



AML Oceanographic

Moving Vessel Profiler (MVP)

Data Acquisition: Sensors and Vessel Installations

Presenters:

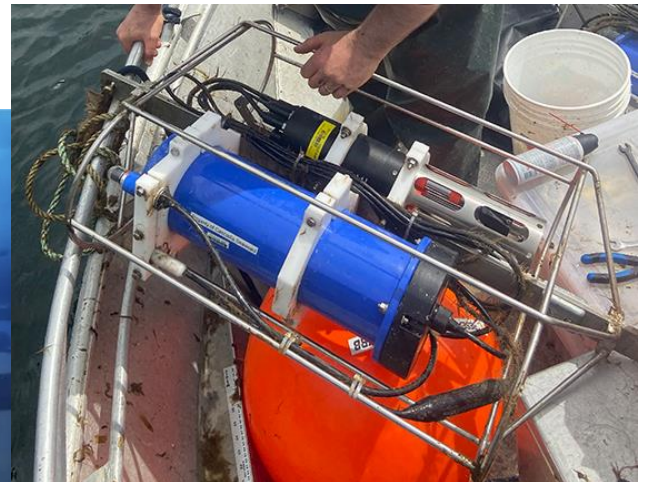
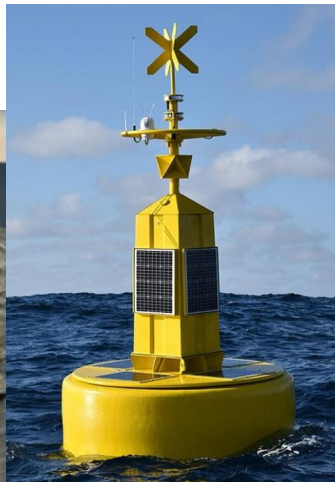
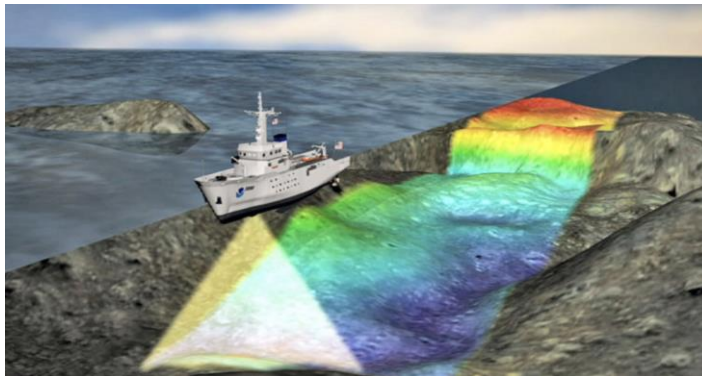
Pete Reedecker – VP Sales

Darrell Groom – Sales Engineer



Located on both the west and east coast of Canada, AML provides ocean sensing solutions around the globe

We help our customers remove the unpredictability - economic and technical - from their various survey operations.



Instrumentation

- Field-swappable sensor-heads
- Largest array of easy to swap sensors
- Environmentally friendly biofouling control
- Wireless charging for USVs
- Fastest delivery in the market



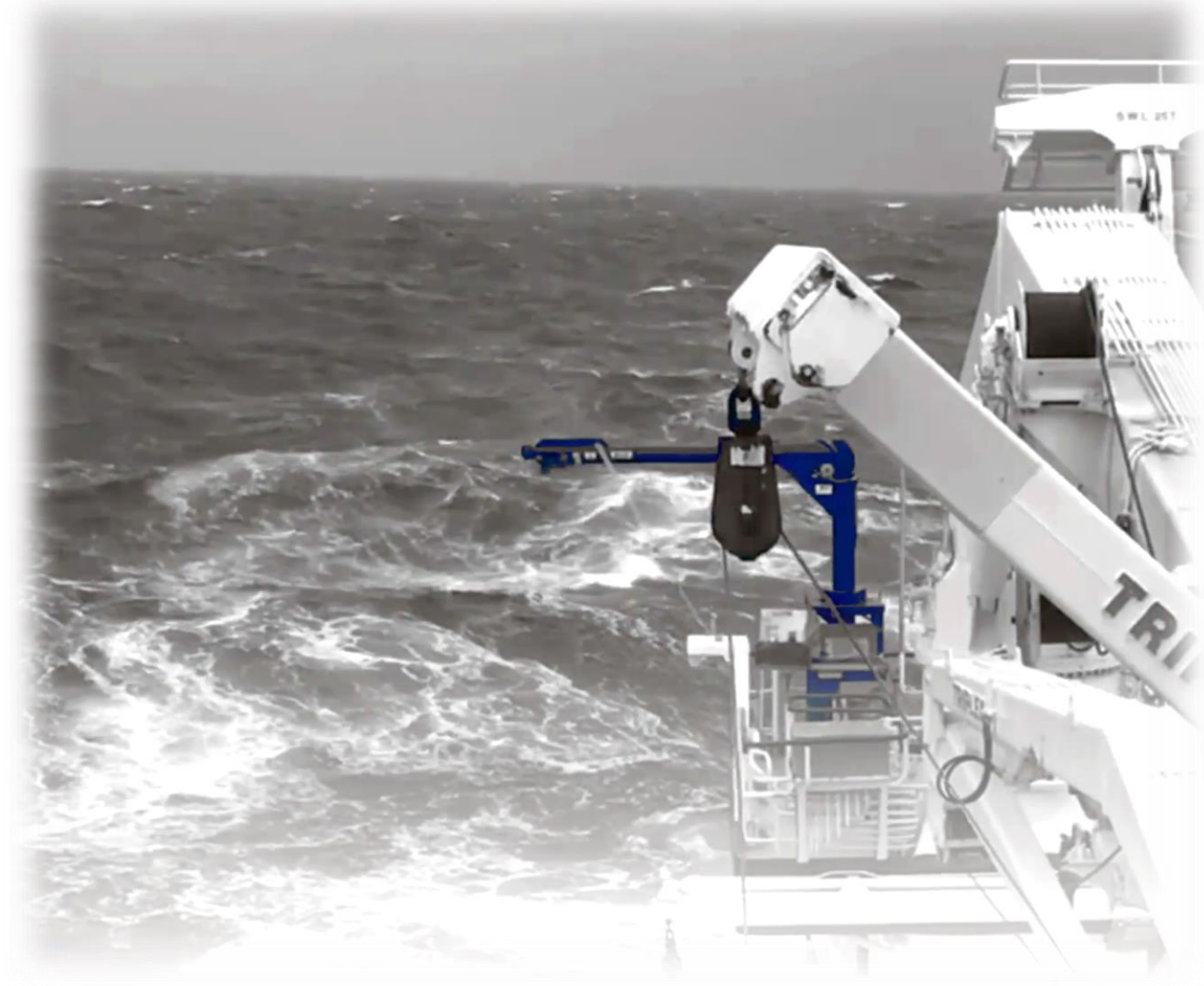






Underway Profiling Systems

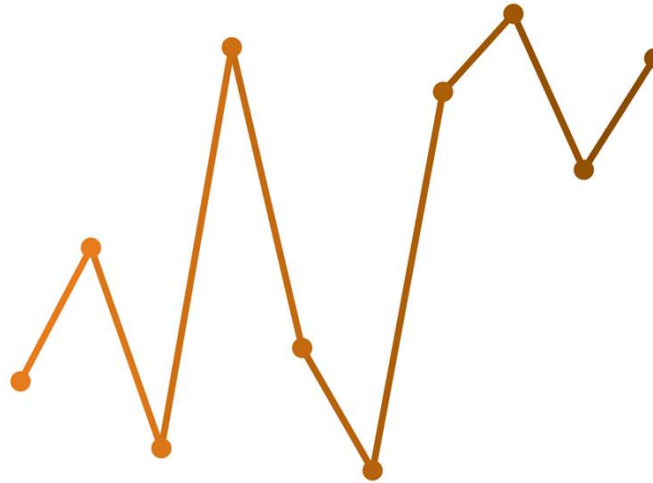
- Expansive sensor suite
- High resolution sensor data thanks to:
 - High velocity casts
 - rapid cycle times when needed
 - Hands off operations



TYPICAL SURVEY CHALLENGES



Survey
Operational
Trade-Offs



Predictability of
Outcome



Less time on deck

Moving Vessel Profiler

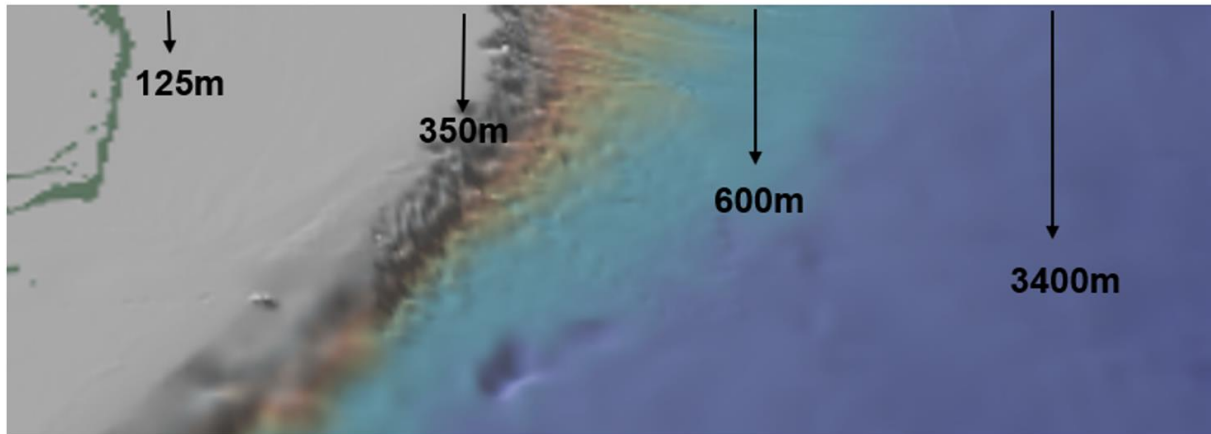


MVP30

MVP30-350

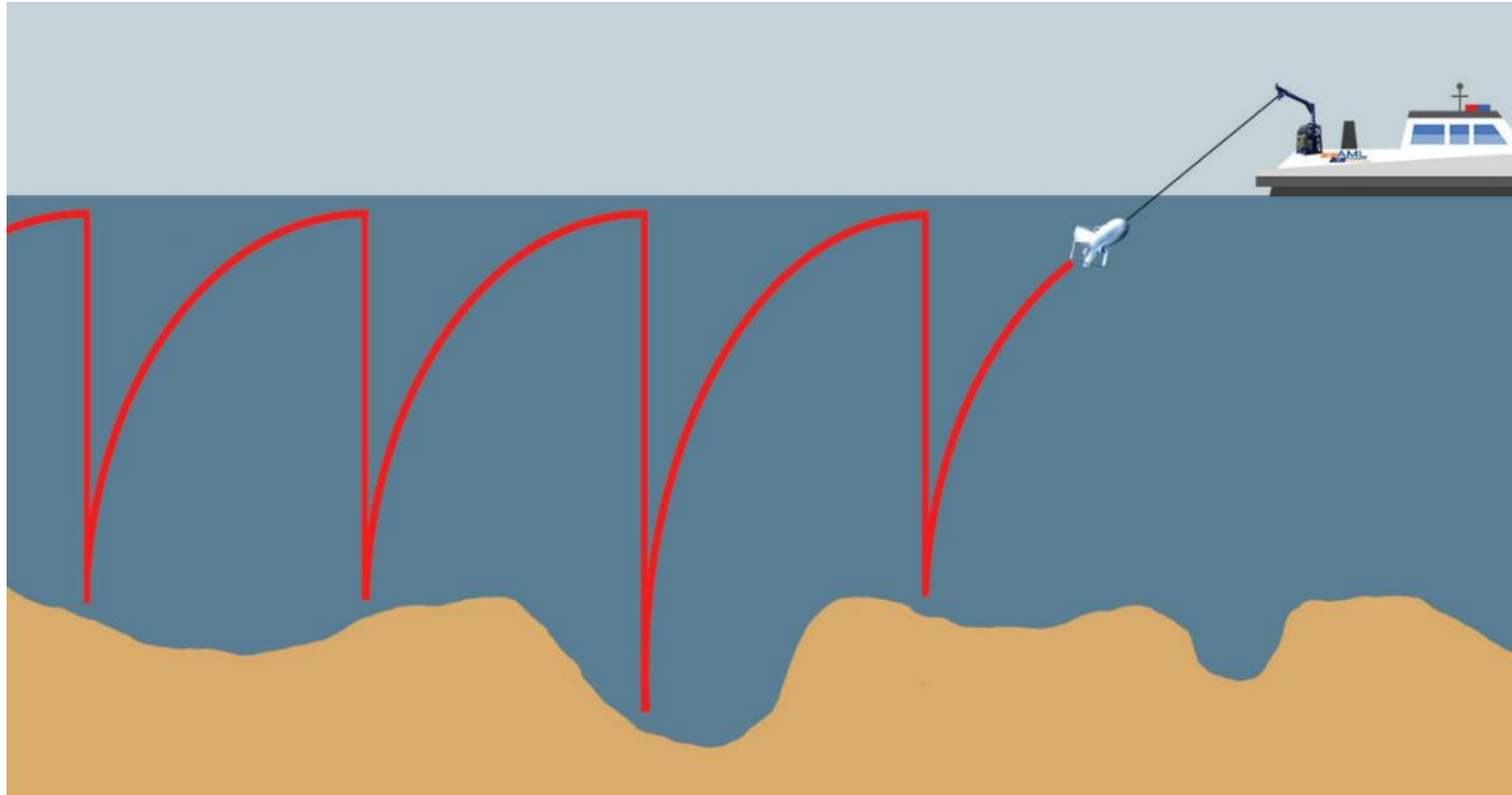
MVP200

MVP300



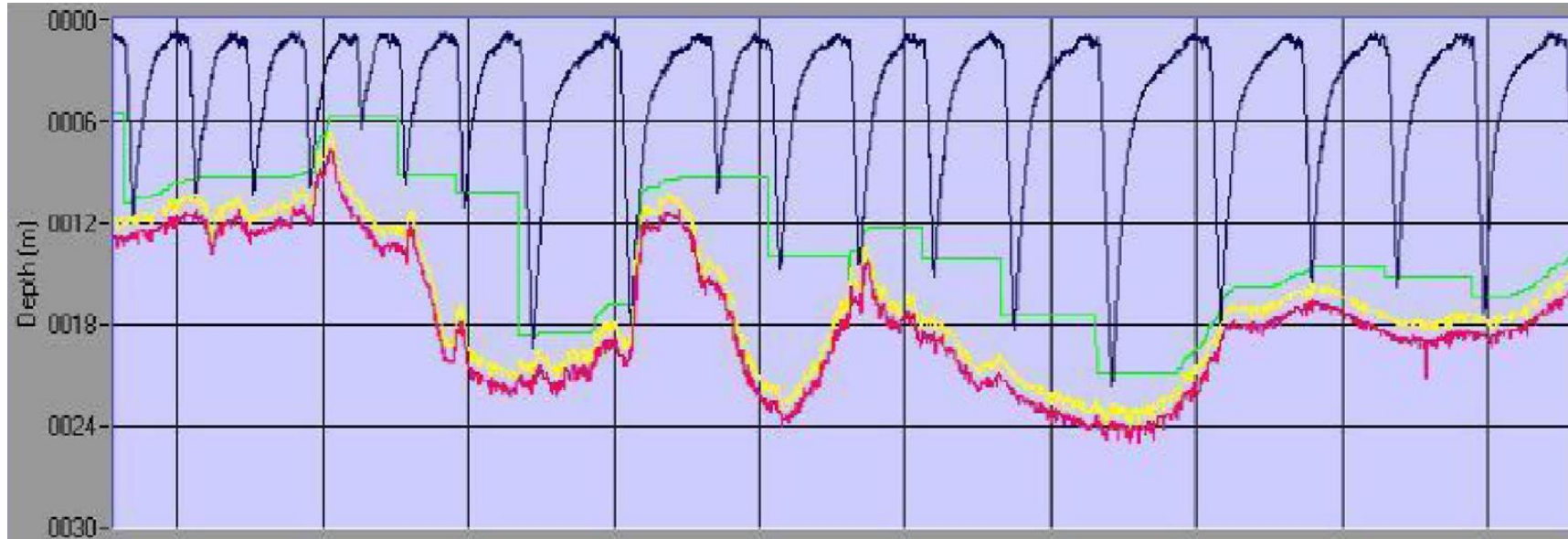


MVP: An automated, real-time vertical underway profiling solution.



Collect vertical water column data continuously in real-time while without stopping

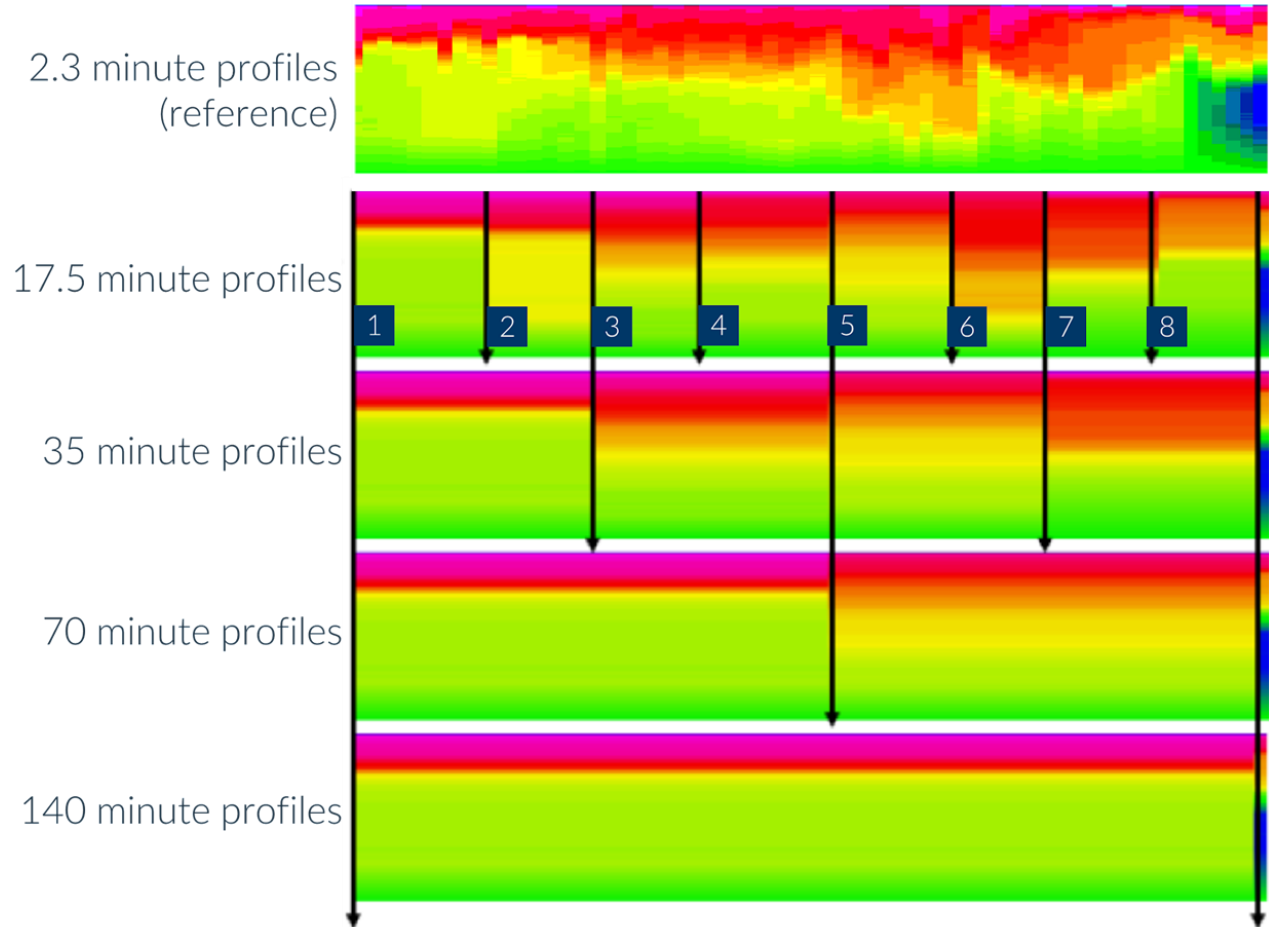
MVP : Automated Seabed Avoidance



Example: Safety block when profiling to 1m altitude. When MVP calculates there is a risk of seabed collision it will automatically put a restriction on deployment depth. Only when safe to do so it will allow full deployment to programmed depth or altitude.

MVP : Data Quality and Resolution

Sound Speed data in
variable environmental
conditions. Comparison is
frequent vs infrequent
profiles
(excerpt from case study)



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

MVP Savings Calculator



Survey Duration (days)

Mean Survey Depth (m)

Number of Required Casts per Day

Time to Stop Vessel to Take Static Profile (min)

Time to Take Static Profile (min)

Time to Re-deploy and Resume Operations (min)

Daily Survey OpEx (USD)

Calculate Savings

<https://amloceanographic.com/>

Total Casts: 360

Time Savings (days): 15

Financial Savings: \$150,000.00

Contact Us

Use It Again

20

MVP Sensor Payloads

- Sensor capability increasing (e.g. SeaBird SUNA Nitrate on large fish)
- Augment mapping survey CTD / SV data with data for science
- Small systems offering expanded sensor payloads



AML Sensors:

	Max Depth	Range	Precision (±)	Accuracy (±)	Resolution	Response Time	Notes
Sound Velocity	6000 m ¹	1375–1625 m/s	0.006 m/s	0.025 m/s	0.001 m/s	20 ms	Time of flight
Sound Velocity & Temperature	6000 m ¹	SV: 1375–1625 m/s T: -5–45 °C	SV: 0.006 m/s T: 0.003 °C	SV: 0.025 m/s T: 0.01 °C	SV: 0.001 m/s T: 0.001 °C	SV: 20 ms T: 500 ms	Combined Sound Velocity & Temperature
Conductivity & Temperature	6000 m ¹	C: 0–5 or 0–90 mS/cm ² T: -5–45 °C	C: 0.003 mS/cm T: 0.003 °C	C: 0.01 mS/cm ⁵ T: 0.005 °C	C: 0.001 mS/cm T: 0.001 °C	C: 25 ms ⁶ T: 100 ms	Combined Conductivity & Temperature
High Accuracy Conductivity & Temperature	6000 m ¹	C: 0–90 mS/cm ² T: -5–45 °C	C: 0.003 mS/cm T: 0.003 °C	C: 0.003 mS/cm ⁵ T: 0.005 °C or 0.002 °C	C: 0.001 mS/cm T: 0.001 °C	C: 25 ms ⁶ T: 100 ms	Combined Conductivity & Temperature
Pressure	50–6000 m	0–50 to 0–6000 dBar	0.03% FS	0.05% FS	0.02% FS	10 ms	Piezoresistive
High Accuracy Pressure	100–6000 m	0–100 to 0–6000 dBar	0.01% FS	0.01% FS	0.001% FS	10 ms	PA10LX Piezoresistive
Temperature	6000 m ¹	-5–45 °C ³	0.003 °C	0.005 °C	0.001 °C	100 ms	-
Turbidity <small>Powered by Turner Designs</small>	600 m	0–1500 NTU	0.5% reading or 0.1 NTU ⁴	2% reading or 0.2 NTU ⁴	0.01 NTU	< 0.7 s	Non-wipered
	200 m	0–3000 NTU	0.04% reading or 0.1 NTU ⁴				Wiper-equipped
Dissolved Oxygen <small>Powered by JFE Rinko FT</small>	2000 m	0–425 µmol/L	-	2% of measured value or 2.0 µmol/L	0.01 µmol/L	< 1 s	-
	6000 m						
CDOM/FDOM	600 m	0–1500 ppb	0.05% FS	Linearity 0.99 R ²	0.01	200 ms	X2-Series fluorometers are powered by Turner Designs
Chl A & B Red Excitation		0–500 µg/L					
Chl A & B Blue Excitation		0–500 µg/L					
Crude Oils		0–1500 ppb					
Flourescein		0–150 ppb					
Optical Brighteners		0–300 ppb					
Phycocyanin		0–4500 ppb					
Phycoerythrin (BGA)		0–700 ppb					
Refined Fuels		0–20 ppm					
Rhodamine		0–200 ppb					
Tryptophan		0–5000 ppb					

Sensors to match client needs:

- Rinko III DO2 Sensor



- SBE 49 FastCAT CTD Sensor



- Seabird ECO-FLNTU-RTD Fluorometer and Turbidity Instrument

- SeaBird Wetlabs ECO-FLbb(RT)D Chlorophyll Fluorometer

- Seabird Irradiance Instrument

- Seabird ECO-NTU Turbidity Instrument

- Seabird PH Instrument



- Seapoint Turbidity Instrument (6000m)



- Turner Cyclops-7F Chlorophyll Fluorometer

- Turner Cyclops-7F Turbidity Sensor

- Turner Cyclops-7F Turbidity Instrument

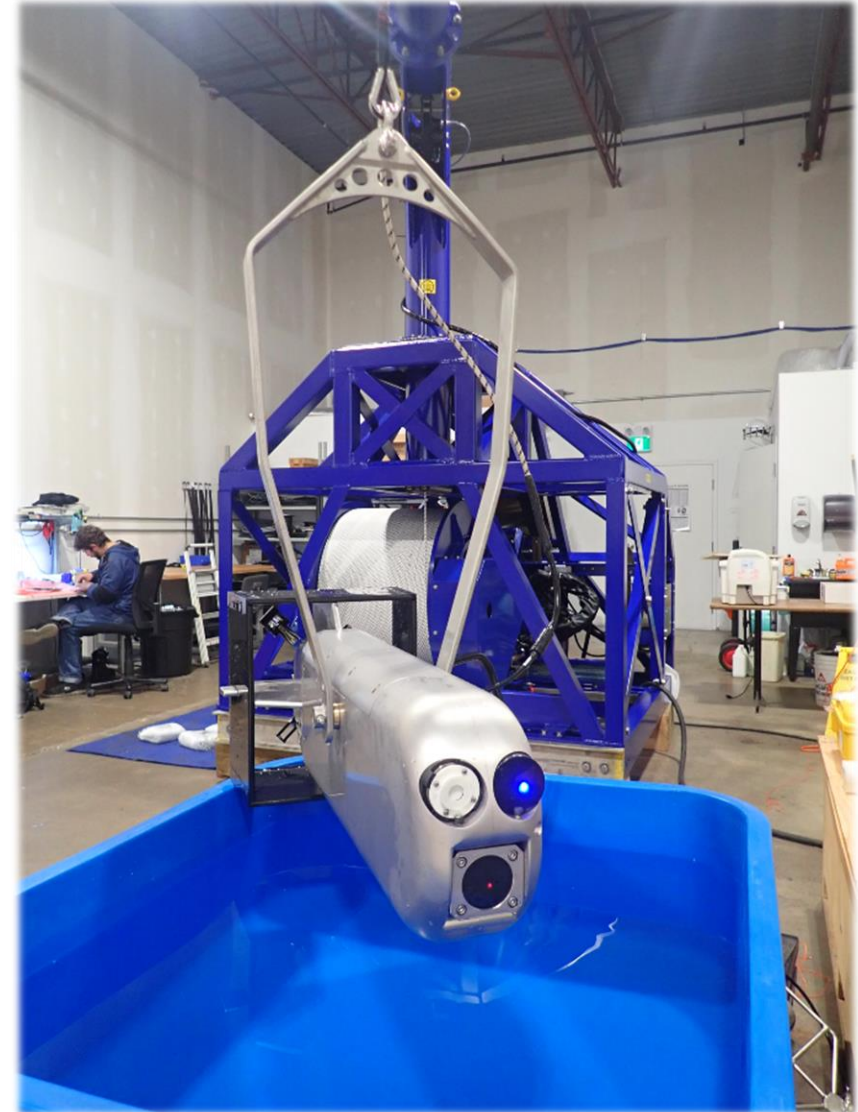
- Turner Cyclops-7F Chlorophyll Fluorometer



- AML XCH2 Expansion Port for X2Change Sensor expansion



Sensors on Multi-Sensor Fish



**At the end of the day, its
all about how successful
the users of the systems
are....**

“We were able to collect an incredibly rich dataset that well characterized the thermohaline structure of this highly dynamic environment.

Once the tow-body is deployed it was a fairly hands off system and only required light supervision for our 12 hour sampling periods

Thank you for helping us get some killer data!”

**Tyler Hennon
Research Assistant Professor
College of Fisheries and Ocean Science
University of Alaska Fairbanks**

Practical Examples: MVP Installations on Vessels of Opportunity

Various models and installations
on different classes of vessels

- MVP 30 / 30-350
- MVP200
- MVP300



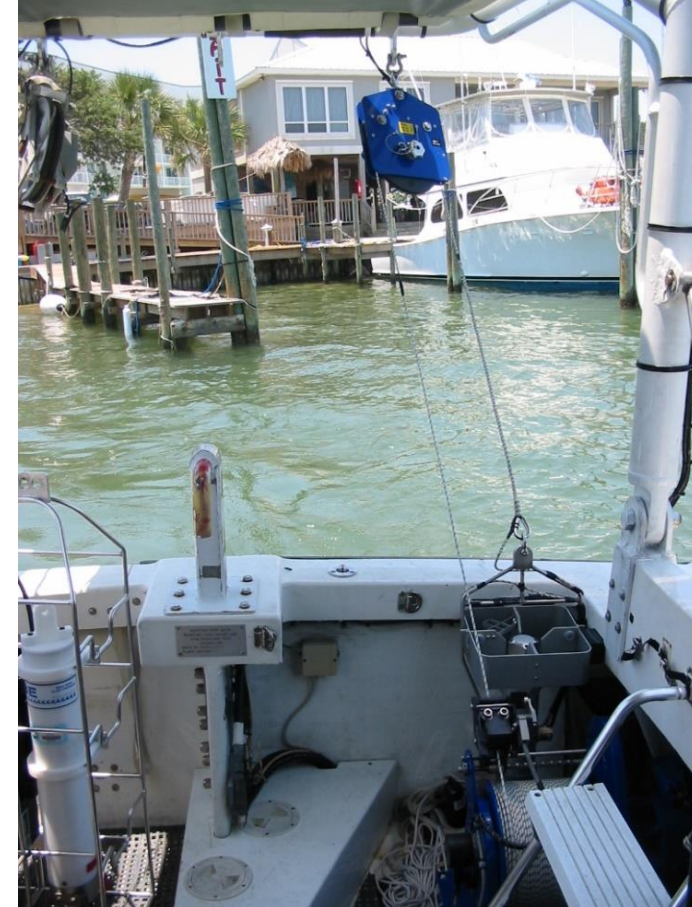
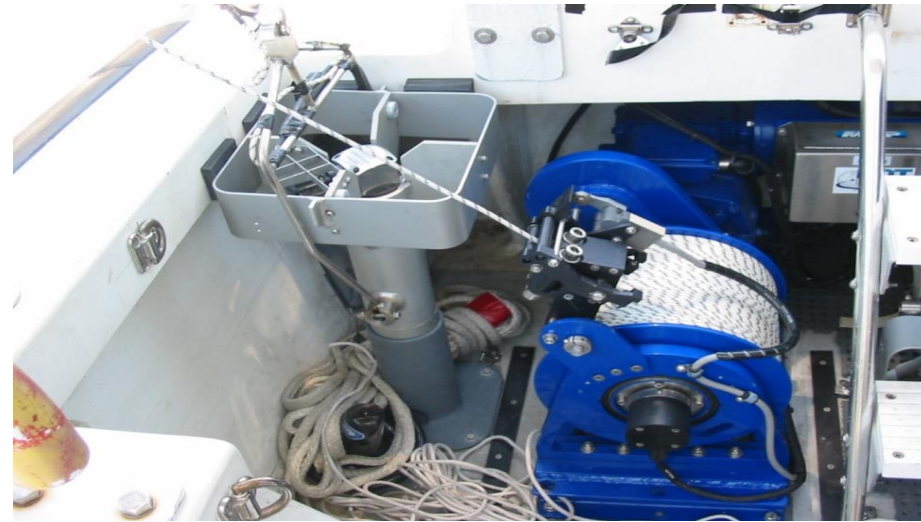
MVP30 / MVP30-350 Installations

University of New Hampshire (UNH) MVP30 Loan



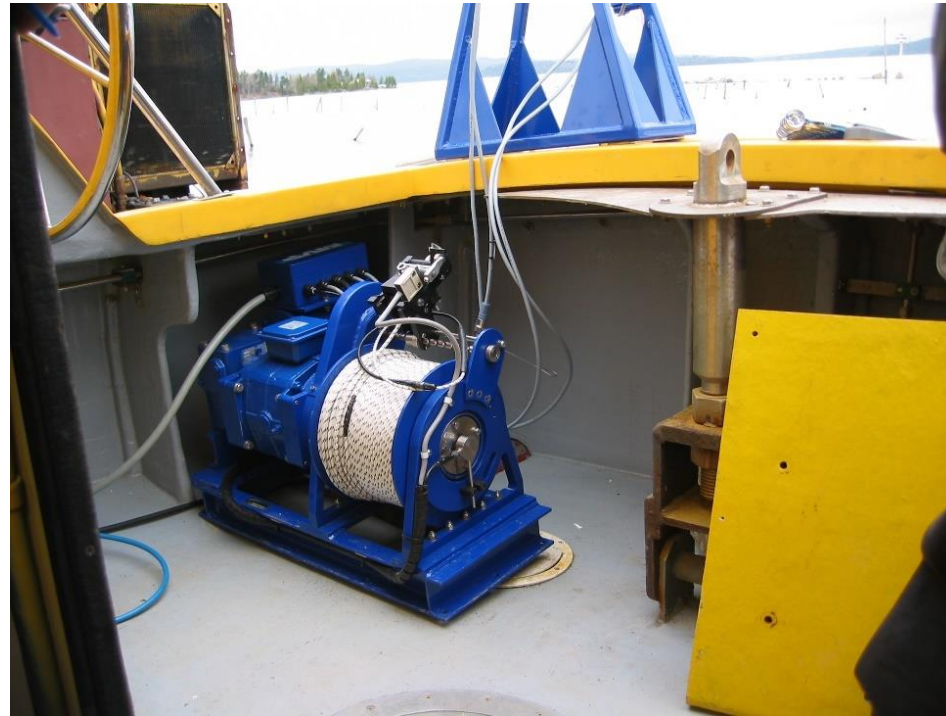
MVP30 / MVP30-350 Installations

Naval Oceanographic Office (NAVO) MVP30 installed on HSL



MVP30 / MVP30-350 Installations

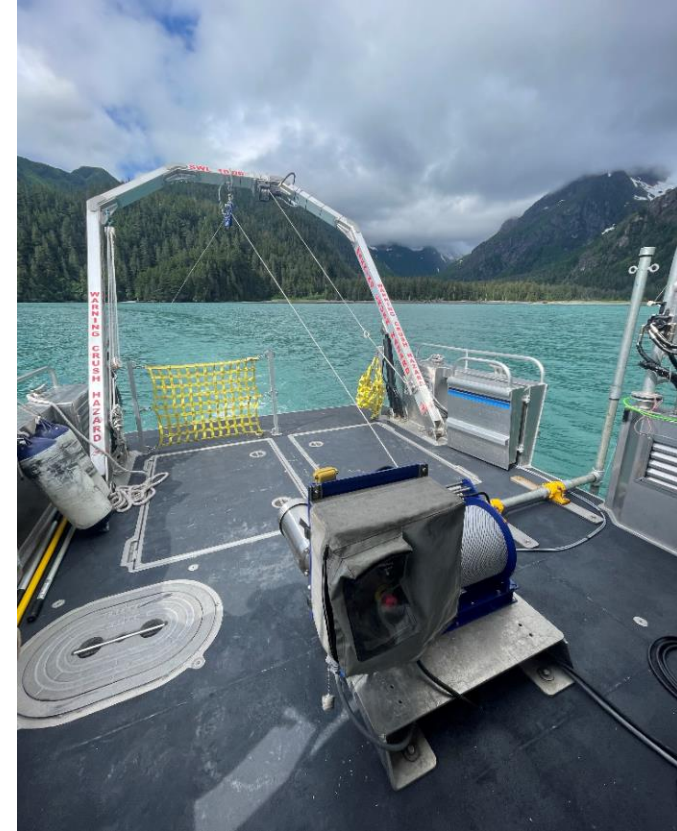
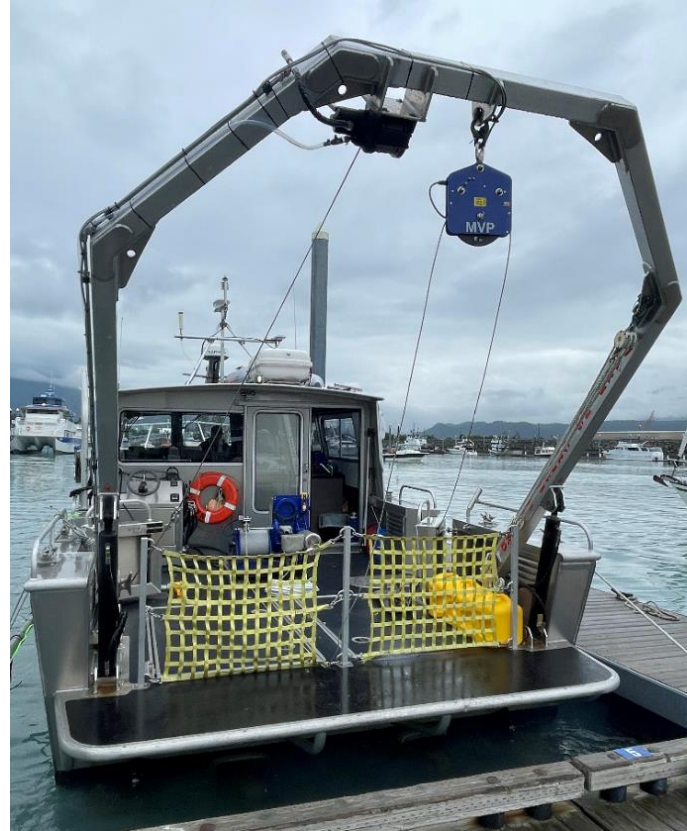
John Hughes Clarke MVP30 installed on RV Heron





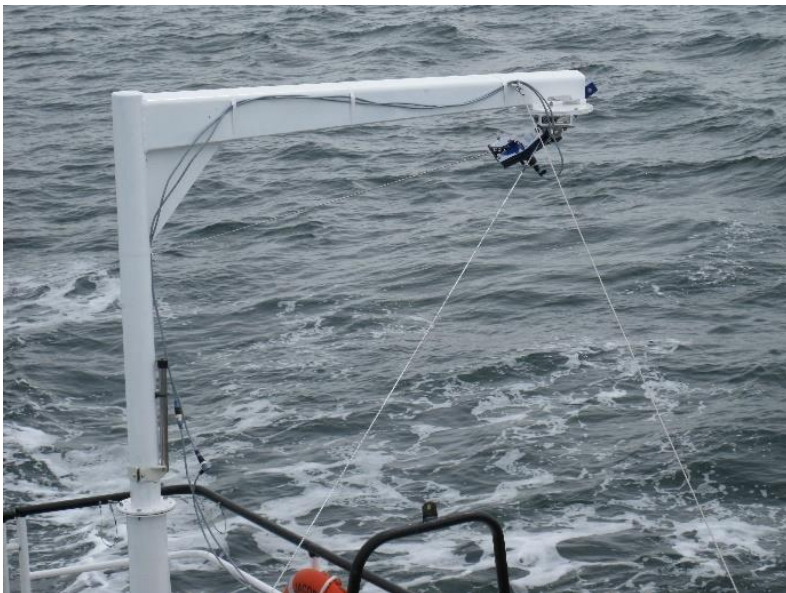
MVP30 / MVP30-350 Installations

University of Alaska Fairbanks MVP30-350 Loan installed on RV Nanuq



MVP30 / MVP30-350 Installations

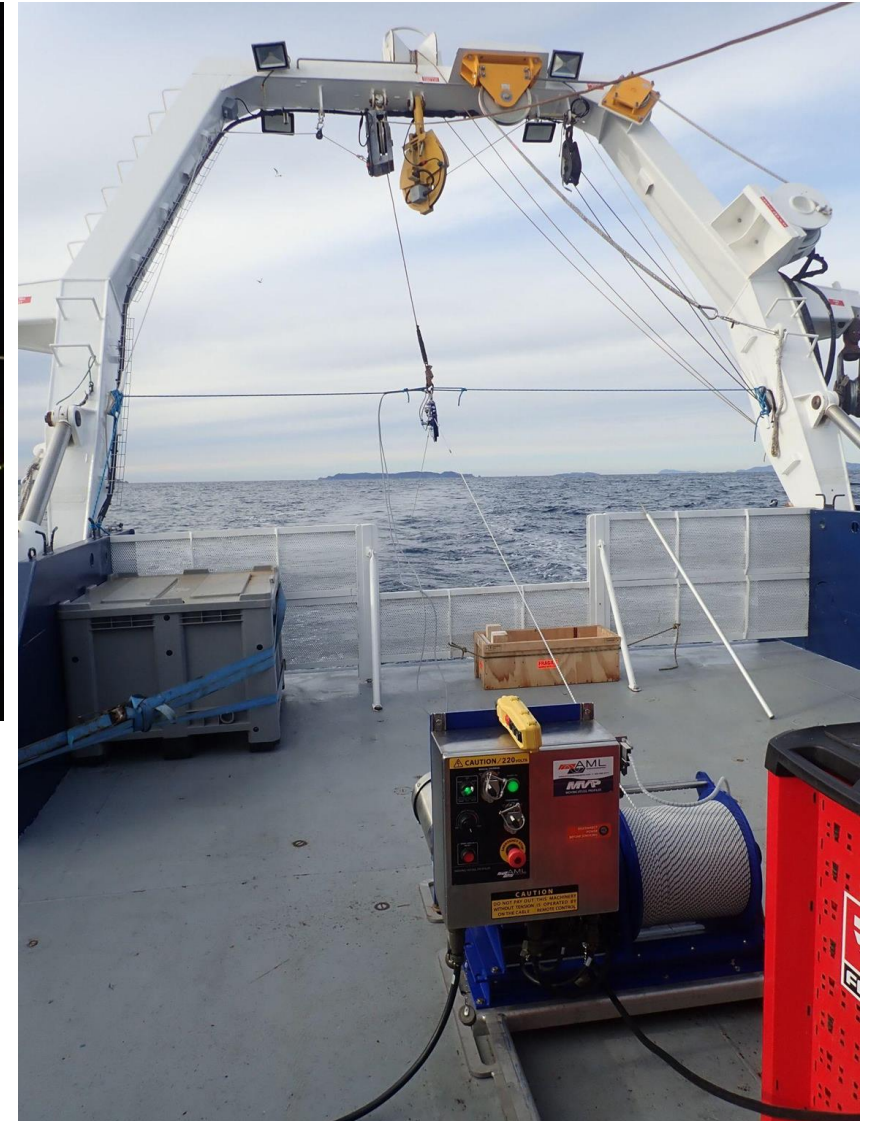
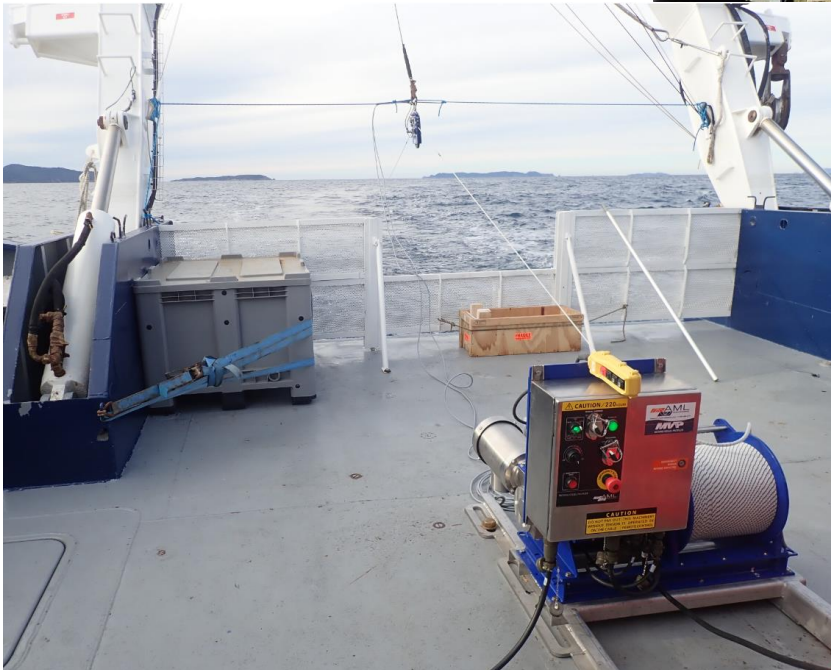
Swedish Maritime Administration (SMA) MVP30-350 installed on RV Jacob Hagg





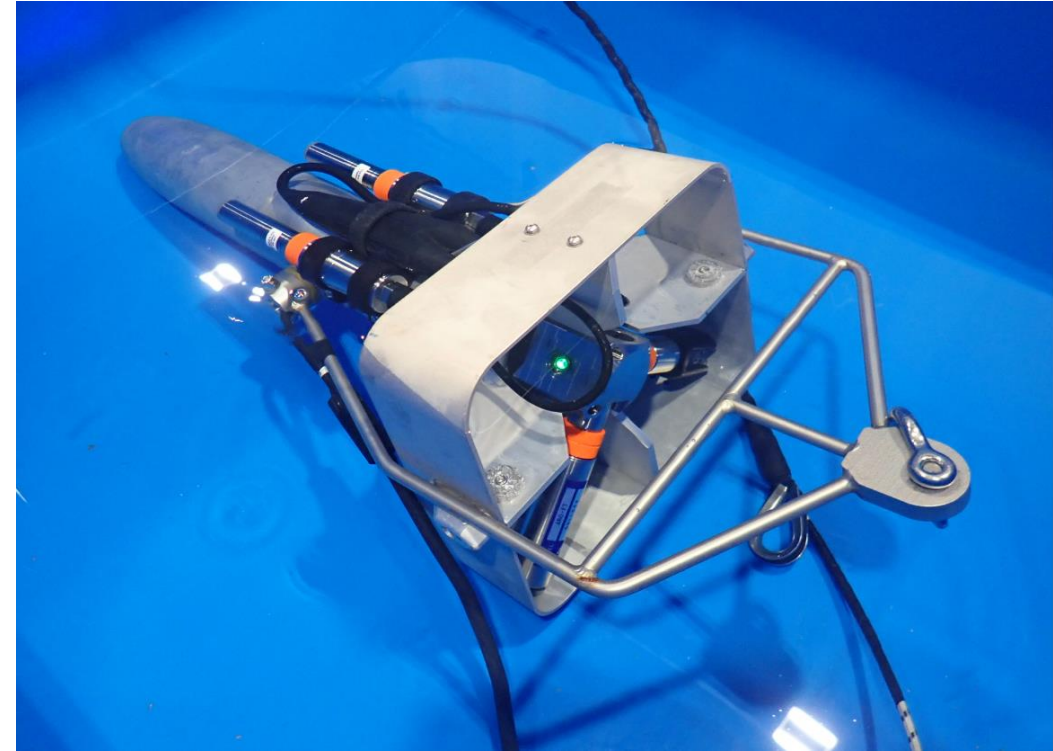
MVP30 / MVP30-350 Installations

Ifremer MVP30-350 installed on RV Tethys II



MVP30 / MVP30-350 Installations

Woods Hole Oceanographic Institution (WHOI) MVP30 Tow Body



MVP30 / MVP30-350 Installations

Fugro Uncrewed Vessel Blue Shadow with MVP30-350



MVP30 / MVP30-350 Installations

Geomar MVP30-350 installed on RV Meteor





MVP30 / MVP30-350 Installations

Brazil Navy MVP30-350 with Integrated A-Frame installed on NHO Taurus



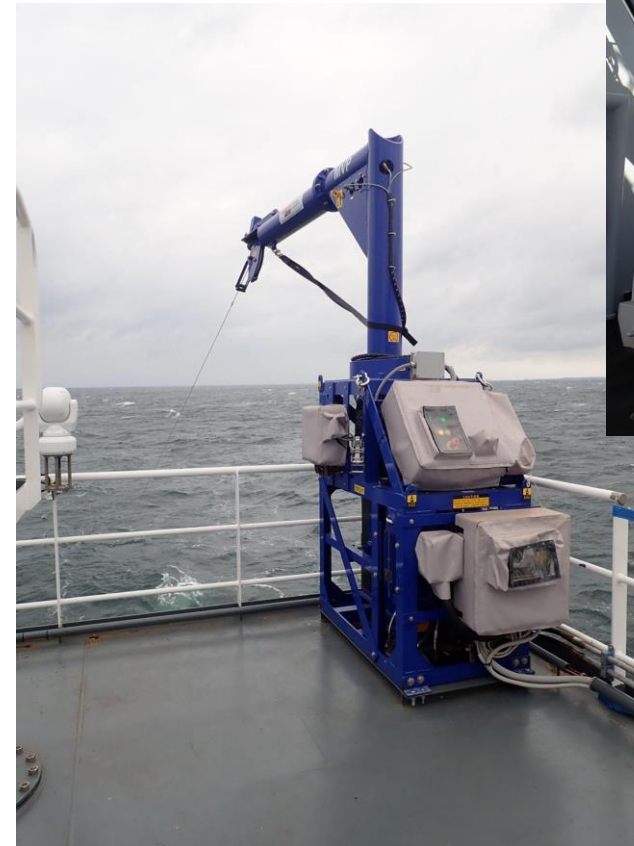
MVP30 / MVP30-350 Installations

Examples of MVP30 and Overboarding Sheave Installed on Subframe



MVP200 Installations

Swedish University of Agricultural Sciences (SLU) MVP200 installed on Research Vessel RV SVEA



MVP200 Installations

Ifremer MVP200 installed on RV Tethys II



MVP200 Installations

Ifremer MVP200 - Operational Video Available on YouTube



Credit to Ifremer: <https://youtu.be/GXuu0Z3Qq3c?feature=shared>

MVP200 Installations

Canadian Hydrographic Service (CHS) MVP200 Systems





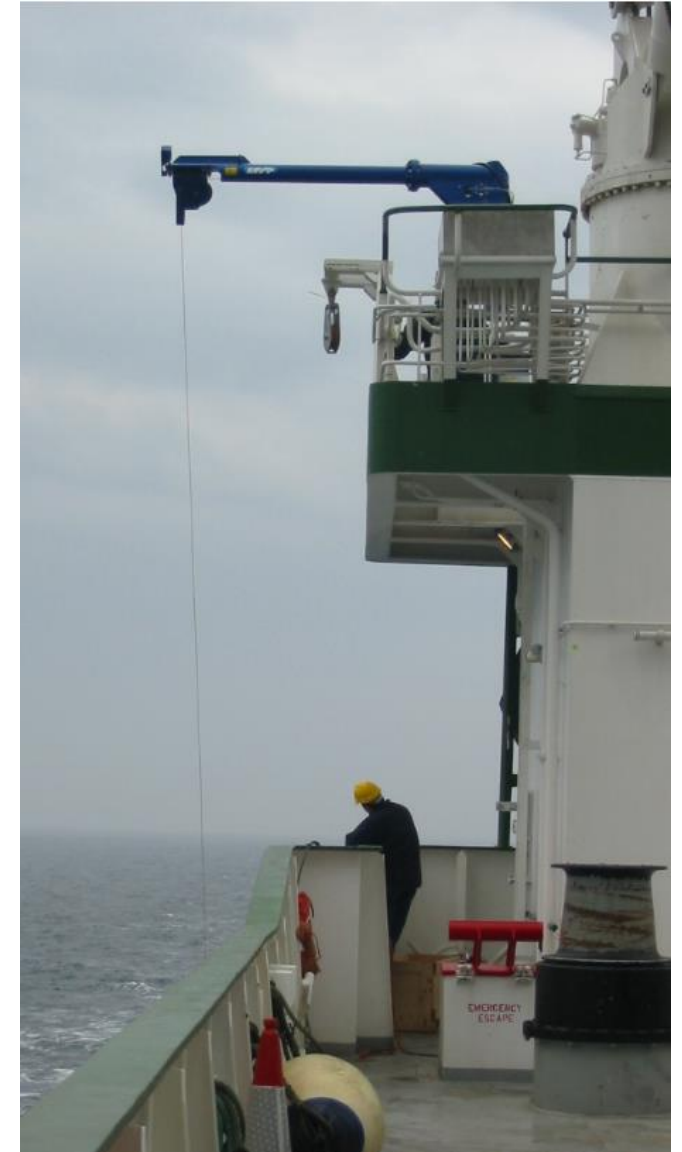
MVP200 Installations

Royal Australian Navy (RAN) MVP200 installed on HMAS Melville



MVP200 Installations

Irish Marine Institute MVP200 installed on RV Celtic Explorer



MVP200 Installations

Irish Marine Institute MVP200 on RV Celtic Explorer - Operational Video

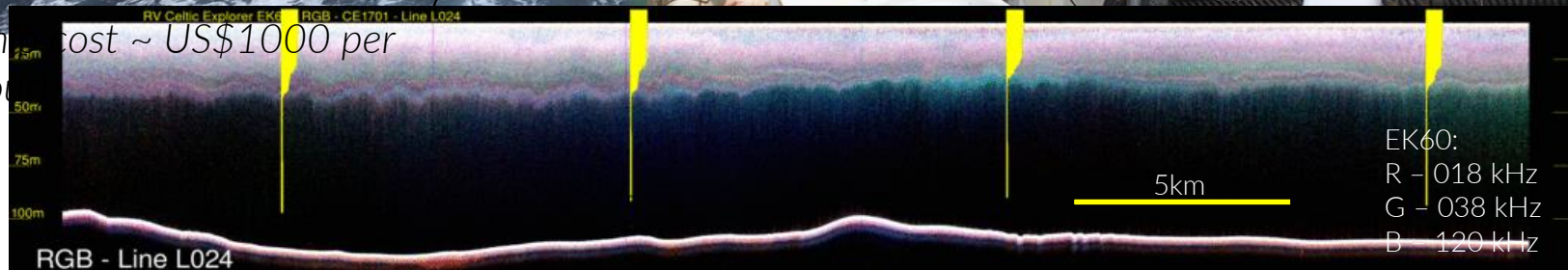


MVP200 Installations

MVP-200 operating in Seastate 7
Deploying to ~ 100m every 30 minutes at 8



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



MVP200 Installations

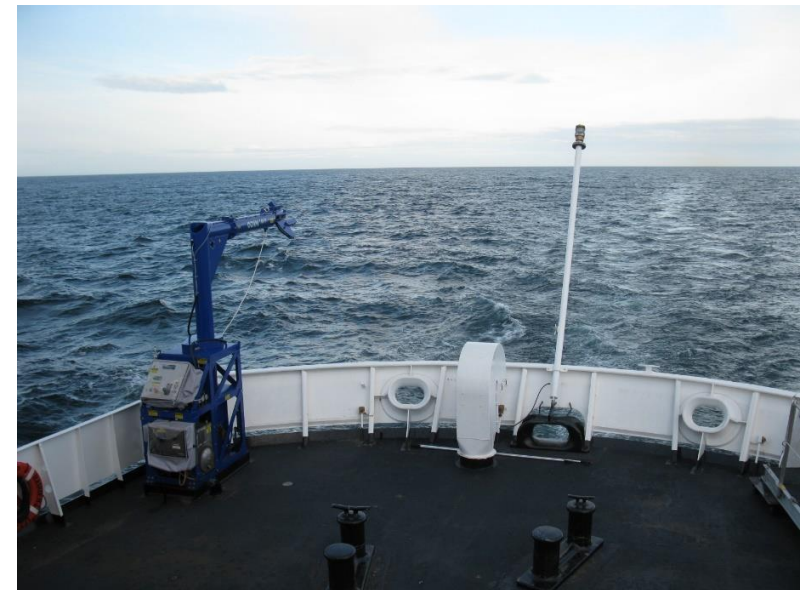
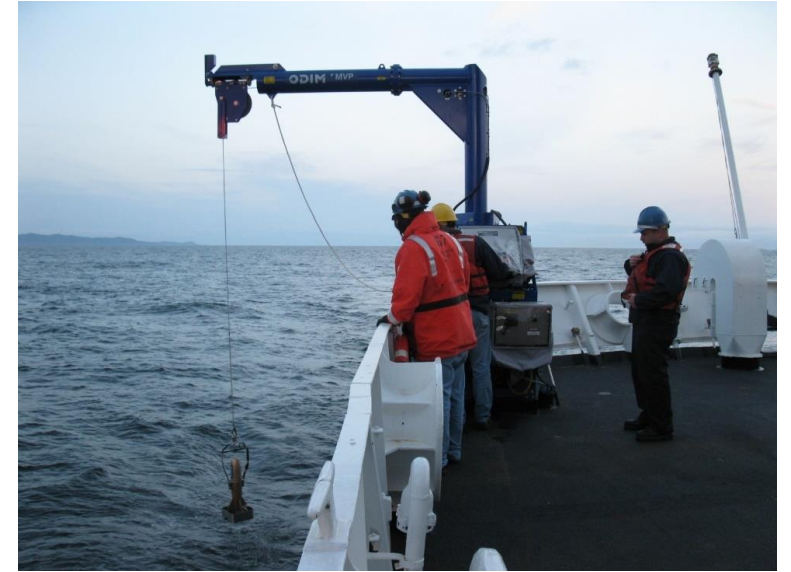
Fugro OSAE MVP200 installed on RV Victor Hensen





MVP200 Installations

NOAA MVP200 installed on NOAA Ship Rainier



MVP200 Installations

Example of an MVP200 with a Stay Wire for Side Deployments



MVP300 Installations

Australian Antarctic Division (AAD) MVP300 installed on RV Nuyina





MVP300 Installations

Amundsen Science MVP300 installed on CCGS Amundsen





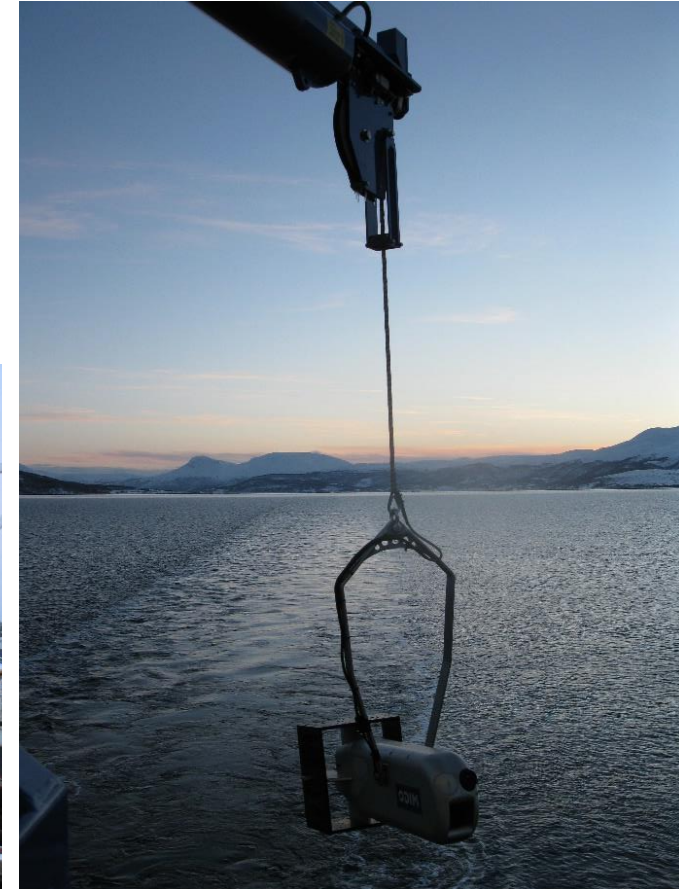
MVP300 Installations

NAVO MVP300 System installed on USNS Bowditch



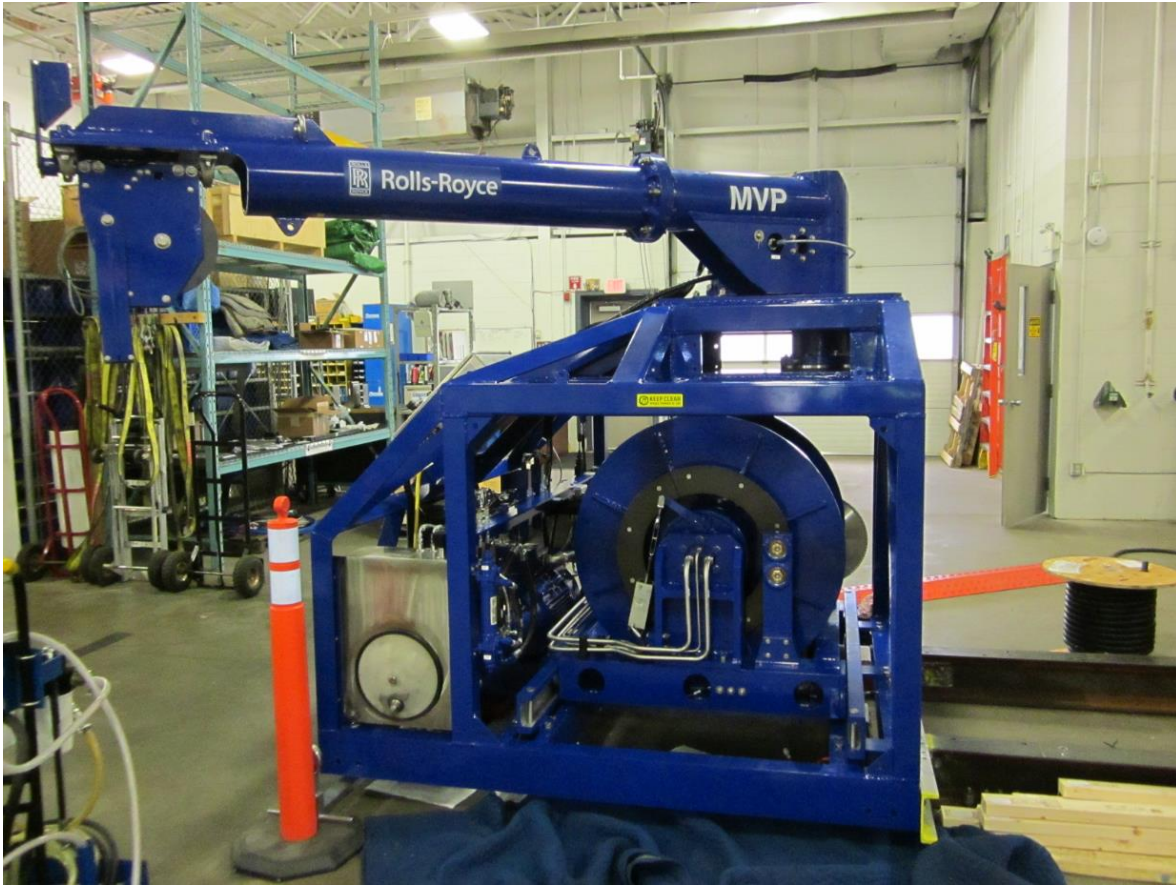
MVP300 Installations

The Arctic University of Norway (UIT) MVP300 System installed on RV Jan Mayen



MVP300 Installations

Example of a Short Frame MVP300 System



MVP300 Installations

Examples of MVP300 with a Stay Wire for Side Deployments





MVP300 Installations

MVP300 to be installed on Vessel CCGS Naalak Nappaaluk

COMING SOON!!!





Thank You!

Questions?

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