

KRAKEN SERVICES

REDUCE DEVELOPMENT COSTS

KATFISH™, SAS Survey

Patrick Merz Paranhos

VP, Integrated Services

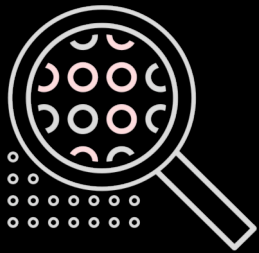
January 2023





EFFICIENCY AND CLARITY

THAT REDUCES DEVELOPMENT COST



+ 10x
RESOLUTION

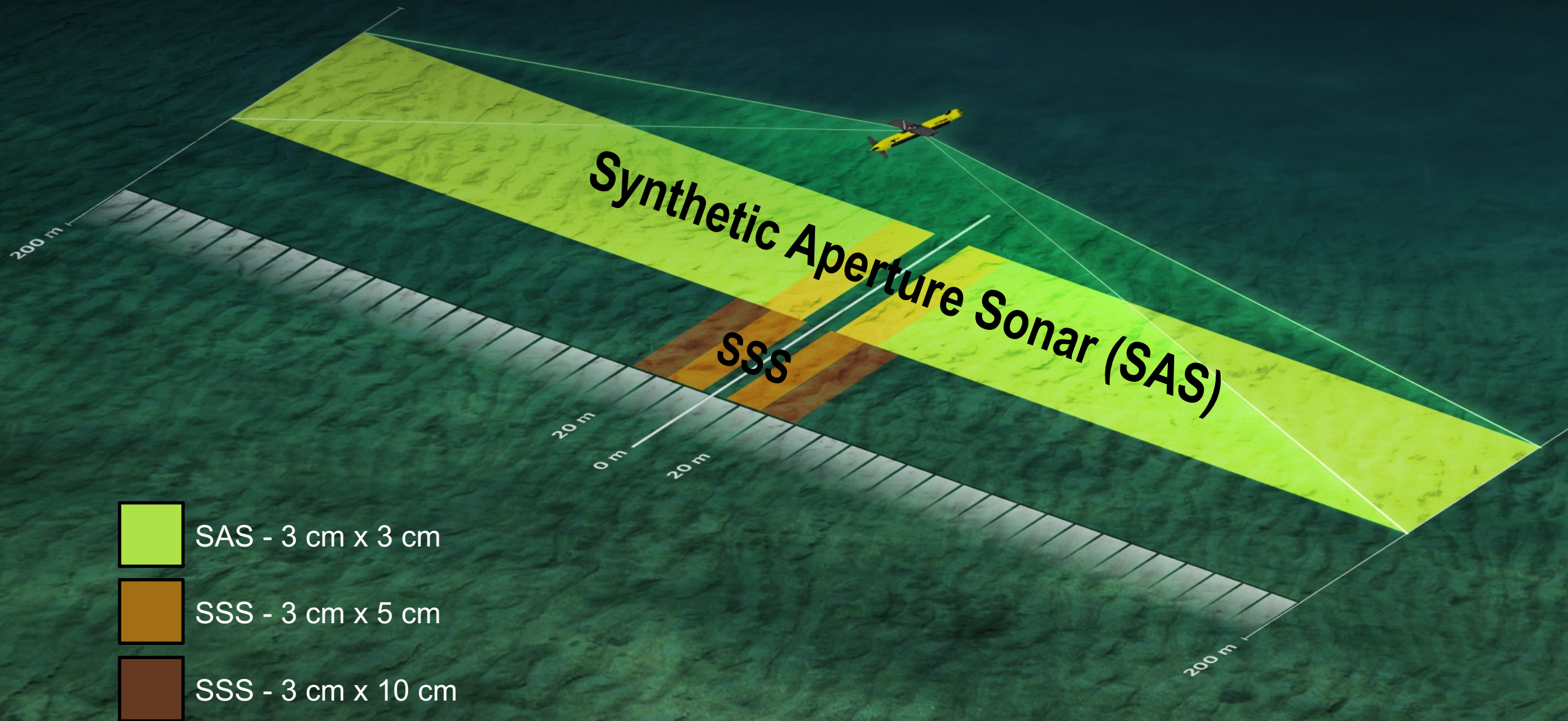


- 50%
VESSEL TIME



- 50%
SURVEY CO²

Breakthrough
SAS Technology
Compared to SSS





SAS SONAR

- 3.0 x 3.3 cm acoustic image
25.0 x 25.0 cm Bathy
400 m swath constant resolution
- Improves Characterization.
Improves Planning
Improves Geo-Hazard



SAS SONAR

3.0 x 3.3 cm acoustic image

→ 25.0 x 25.0 cm Bathy

400 m swath constant resolution

Improves Characterization.

→ Improves Planning

Improves Geo-Hazard

The background of the slide is a high-resolution acoustic image of a seabed. It shows a dark, textured surface with various features, including a prominent, light-colored, elongated object that appears to be a shipwreck or a large piece of debris. The image is rendered in a false-color style, with darker areas representing deeper water or shadows and lighter areas representing shallower water or reflective surfaces. A red rectangular bar is positioned in the upper left corner, containing the title 'SAS SONAR' in white, bold, sans-serif font. Below the bar, on the left side, is a list of capabilities in white text. The first three items are separated by horizontal lines, and the last two are preceded by right-pointing arrows. The overall layout is clean and professional, emphasizing the technical capabilities of the SAS SONAR system.

SAS SONAR

3.0 x 3.3 cm acoustic image

25.0 x 25.0 cm Bathy

→ **400 m swath constant resolution**

Improves Characterization.

Improves Planning

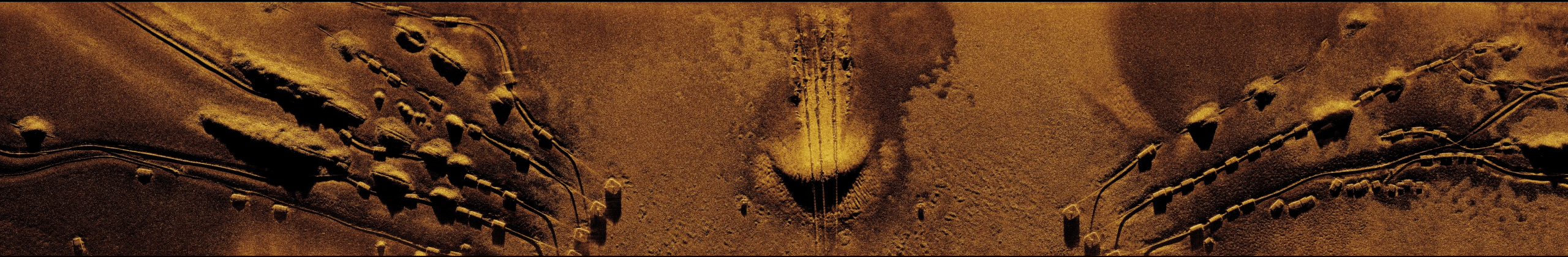
→ **Improves Geo-Hazard**



**DE-RISK
DEVELOPMENT**

+ 10X RESOLUTION

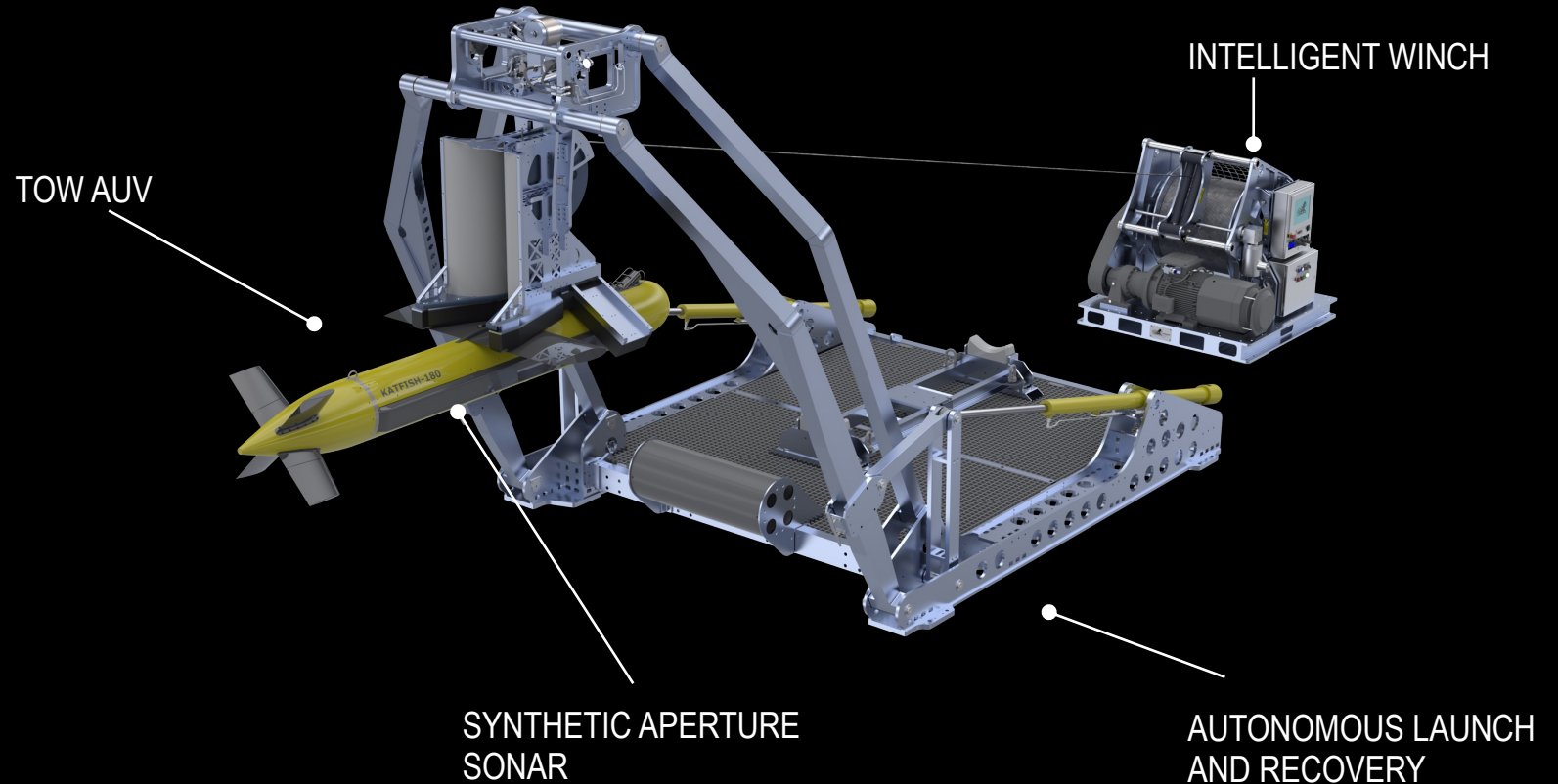
compared to SSS at 400m swath





KATFISH SYSTEM

Depth :	10 m – 300 m
Speed:	4 kts – 10 kts
ACR:	Up to 4 km ² / hr
Swath:	400 m
Seamless Imagery:	3.0 cm x 3.3 cm
3D IHO Bathymetry:	25.0 cm x 25.0 cm
Weather:	2.5 SWH





KATFISH SYSTEM

- 400 m swath SAS
- 10 knots survey speed
- 2.5 m SWH operations
- Increase Efficiency
- Reduce Survey Days
- Reduce Weather Days



KATFISH SYSTEM

400 m swath SAS

→ 10 knots survey speed

2.5 m SWH operations

Increase Efficiency

→ Reduce Survey Days

Reduce Weather Days



KATFISH SYSTEM

400 m swath SAS

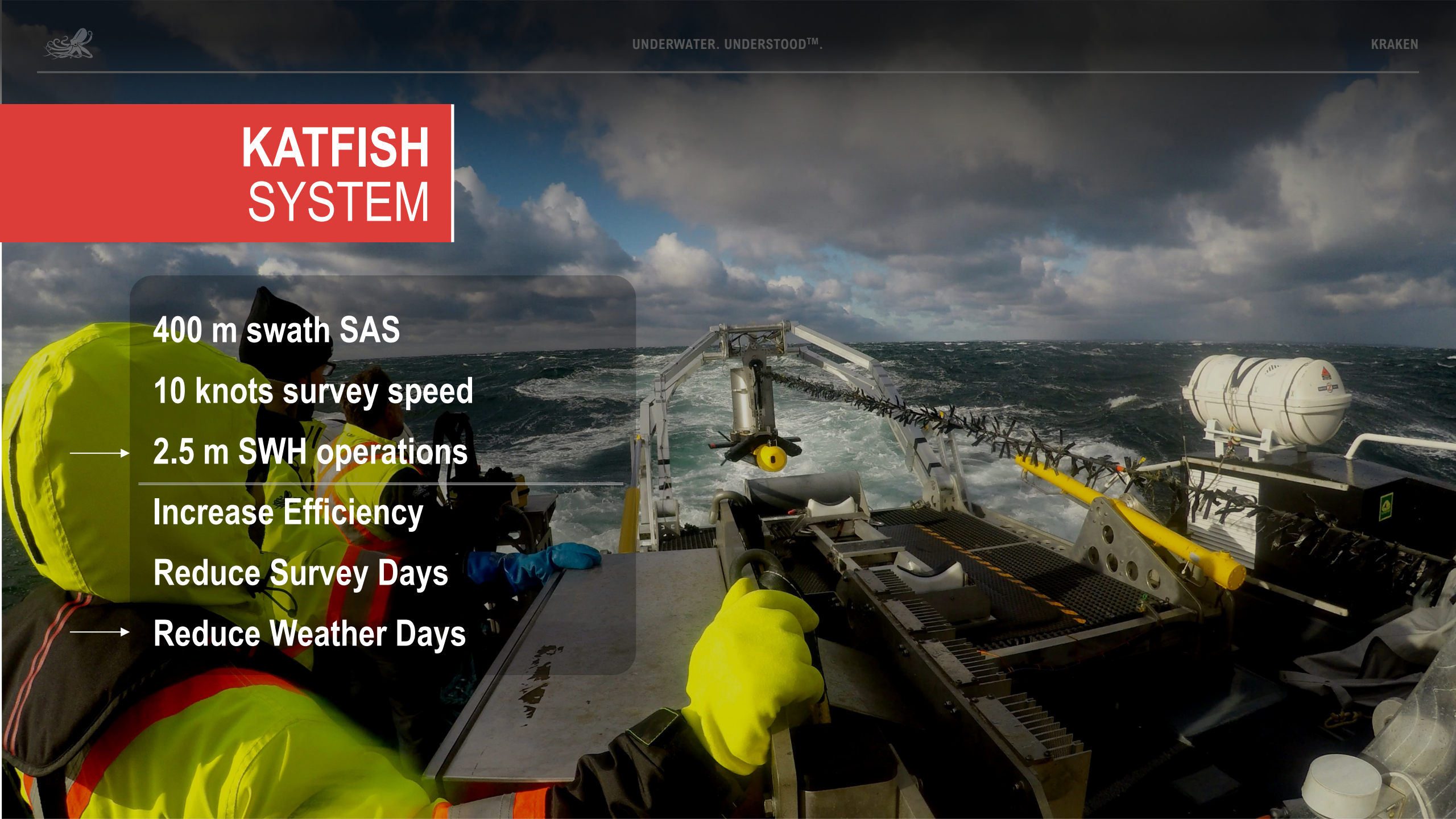
10 knots survey speed

→ 2.5 m SWH operations

Increase Efficiency

Reduce Survey Days

→ Reduce Weather Days





UNDERWATER. UNDERSTOOD™

KRAKEN

**REDUCE
SURVEY TIME**

- 50% VESSEL TIME

compared to SSS tow survey

MSF 2

MSF 1

22
20
18

22
20
18

22
20
18

22
20
18



FAST CAMPAIGNS, HIGH ROI

Reduce Development Costs

Site Survey: 254 km²

Location: North Sea

Start: 1st August

Survey Days: 16-days SAS vs 36-days SSS

Weather Days P(80): 3-days SAS vs 86-days SSS

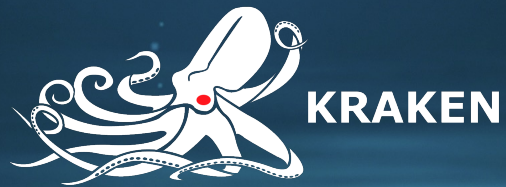
Save 103 Vessel Days
\$2.6 Million

Reduce Carbon Emission
3.1M KG CO²



Q&A

SSS vs SAS





SAS

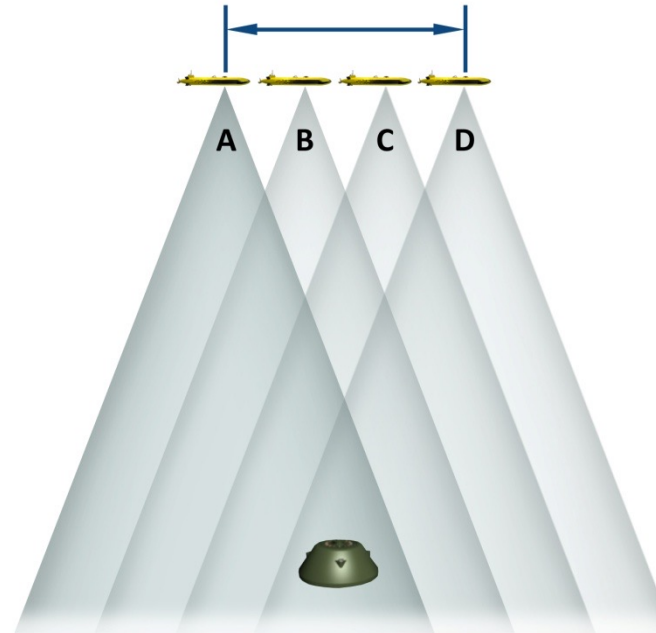
Compared to conventional sidescan sonar systems, SAS significantly improves the image resolution allowing for automatic detection and classification of small objects on the seafloor.

The principle of SAS is to move a sonar along a line and illuminate the same spot on the seafloor with several acoustic pings. This produces a “synthetic aperture” equal to the platform distance traveled.

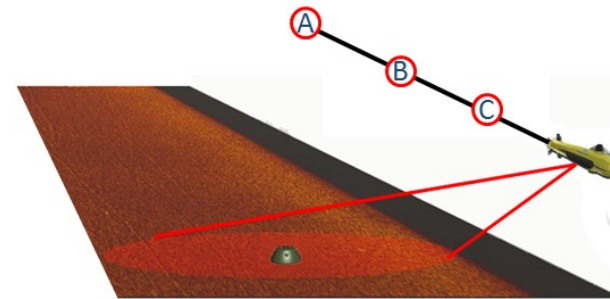
SAS uses sophisticated signal processing software to coherently recombine the acoustic pings and create ultra-high resolution images.

SAS image resolutions are MCM GRADE (5cm) and provide over 10x the area coverage rates of conventional sidescan sonar.

Interferometric SAS enables real-time 3D bathy data that’s co-registered with the imagery.



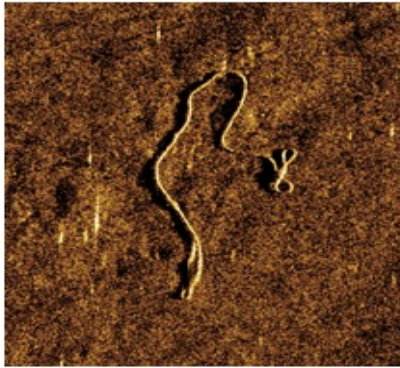
Along Track
Resolution = $\frac{L_t}{2}$
(independent of range
and frequency)



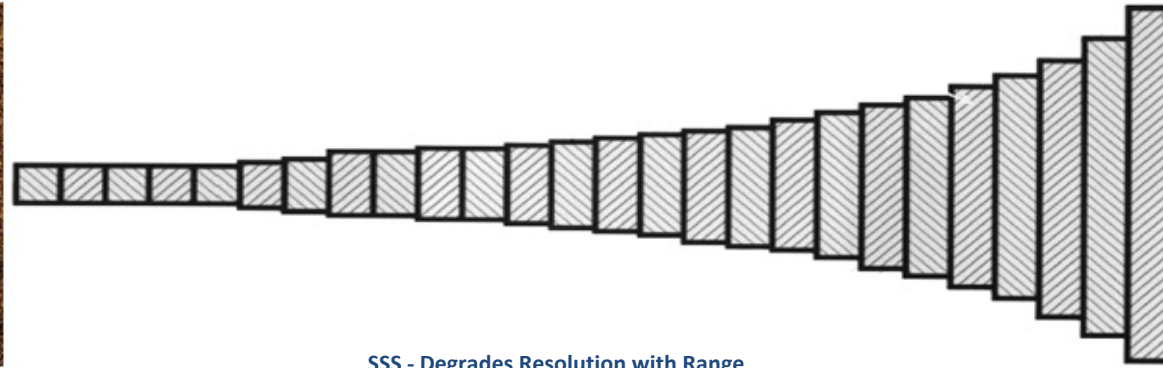


Why is SAS better than SSS ?

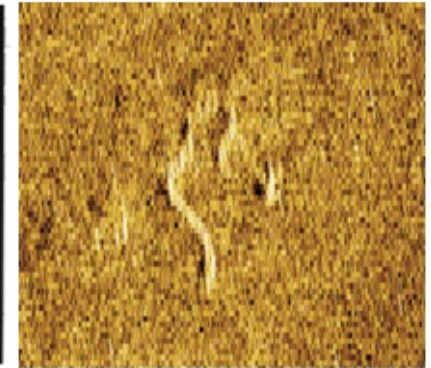
SAS vs SSS



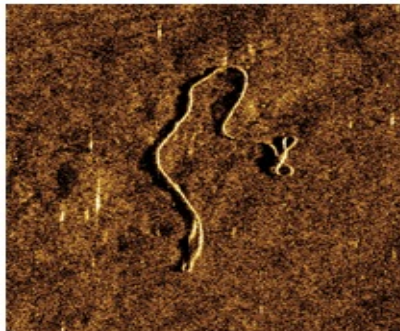
SSS at 5m



SSS - Degrades Resolution with Range



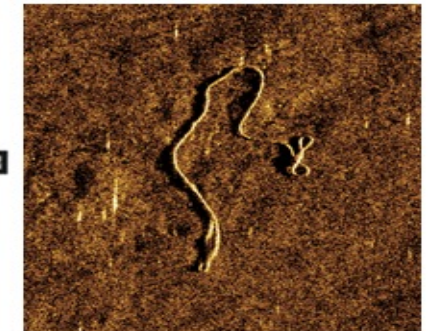
SSS at 100m



SAS at 5m



SAS - Constant Resolution with Range

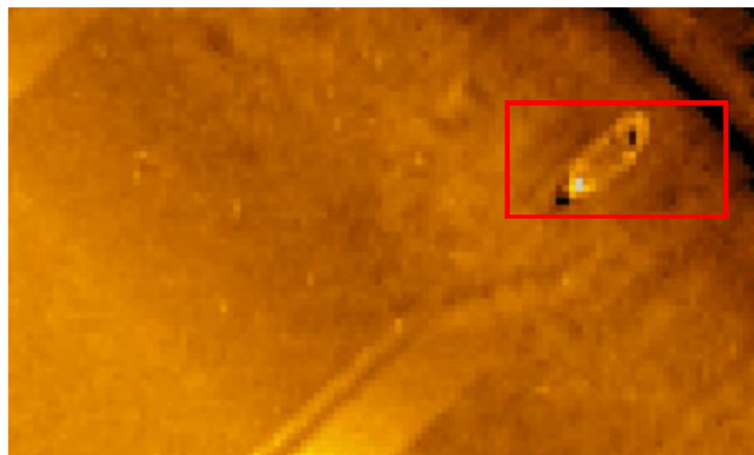
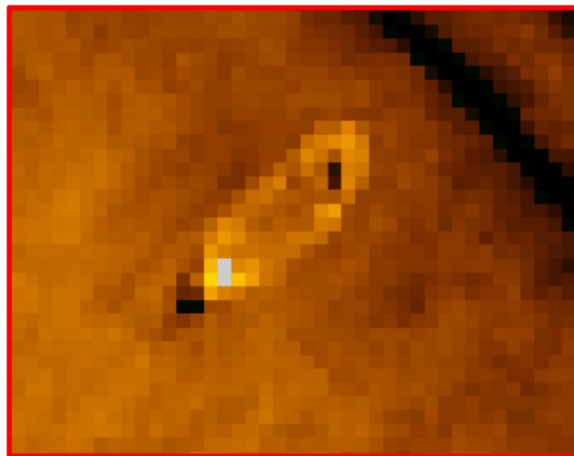


SAS at 100m

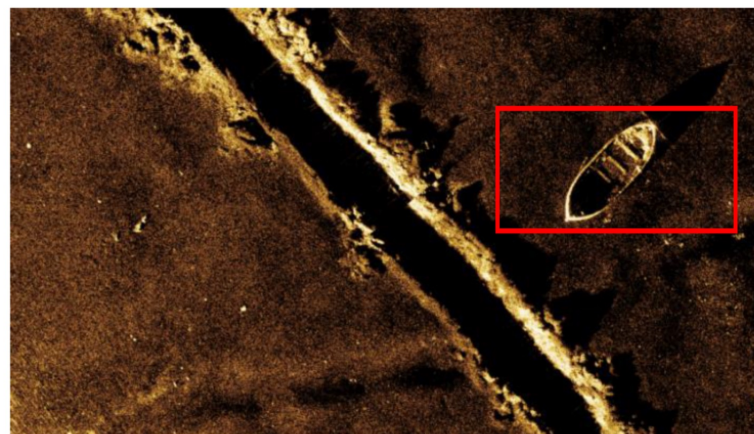


SYNTHETIC APERTURE SONAR

10x SSS Resolution at 150m range



SSS on AUV
900 kHz



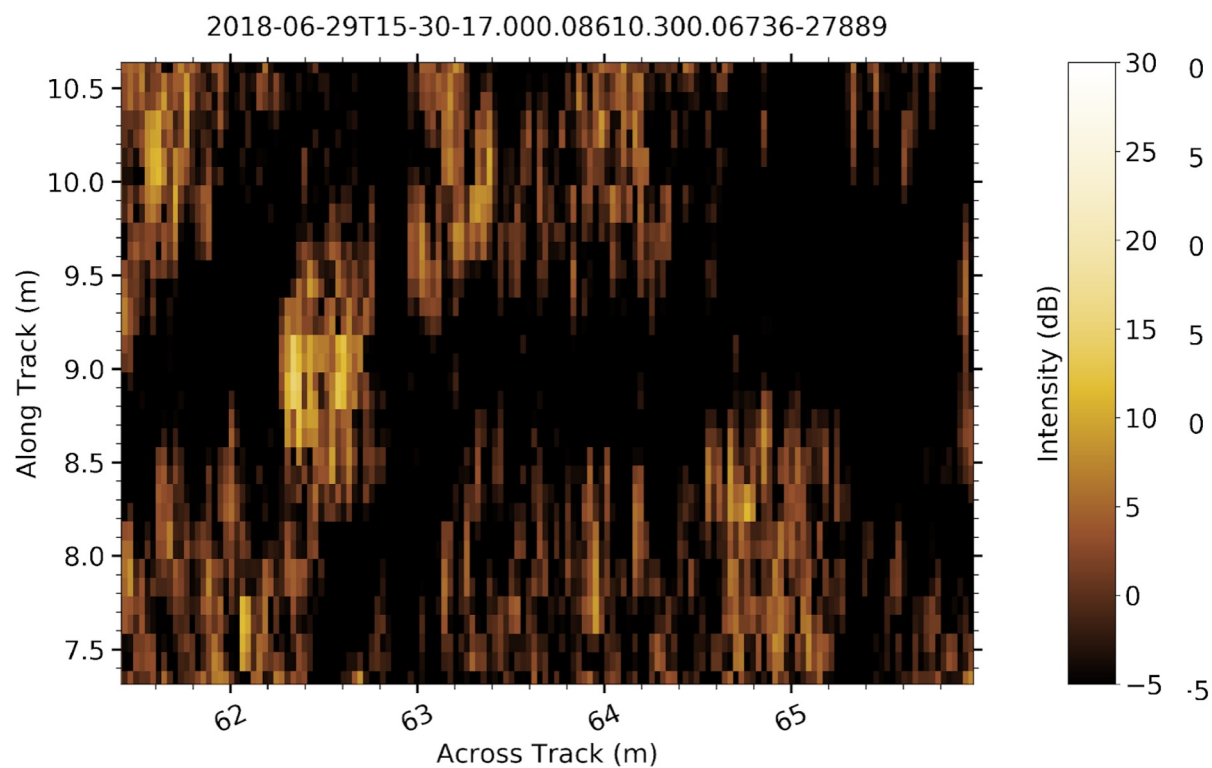
SAS on same AUV
337 kHz



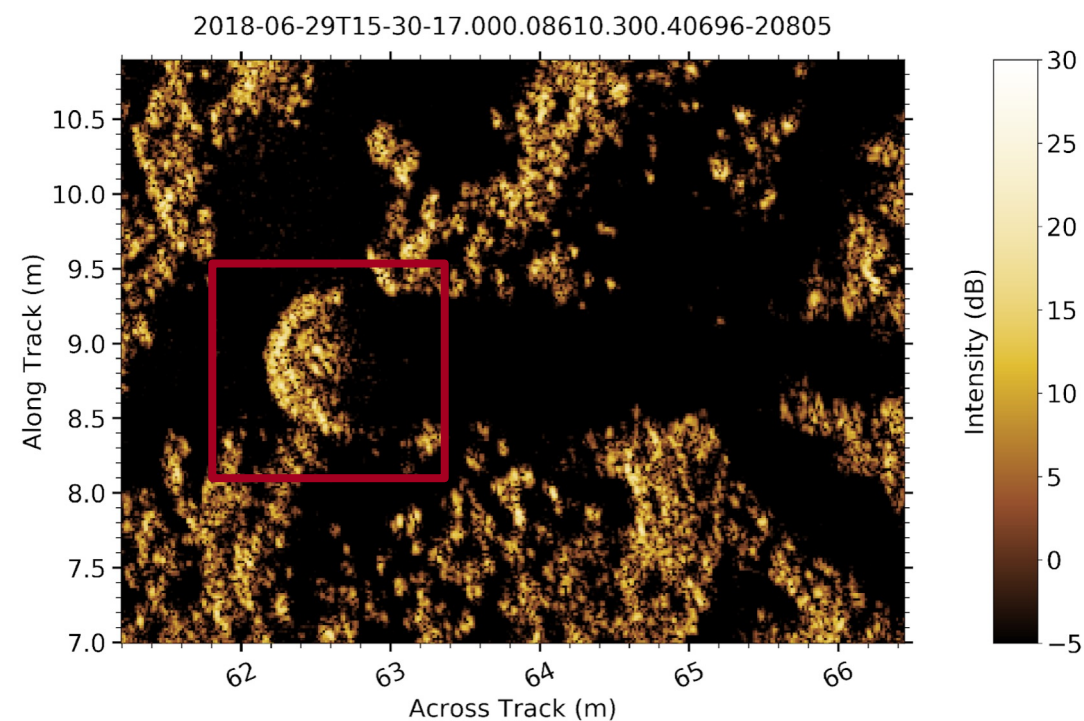
SYNTHETIC APERTURE SONAR

Target Identification

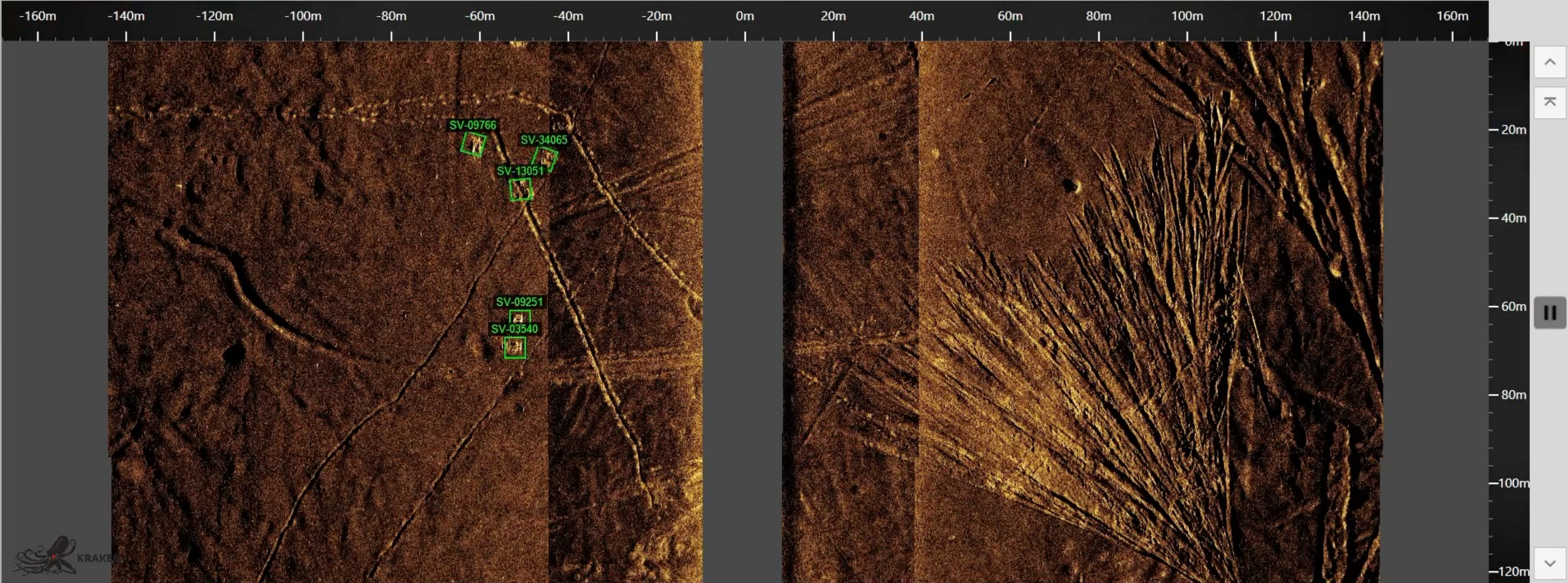
**SSS Resolution at 65m
(3 cm x 35 cm)**



**SAS Resolution at 65m
(2 cm x 2 cm)**



Connection Diagnostics									
CONFIGURED	ALTITUDE 15.0 m	SPEED 6.6 kn	SPEED OF SOUND 1463.0 m/s	WATER TEMP 4 °C	PITCH INT	ROLL INT	PULSE INTERVAL 210 ms	PULSE LENGTH 12 ms	GAIN 54 dB
ACTUAL	ALTITUDE 14.8 m	SPEED 6.7 kn	SPEED OF SOUND 1462.6 m/s	WATER TEMP 4 °C	PITCH -1.3 °	ROLL 0.1 °	DEPTH 54.8 m	MODE --	





Q&A

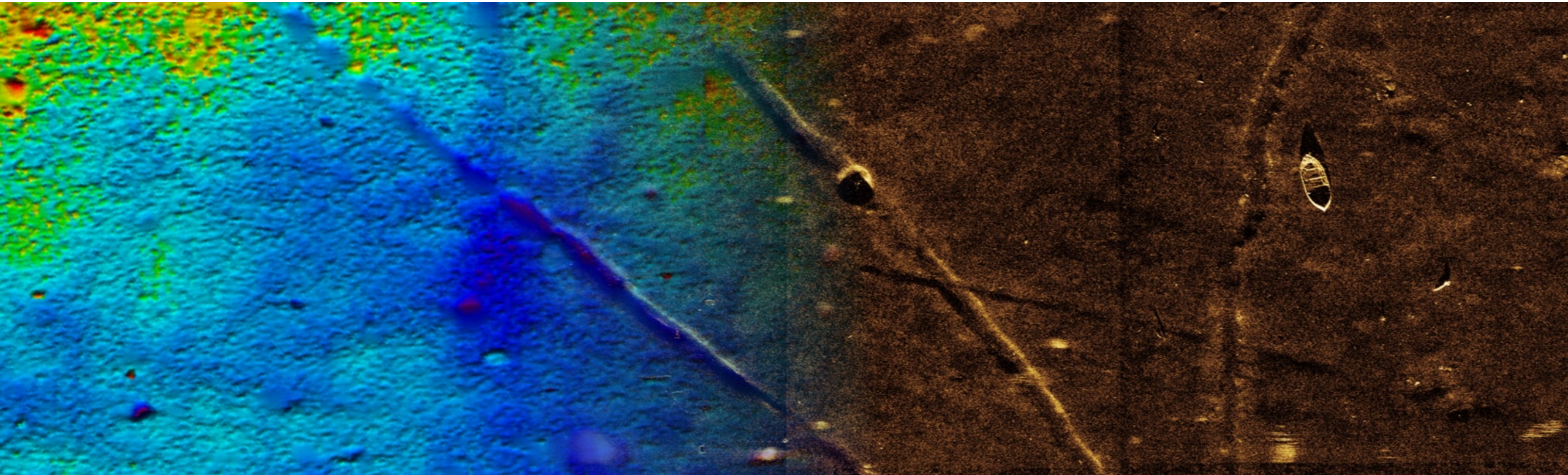
SAS Bathy vs MBES

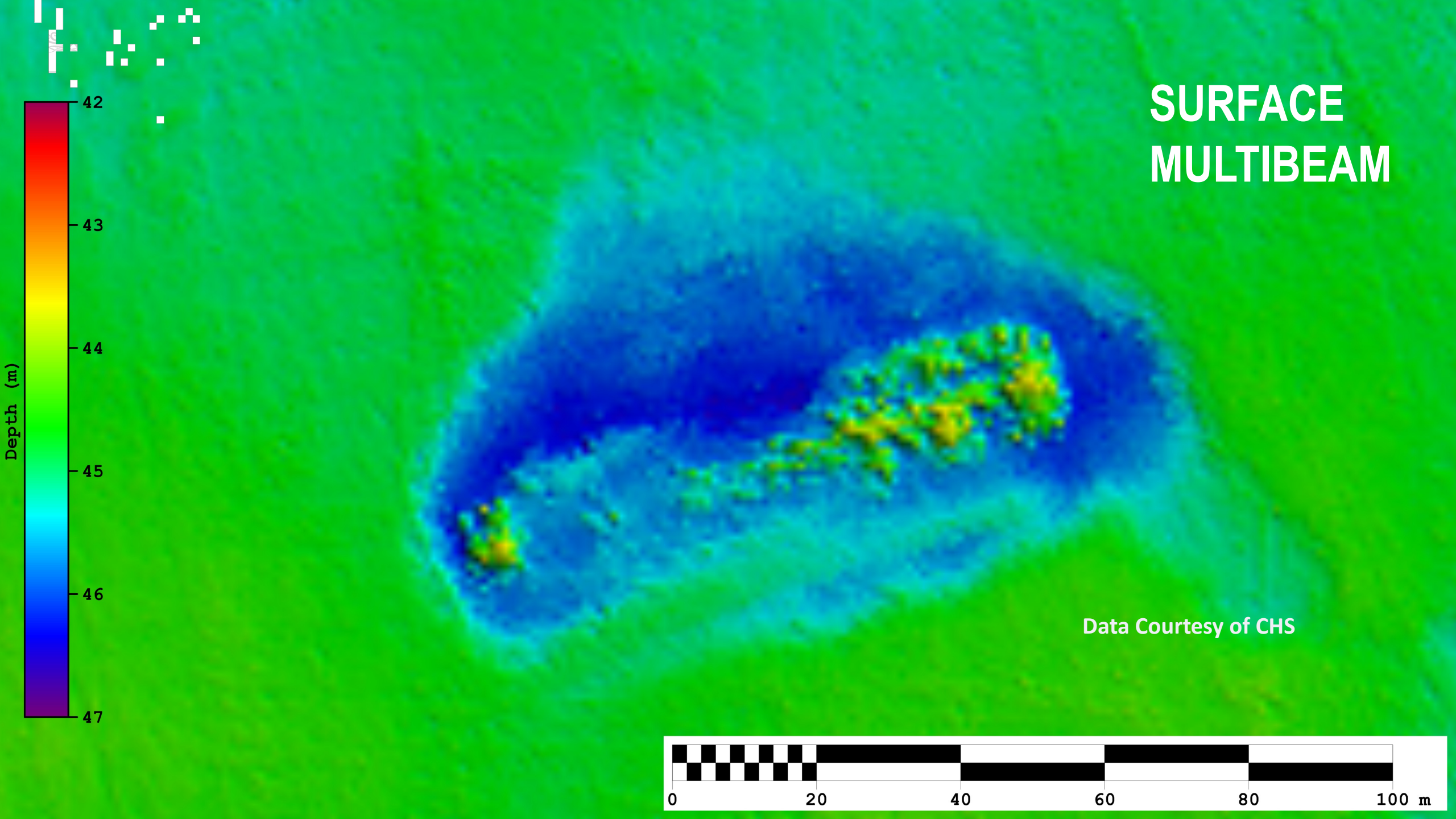




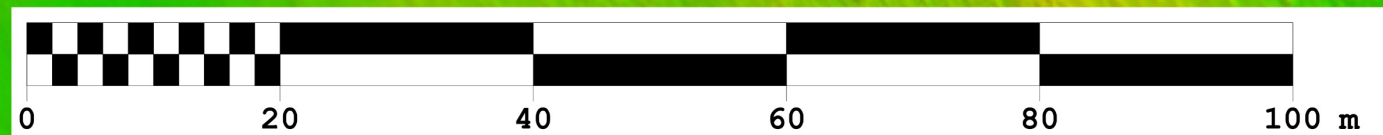
How good is SAS Bathymetry ?

25 x 25 cm resolution at 300 m swath.





SAS BATHYMETRY

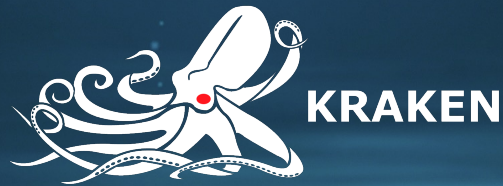






Q&A

KATFISH on USV / Vessel





Rapid Mobilization

- Integrated Tentacle Winch, KATFISH, and LARS
- Available in ISO Footprint
- Complete system can be quickly installed or removed from vessel as required
- Heave Compensated winch and A Frame to reduce risk during Launch and Recovery





KATFISH – Installed on 12+ Types of Vessels





THANK YOU

