ASL Environmental Sciences

Solutions Newsletter

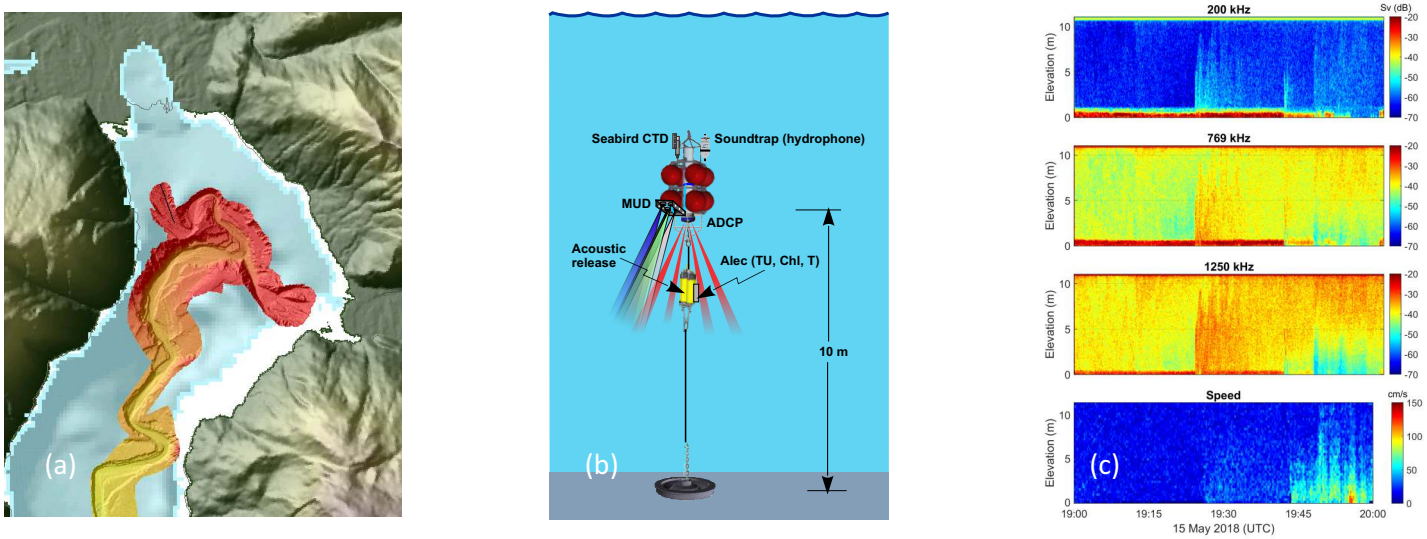
Spring 2019

Spring 2019 ASL Newsletter. This issue:

MUD: The Next Generation in Acoustic Backscatter Measurements

A new tool to measure both sediment concentration and sediment size has been built by ASL Environmental Sciences Inc. (ASL). The Multi-frequency Ultrasonic Device (MUD™) is based on ASL's successful Acoustic Zooplankton Fish Profiler (AZFP). The MUD and AZFP echosounders can be configured with up to four frequencies ranging from 38 kHz to 2 MHz. The MUD is based on a set of higher frequencies (200 kHz, 769 kHz, 1.2 MHz and 2.0 MHz) that will allow for a broad range of particle size discrimination. While the AZFP is a high gain device for low scattering conditions and the greatest possible range, the MUD echosounder is a lower gain system that is being tuned to work in higher backscatter regimes such as the bottom or in high concentrations of suspended sediment. ASL's echosounders are designed for autonomous deployments, with small size and low power draw.

In May 2018, Dr. Gwyn Lintern of NRCan, in collaboration with university researchers, deployed a three frequency (200 kHz, 769 kHz, 1250 kHz) MUD in Bute Inlet, one of the principal inlets of the British Columbia coast. This site was selected due to its large number of seasonal turbidity flows. The timing of the deployment coincided with the spring freshet, a time where turbulent suspension of sediments was likely. On May 15th, a turbidity flow event was detected by the MUD. All three frequencies clearly recorded the characteristics of the turbidity flow without the signal saturating. These real-world data, along with further in-situ and laboratory calibrations, will provide a method to develop multi-frequency inversion techniques to resolve sediment concentration.

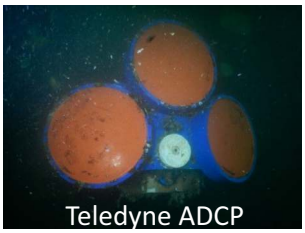


Bute Inlet bathymetry (a), MUD deployment diagram showing mooring instruments (b) and acoustic backscatter echograms showing turbidity flow (c).

ASL Environmental Sciences

ASL Environmental Sciences Inc.
#1-6703 Rajpur Place, Victoria, BC, Canada V8M 1Z5
Phone: 1-250-656-0177 **Fax:** 1-250-656-2162 **Email:** asl@aslenv.com
www.aslenv.com

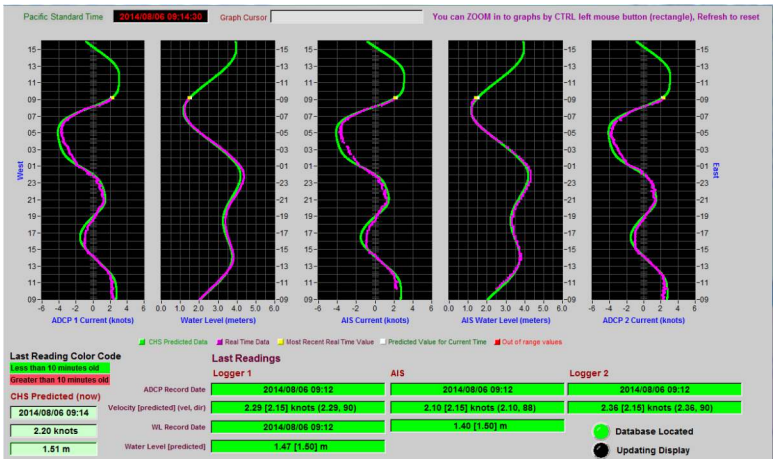
Real-time Currents - Second Narrows


Teledyne ADCP

The Port of Vancouver provides real-time current and water level data to vessels transiting beneath the Second Narrows bridge in Burrard Inlet, Vancouver. The information is transmitted to the vessels through the Automated Identification System (AIS). ASL Environmental Sciences has been maintaining the system since 2014. A duplicate redundant system allows hardware maintenance and swap-outs with minimal downtime.

Currents are measured using a Teledyne RDI 300 kHz H-ADCP. The three-transducer ADCP has narrow acoustic beams with a nominal range of 300 m, enabling measurements to span the gap between the bridge abutments. A subset of the valid bins is averaged to provide a mid-channel current velocity.

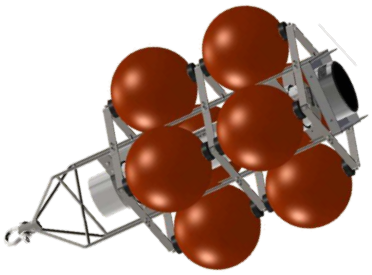
Second Narrow bridge, Vancouver, BC.



Real-time current and water level data.

Mooring Design, System Integration

Not everyone is willing or able to come up with a platform to deploy their instrumentation at sea. Many just want the data, thank you very much. ASL can provide assistance, mooring design, etc., up to the full meal deal with a ready-to-go mooring complete with anchor if desired. We can integrate off-the-shelf instruments and sensors as well as custom instrumentation. We provide this service to industry, academia and government. The mooring can be shipped to the site and ASL will even do the deployment and recovery if you like.



Deployment of custom AZFP bottom frame mooring in 2017 for Dr. Leandra Sousa, a biological oceanographer at the North Slope Borough in Alaska.


Photo credit: John Bergman

ASL Environmental Sciences

ASL Environmental Sciences Inc.
#1-6703 Rajpur Place, Victoria, BC, Canada V8M 1Z5
Phone: 1-250-656-0177 **Fax:** 1-250-656-2162 **Email:** asl@aslenv.com
www.aslenv.com

Sea Level Variation Study Using GPS and an Ice Profiling Sonar in the Disko Bay Region of Western Greenland

Dr. David Holland of New York University, in collaboration with Dr. Natalya Gomez at McGill University, is leading an investigation of sea level variations in the Disko Bay region of western Greenland. A shore-based system compares the direct arrival of GPS signals to the signals reflected off the sea surface to obtain sea level. The presence of sea ice and icebergs complicates the measurements. A shore-mounted camera provides information about the surroundings and the presence of sea ice and icebergs when there is daylight. Underwater sonar devices can supplement the camera-based observations and eliminate the dependence on daylight to characterize the ice.

An ASL Ice Profiling Sonar (IPS) was chosen to make ice-draft measurements. Two sites located within 150 m of shore in water depths of 20–30 m were selected. One of the sites near Jakobshavn Glacier could not be accessed by boat and required a combination of helicopter and a small rubber boat. ASL's engineering team was tasked with designing and building a lightweight mooring system which could be deployed by two people using the small rubber boat. In the summer of 2018, the field team successfully deployed two mooring systems. The team is currently looking forward to the 2019 field season to service the shore-based and mooring-based instruments and recover the data stored on site.

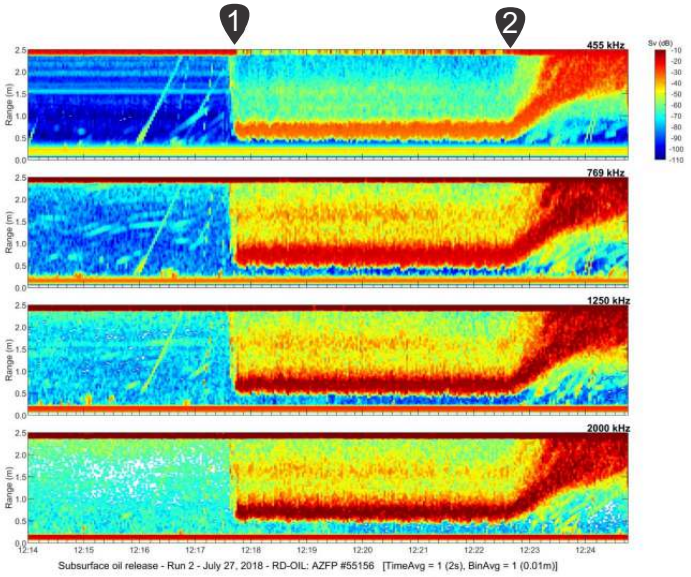
Remote staging of field equipment.

Pre-deployment setup.

Detection of Subsurface Oil

A recent experiment in a large test tank using ASL's AZFP with four high-frequency channels (455, 769, 1250 and 2000 kHz) has shown that subsurface oil is detectable with those acoustic frequencies. The figure to the right shows the signal received from oil injected into the tank. The injection begins at the point labelled 1, and stops at 2, after which the oil can be seen rising through the water.

Oil injection event as recorded by the four frequencies of the AZFP. ►



ASL Environmental Sciences

ASL Environmental Sciences Inc.
#1-6703 Rajpur Place, Victoria, BC, Canada V8M 1Z5
Phone: 1-250-656-0177 **Fax:** 1-250-656-2162 **Email:** asl@aslenv.com
www.aslenv.com

IPS To Measure Frazil Ice

St. Lawrence River, Quebec, Canada where ORPC, Inc. deployed an ASL Ice Profiling Sonar.

This past winter, ORPC and its Montreal-based subsidiary, ORPC Canada, deployed an ASL Ice Profiling Sonar to measure frazil ice and collect ice characterization data in the St. Lawrence River.

“ASL's Ice Profiling Sonar was easy to fit into our instrumentation package and gives us the possibility of detecting the occurrence of frazil ice. We chose to deploy the IPS because previous studies using the instrument were able to detect frazil ice occurrences during deployments using the backscatter data. Understanding more about frazil ice could prove pivotal in marine renewable energy projects and using the ASL Ice Profiling Sonar is one of our first steps to better understanding these extreme environments.”

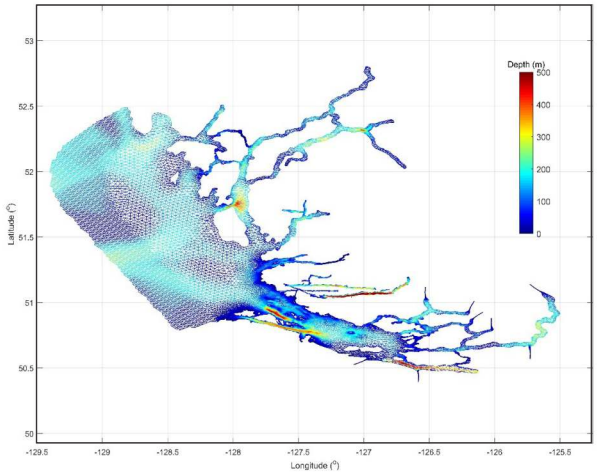
--Sean Anderton, ORPC Director of IT and Field Services

ORPC improves people's lives and their environment through sustainable energy solutions, primarily marine renewable energy technology and project development, and specializes in microgrid to utility-scale river and tidal energy applications. A focus for the company is providing environmentally sustainable energy solutions to diesel-powered remote communities.

Worldwide, ORPC is the only company to have built, operated and delivered power to a utility grid from a hydrokinetic tidal project (in Maine), and to a remote community grid from a hydrokinetic river project (in Alaska). For more information visit www.orpc.co.

Hydrodynamic Modelling

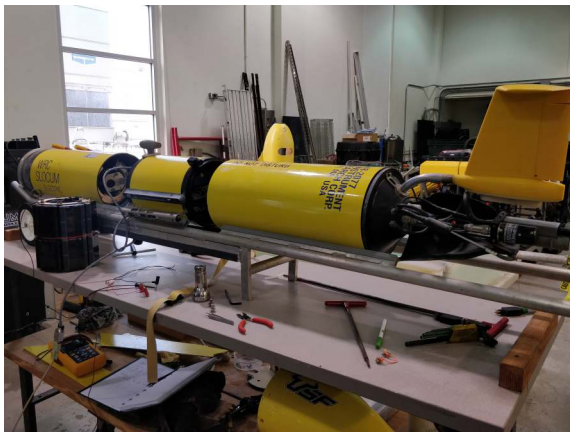
ASL is assisting Fisheries and Oceans Canada, under the Program for Aquaculture Regulatory Research (PARR), with the development of a high resolution hydrodynamic model of the BC coast extending from the Broughton Archipelago to Queen Charlotte Sound. When coupled with a biogeochemical component, it will help address issues such as virus dispersion and sea lice infectivity. With the apparent trend toward area-based ecosystem management, ASL is well qualified to help the aquaculture industry meet more demanding government standards.



High resolution hydrodynamic model of the BC coast extending from the Broughton Archipelago to Queen Charlotte Sound.

ASL Tours College of Marine Science USF Slocum Glider Laboratory

Dr. Steve Pearce and Jay Milligan of ASL Environmental Sciences recently visited Chad Lembke at the College of Marine Science laboratory at the University of South Florida (USF). This lab was the first group to integrate an ASL Acoustic Zooplankton Fish Profiler (AZFP) into a Slocum glider for oceanographic biological surveys (read Sea Technology article). Christopher DeCollibus, Product Line Manager of the Slocum Gliders of Teledyne Marine was also in attendance. This was an opportunity for ASL staff to meet clients face to face to discuss the technologies, work on fine-tuning and instrument interfacing and to focus on research potentials. Some of these research interests included oil detection and acoustic detection of algae blooms, a significant issue to waters in and around the State of Florida. There was time spent touring their facilities, presenting technical background and discussing ideas with USF research staff and the broader scientific community. Of the two-day visit, much of the time was spent in the lab to test, troubleshoot and examine instrument performance. This provided an excellent learning situation for ASL to see how the AZFP and Slocum glider work together to create an effective, autonomous, low-power, calibrated sonar system for scientific use.



Slocum glider assembly showing the modular segments.

Dr. Steve Pearce (left) and Christopher DeCollibus (right) working on the AZFP/Slocum interface.

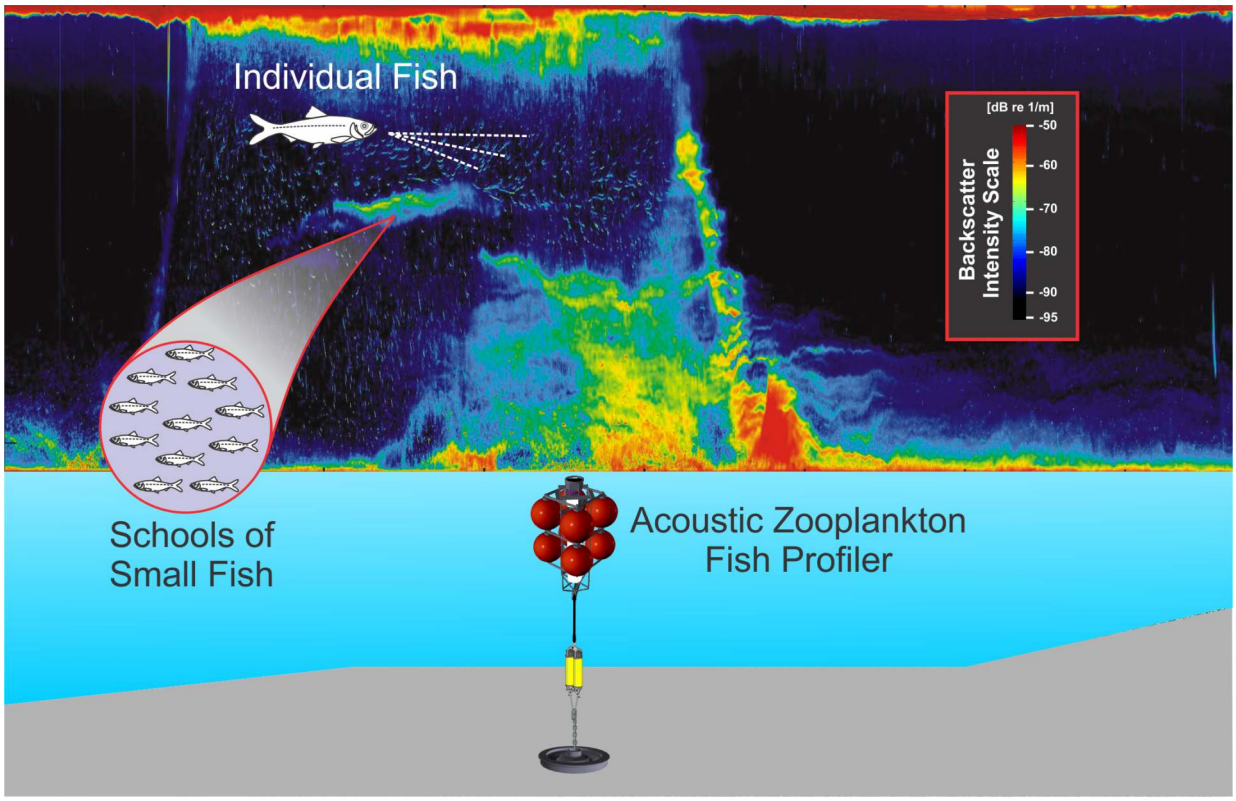
ASL Environmental Sciences

ASL Environmental Sciences Inc.
#1-6703 Rajpur Place, Victoria, BC, Canada V8M 1Z5
Phone: 1-250-656-0177 **Fax:** 1-250-656-2162 **Email:** asl@aslenv.com
www.aslenv.com

Computer Vision-based Detection of Fish from Acoustic Backscatter Time Series

ASL Environmental Sciences Inc. (ASL) is excited to announce the recent awarding of a Natural Sciences and Engineering Research Council (NSERC) Engage Grant for the development of new automated or semi-automated analysis tools for Acoustic Zooplankton Fish Profiler (AZFP) data with the University of Victoria and ASL. This collaboration will be led by Dr. Alexandra Branzan Albu's research group from the Electrical and Computer Engineering Department of the University of Victoria along with ASL acoustic and remote sensing specialists. AZFP data will be provided by Dr. Stéphane Gauthier of the Department of Fisheries and Oceans Canada, who will also bring expertise in the areas of fisheries acoustics, data analyses and interpretation.

The AZFP provides high temporal and spatial resolution acoustic backscatter. Through this grant, efforts will focus on developing methods to automatically detect and classify fish backscatter from AZFP data. Dr. Albu and her team bring specialized knowledge to this issue with experience in computer vision and machine learning. Traditional AZFP processing techniques are dependent upon human vision and visualization methods; the application of automated techniques will be used to create unbiased classifications based on shape, structure and pattern detection. Detection algorithms will be tested and tuned on data sets containing well-defined fish schools such as the ones produced by Pacific herring, a small pelagic coastal species abundant in British Columbia's waters.



AZFP echogram showing acoustic backscatters.

ASL Environmental Sciences Inc.
#1-6703 Rajpur Place, Victoria, BC, Canada V8M 1Z5
Phone: 1-250-656-0177 **Fax:** 1-250-656-2162 **Email:** asl@aslenv.com
www.aslenv.com

Equipment Leasing

ASL Environmental Sciences has the largest lease pool of metocean equipment in Canada and leases worldwide. We offer ADCPs (2MHz to 75 kHz), CTDs, acoustic releases, acoustic profilers including the Ice Profiling Sonar (IPS5) and the Acoustic Zooplankton Fish Profiler (AZFP), wave and tide gauges, pingers and transponders, mooring cages and frames, flotation, drogued drifters, sediment grab samplers and traps, and water quality sensor/loggers (DO, Tu, Chlorophyll). We have over 60 ADCPs. Two new 6000 m rated ADCPs were recently added to the lease pool: TRDI 300 and 600 kHz. Both have high accuracy bottom-tracking for deep turbidity flow studies. They can also be used for deep ocean mining.

ASL represents the following companies and products:

Teledyne RDI
www.teledynemarine.com

TELEDYNE RD INSTRUMENTS
Everywhereyoulook™

Deepwater Buoyancy DWB
deepwaterbuoyancy.com

DeepWater® BUOYANCY

WERA Northern Radar
www.helzel.com

WERA NorthernRadar
Powered by ASL

ASL Environmental Sciences

ASL Environmental Sciences Inc.
#1-6703 Rajpur Place, Victoria, BC, Canada V8M 1Z5
Phone: 1-250-656-0177 **Fax:** 1-250-656-2162 **Email:** asl@aslenv.com
www.aslenv.com

New ASL Personnel

Martin Taillefer presenting at 2017 CMOS conference

Martin Taillefer: Senior Project Manager and Business Development

ASL is happy to announce the appointment of Mr. Martin (Marty) Taillefer to the position of Senior Project Manager and Business Development. Martin has been working in the fields of oceanography, hydrography, ocean acoustics and underwater warfare for over 25 years. A naval officer for over 20 years, the latter 10 years were spent as an Underwater Warfare Director and Oceanographer for the Pacific Fleet. Martin oversaw the implementation and operations of decisional systems, acoustic modeling and operational systems to create operational products to the fleets. He also oversaw the routine creation and production of real-time oceanographic and acoustic products for operational purposes and fleet uses —often in high tempo naval and military operations. Martin has extensive operational experience in applying his expertise and knowledge in the oceanographic tactical domain. He spearheaded operational oceanography, acoustic modeling and decisional technologies with DND, General Dynamics (GD) Canada and Fisheries and Oceans Canada (DFO) since the early 1990s.

At GD Canada, his work spanned from coordination and installation of sonar systems aboard Swedish warships at two Swedish shipyards (Karlskrona and Muskö Naval Base), worked on the Sikorsky CH-148 Cyclone (MHP) program and the Aurora Modernization. At DFO, he led the Earth Observation Funding Program for DFO scientists, was the architect of the CONCEPTS collaboration agreement between DFO, Environment Canada (EC) and DND and was the technical advisor for the Offshore Oceanographic Science Vessel (OOSV).

He earned a B.Sc. from Royal Roads Military College in Physics and Oceanography (graduated in 1987). While in uniform, the Royal Canadian Navy selected Martin to earn a master's degree at the University of Victoria (graduated in 1997), where his studies focused on Matched Field Processing, tracking an underwater target in 3D, using only passive acoustics. In 2010, with the support of ASL, Martin founded and started a new defense company called Maritime Way Scientific, which for the next nine years earned a reputation as an effective and capable acoustic modelling and sonar analysis company. Maritime Way developed an acoustic modelling system called SPARTA for Lockheed Martin, an acoustic modelling system for arctic sound propagation called Arctic BellTex and acquired the technologies and assets of a Seabed Classification System. In his new role at ASL, Martin will be leading several technology projects and will be expected to foster a greater involvement with defense opportunities. He will be working closely with Mr. Todd Mudge.

Conferences Attendance

Recent

- Oceans 2018 MTS/IEEE Oct 22–25, 2018 Charleston, North Carolina
- 176th Meeting of the Acoustical Society of America, Nov 5–9, 2018 Victoria, BC
- Asian Fisheries Acoustics Society (AFAS 2018) Nov 13–15, 2018 Jeju, South Korea
- National Forum on Earth Observation from Space, Nov 19, 2018 Montreal QC
- ArcticNet Science Meeting, Dec 10, 2018, Ottawa, ON
- Alaska Marine Science Symposium (AMSS) 2019 Jan 28–Feb 1, 2019 Anchorage, Alaska
- Oceanology International Americas, Feb 25–27, 2019 San Diego, USA
- Pacific Fleet Maritime Acoustic Symposium 2019, April 8-9, Victoria, BC

Upcoming

- Working Group on Fisheries Acoustics Science and Technology (WGFAST) 2019 April 29–May 3, 2019 Galway, Ireland
- Ocean Technology Conference (OTC) 2019 May 6–9, 2019 Houston, Texas
- Aquaculture Canada 2019 Conference and Tradeshow, May 5–8, 2019 Victoria BC
- Canadian Symposium on Remote Sensing, June 4–6, 2019 Fredericton, NB
- 42nd AMOP Technical Seminar on Environmental Contamination and Response, June 4–6, 2019 Halifax, NS
- GeoIgnite 2019, June 18–19, 2019 Ottawa, ON
- IUGG General Assembly, July 8–18, 2019 Montreal, QC