IMPORTANCE OF SV FOR HYDROGRAPHIC SEABED MAPPING

AGENDA

1. Intro
2. Importance of SV
3. SV Data Collection
4. Success Stories
5. Q&A

WHO ARE WE?

David Wilson
Regional Sales Manager, EMEA

AML provides ocean sensing solutions. We help our customers remove the unpredictability - economic and technical - from their survey operations.

We Make it Easy

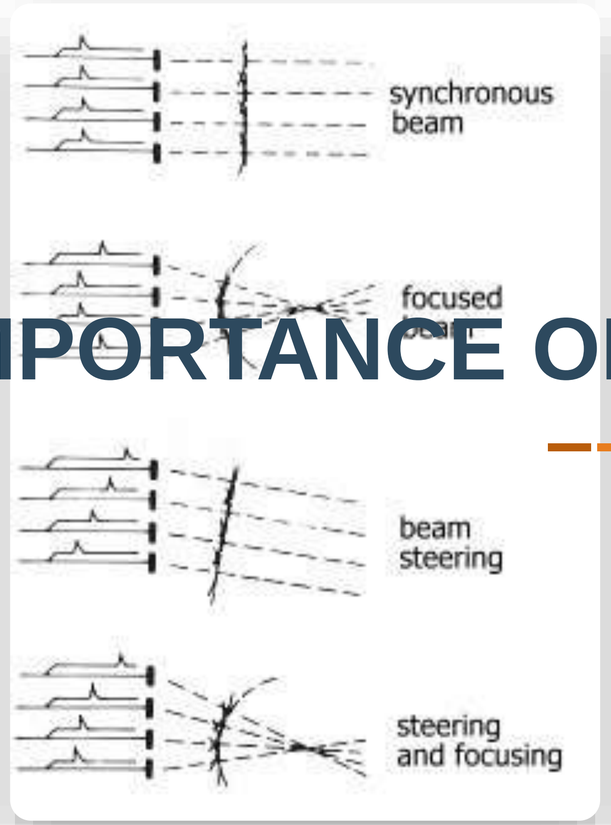
- Family of oceanographic instruments and sensors
- Sensors are interchangeable with other instruments
- Sensor heads are calibrated independently

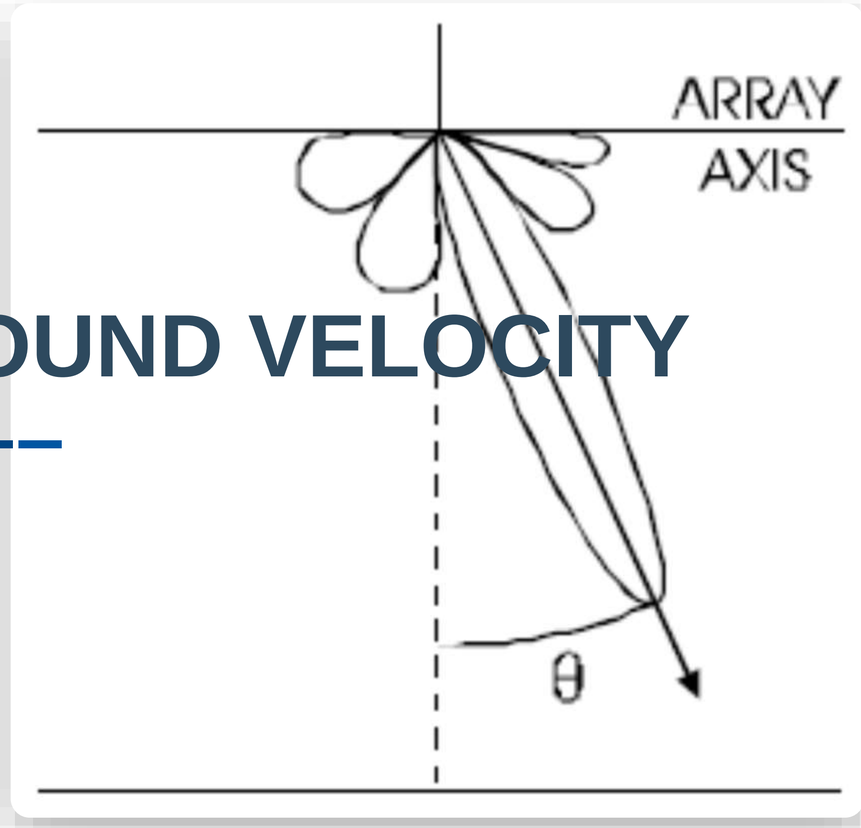
Where is sound velocity measurement used in multibeam systems?

(1) At the multibeam head for the purposes of beam steering (changing the “listening direction” of a multibeam head → one ping, many “ears”)

IMPORTANCE OF SOUND VELOCITY

Induced time delay between elements is a function of local SV.





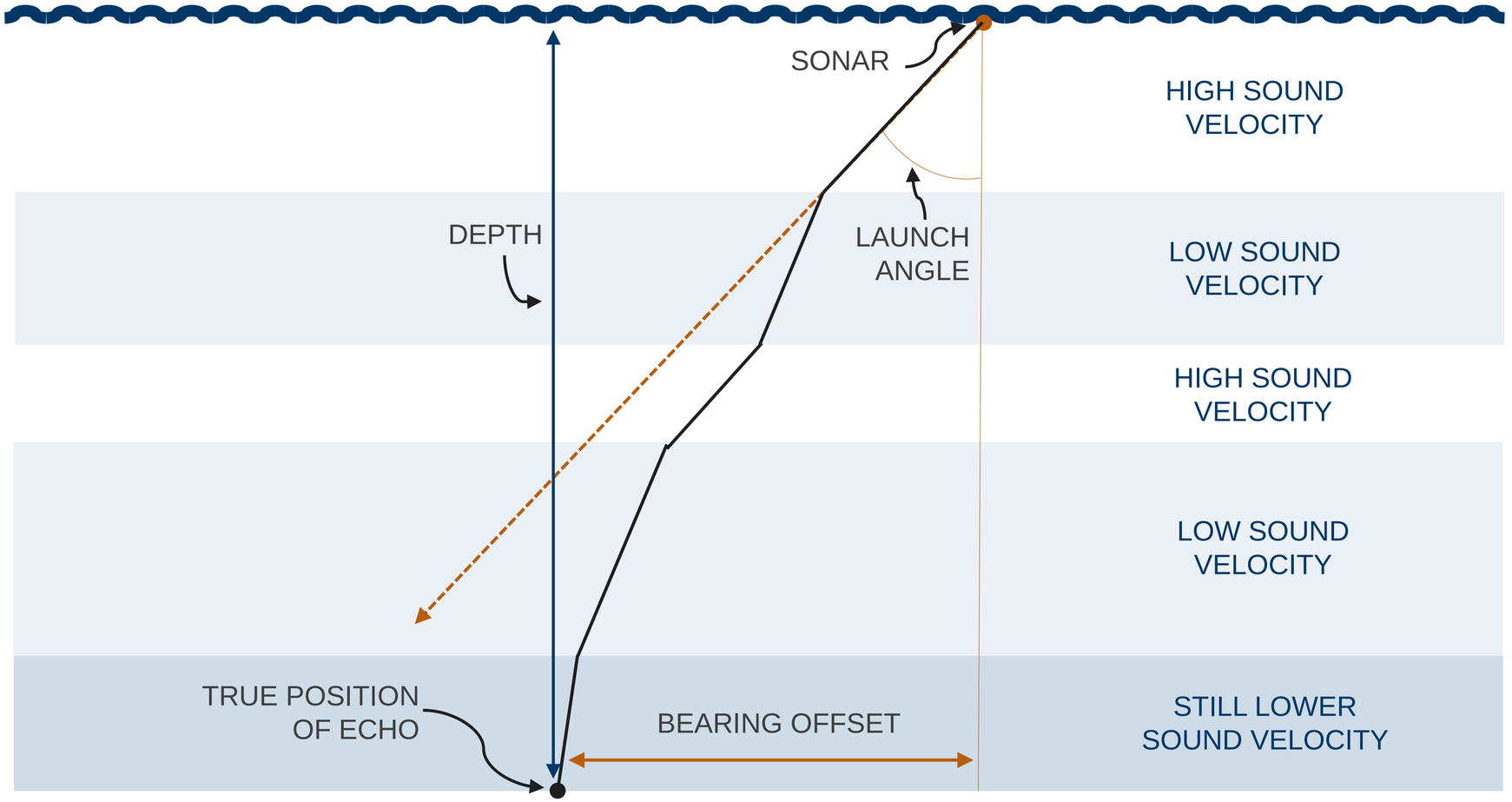
Sound speed measurement at a multibeam head is critical for proper beam steering control.

Where is sound velocity measurement used in multibeam systems?

(2) Within the water column itself to correct for both refraction and range errors.

Snells Law:

$n_1 \sin(\theta_1) = n_2 \sin(\theta_2)$



CTD-Derived SV vs ToF SV Measurement

CTD profilers use an empirically-derived conversion to compute SV.

Measurement/Equation	Accuracy
Conductivity	0.003 mS/cm
Temperature	0.005˚C
Pressure	0.05 %FS
CT&P conversion to salinity(S)	0.01 ppt
ST&P conversion to sound speed	0.19 m/s

Generally accepted accuracy of CTD-SV: **0.25 m/s**

ToF SV profilers measure SV directly.

Accepted accuracy of ToF SV: **0.025 m/s**

How often should I be taking a profile?

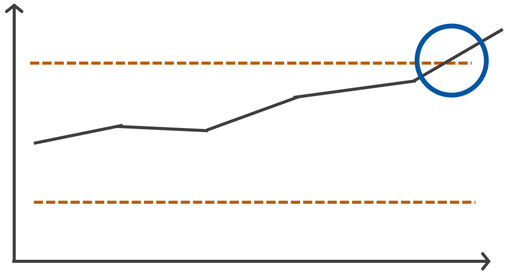
General Guidelines

Temporal Based

Once per *X* hour, give or take.

Spatial Based

Once every *x* km.



Sea Surface SV Changes

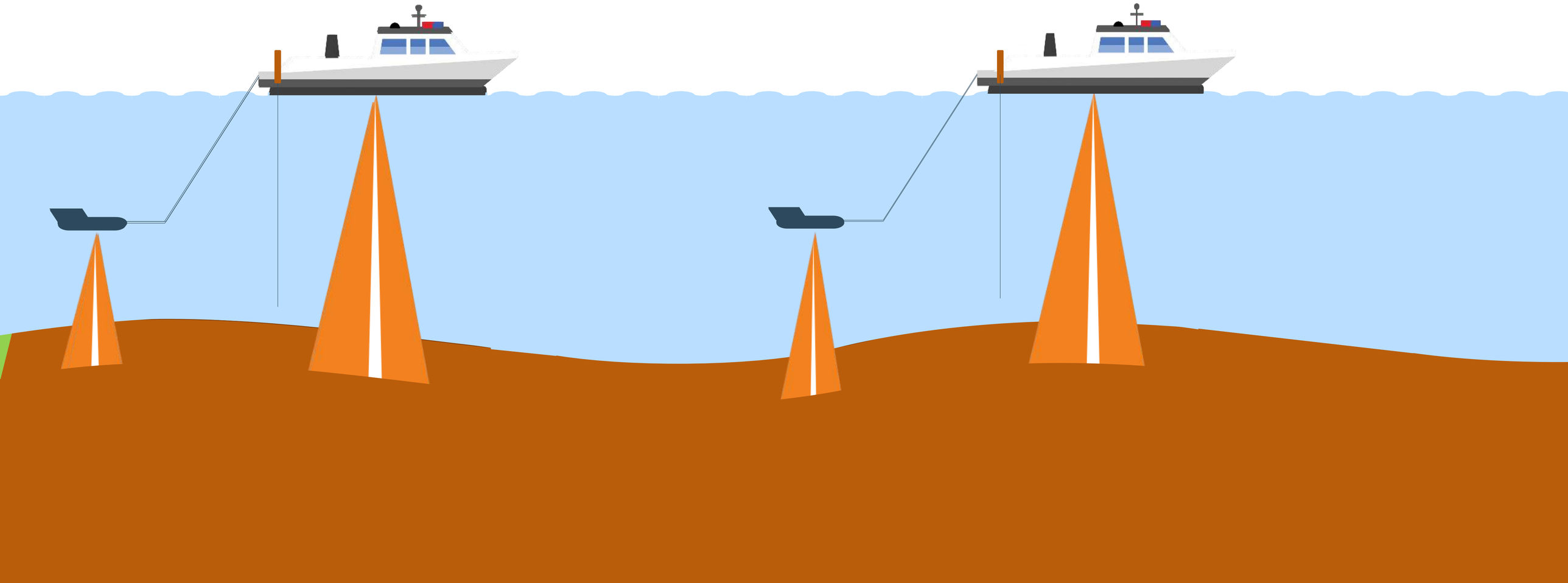
Once the sea surface SV changes by more than some fixed amount (~*X* m/s)

OR

- Once per day
- Never?

← Certainly not compatible with an IHO-level survey

TRADITIONAL SV DATA COLLECTION PROCESS



WHAT IF YOU COULD:

Increase Efficiency & Decrease Costs

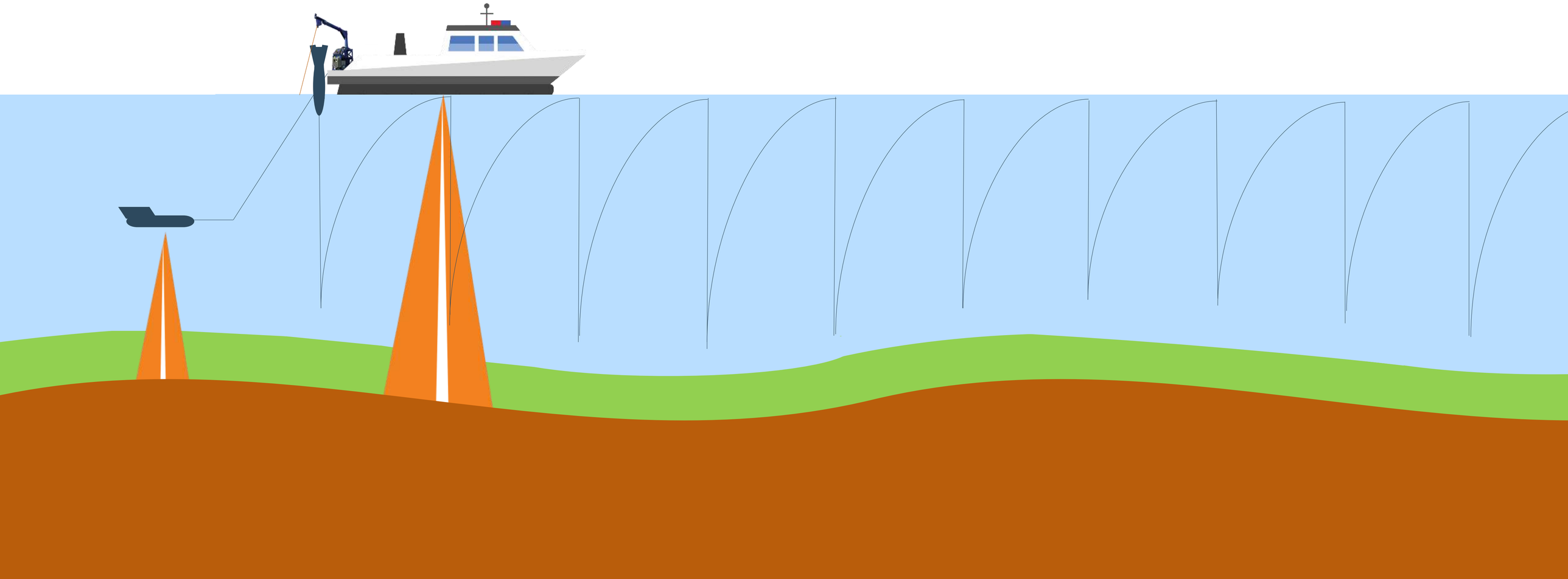
Improve Data Quality

Eliminate XBT Management

…regardless of oceanographic conditions!

AML OCEANOGRAPHIC

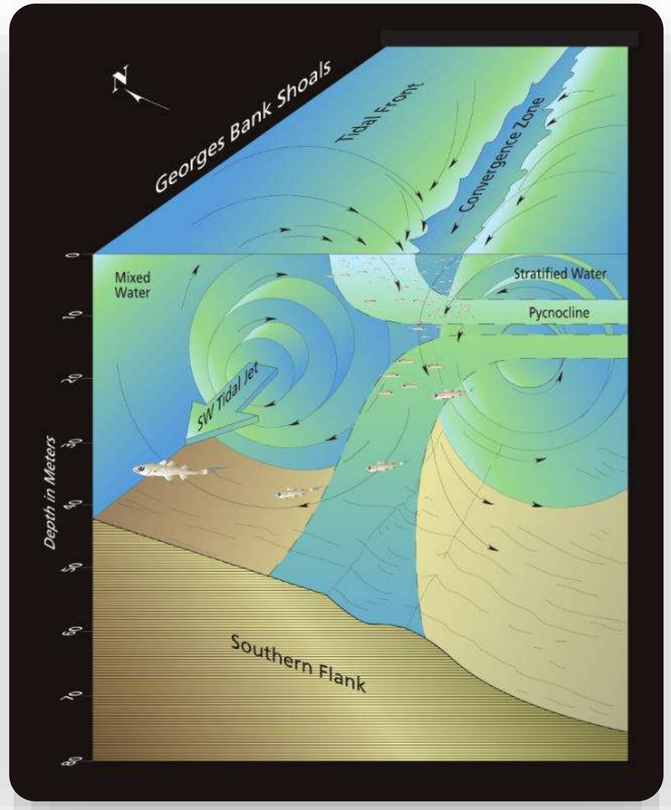
ALTERNATIVE SV DATA COLLECTION PROCESS



CASE STUDY

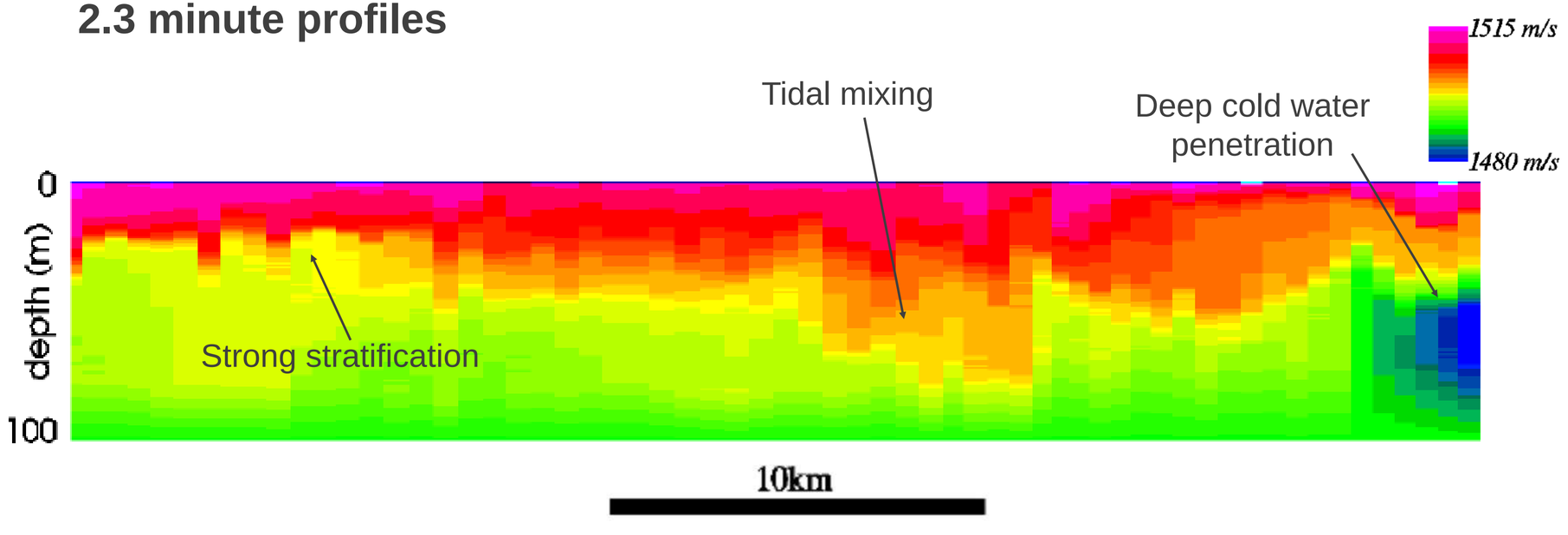
How often should I be taking a profile?

A demonstration of what happens when a water mass is under-sampled.



COMPARISON: TIME BETWEEN PROFILES

2.3 minute profiles

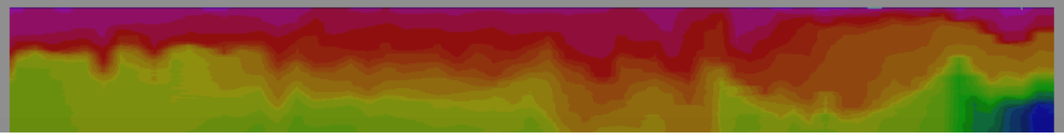


140 minute profiles

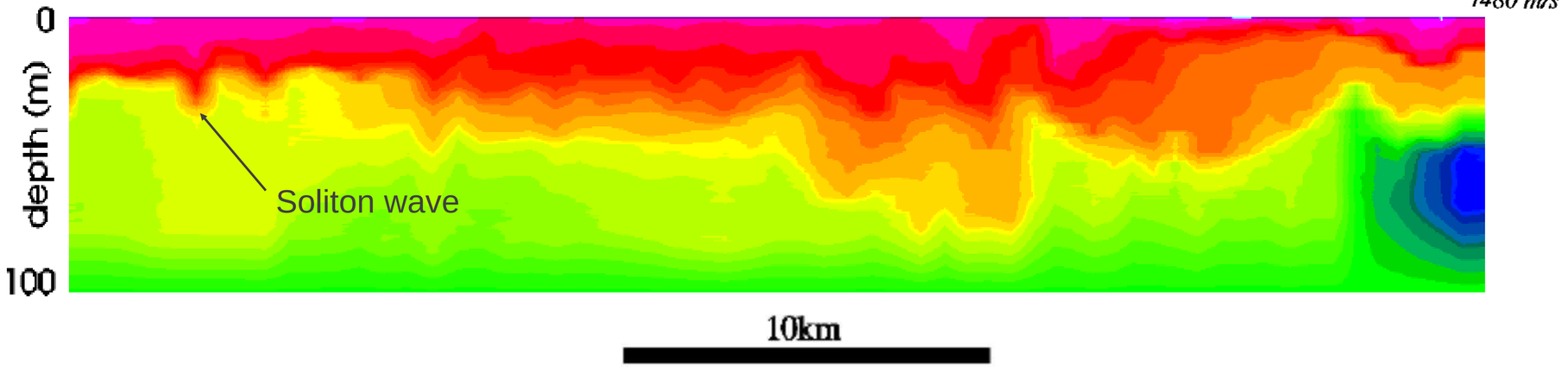
Source: Integration of near-continuous sound speed profile information. J. H. Clarke, M. Lamlugh, E. Kammerer. May 2000

Interpolated

2.3 minute profiles
(~continuous)



Interpolation Model



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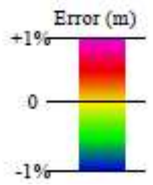
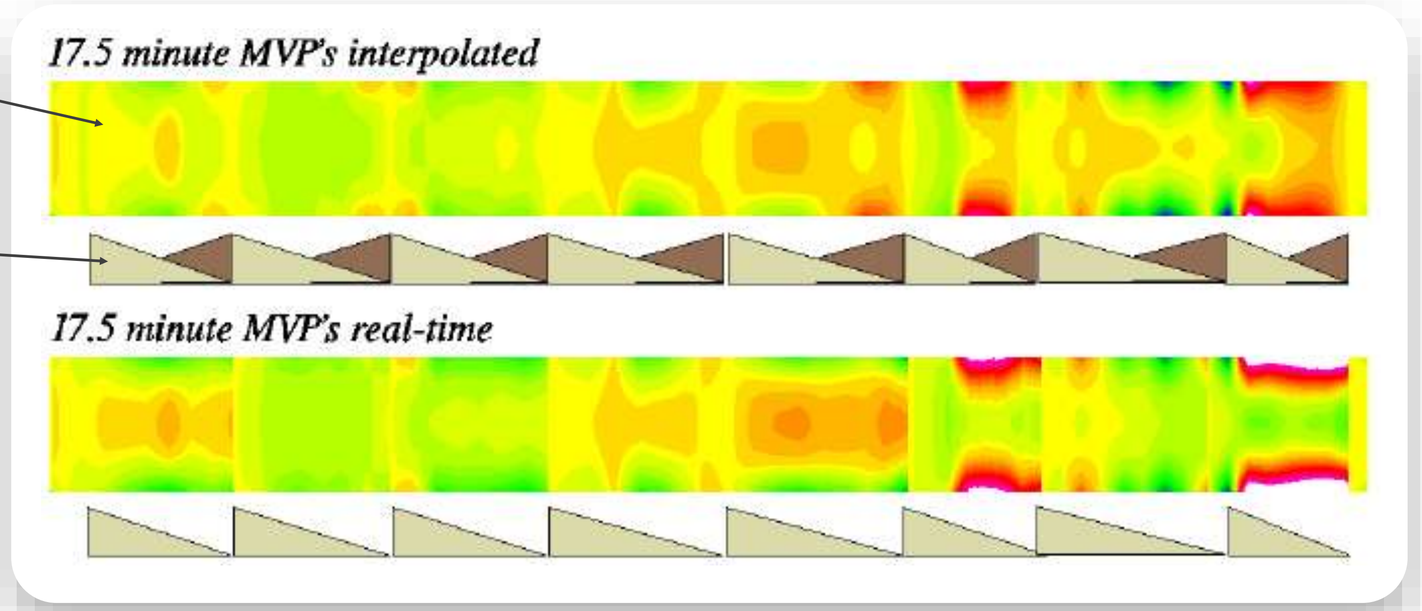
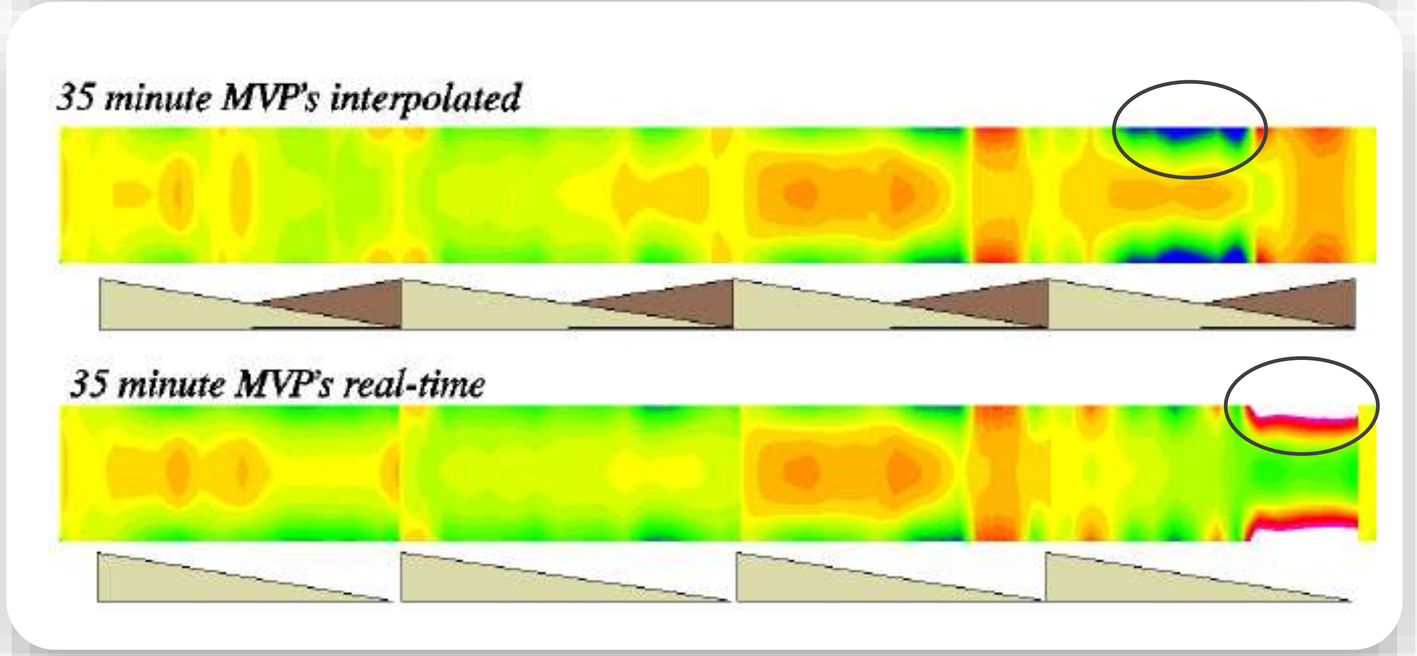


Depth difference

Profile weightings

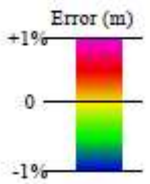


17.5 – Some error, but generally good agreement between interpolated and real time.



35 – Errors starting to get worse.

Source: Integration of near-continuous sound speed profile information. J. H. Clarke, M. Lamlugh, E. Kammerer. May 2000



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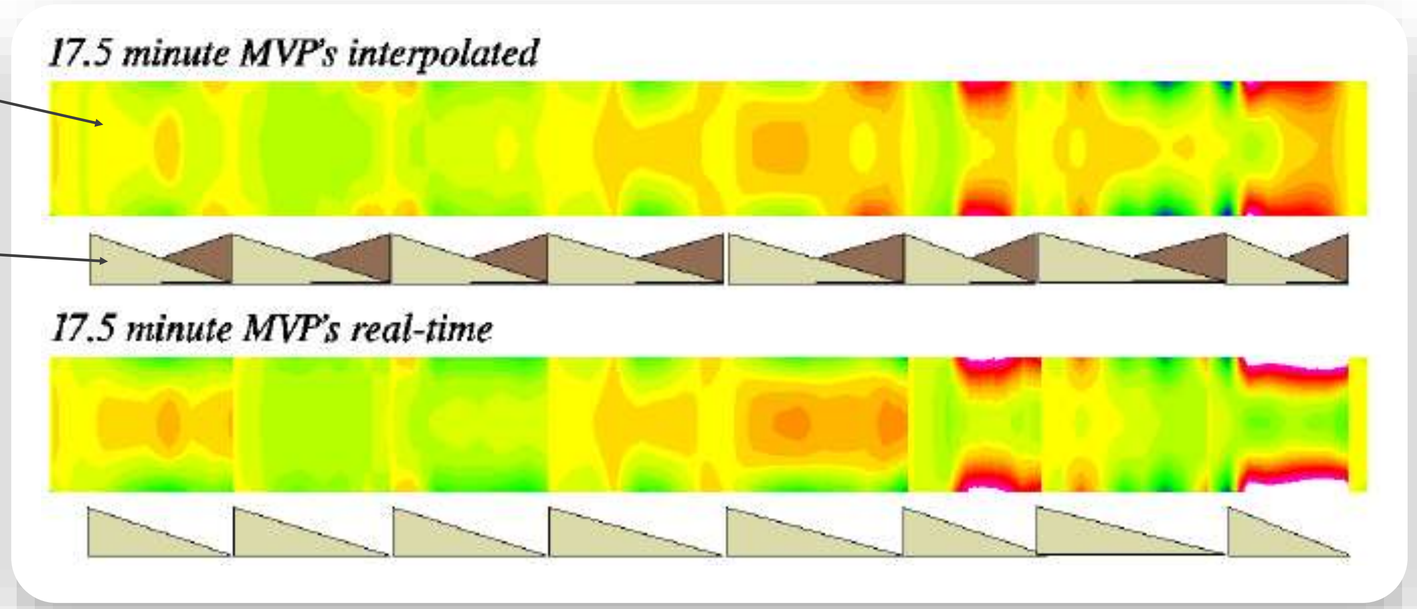

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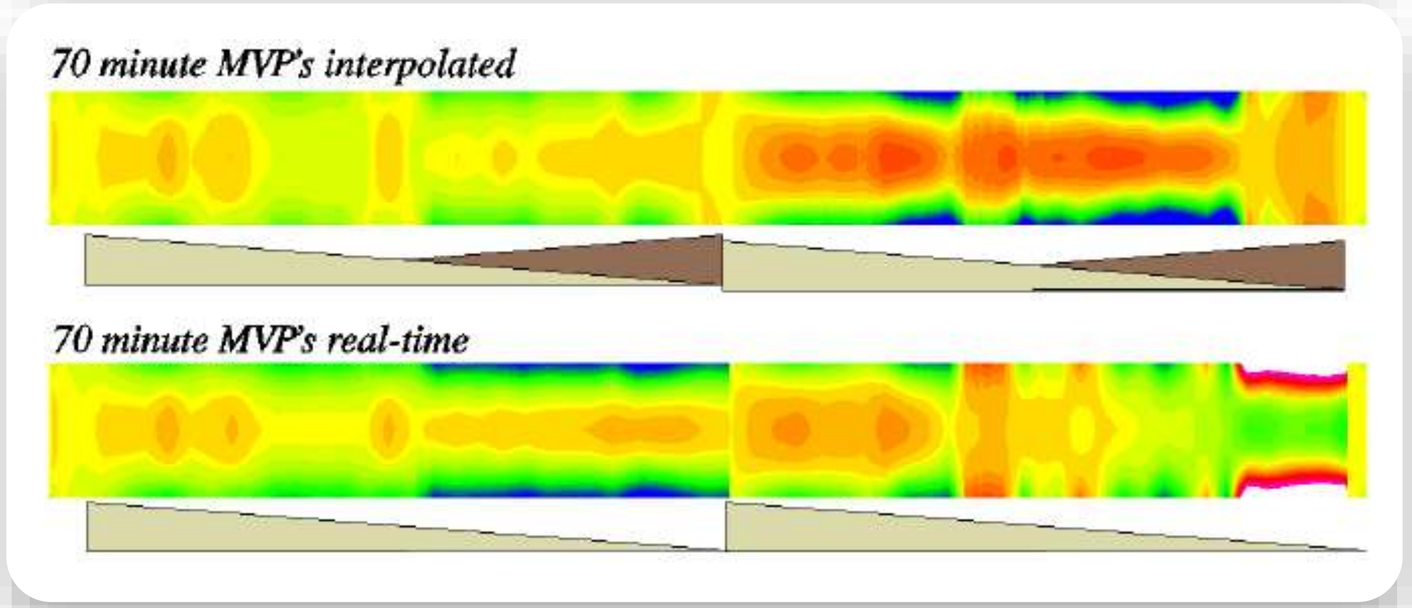

70 min – Notably worse than previous results

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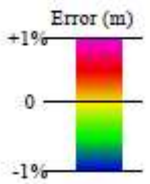
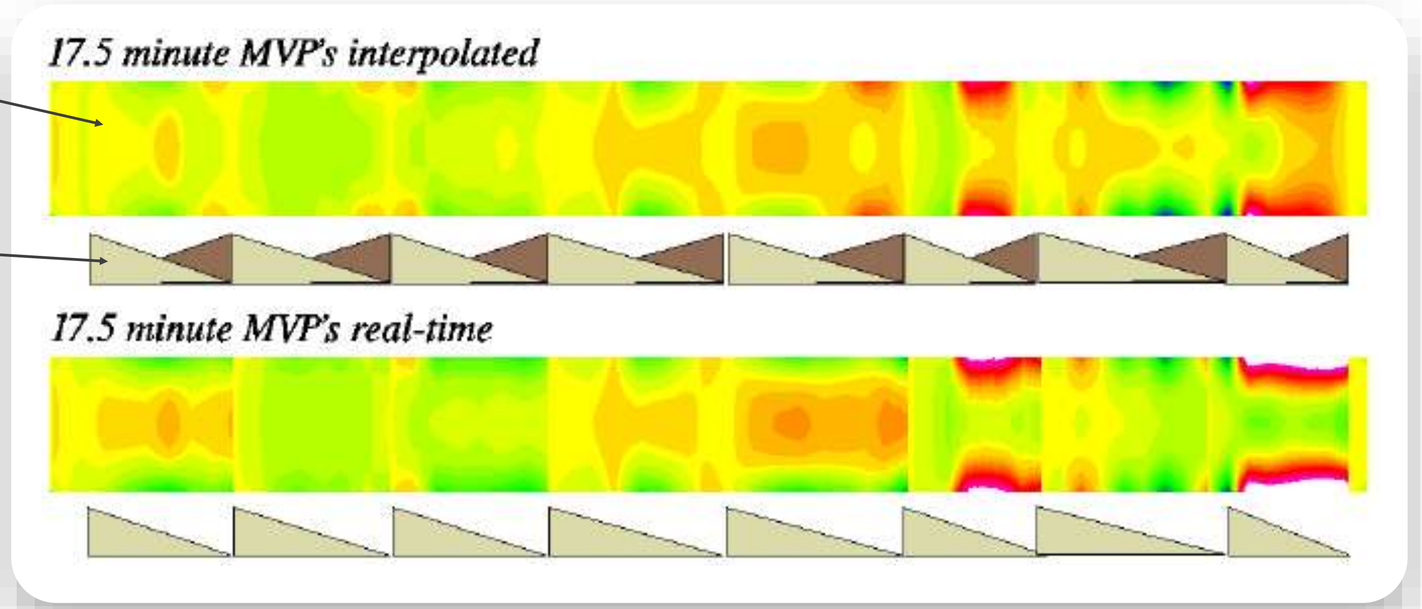


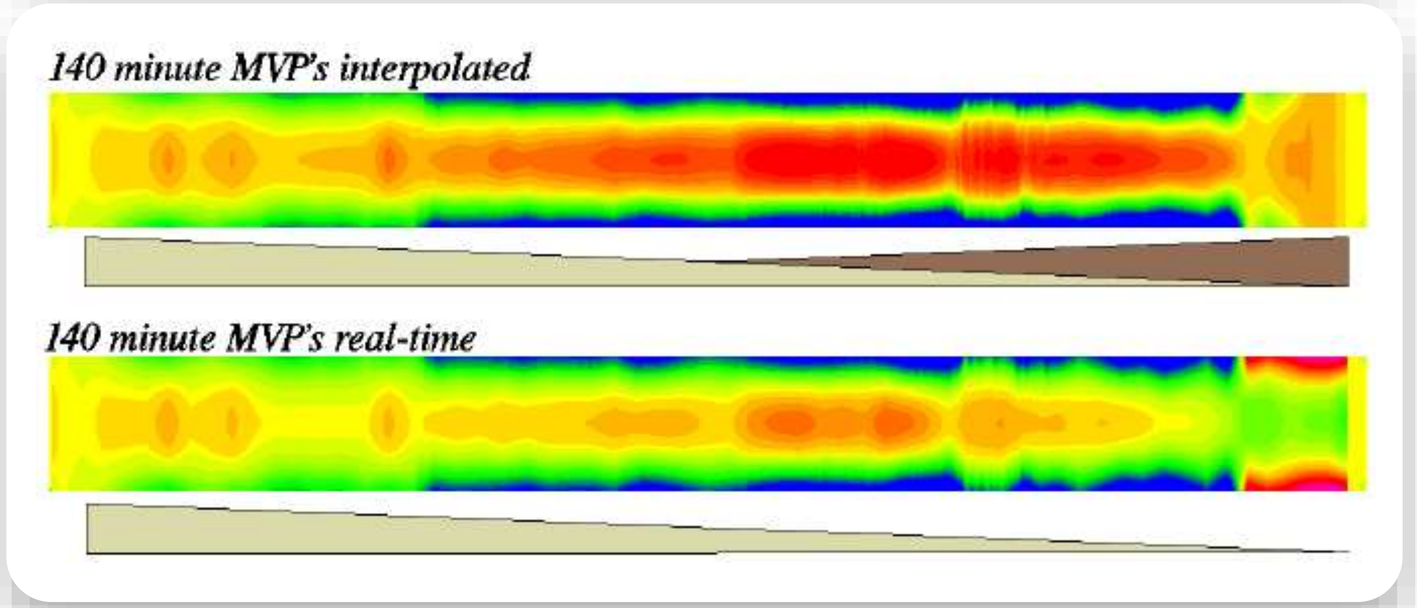
Depth difference

Profile weightings



17.5 – Some error, but generally good agreement between interpolated and real time.

140 min – Disaster



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Moving Vessel Profiler (MVP)

MVP30/350 Profiles to 30m WD at 12 knots, and 155m at 6 knots

MVP200 Profiles to 200m WD at 12 knots, and 310m at 6 knots

MVP300 Profiles to 300m WD at 12 knots, and 1250m at 6 knots

HOW DOES MVP COMPARE?

	MVP	Other Underway Profilers *	XBTs	Static Profilers
Real-time Data	✓	✗	✓	Some
High Density Data	✓	✓	✓	✗
Continuous Profiling	✓	✓	✗	✗
Full Water Column Coverage	✓	✗	✓	✓
Multiparameter Data	✓	✗	✗	✓
Military Grade	✓	✗	✓	✓
Automated Bottom Tracking	✓	✗	✗	✗

*** vertical profiles**

TYPICAL SURVEY CHALLENGES

Survey Trade-Offs

Performance Predictability

Managing XBTs

ROYAL NETHERLANDS NAVY

NAVO

INFOMAR

How often should I be taking a profile?

The Right Answer:

Continuously ?

As often as practically possible?
Probably more often than you do today!

> The use of the MVP is estimated to have increased the survey coverage and efficiency by 12%.”

Thomas Furey
Joint Programme Manager, INFOMAR
Marine Institute of Ireland

> The MVP system proved itself to be very reliable, robust and.... contributes to increased Multibeam data quality and significantly increases daily and overall production.”

Paul Rybinski
Party Chief, MV Fugro Discovery
Fugro Germany Marine GmbH

THANK YOU

Questions?

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