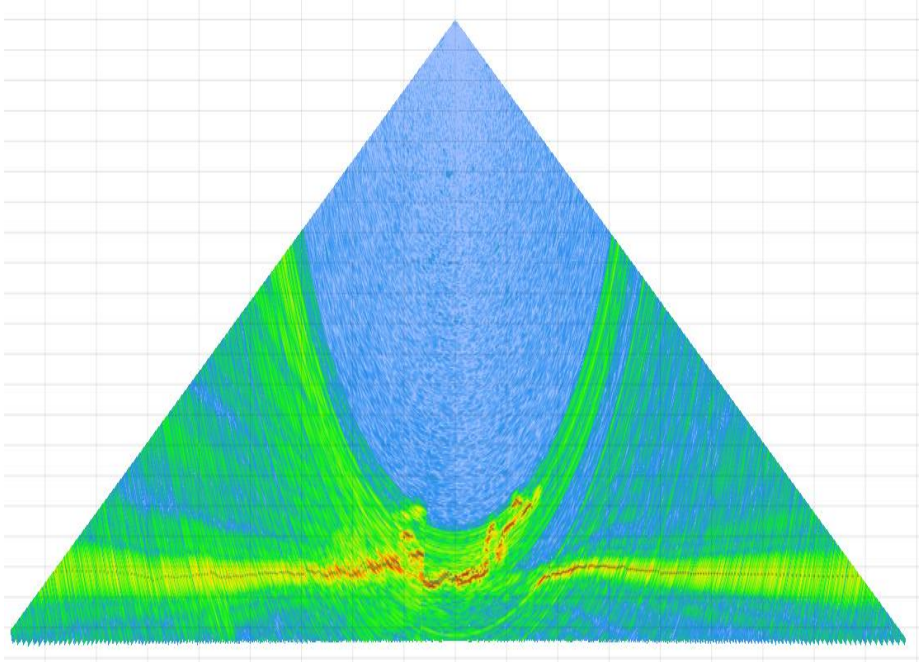




Rijkswaterstaat
Ministry of Infrastructure and the
Environment



Shallowest Point Determination

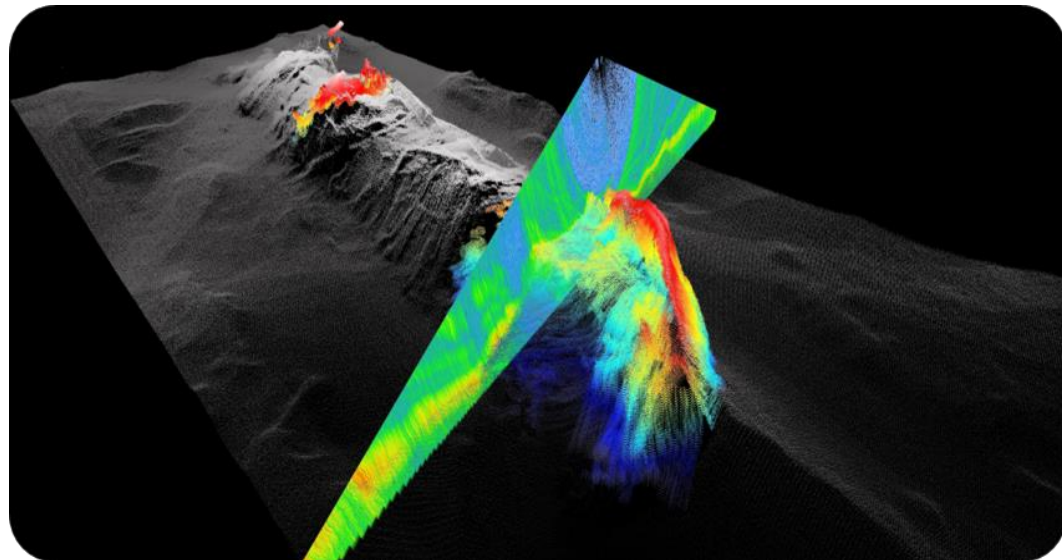
Bsc Thesis - Presentatie

Daan van der Heide CIV IGA / MIWB

07 July 2017

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- Subject
- Water Column Imaging theory
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- Conclusions
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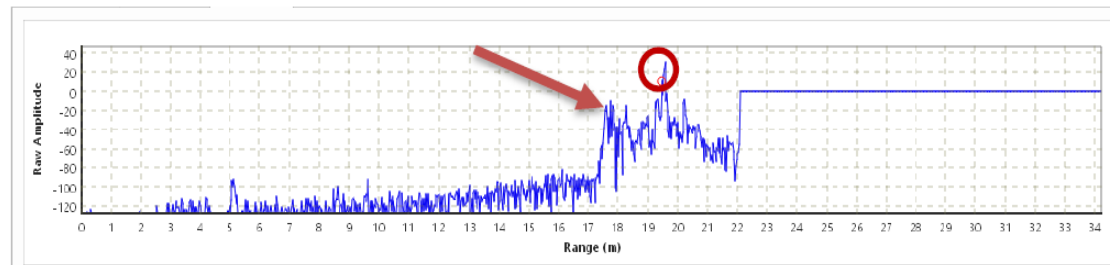
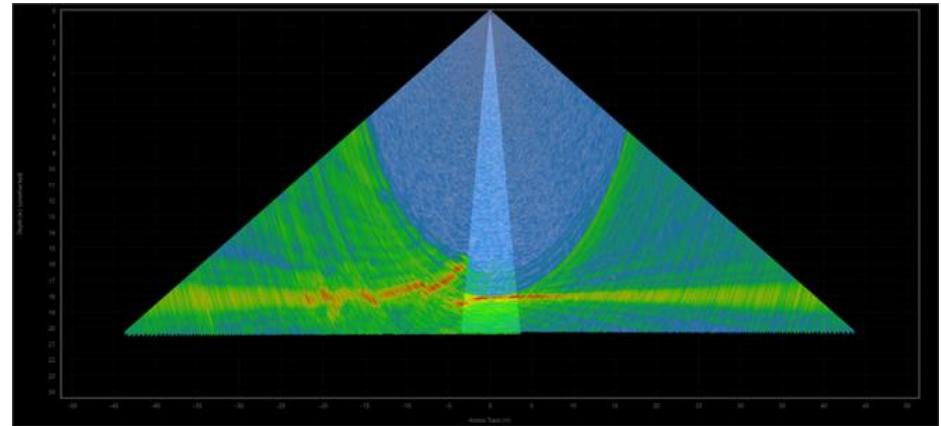


Subject

How can water column imaging be an aid for wreck surveys at Rijkswaterstaat?

Water column imaging

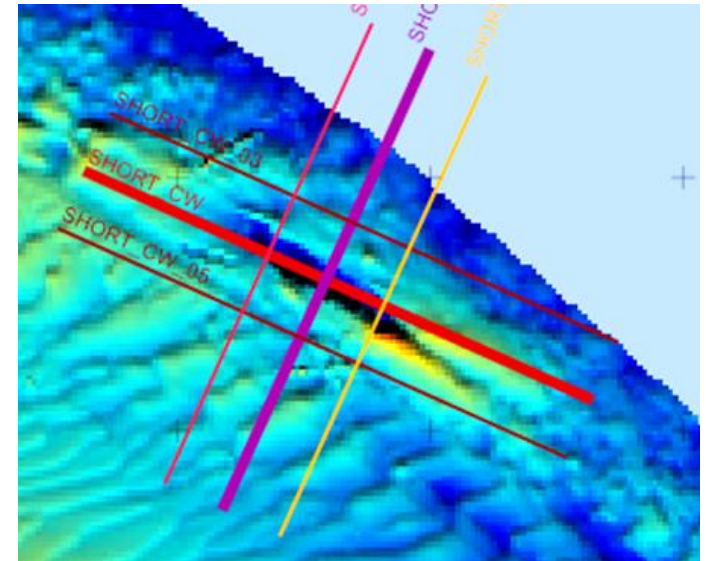
- Definition
- Detection methods
- Resolutions
 - Along-track
 - Across-track
 - Angular
 - Range





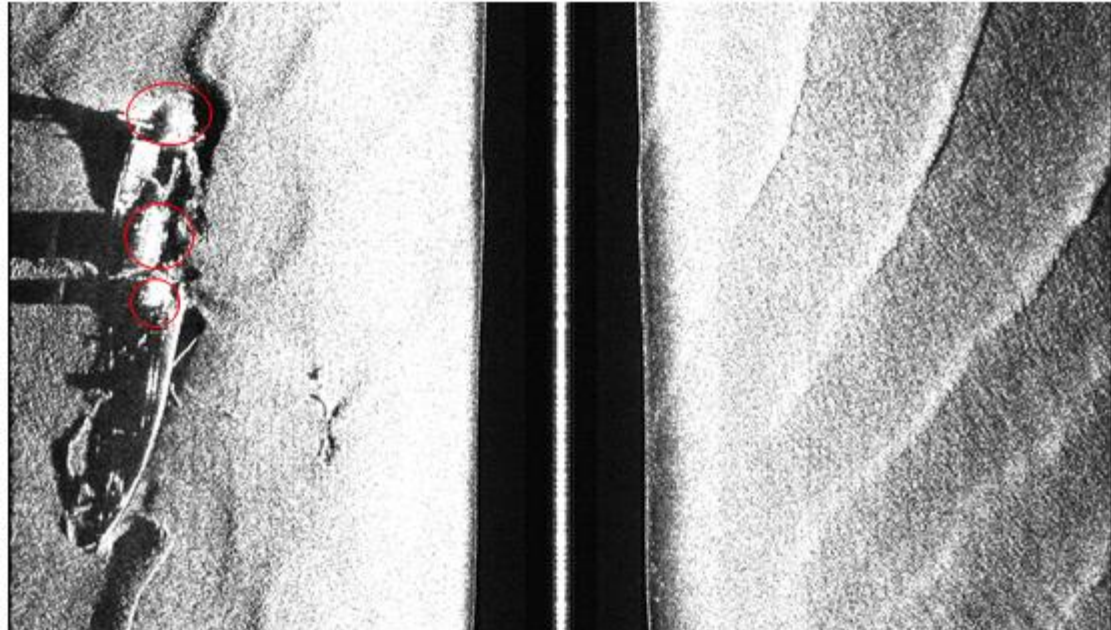
Methodology case studies

- Scope
 - Validation of different pulse lengths
 - Wreck characteristics
 - Optimal survey plan
- Run time parameters
- Filters



Case study 1: Wreck SR7285

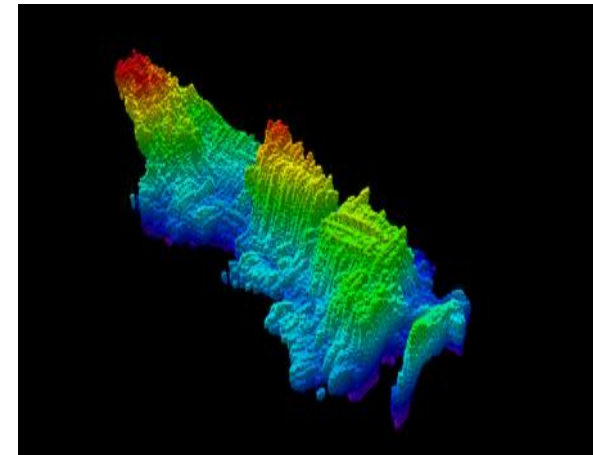
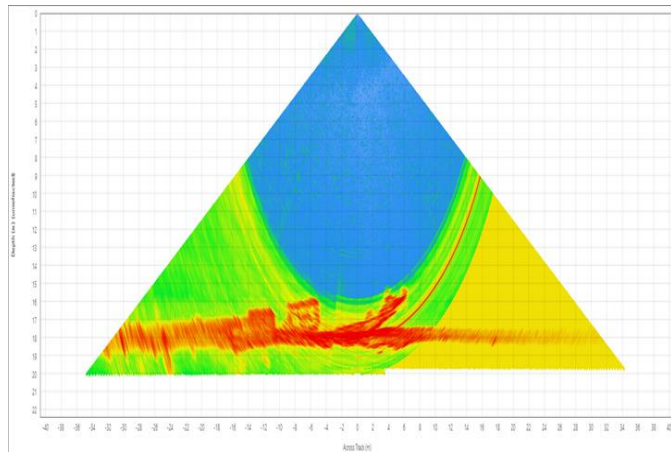
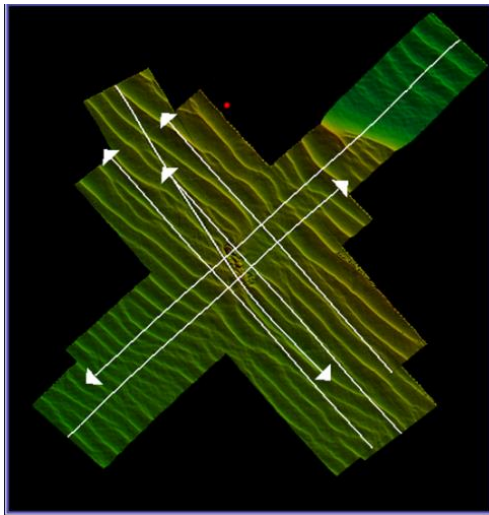
- Side scan sonar survey
- Diving operation
- Survey setup





Case study 1: Wreck SR7285

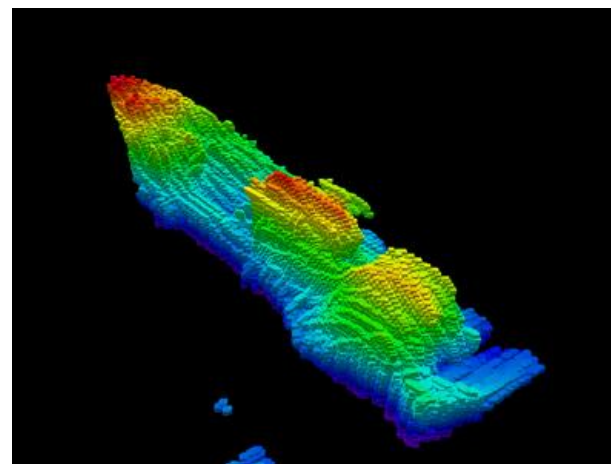
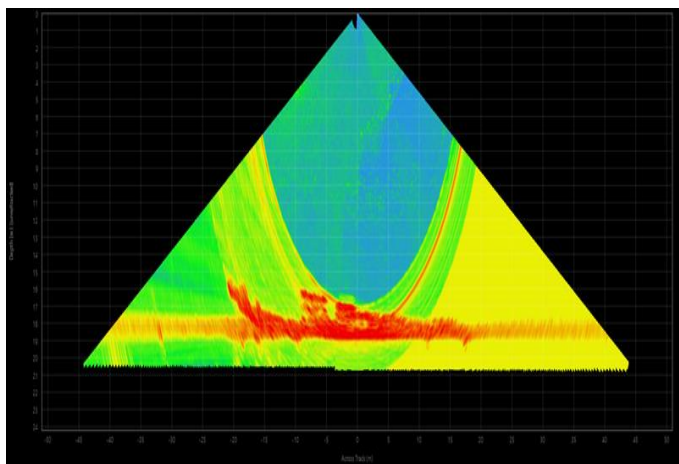
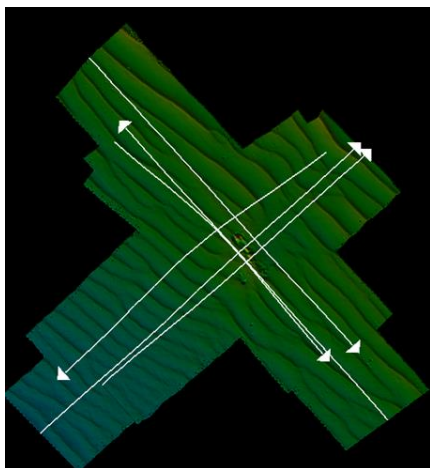
- Results Medium-CW – short phase ramp





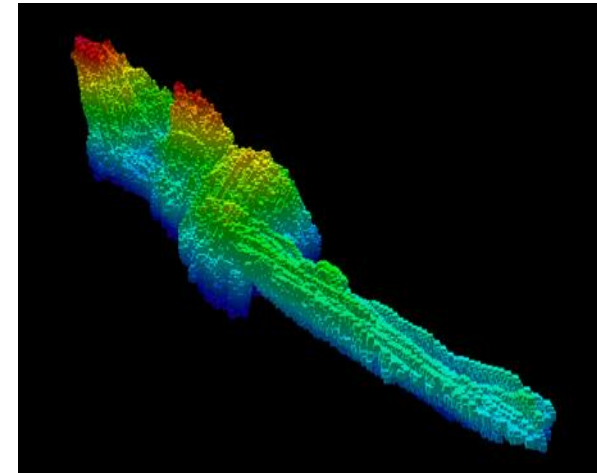
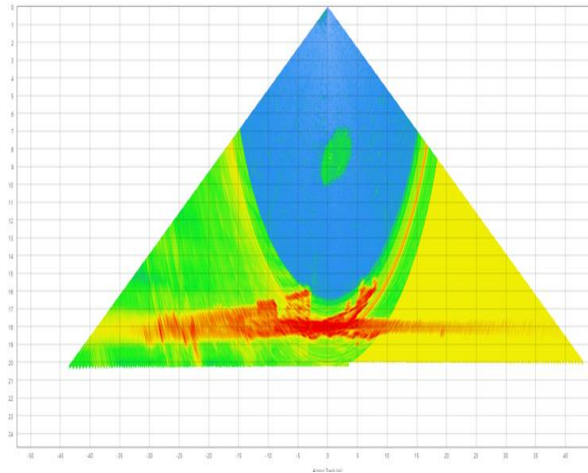
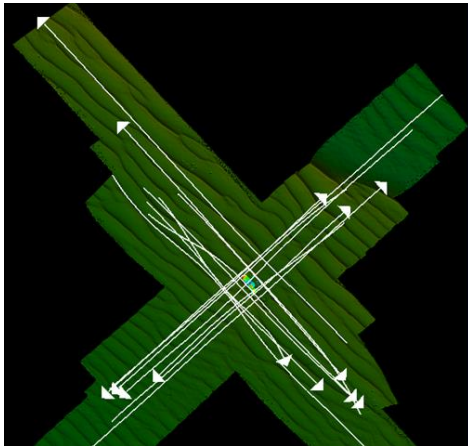
Case study 1: Wreck SR7285

- Results Long-CW



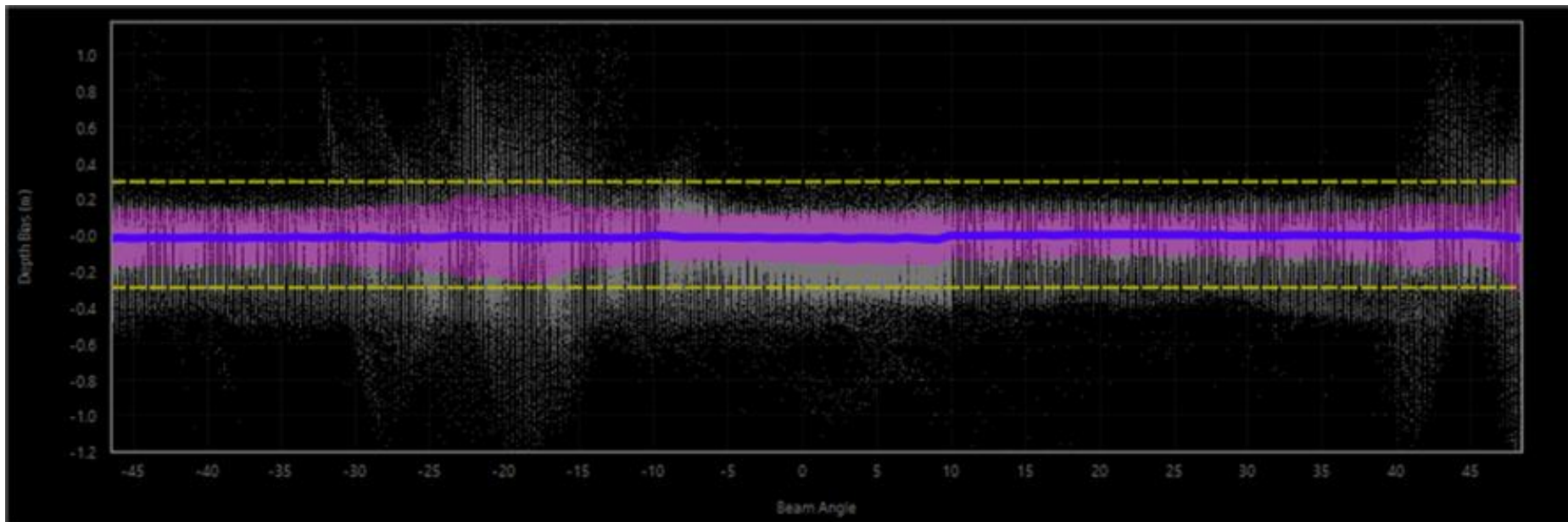
Case study 1: Wreck SR7285

- Results Medium-CW





Case study 1: Wreck SR7285





Case study 1: Wreck SR7285

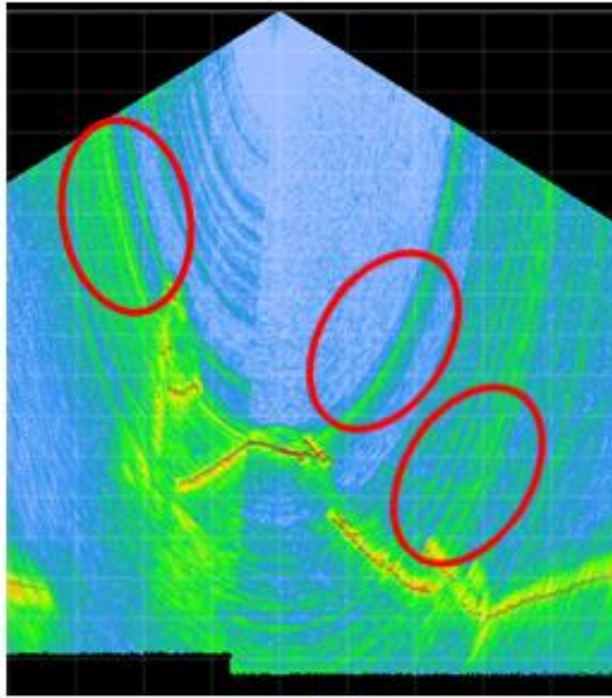
- Comparison table

Line groups	$\Delta_{\text{depth}}(\text{m})$
M_SP-A	-0.11
M_SP-B	-0.010
M_SP-C	-0.11
L-A	-0.010
L-B	+0.20
L-C	-0.010
M-A	+0.17
M-B	+0.15
M-C	+0.070
M-D	+0.070
M-E	+0.070

– Average depth difference: 0.041 m

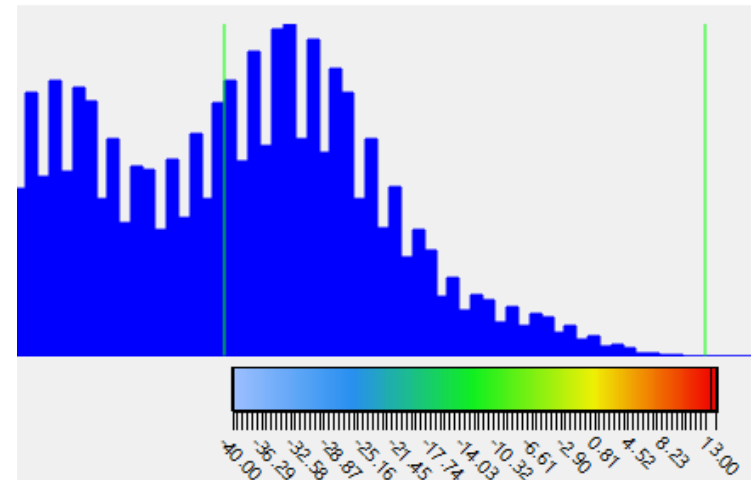
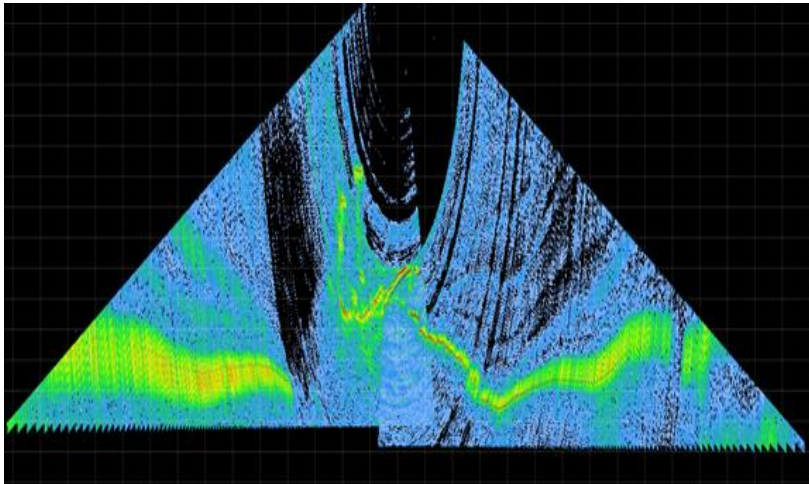
Case Study 2: Characteristics

- The different slant ranges in one single fan view;



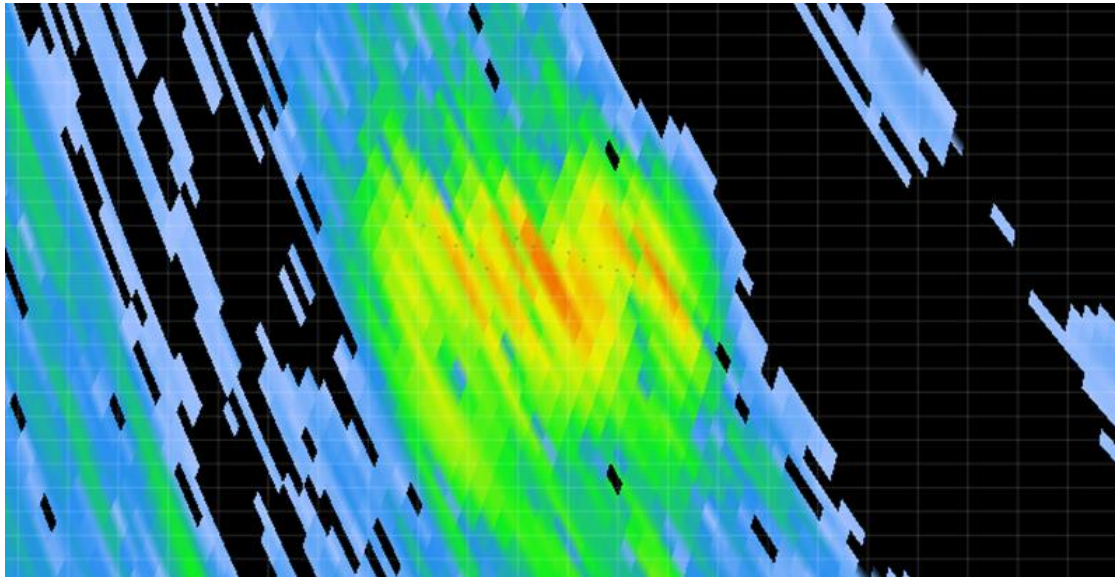
Case Study 2: Characteristics

- The intensity levels of wreck-targets are between -40dB up to and including 13dB;



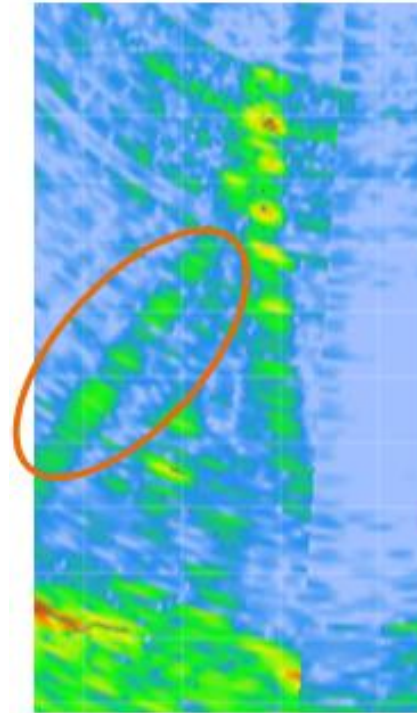
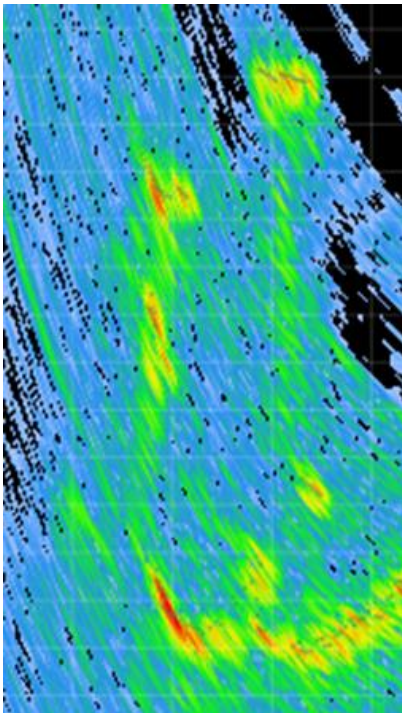
Case Study 2: Characteristics

- A low amplitude reflection around the sounding at steel (riveted) wreck-like targets;



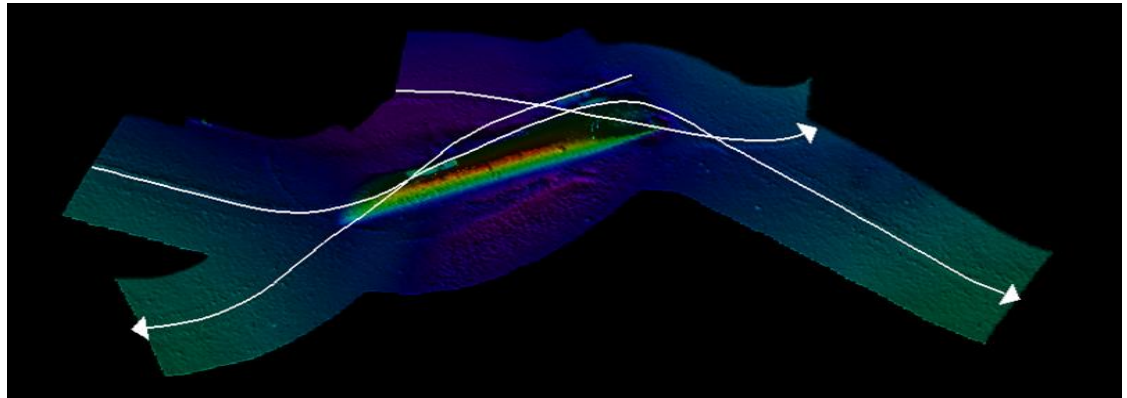
Case Study 2: Characteristics

- The number of low in amplitude spots below mast-like targets.



Case study 3: Wire sweeping vs WCI

- Setup
- Comparison
- IHO order



Method	Shallowest depth (m)	Point(s)
Wire	4.75	<i>Inapplicable</i>
WCI	4.85	2
Comparison	-0.10	<i>Inapplicable</i>



Conclusions

- Comparison between near absolute and WCI-data
- IHO standards for wreck-like surveys using WCI
- Optimal survey methodology
- **How can water column imaging be an aid for wreck surveys at Rijkswaterstaat?**
 - *Primary tool*
 - *IHO special order*
 - *Wreck-like target characteristics*



Recommendations

- Different weather and environment types
- FM pulse in comparison with CW pulses
- New nautical chart symbol



Vragen?



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