DEALING WITH VARIABLE SV STRUCTURE @ 16th SAIHC

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

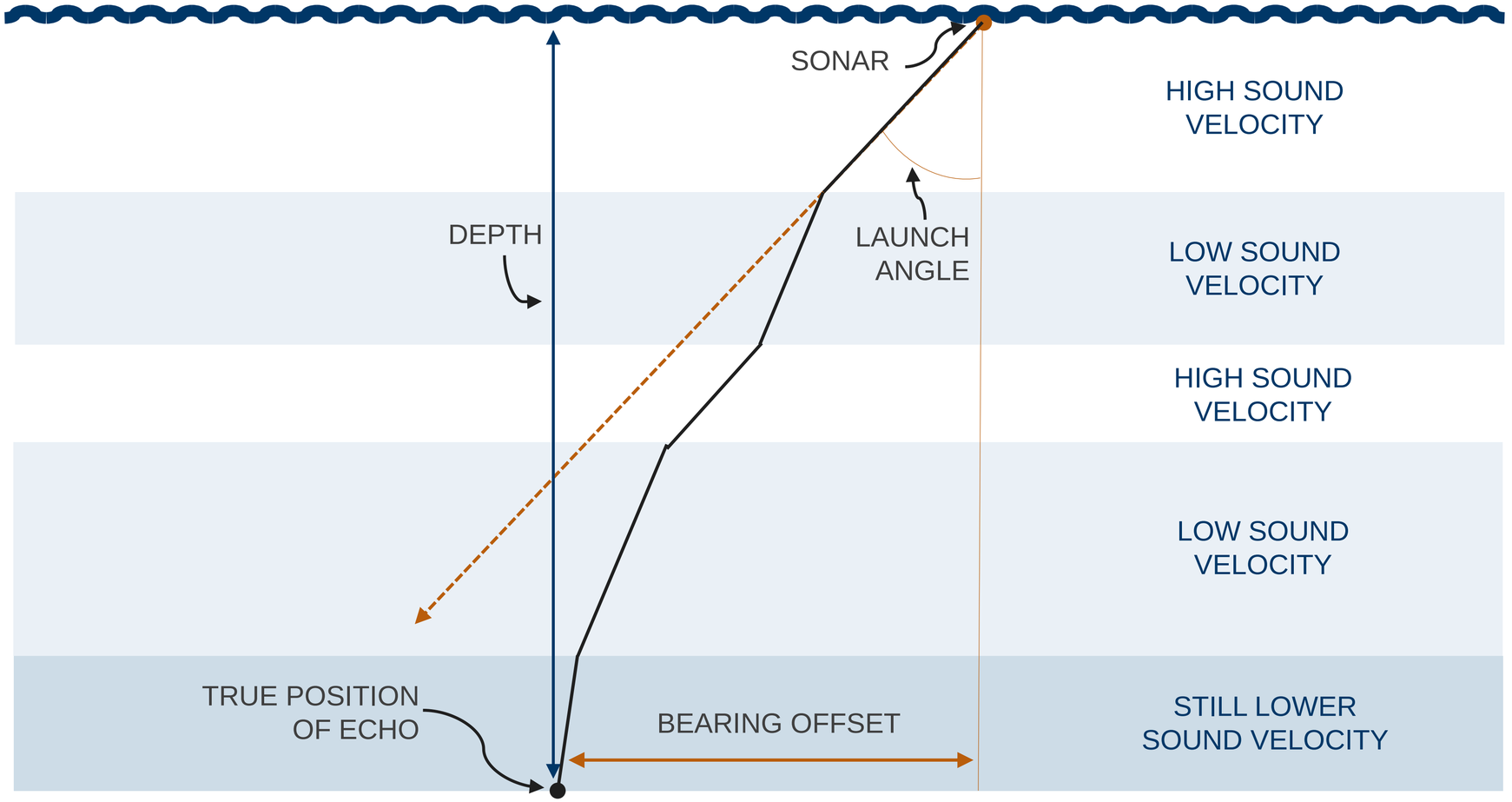
- Family of oceanographic instruments and Xchangeable sensors

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?

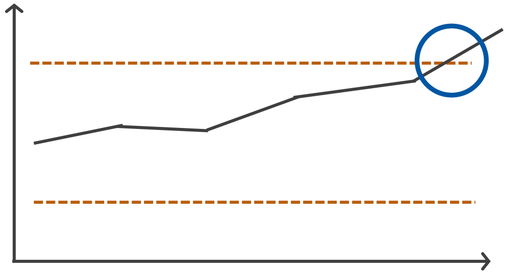
General Guidelines

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 Issues when experiencing 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

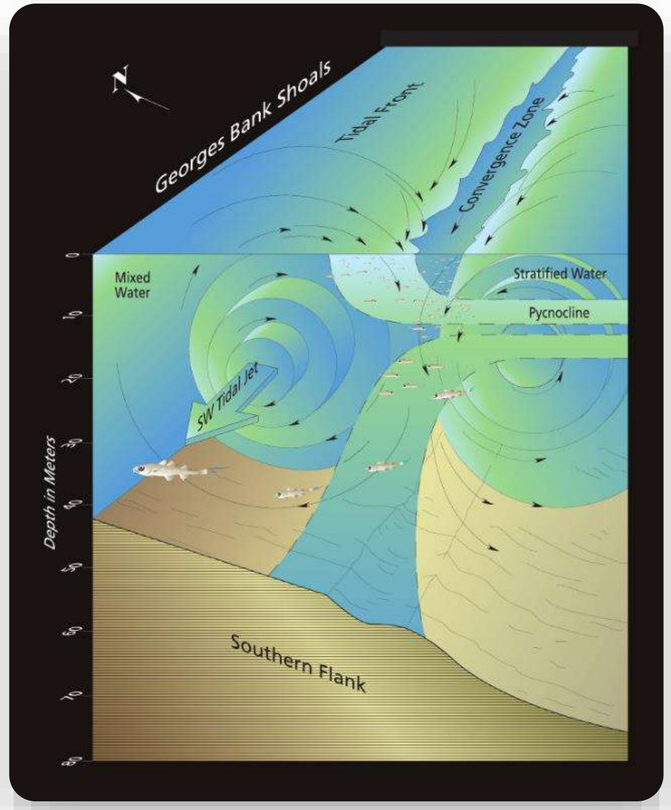
MVP200 Profiles to 200m WD at 12 knots, and 310m at 6 knots

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

CASE STUDY

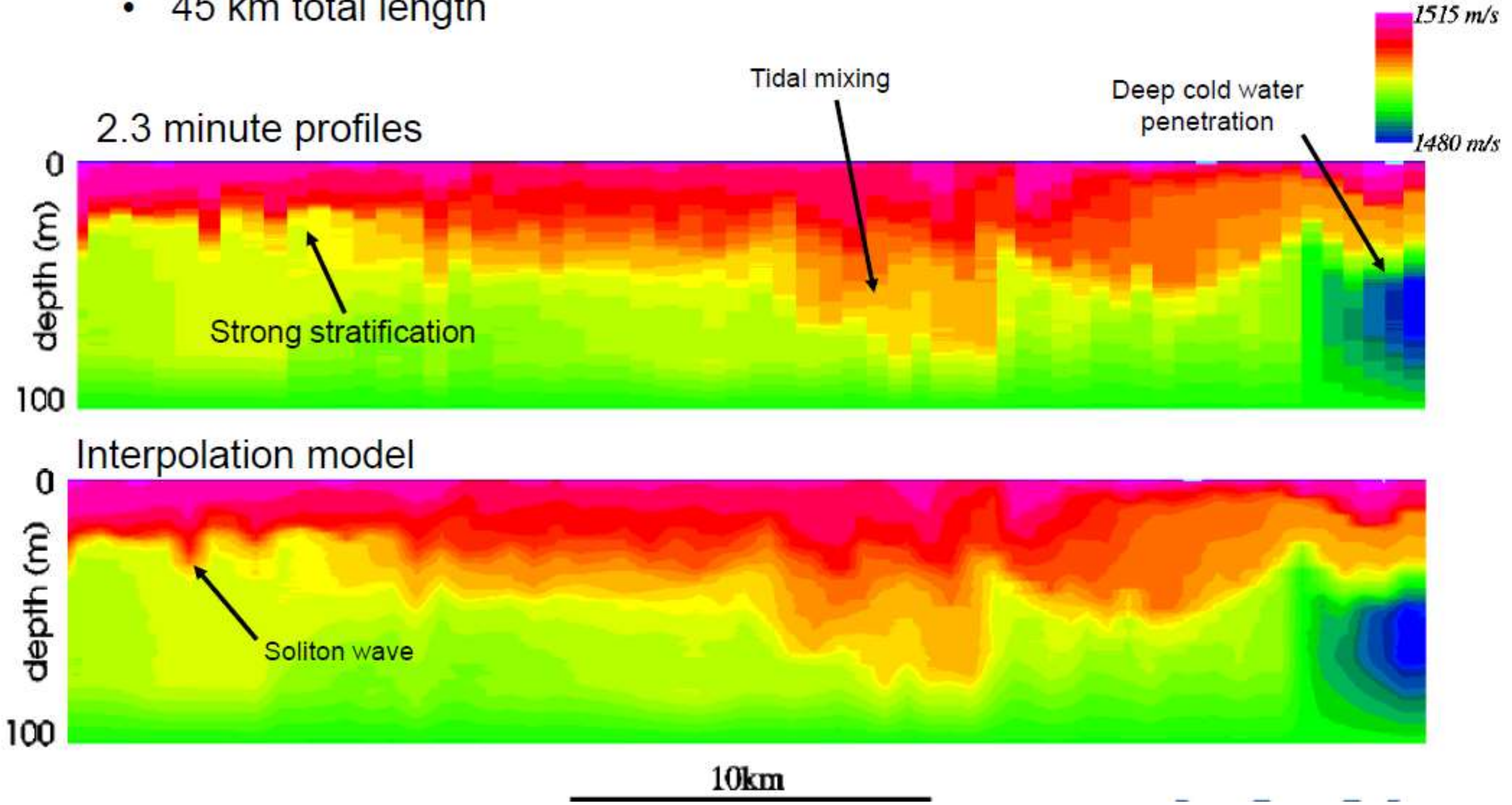
How often should I be taking a profile?

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

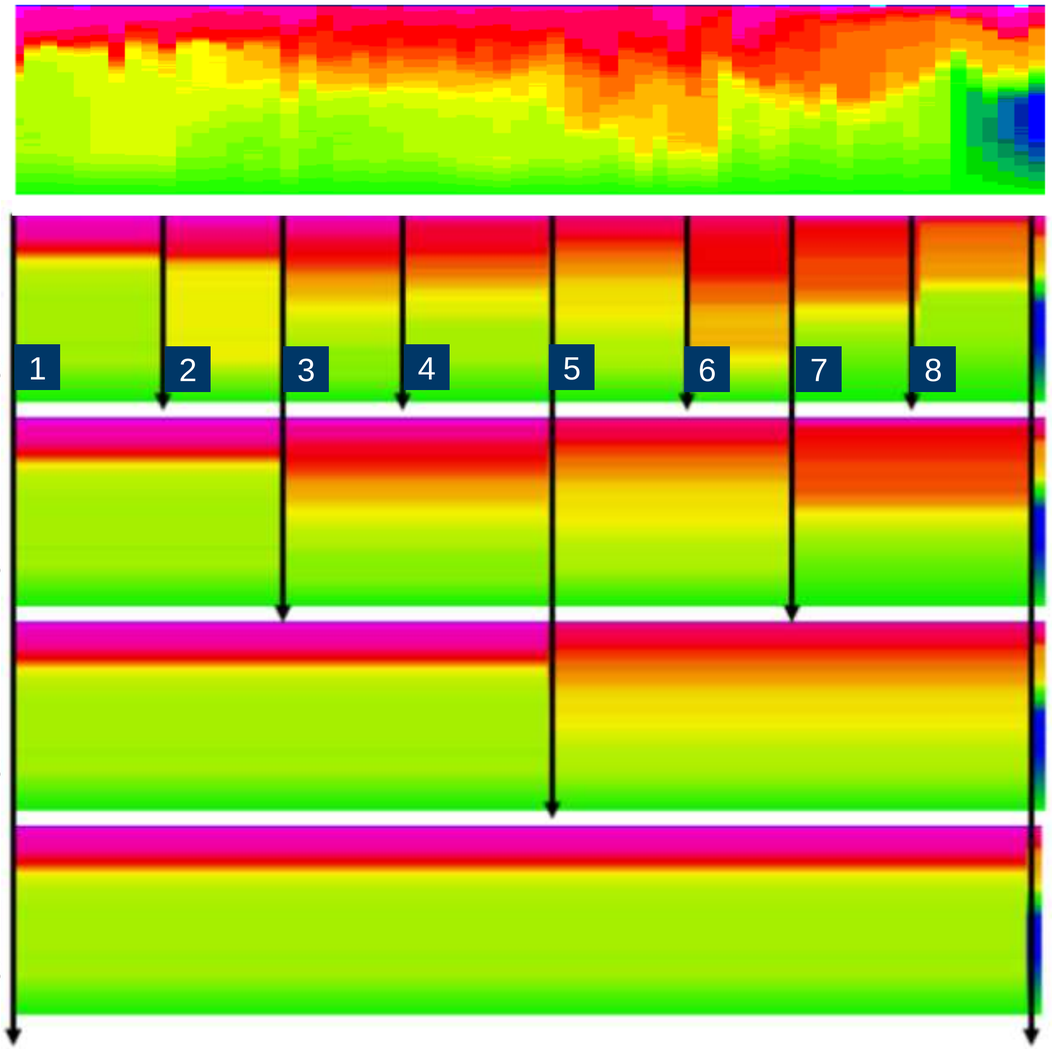
2.3 minute interval between profiles (reference)

17.5 minute interval between profiles

35 minute interval between profiles

70 minute interval between profiles

140 minute interval between profiles



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

Interpolated

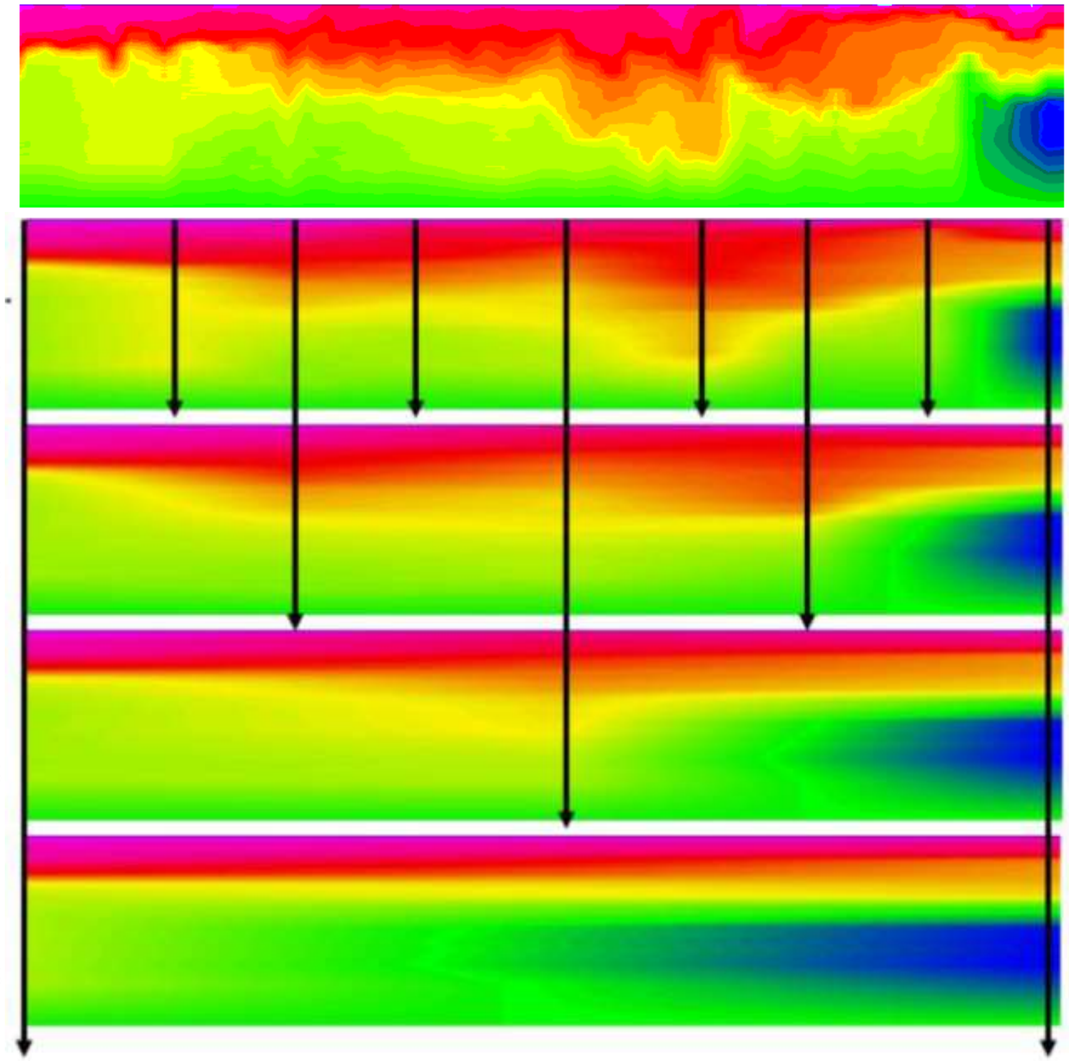
2.3 minute interval (~continuous)

17.5 minute interval between profiles

35 minute interval between profiles

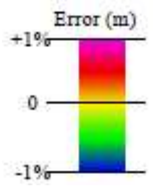
70 minute interval between profiles

140 minute interval between profiles



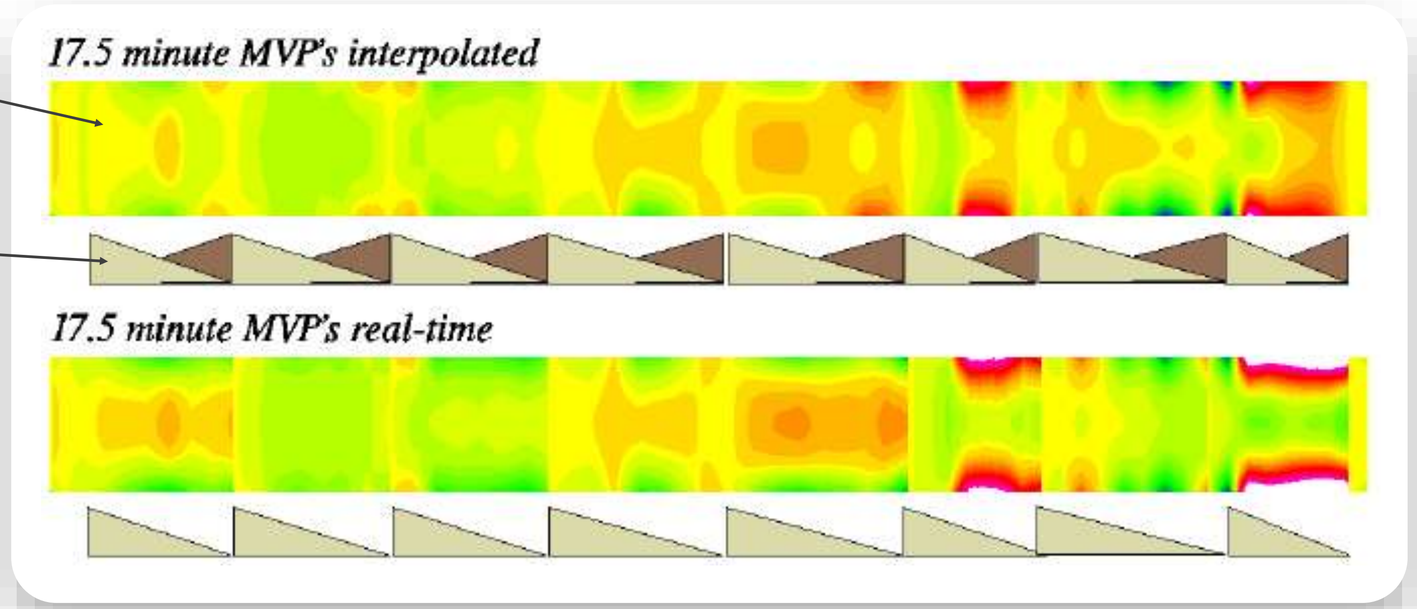
Interpolation is only useful and productive if the SV profile frequency is greater than the rate of change in oceanographic conditions.

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

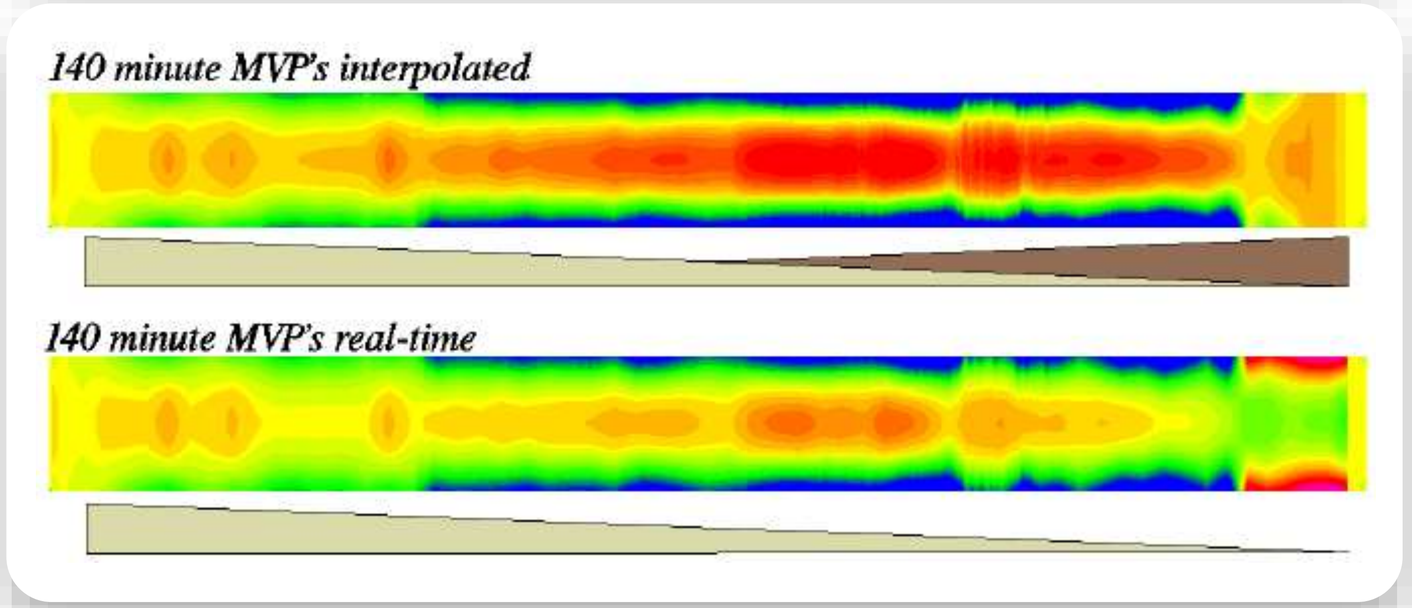


Depth difference

Profile weightings



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



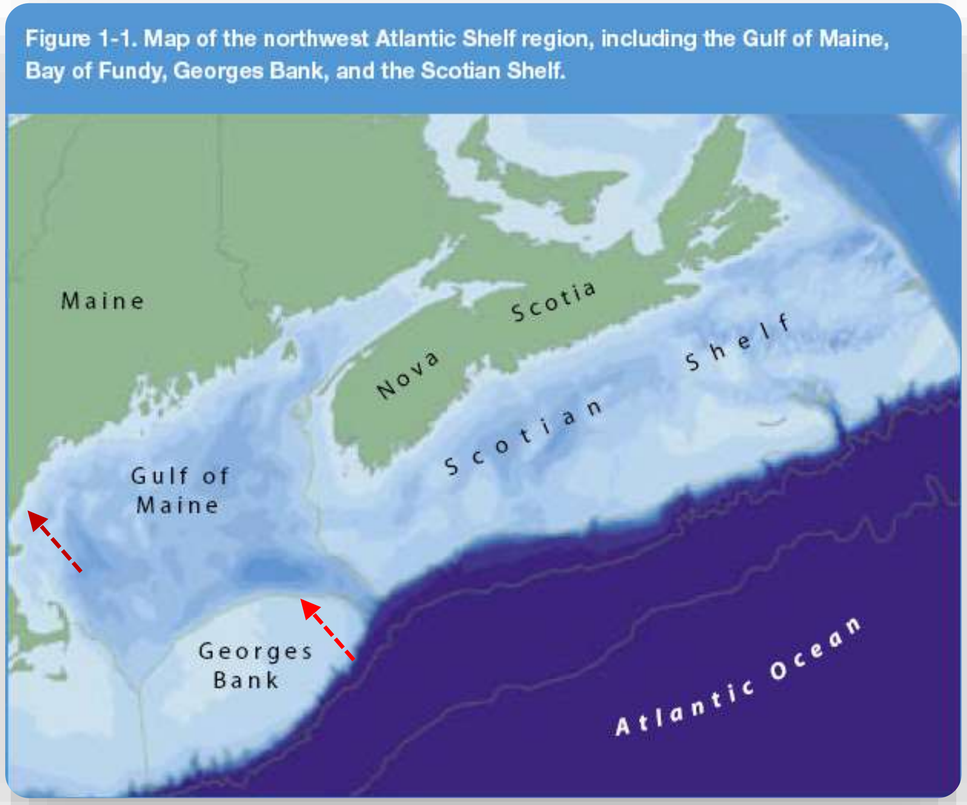
140 min – Disaster. Many errors between 1% and 5% of depth

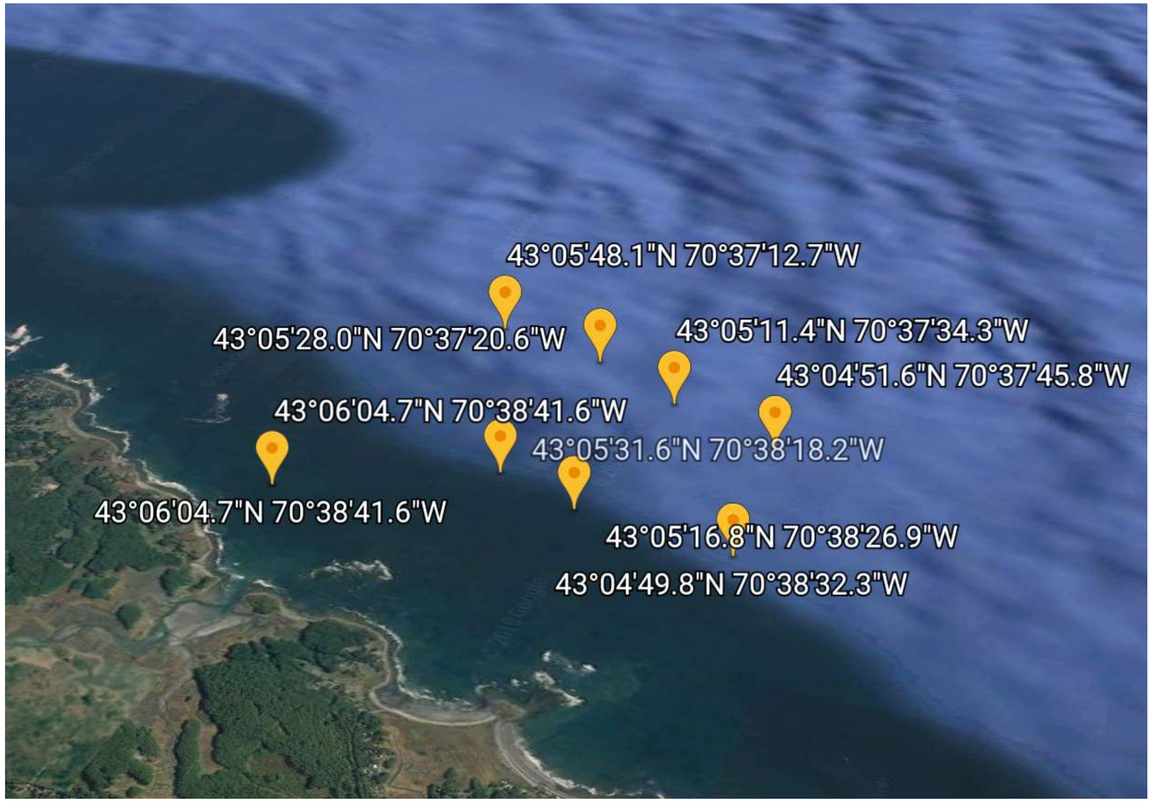
Source: Integration of near-continuous sound speed profile information. J. H. Clarke, M. Lamlugh, E. Kammerer. May 2000

CASE STUDY 2

How often should I be taking a profile?

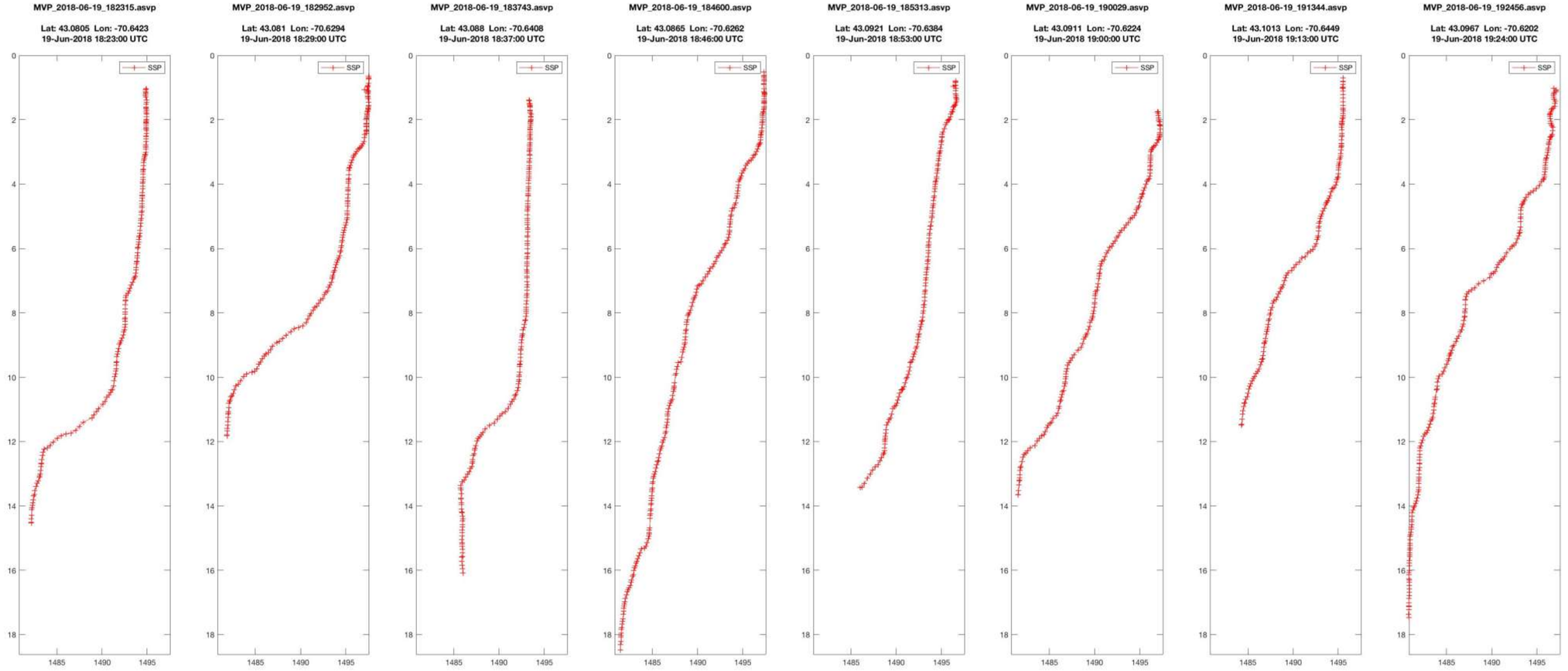
A demonstration of what happens when a water mass is under-sampled.





Courtesy of Semme Dijkstra, UNH.

Sound Speed Profiles Over Time

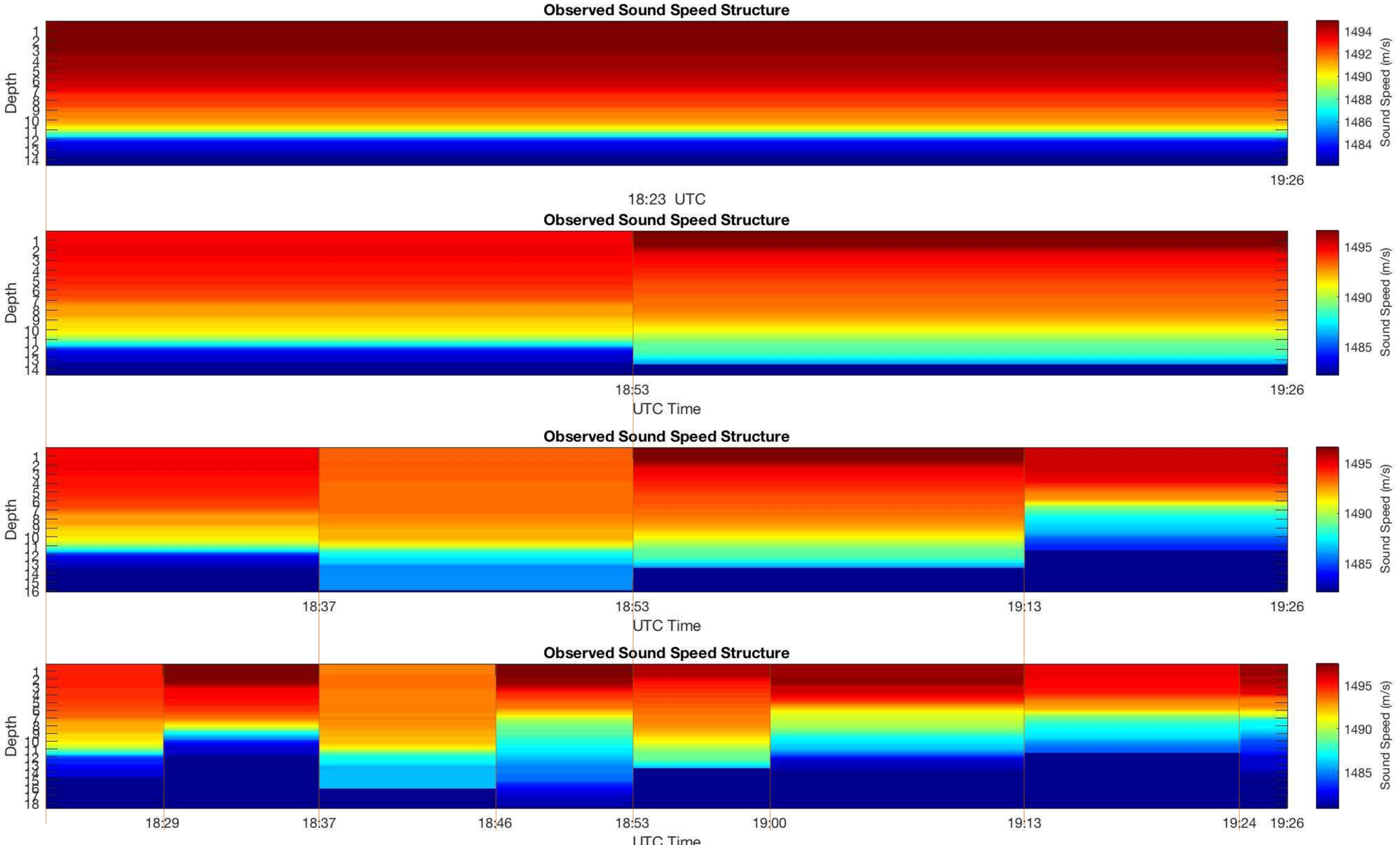


Very near shore (< 1 NM) along non linear Seacoast
Variations in sound speed primarily due to tidal currents affected by local bathymetry

Courtesy of Semme Dijkstra, UNH.

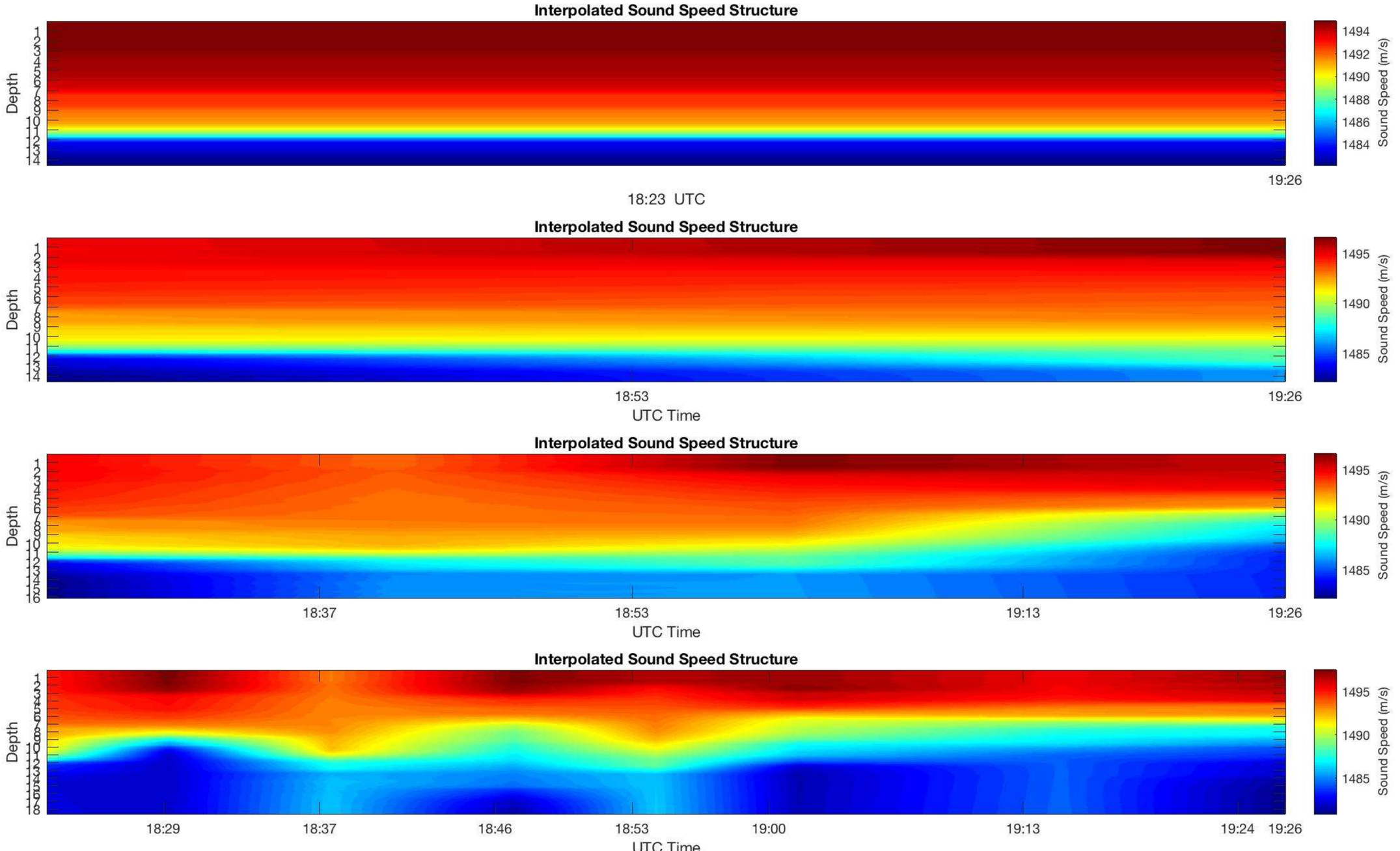
Observed Profiles

Courtesy of Semme Dijkstra, UNH.



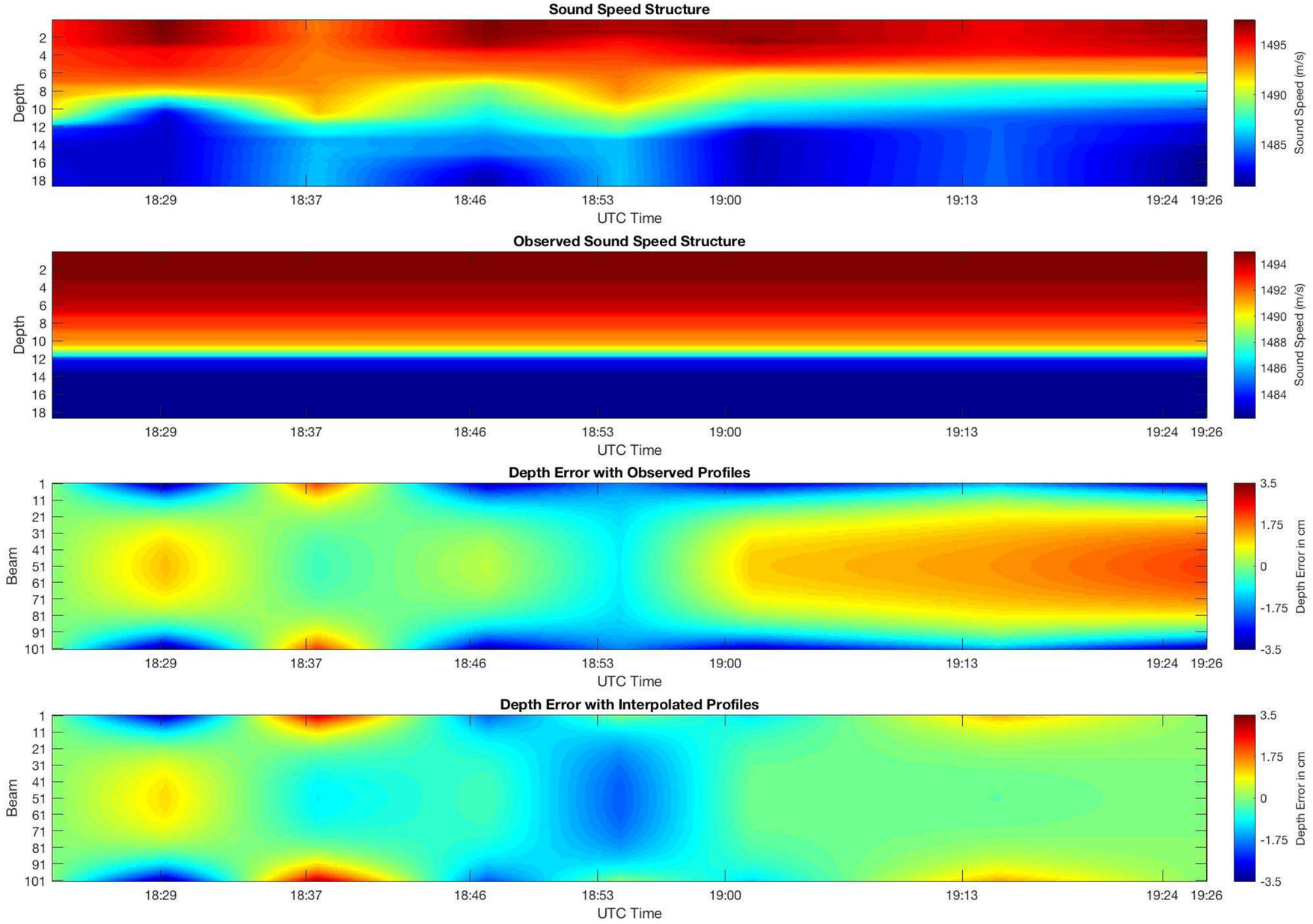
Interpolated Profiles

Courtesy of Semme Dijkstra, UNH.



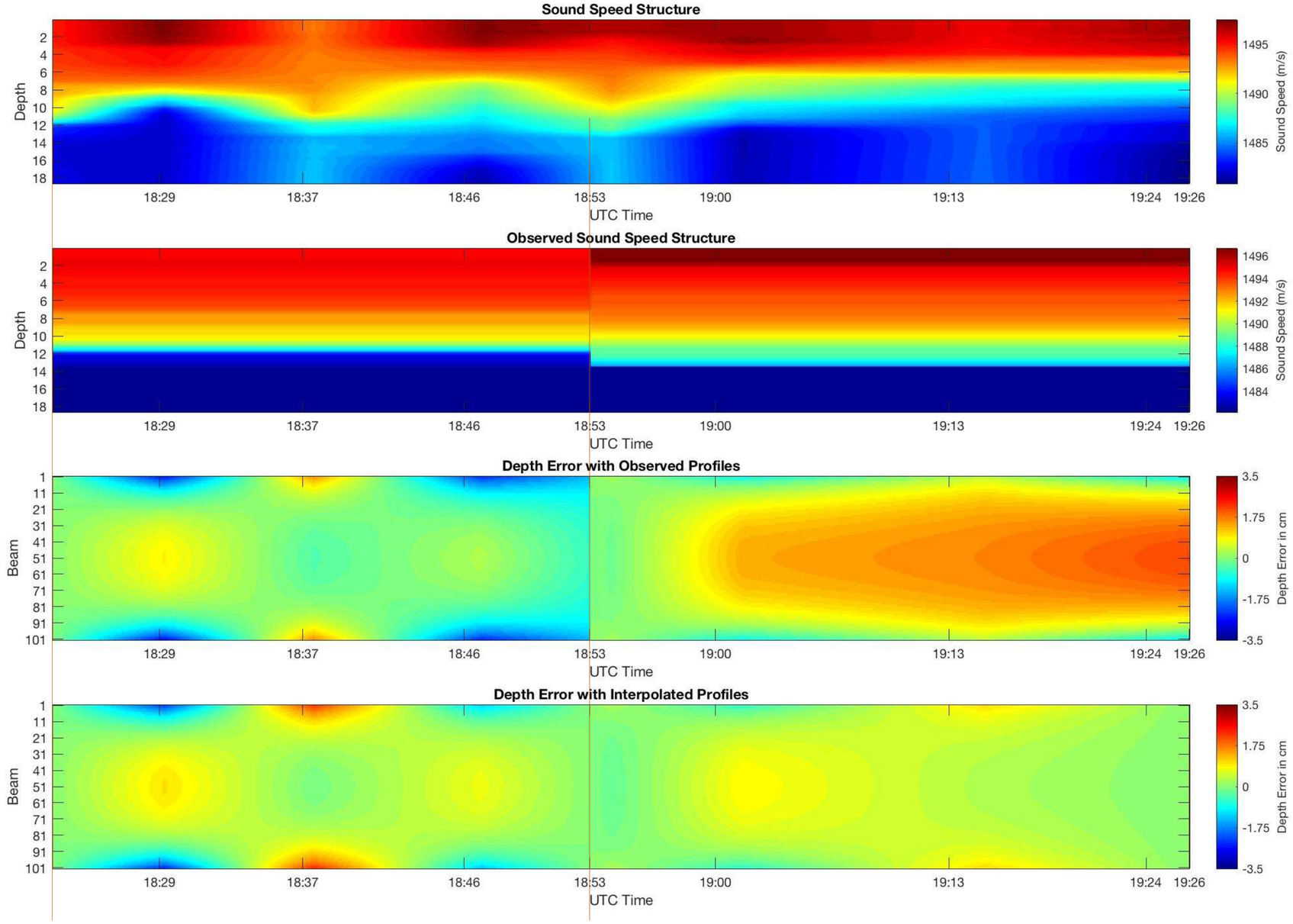
Depth Errors Using 1 Profile

Courtesy of Semme Dijkstra, UNH.



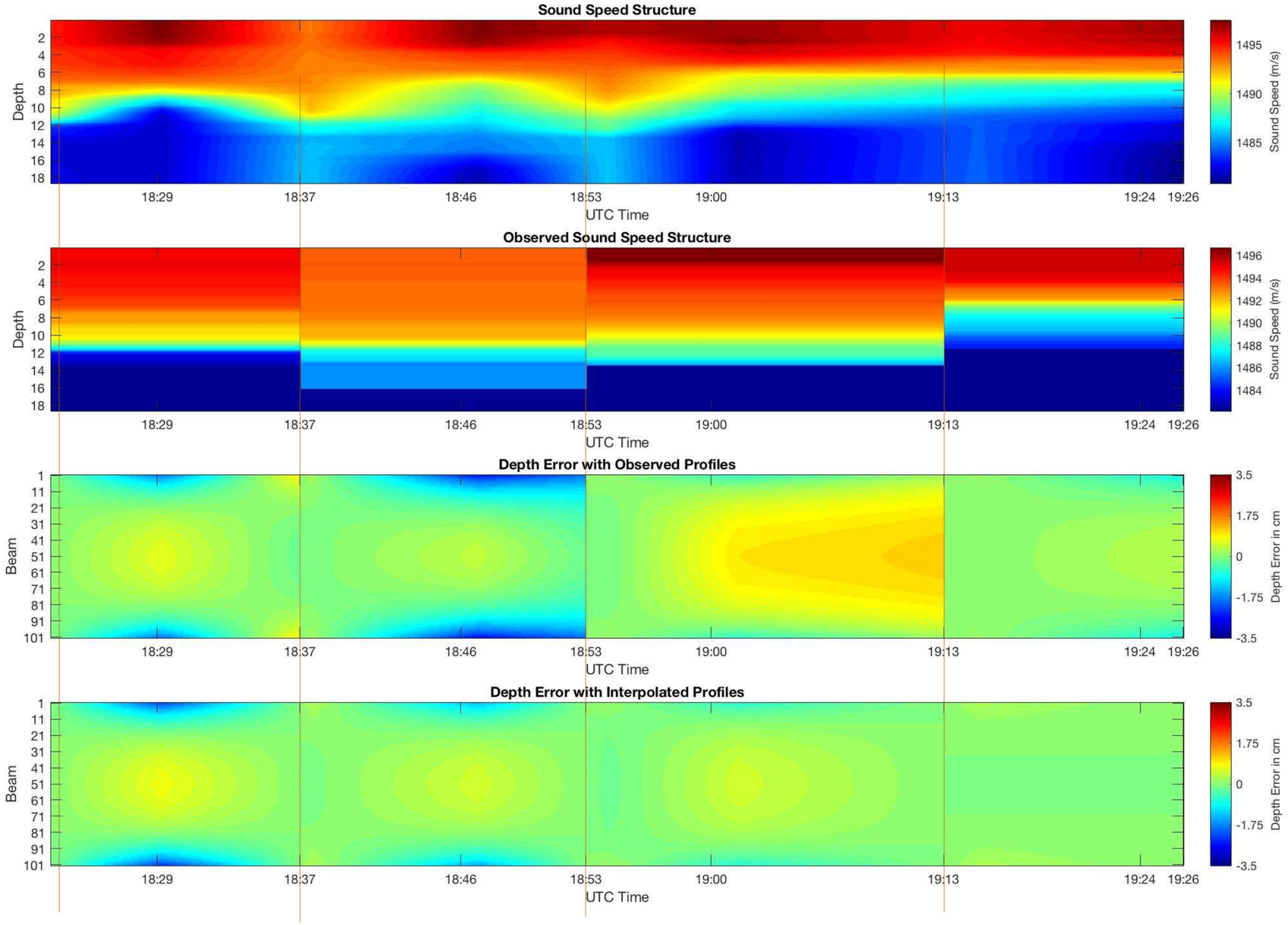
Depth Errors Using 2 Profiles

Courtesy of Semme Dijkstra, UNH.



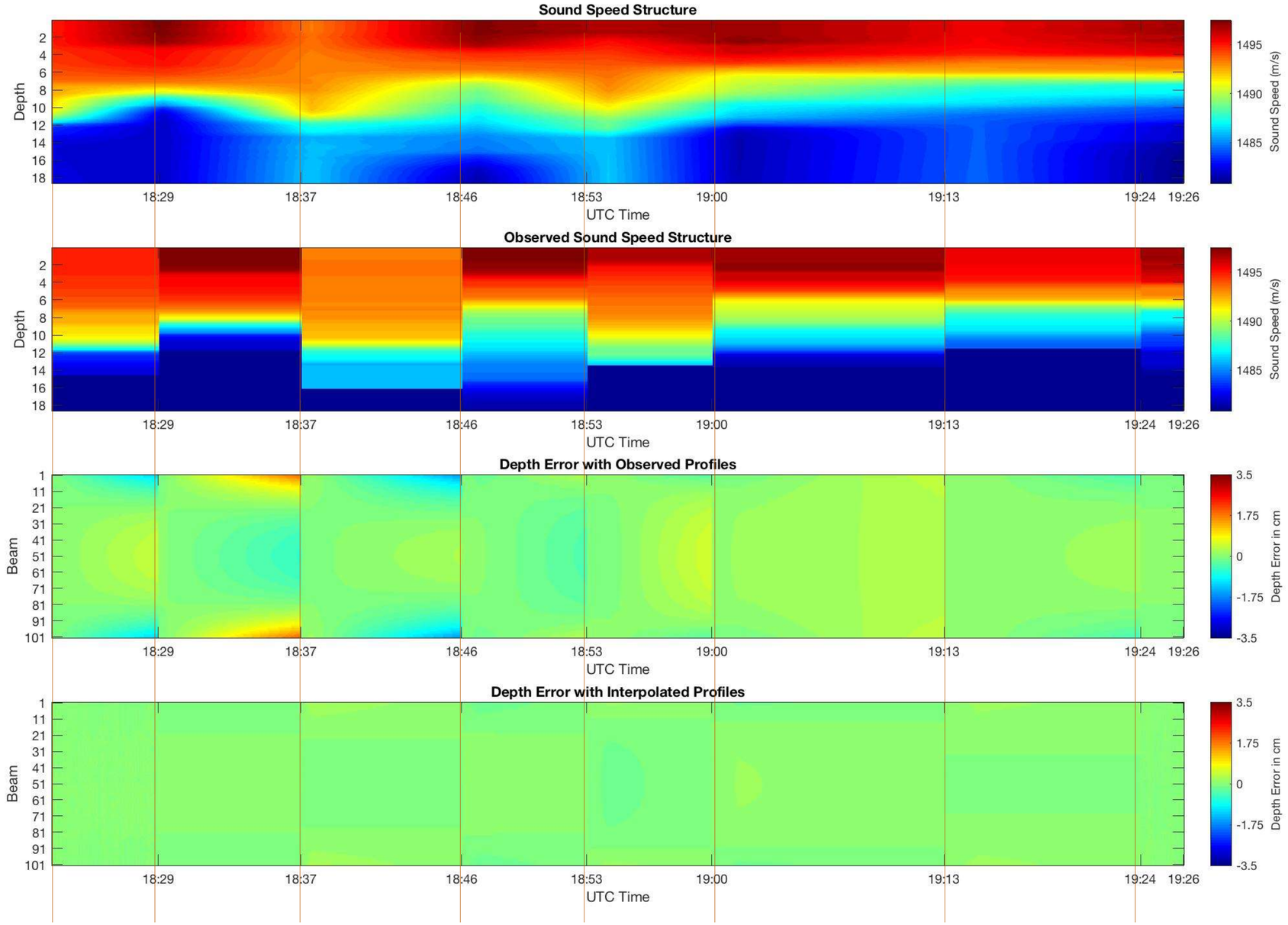
Depth Errors Using 4 Profiles

Courtesy of Semme Dijkstra, UNH.



Depth Errors Using 8 Profiles

Courtesy of Semme Dijkstra, UNH.



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

FFI Forsvarets forskningsinstitutt
Norwegian Defence Research Establishment

SHOM L'océan en référence

National Oceanography Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

University of New Hampshire

INFOMAR

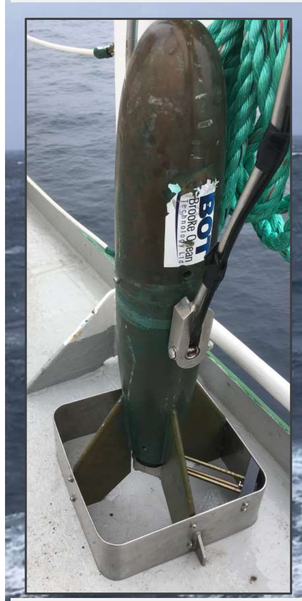
NAVAL OCEANOGRAPHIC OFFICE

FUGRO

AML OCEANOGRAPHIC

MVP-200 operating in Sea State 7

Deploying to ~ 100m every 30 minutes at 8 knots



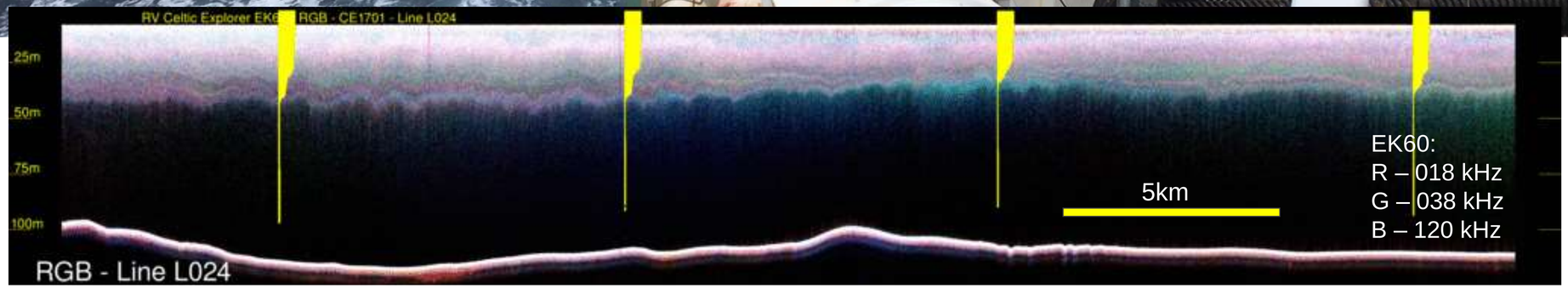
500 profiles in 12 days

each profile equivalent to

~ 0.5 hours stationary

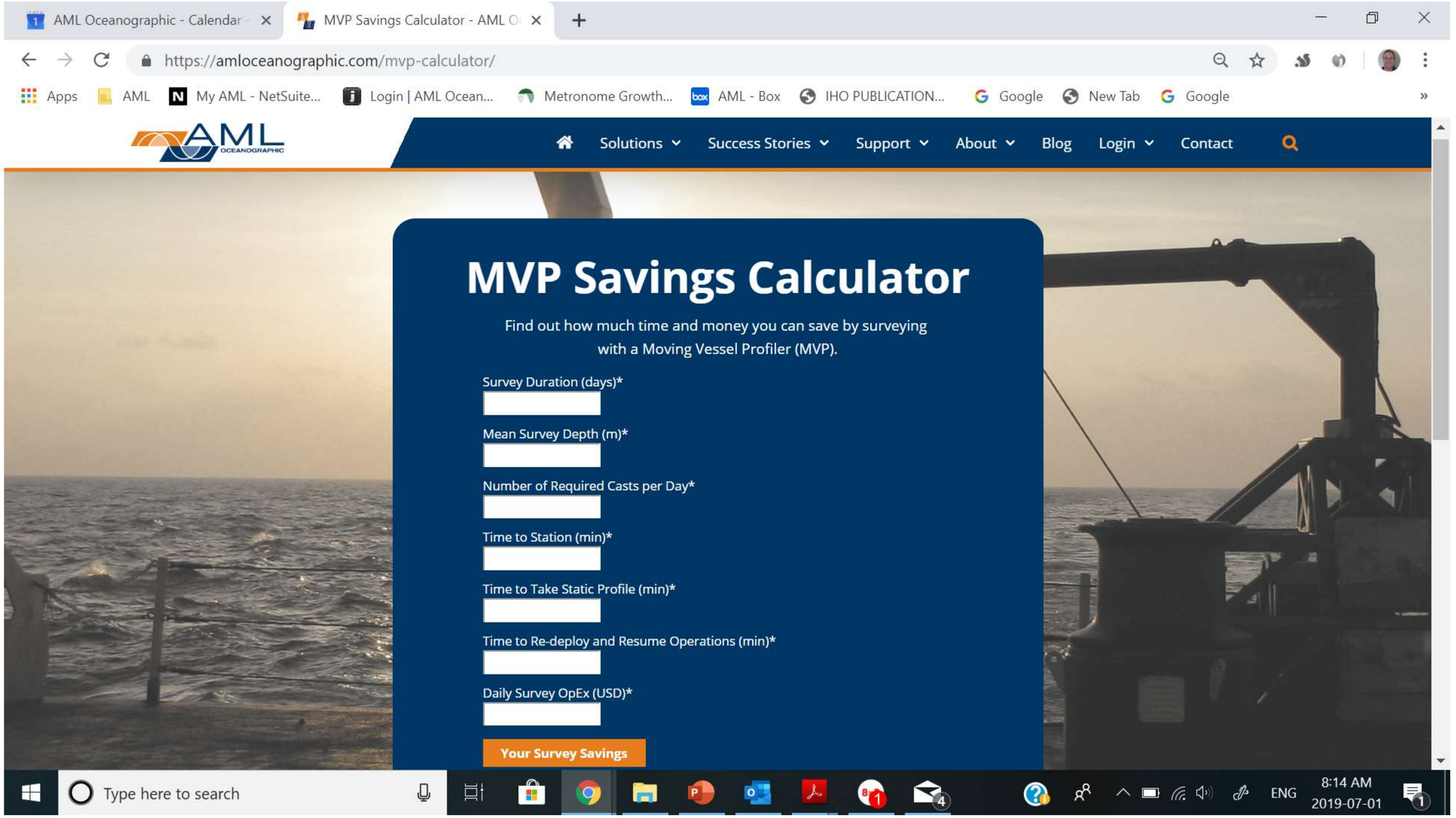
(ship cost ~ US$1000 per hour)

Total saving…10 days / 250,000 USD



Courtesy of INFOMAR and John Hughes Clarke, UNH.

MVP Savings Calculator



https://amloceanographic.com/mvp-calculator/

MVP Time Saving Calcs

Survey Duration (days): **70**

Mean Survey Depth (m): **500**

Number of Required Casts per Day: **2**

Time to Stop Vessel to Take Static Profile (min): 15
Time to Take Static Profile (min): 30
Time to Re-deploy and Resume Operations (min): 15

Total non productive time per Static SVP (min): 60

Daily Survey OpEx (USD): 31000

Time (hrs) Spent on STATIC Casts per Day: 2.0

Cost per Day with STATIC Casts: $2,583.33

Potential Survey Savings with MVP: $180,833.

Potential Time Savings on this Project (days): 5.8

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?

AMLoceanographic.com

Contact

+1 250-656-0771

sales@amloceanographic.com