DEALING WITH VARIABLE SV STRUCTURE NIOHC19

AGENDA

1. Intro
2. Concerns when variable SV structure
3. Case Study
4. Refs
5. Q&A

AML OCEANOGRAPHIC

WHO ARE WE?

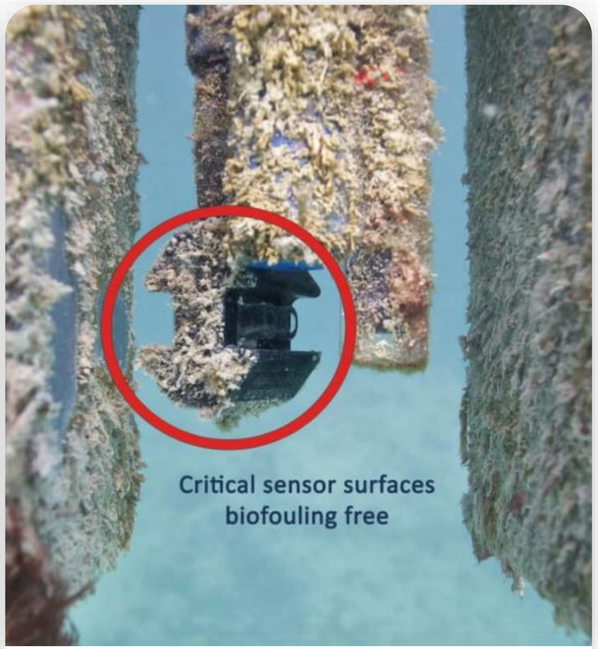
David Wilson
Regional Sales Manager, EMEA

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

OUR SOLUTIONS

Underway Profiling

Instrumentation



Biofouling Control

AML OCEANOGRAPHIC

We Make it Easy

- Family of oceanographic instruments and Xchangeable sensors

We Make it Easy

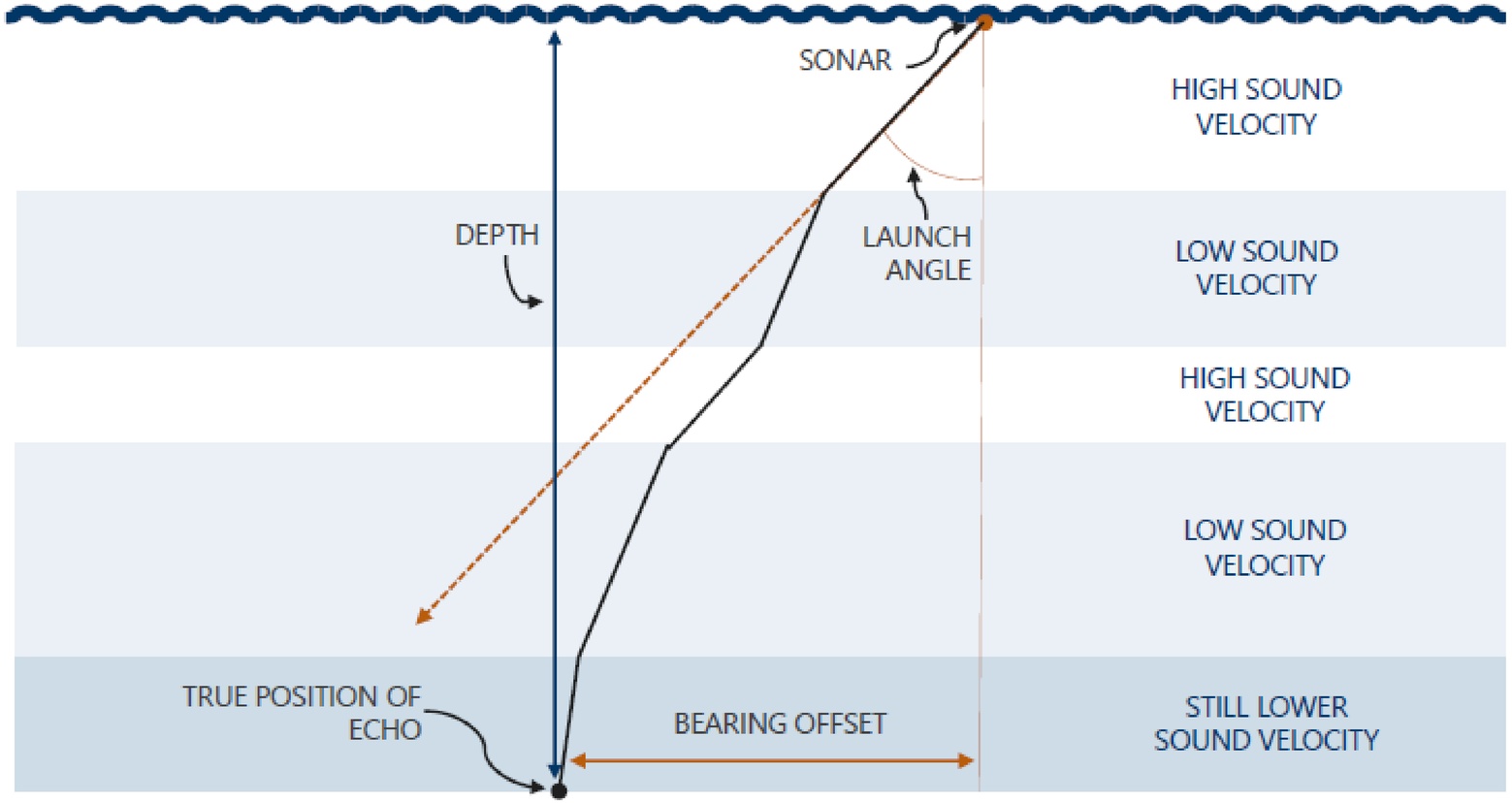
- Family of oceanographic instruments and sensors
- Sensors are interchangeable with other instruments
- Sensor heads are calibrated independently

Where is sound velocity measurement used in multibeam systems?

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

Snells Law:

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



How often should I be taking a profile?

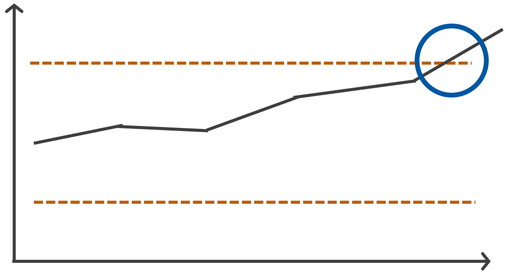
General Guidelines

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

Customer Concerns with variable SV Structure

- Forced to compromise between survey efficiency and data quality
- Exposed to cost over-runs
- Unpredictability in planning process
- Risk to other equipment & personnel
- Not always possible to take static profile

WHAT IF YOU COULD:

Increase Efficiency & Decrease Costs

Improve Data Quality

Eliminate XBT Management

…regardless of oceanographic conditions!

AML OCEANOGRAPHIC

Moving Vessel Profiler (MVP)

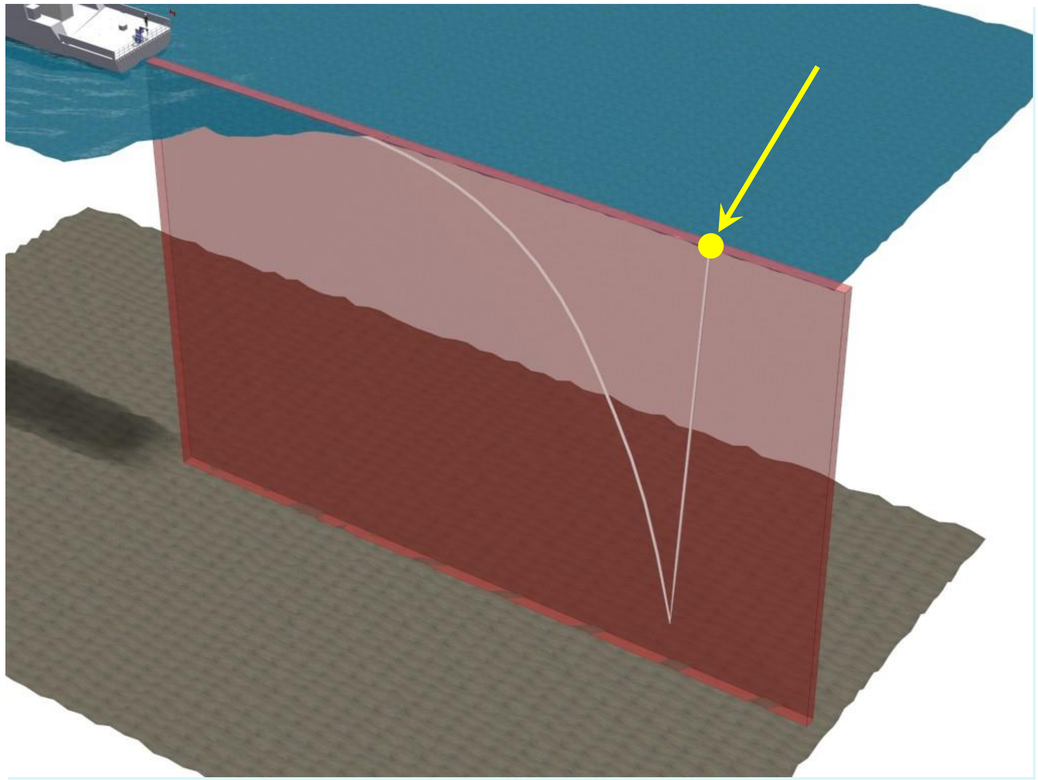
MVP30/350* Profiles to 30m WD at 12 knots, and 155m* at 6 knots

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

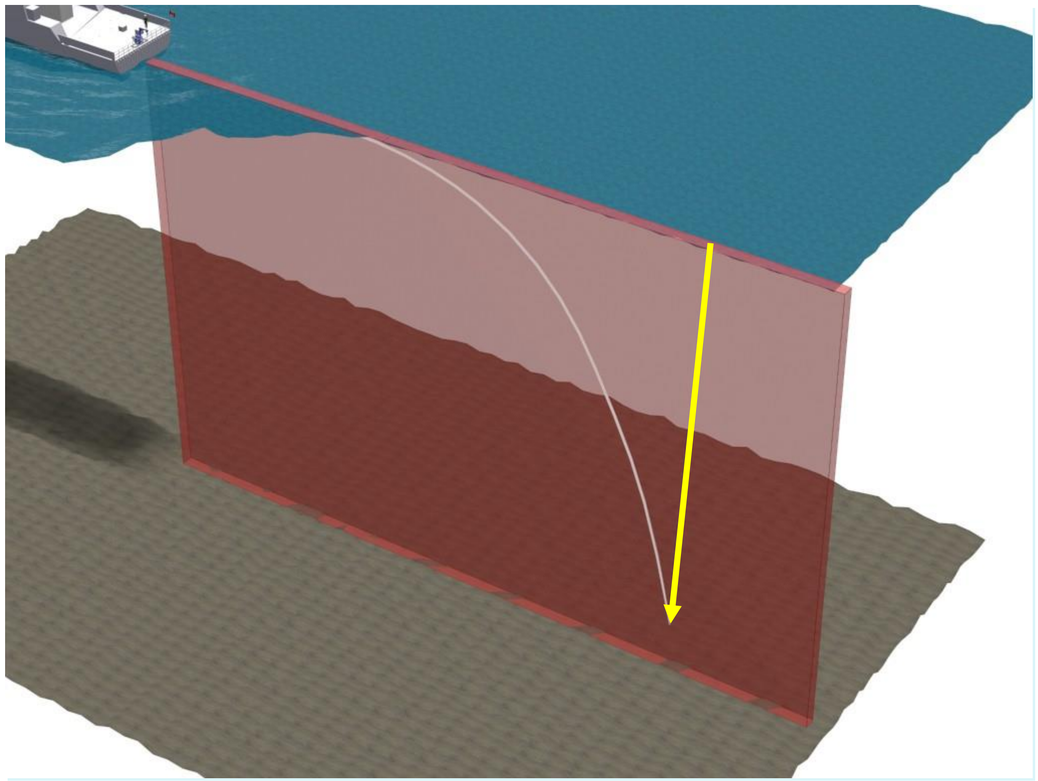
The MVP system: How it works

- Deployment



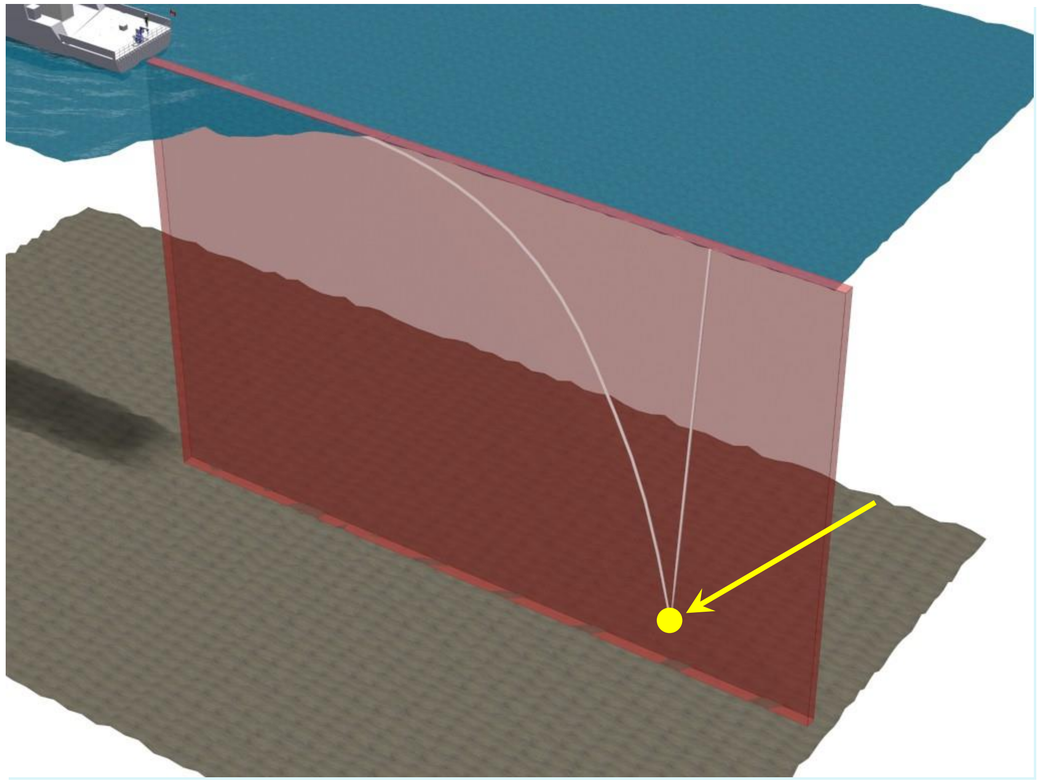
The MVP system: How it works

- Deployment
- Free Fall



The MVP system: How it works

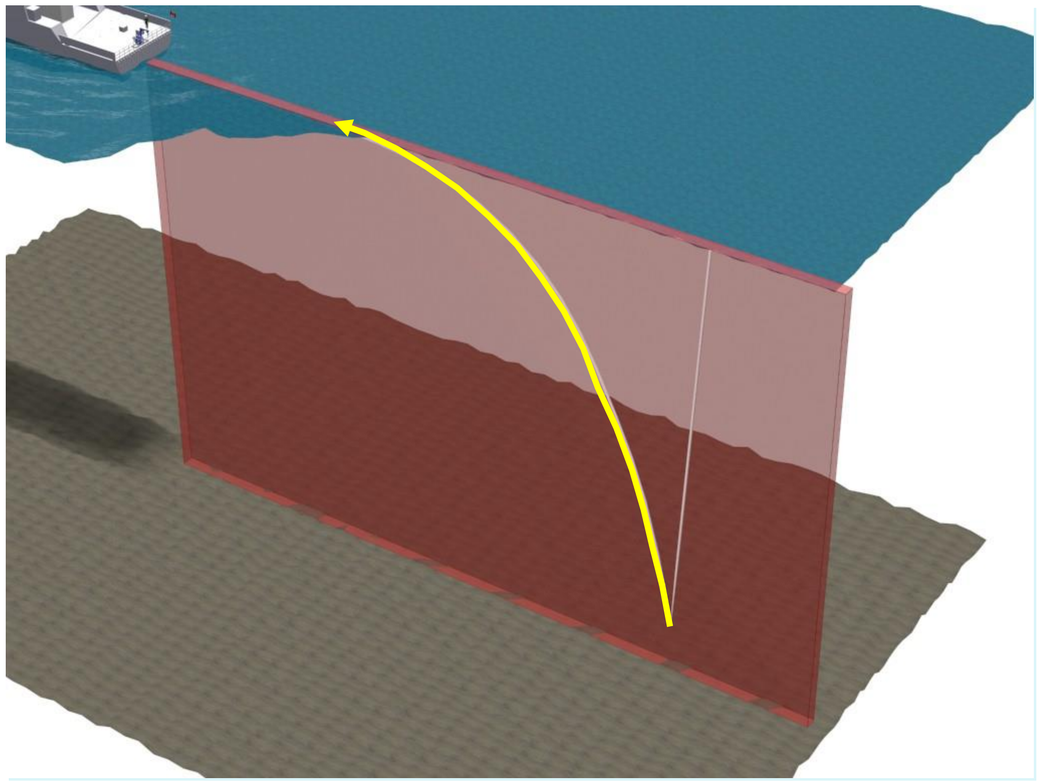
- Deployment
- Free Fall
- Fixed Depth or Altitude



SV file can be transferred via towcable for immediate application in MBES

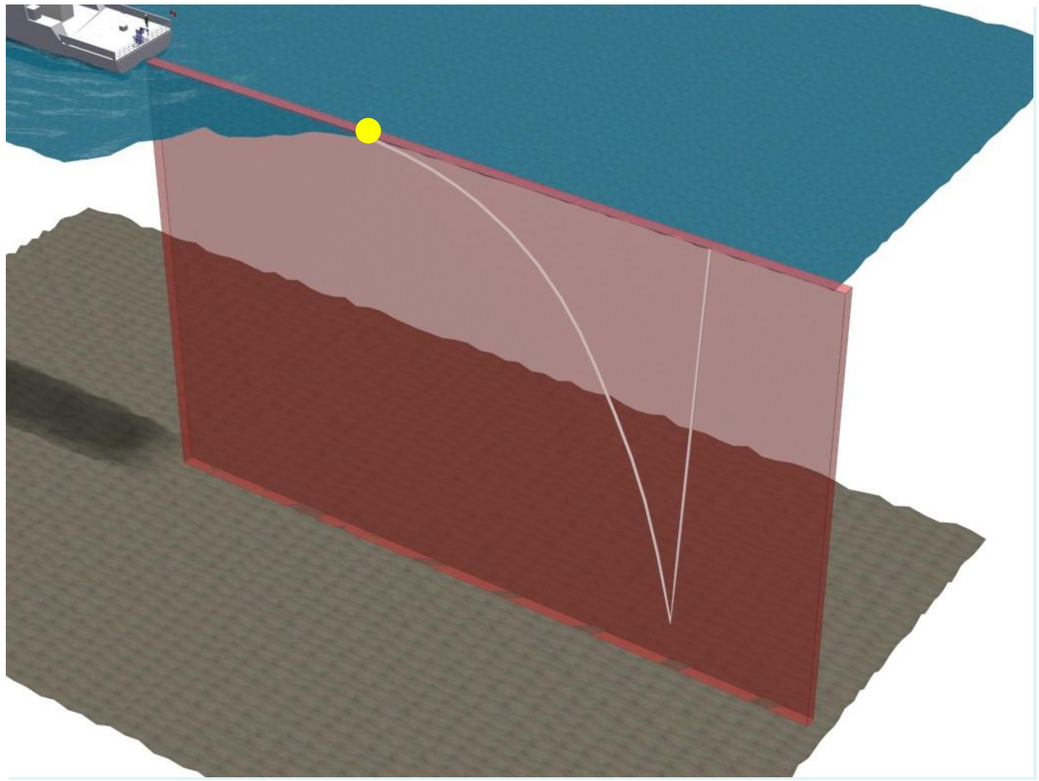
The MVP system: How it works

- Deployment
- Free Fall
- Maximum Depth
- Winch Recovery



The MVP system: How it works

- Deployment
- Free Fall
- Maximum Depth
- Winch Recovery
- Towed Position



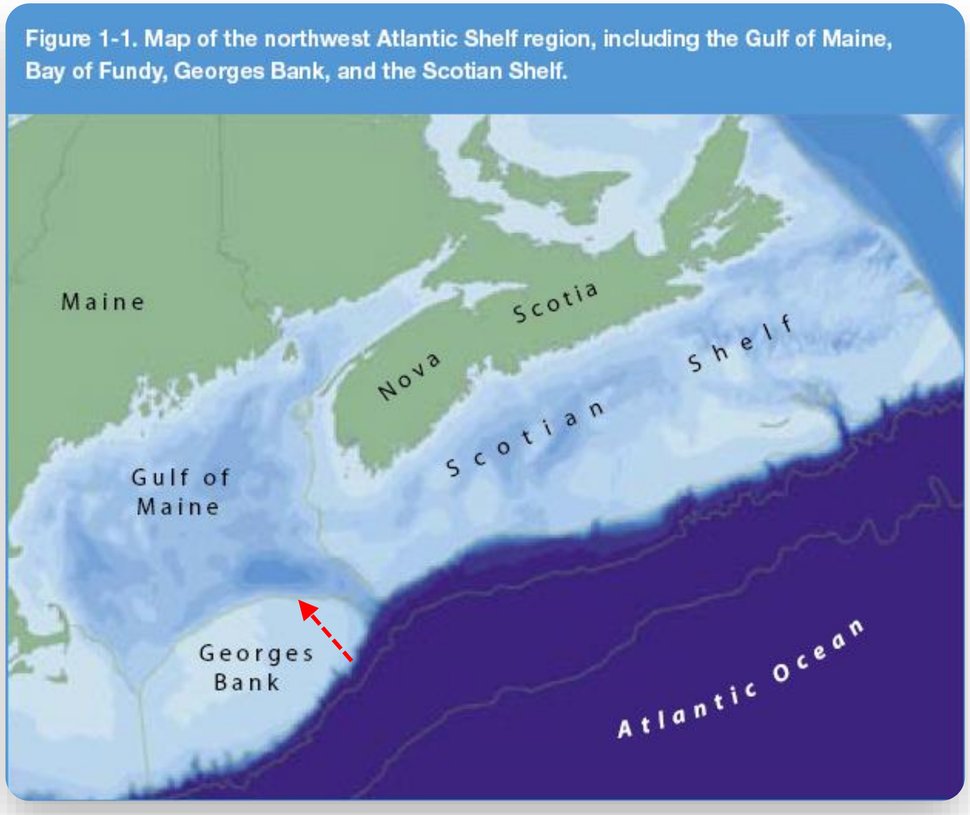
System Specifications:

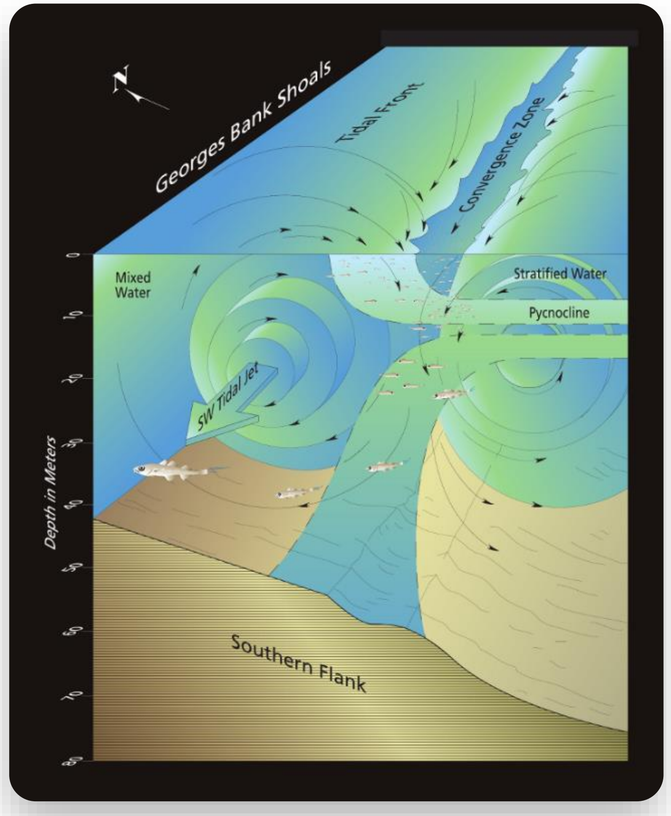
	MVP30		MVP30-350		MVP200		MVP300	
Speed (knots)	Depth Obtained (m)	Cycle Time (min.)	Depth Obtained (m)	Cycle Time (min.)	Depth Obtained (m)	Cycle Time (min.)	Depth Obtained (m)	Cycle Time (min.)
0	125	2.6	350	8.5	600	12.9	3400	70
1	105	2.5	280	7.8	520	9.9	2683	61
2	90	2.3	245	7.5	457	8.4	2200	57
3	80	2.2	228	7.3	406	7.4	1900	55
4	73	2.1	200	7.0	368	6.9	1650	53
5	66	2.1	175	6.7	335	6.5	1450	50
6	60	2.0	155	6.4	310	6.4	1250	46
7	56	1.9	140	5.8	285	6.0	950	37
8	51	1.8	121	5.1	265	5.9	740	29
9	47	1.7	90	4.2	250	5.8	580	23
10	42	1.7	70	3.3	235	5.8	460	19
11	35	1.6	55	2.5	223	5.7	370	16
12	30	1.6	30	2.2	200	5.6	300	13
Dimensions w/o boom (m)	0.7 x 0.3		0.9 x 0.7		1.3 x 0.7		2.0 x 2.0	
Weight (kg)	120		250		760		1800	
Power (hp)	1.5		1.5		15		25	

CASE STUDY

How often should I be taking a profile?

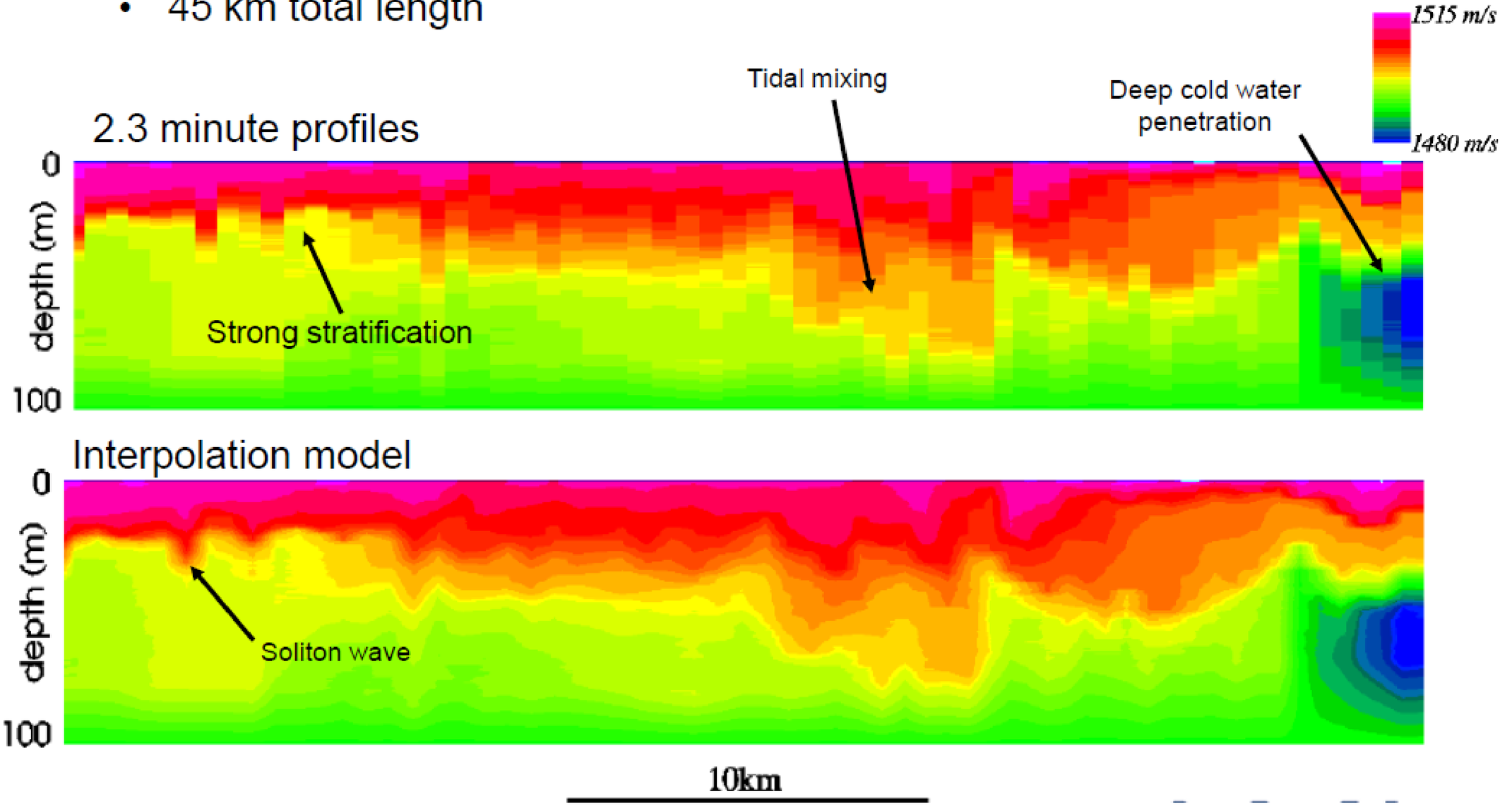
A demonstration of what happens when a water mass is under-sampled.





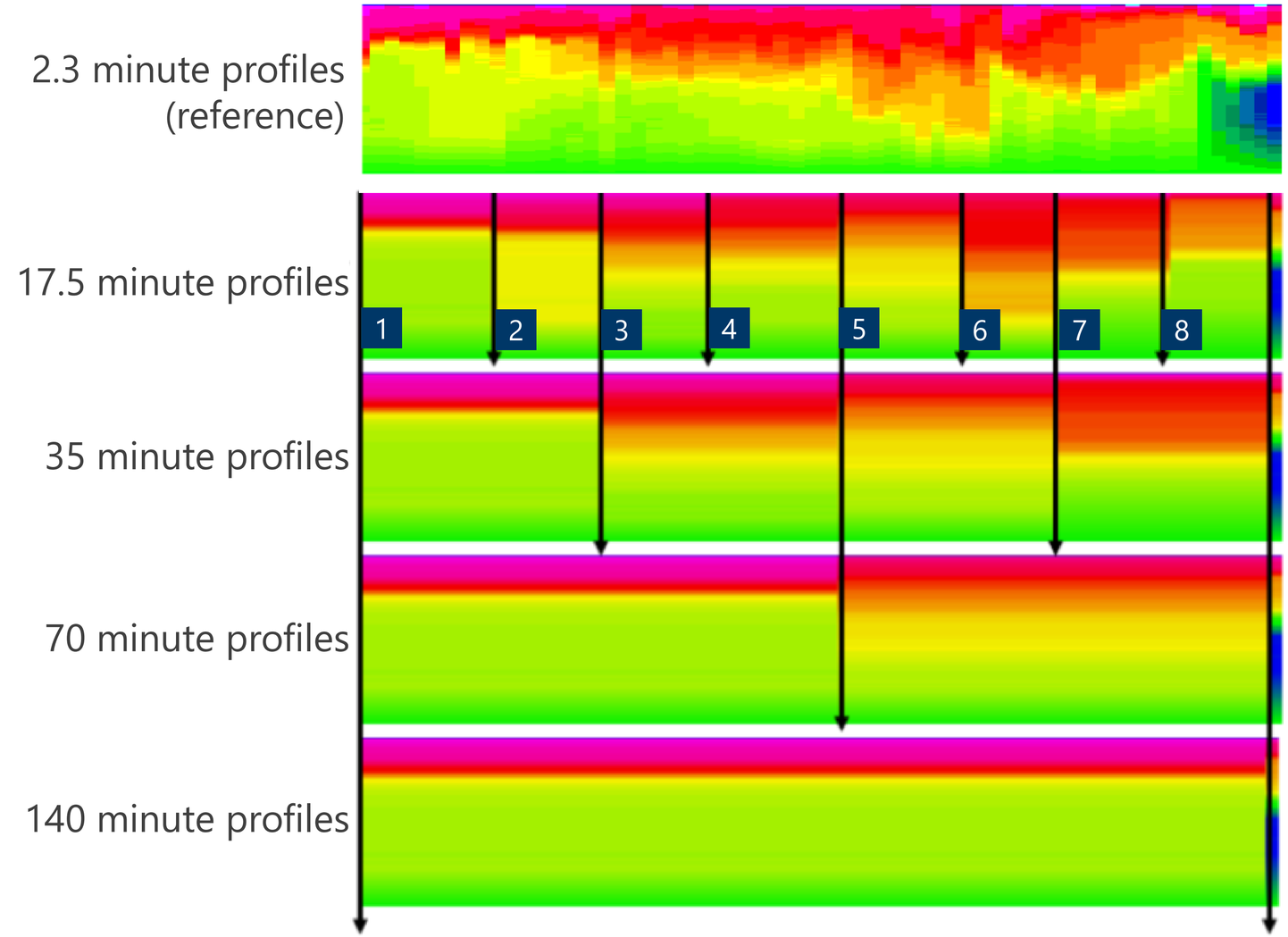
Courtesy of UNH & CHS

- 60 individual casts (1 cast every 2.3 minutes)
- 45 km total length



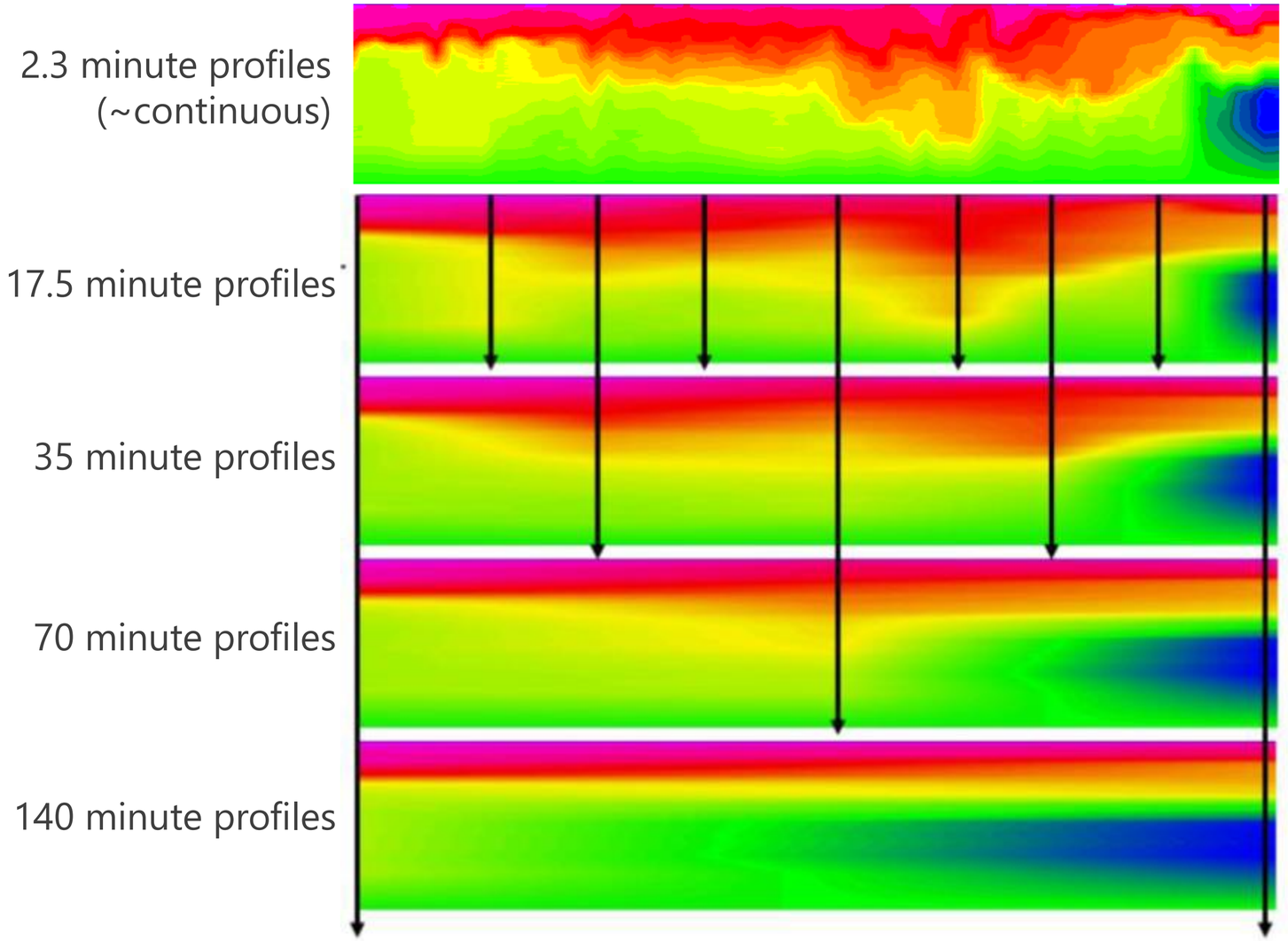
COMPARISON: TIME BETWEEN PROFILES

Real Time



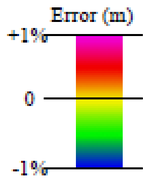
Source: Integration of near-continuous sound speed profile information. J. H. Clarke, M. Lamlugh, E. Kammerer. May 2000

Interpolated



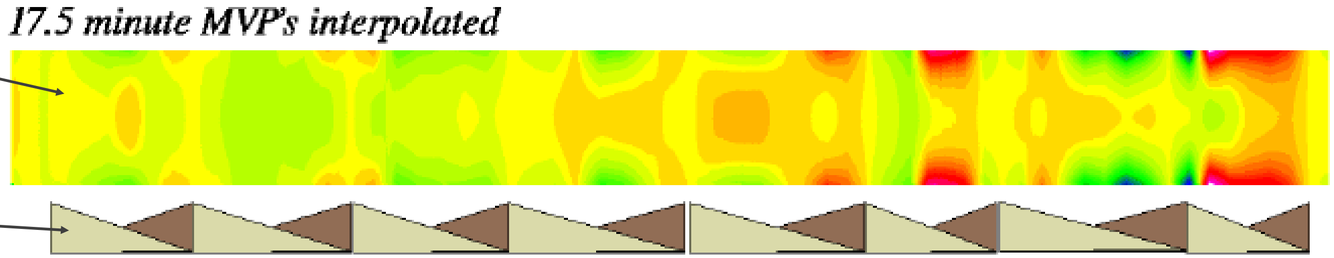
Interpolation is only useful and productive if the SV profile frequency is greater than the rate of change in oceanographic conditions.

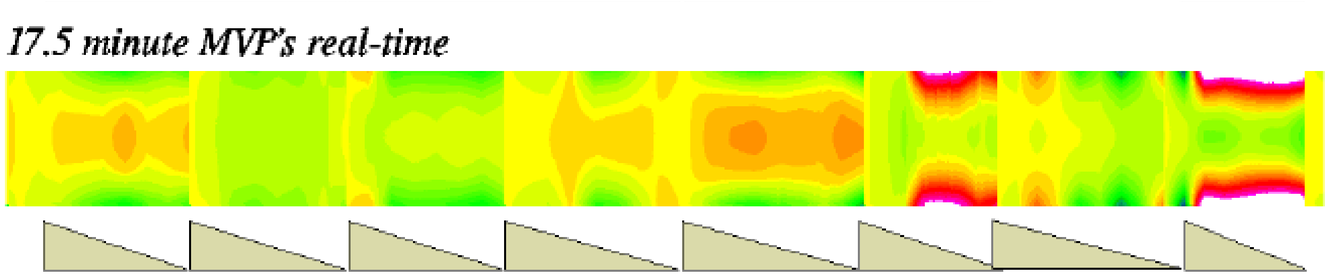
Source: Integration of near-continuous sound speed profile information. J. H. Clarke, M. Lamlugh, E. Kammerer. May 2000



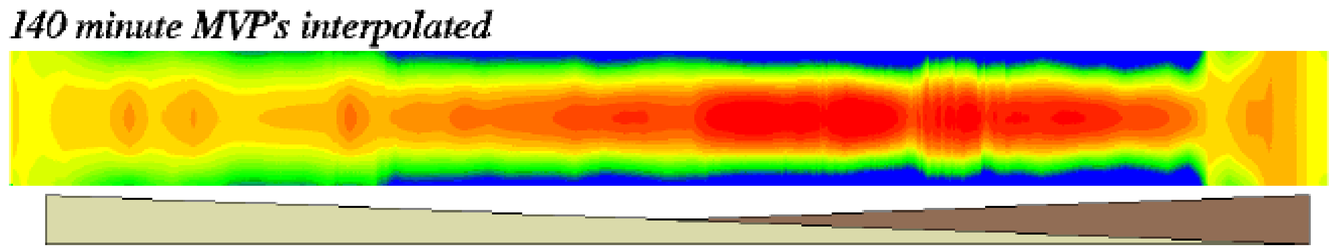
Depth difference

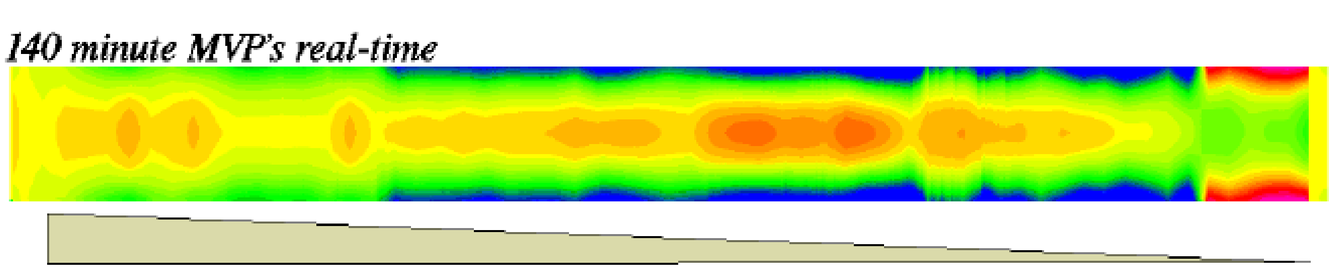
Profile weightings





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





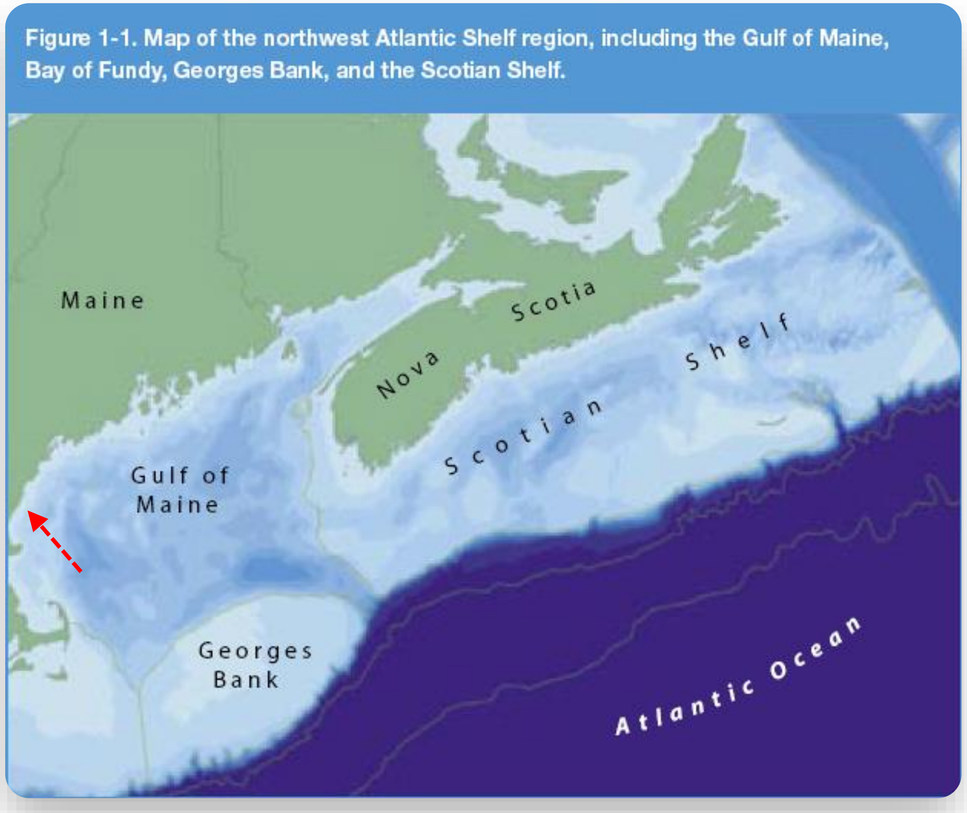
140 min – Disaster. Many errors between 1% and 5% of depth

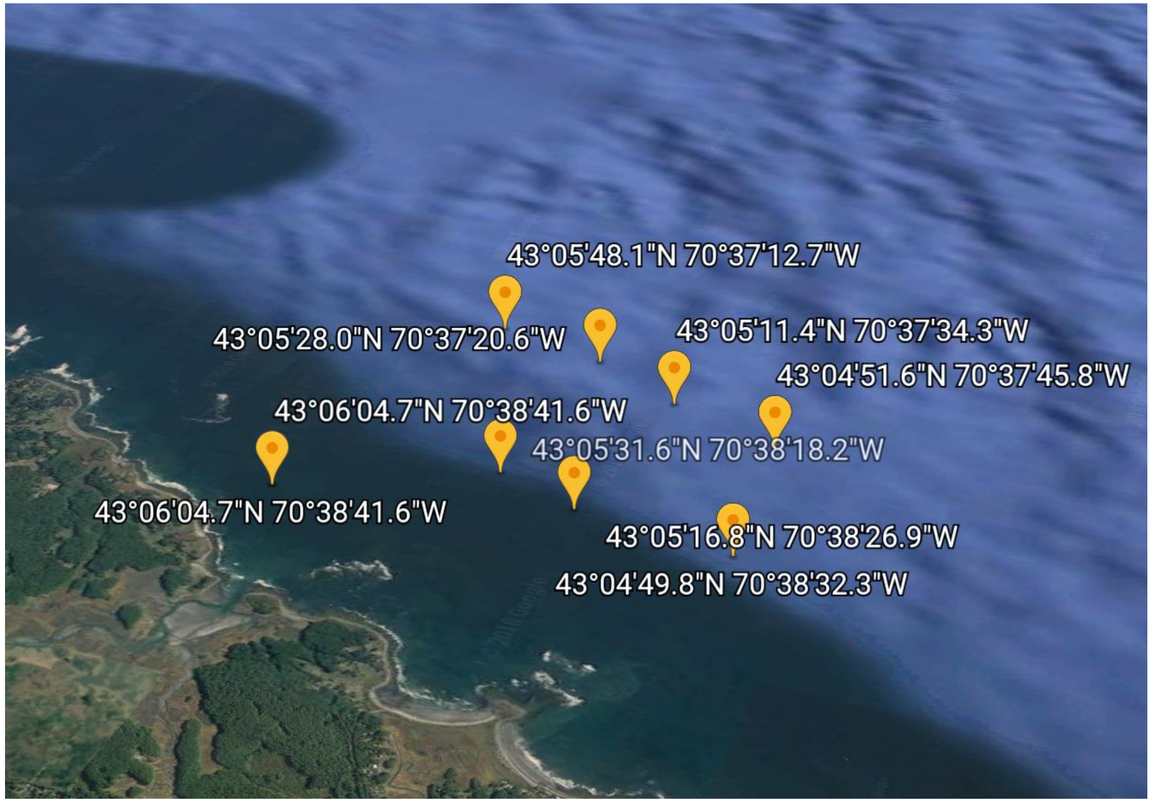
Source: Integration of near-continuous sound speed profile information. J. H. Clarke, M. Lamlugh, E. Kammerer. May 2000

CASE STUDY 2

How often should I be taking a profile?

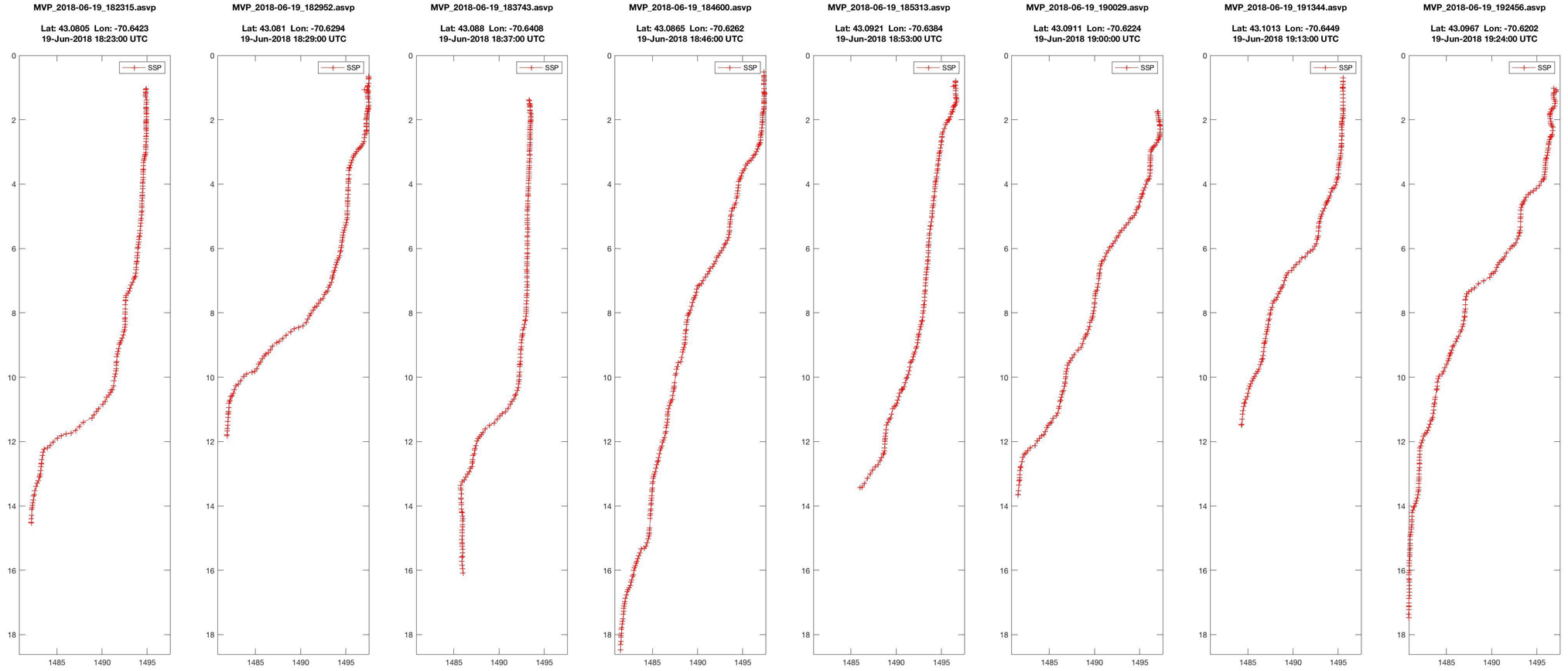
A demonstration of what happens when a water mass is under-sampled.





Courtesy of Semme Dijkstra, UNH.

Sound Speed Profiles Over Time

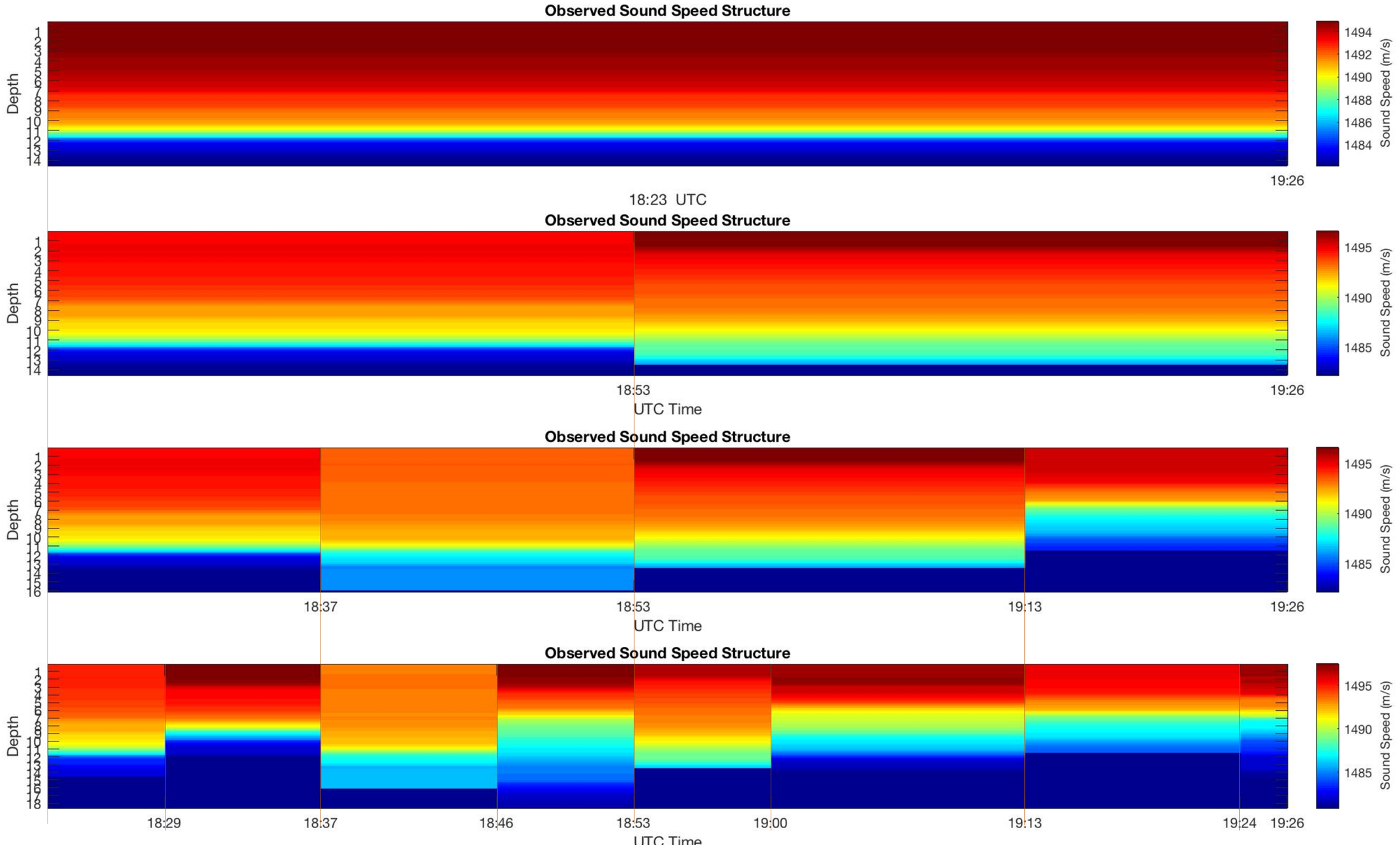


Very near shore (< 1 NM) along non linear Seacoast
Variations in sound speed primarily due to tidal currents affected by local bathymetry

Courtesy of Semme Dijkstra, UNH.

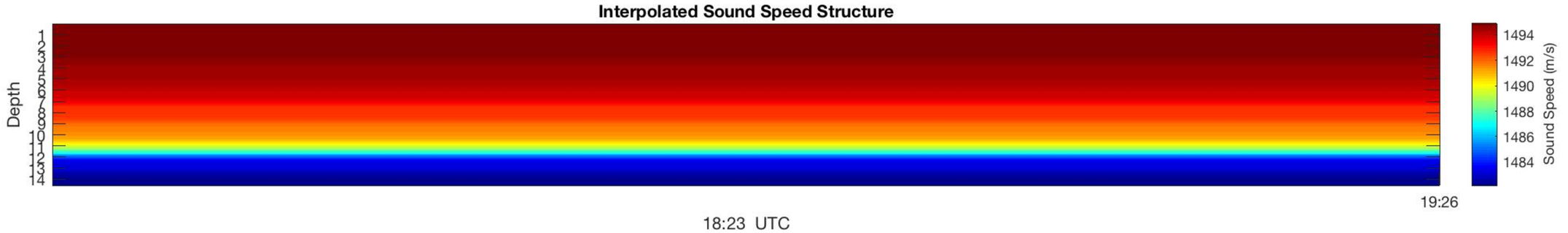
Observed Profiles

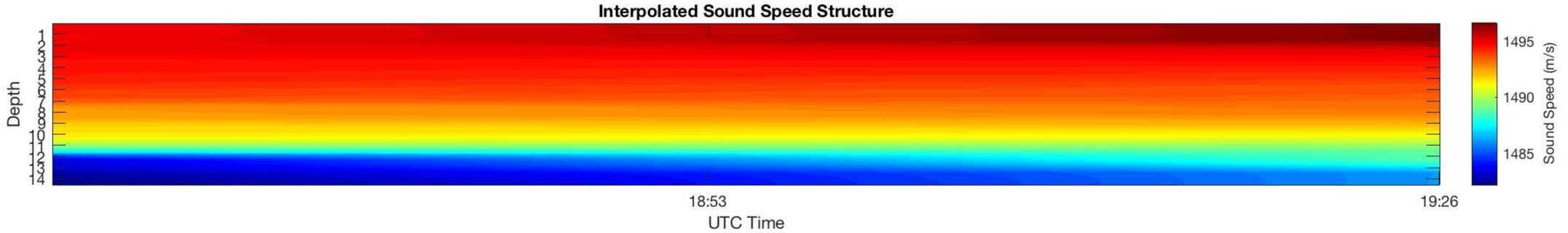
Courtesy of Semme Dijkstra, UNH.

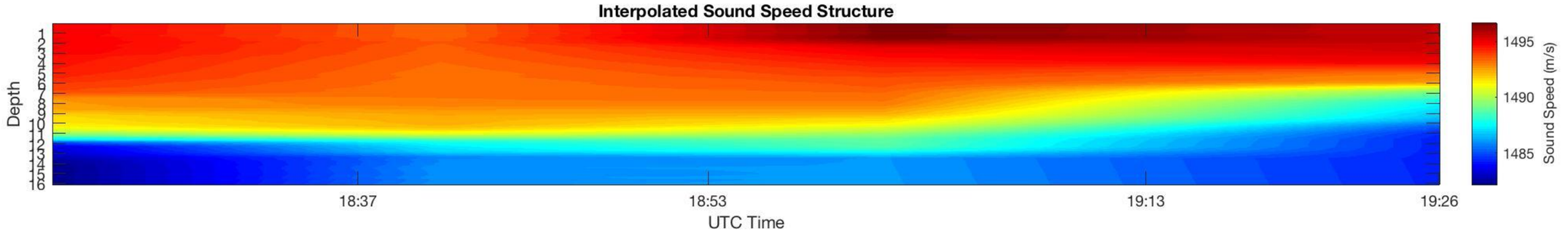


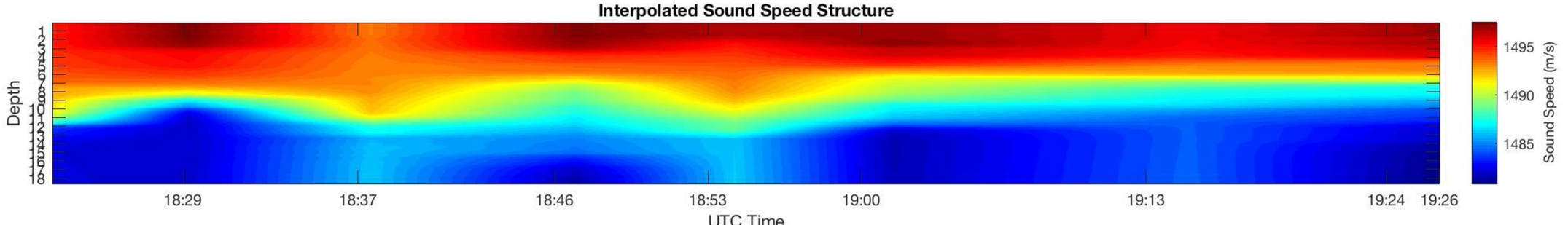
Interpolated Profiles

Courtesy of Semme Dijkstra, UNH.



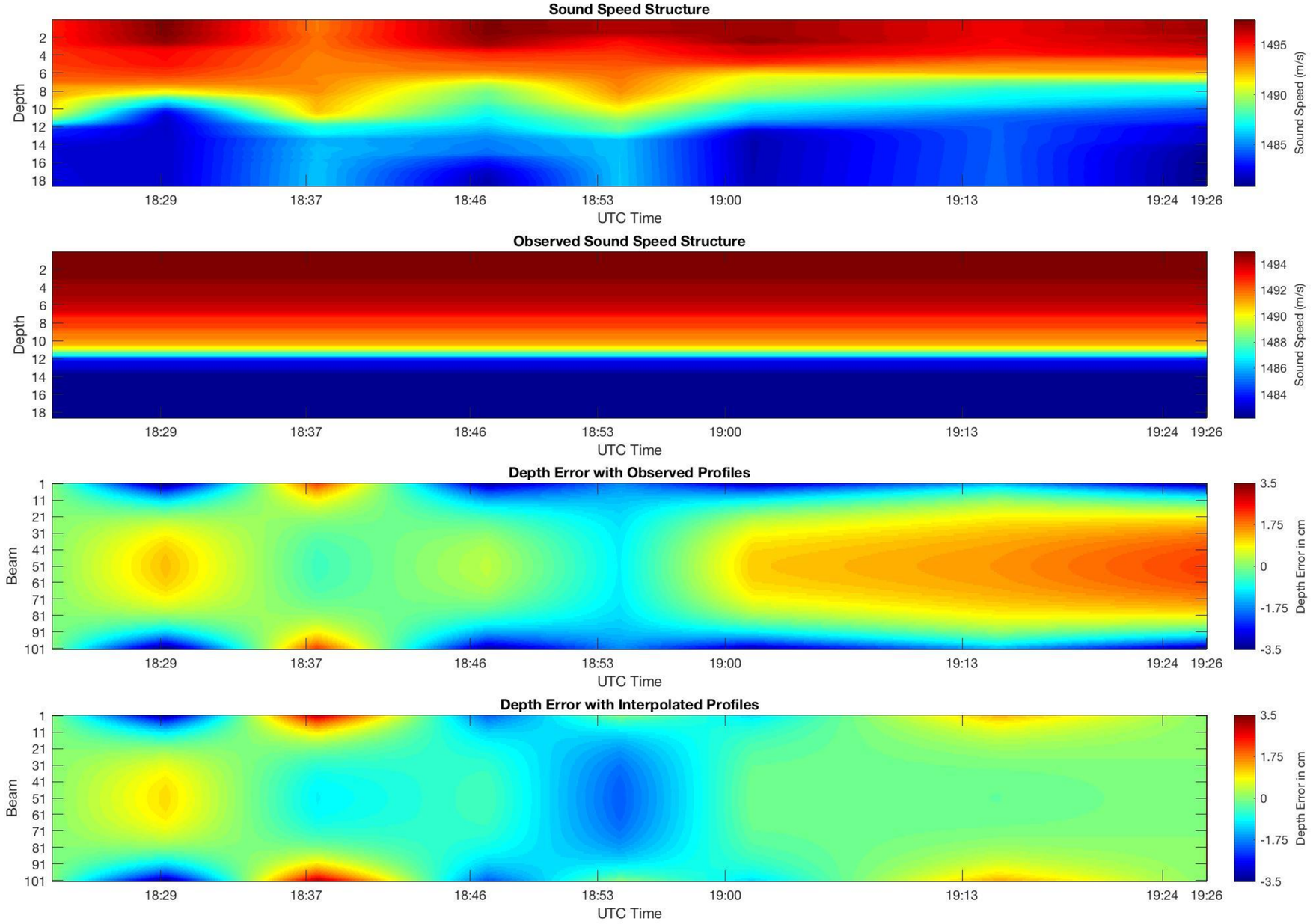






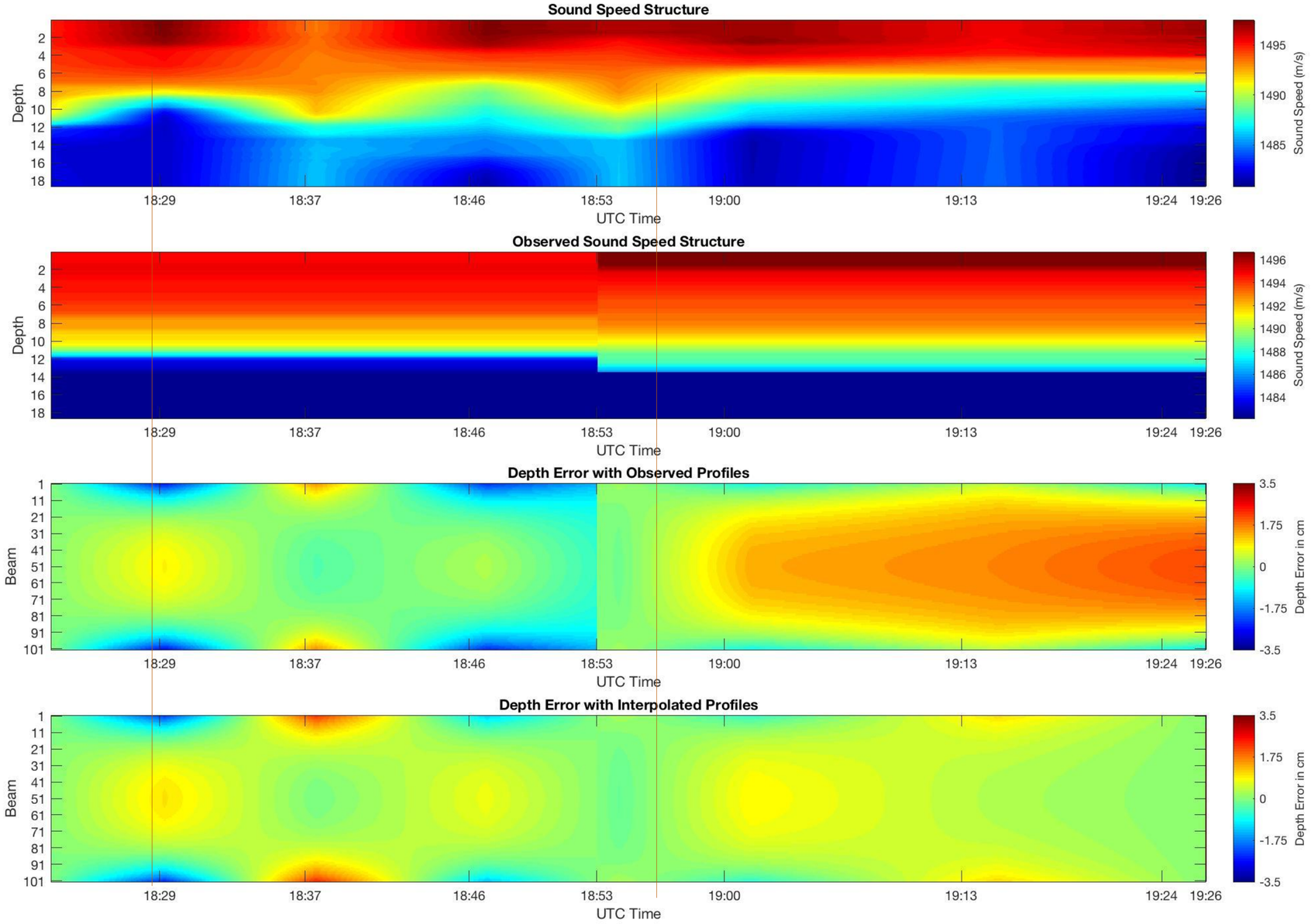
Depth Errors Using 1 Profile

Courtesy of Semme Dijkstra, UNH.



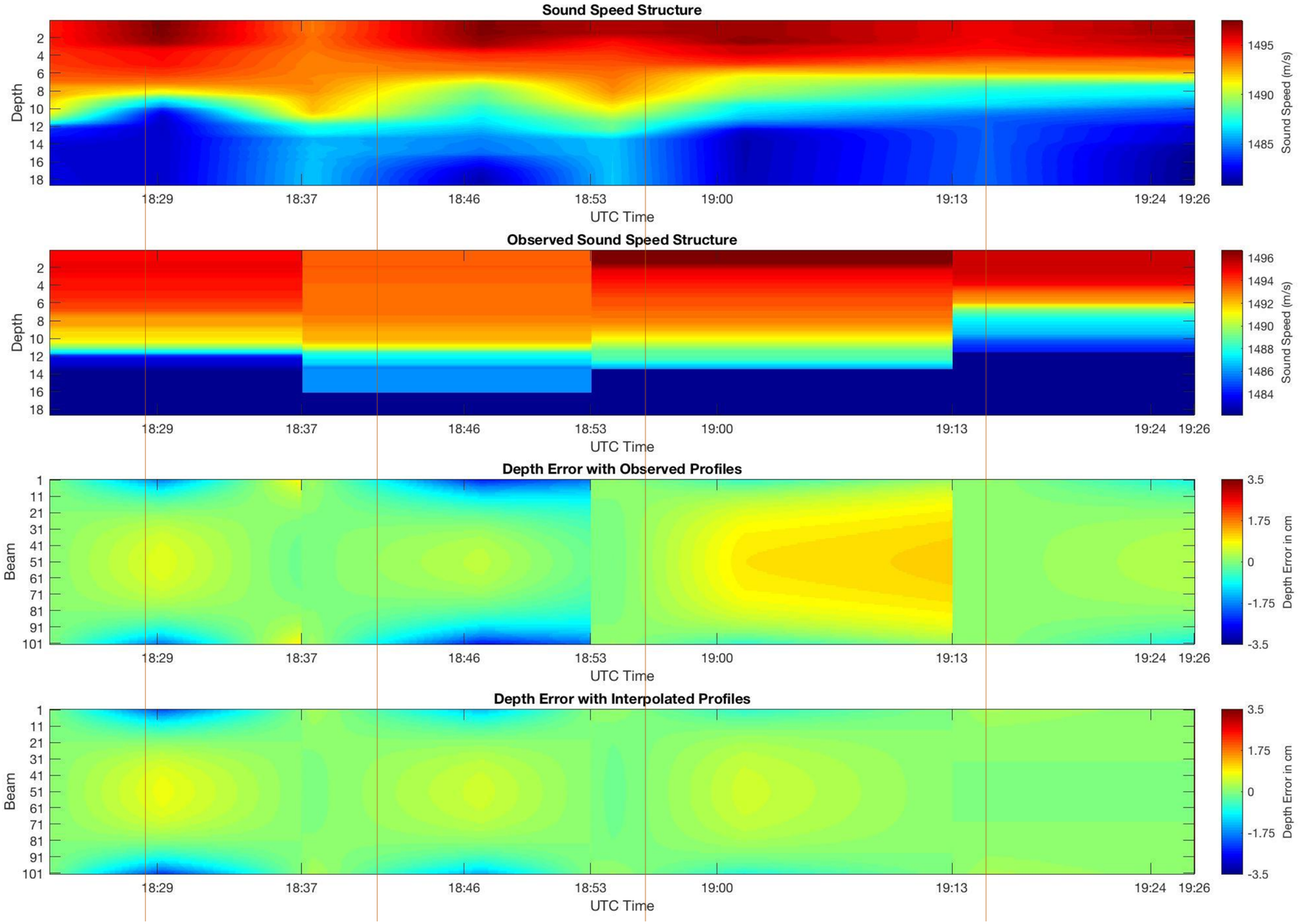
Depth Errors Using 2 Profiles

Courtesy of Semme Dijkstra, UNH.



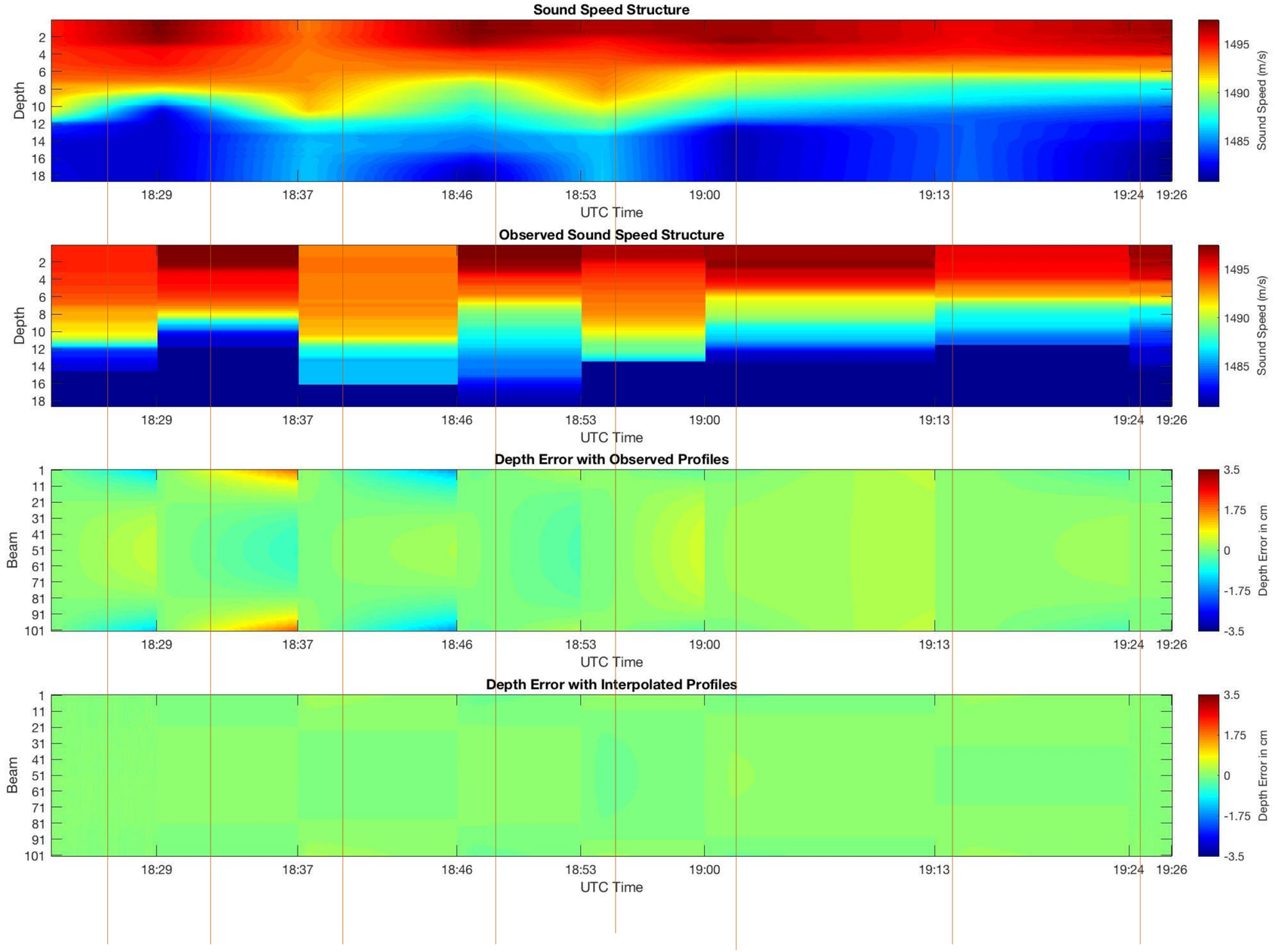
Depth Errors Using 4 Profiles

Courtesy of Semme Dijkstra, UNH.



Depth Errors Using 8 Profiles

Courtesy of Semme Dijkstra, UNH.



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 Seabed Avoidance	✓	✗	✗	✗

*** vertical profiles**

AML help hydrographic organizations increase survey efficiency and improve data quality, regardless of prevailing oceanographic conditions.

BANGLADESH NAVY

SHOM L'océan en référence

NAVAL OCEANOGRAPHIC OFFICE

ROYAL AUSTRALIAN NAVY

INFOMAR

FUGRO

University of New Hampshire

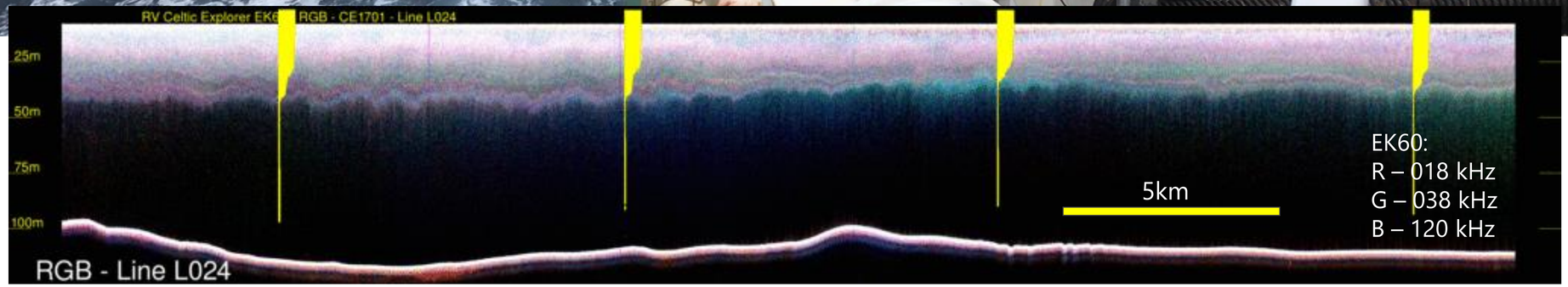
AML OCEANOGRAPHIC

ROYAL NETHERLANDS NAVY

MVP-200 operating in Seastate 7

Deploying to ~ 100m every 30 minutes at 8 knots

500 profiles in 12 days
each profile equivalent to
~ 0.5 hours stationary
(ship cost ~ US$1000 per hour)



Courtesy of INFOMAR and John Hughes Clarke, UNH.

How often should I be taking a profile?

The Right Answer:

Continuously ?

As often as practically possible?

Probably more often than you do today!

THANK YOU

Questions?

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