ASL Environmental Sciences

Solutions Newsletter

Spring 2022

Spring 2022 ASL Newsletter. This issue:

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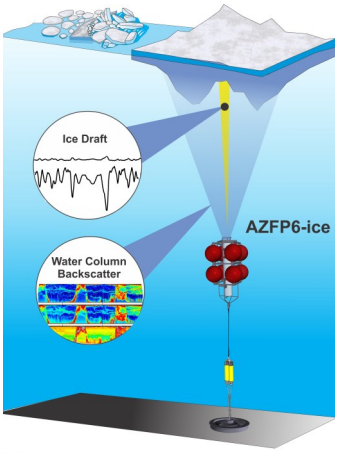
ASL Introduces the AZFP-*ice*, the Next Generation of Upward-Looking Sonars for Ice-Infested Waters

ASL Environmental Sciences is pleased to announce the combining of our Acoustic Zooplankton Fish Profiler (AZFP) with our Ice Profiling Sonar (IPS) to provide a comprehensive solution for ice thickness detection and water column profiling of fish, zooplankton, bubbles and suspended sediments in ice-infested waters. The AZFP-*ice* is the next generation in high resolution, low power, continuous recording subsurface instruments that are capable of long-term deployments of a year or more.

The AZFP-*ice* would typically be used in an upward looking taut-line mooring as illustrated below but could easily be inverted to record the water column in a downward-looking orientation. Built into the ice profiling sensor is a logarithmic detector which resolves both strong and weak acoustic targets. In practice, this means that the signal from strong reflections such as the water–air interface at close range doesn't saturate, and weak targets such as the water–ice interface at long range are still measurable.

A narrow-beam 420 kHz frequency channel on this Instrument (identical to the one used on ASL's well-known IPS) is used for high spatial resolution ice cover measurements. The three other calibrated fishery acoustic channels of the instrument acquire details of constituent targets within the water column. The memory capacity of this new generation instrument has been upgraded from a single 32 GB compact flash card to the now expanded 512 GB capacity using dual 256 GB SD cards with plans to continue expanding memory capacity.

The first AZFP-*ice* prototype with ice profiling capabilities was deployed October 2021.



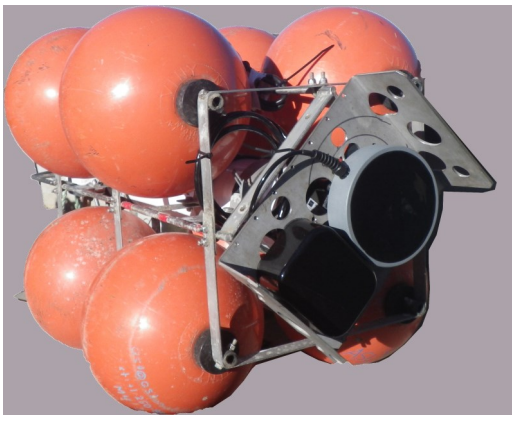


Diagram of AZFP-*ice* deployment showing the ice and water column profiling capabilities. (Left)

AZFP-*ice* deployment configuration. The black circular transducer is for the ice profiler and the black square transducer is for the multi-frequency calibrated echosounder. (Right)

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Newly Awarded Challenge: Develop a Canadian Coastal Information System

Westcoast Oceanography Inc. (operating as ASL Environmental Sciences Inc.) is pleased to announce that it was recently awarded a research and development contract ($167,989.91) through the Innovative Solutions Canada (ISC) program to develop a proof of feasibility for Public Services and Procurement Canada, in response to the Canadian Coastal Zone Information System (CCZIS) challenge. ASL has partnered with Trailmark Systems Inc. of Victoria, B.C. to develop a proof of feasibility that will showcase a robust, interoperable, and user-friendly web-based geographic information system. Our two companies will collaborate to develop a detailed report, outlining how a functional prototype would address the goals outlined in the ISC challenge.

CCZIS will include data manipulation, extraction, and analytical tools to support climate change coastal risk assessment through an intuitive website. CCZIS will also integrate many datasets and model outputs, including marine winds, tides and water levels, storm surges, nearshore wave climate parameters, water levels, and sea ice. CCZIS will support convenient access to historical and future statistical climate information to support several end-user groups, ranging from civil engineers to small harbour operators. High resolution multibeam bathymetry will be featured along with information on existing coastal structures, infrastructure, and shoreline geology. Other key functions will include the ability to extract, calculate, interpret, and visualize data, as well as incorporate new datasets, plans, reports, and drawings as they become available to ensure that the system remains up to date. It is anticipated that the integration of this ensemble of interdisciplinary coastal datasets will provide a powerful decision support tool that will support effective planning and designs for future operations in our changing coastal zones in Canada.

View of Port Sidney Breakwater from
Sidney Pier, Sidney, BC
(photo credit Matthew Asplin)

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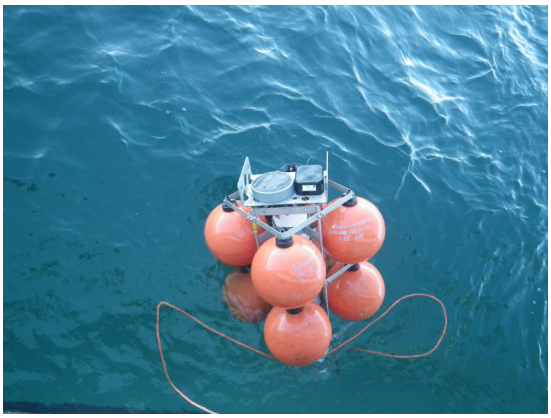
AZFP-*ice* Deployed Near Nain, Labrador to Examine Ice Characteristics and Biological Activity in a Dynamic Environment

A prototype of the AZFP-*ice* was deployed in the coastal waters approximately 40 km east of the town of Nain, Labrador, an area used for Indigenous traditional hunting and fishing. This deployment was carried out by ASL in collaboration with the Inuit Nunatsiavut Government in October 2021 and will be recovered in the fall of 2022. The AZFP-*ice* combines the technology of the Ice Profiling Sonar (IPS) with its ability to detect ice draft along with the calibrated Acoustic Zooplankton Fish Profiler (AZFP) echosounder to examine zooplankton, fish, bubbles and suspended sediments within the water column. The upgraded IPS component used in this unit includes a logarithmic detector to prevent signal saturation of strong targets while at the same time still providing information on weak targets. This revised version of the IPS is referred to as the Log IPS. The AZFP-*ice* at this site will be used to better understand the impact of climate change on the ice and biology of the region. A notable ocean-ice feature in this region are year-round ice-free areas, locally referred to as rattles or polynya. These year-round ice-free areas are considered biologically rich. Placement of the mooring this year was "downstream" from a known rattle location in order to provide insights into the biological activity and ice dynamics associated with this ice-free feature. The results from a Log IPS deployed approximately 500 m away, as well as two previous years of IPS data collected in this location, will provide a useful comparison with the new AZFP-*ice* data along with the now added benefits of the bioacoustics echosounders.

Log IPS data from a previous deployment from 2020/2021 revealed a dynamic environment with some days exhibiting a full range of open water, waves, flat level ice and moderately sized keels measuring up to 13 m drafts. This instrument had a sampling rate of 2 Hz and was deployed through the ice at a depth of about 100 m on February 15, 2020 and recovered 263 days later on October 27, 2020. With the improved capabilities of the logarithmic detector, the instrument detected enhanced backscatter at the air–water interface suggesting the potential of the instrument to resolve the presence of frazil ice and differentiate between consolidated and unconsolidated ice.

With this year's deployment of the AZFP-*ice*, further insight will shed light on this dynamic region and provide useful information to help manage the risks associated for those that traverse this area.

Through-the-ice deployment of the Log IPS on February 15, 2020. The Log IPS mooring cage is shown on the right along with an ADCP cage in the foreground to measure currents.



An AZFP-*ice* being deployed near Nain, Labrador in October 2021. Both the AZFP and the Log IPS transducers are visible at the top of this mooring.

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Acoustic Scintillation Flow Meter Mentioned in Recent American Society of Mechanical Engineers Performance Test Code Document

ASL AQFlow's Acoustic Scintillation Flow Meter (ASFM) has been mentioned in the recent American Society of Mechanical Engineers performance test codes (ASME PTC 18-2020) for Hydraulic Turbines and Pump-Turbines. Although the ASFM has not yet been adopted into code, it is being evaluated for future code releases. The ASFM is considered to be a permissible technique to test, or to test in conjunction with, a code approved method to measure hydroelectric discharge. A detailed explanation of how the ASFM works and guidance on its use appears in the nonmandatory appendix C section of this code document.

The ASME Standards were established in the 1880s with a goal to establish a standard for testing to ensure safe, reliable and efficient machine design and mechanical production. This was first applied to steam boilers and has since expanded to 48 performance test codes that apply to a host of engineering equipment and systems. These standards provide a "level playing field" for both manufacturers and the end-users of the equipment evaluated. Code acceptance ensures the highest level of accuracy, precision and reliability based on the most up-to-date engineering knowledge.

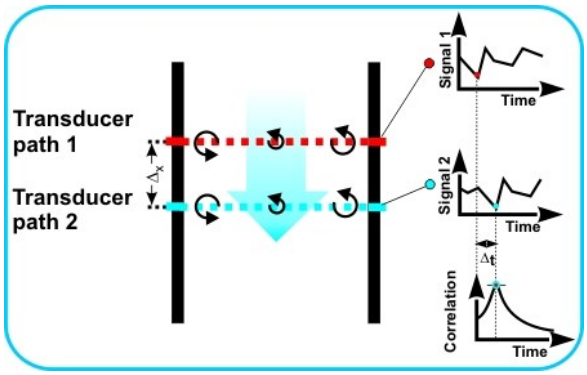

Figure 1. Simplified representation of time delay measurement by acoustic scintillation.

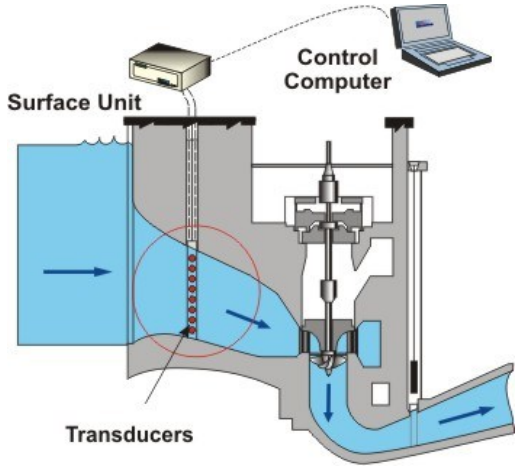

Figure 2. ASFM Advantage.

The ASFM is a non-intrusive method that uses ultrasonic pulses across an intake to analyze variations in turbulence to measure flow at hydroelectric plants (Figure 1). These data are used to produce real-time current velocities and discharge volumes. Installations are useful for turbine efficiency and optimization. The ASFM has had successful installations at hydroelectric plants all around the world including Canada, USA, France, Czech Republic, Spain, Korea and Sweden.

The ASFM offers two typical configurations. The ASFM Advantage and the ASFM Monitor. The Advantage is illustrated in Figure 2. Listed below are some of the features of this unit.

- No intake/unit dewatering required if frame installed.
- Cost-effective support of unit, plant and system level optimization models.
- Non-intrusive, no headloss and no vulnerability to debris impact.
- No moving parts, no mechanical maintenance and no calibration.
- Can be set up for single or multi-bay installation, with up to 30 paths distributed among the bays. The same equipment and frames can be used at all intakes at a multi-unit plant.
- Can be adapted for fixed or profiling frame operations.
- Discharge results available immediately after completion of measurements.
- Offers simple, user-friendly displays and outputs.
- Can be operated remotely or locally.

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ASL Hires Julek Chawarski for the Position of Biological Oceanographer

ASL is excited to announce the appointment of Julek Chawarski to the position of Biological Oceanographer as a part of our team. Julek contributes nearly a decade of experience in fisheries science, with expertise in forage fisheries and biological oceanography in coastal and deep ocean ecosystems. He will be responsible for developing consulting services for our ocean monitoring clients and will develop new tools for hydroacoustic studies of aquatic ecosystems.

Previous to his appointment at ASL, Julek completed a Masters in Marine Biology at the University of Maine. During his studies he designed experiments to investigate the effects of marine protected areas (MPAs) on the recovery of groundfish stocks in the Gulf of Maine. He trained in acoustic analysis and provided new insights into the spatial distribution of herring spawning in inshore waters of Maine. Soon after completing his Masters, Julek attended Memorial University of Newfoundland where he is currently completing his doctorate in Fisheries Science.

His work over the last several years has focused on a range of topics including mesopelagic and Arctic fisheries. Before joining ASL he's worked with industry, government and non-profit groups such as the Fish, Food & Allied Workers Union, Department of Fisheries and Oceans Canada (DFO), and the Greenland Institute for Natural Resources.

His technical expertise in scientific echosounders and passion for marine ecology has brought him to some of the far reaches of the ocean. From 2018-2020, Julek worked with DFO to develop studies in the Labrador Sea as a part of the Integrated Studies & Ecosystem Characterization of the Labrador Sea Deep Ocean (ISECOLD). His work helped advance methods of eDNA to detect deep-sea fishes and explore the mechanisms that form biogeographic boundaries for fish communities at high-latitudes. In 2019, he took part in a Swedish expedition to an uncharted glacial fjord in Northwest Greenland where the team uncovered new insights into fjord morphology and glacial melting dynamics. In 2022, he travelled by icebreaker to the North Pole to contribute his expertise in the European Fisheries Inventory of the Central Arctic ocean.

Julek brings a wealth of knowledge and insight to using echosounders, biological sampling and other innovative technologies to the studies of aquatic systems and is eager to develop new tools for monitoring the ocean's health and its resources.

ASL–Silver Sponsors of Vancouver Island Science Fair

ASL is pleased to announce the winner of the Top Overall Fourth Place prize which we sponsored at the 61st Vancouver Island Regional Science Fair on April 10th this year. The winner is Nathan Hellner-Mestleman, a student from Mount Douglas Secondary School. The title of his project is "Breakup is a Drag." Those wishing to learn more about the results of the science fair can check the results at SAYS (virsf.ca).

Nathan is one of seven students from our region who will proudly be representing us at the Canada-Wide Science Fair next month. We wish Nathan and all of the representatives from our region well as they advance to the Canada-Wide competition. We also want to wish all of the participants of the fair well in their continued studies. We hope they learned a lot from their projects, continue to engage in science, and continue to spread their enthusiasm for science which was so evident at the fair.

Nathan Hellner-Mestleman

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New Equipment Added to ASL's Lease Pool

ASL continues to augment and update our metocean equipment lease pool with the recent additions:

- Three Sofar Spotter GPS wave buoys. These are small, easily deployable, wave buoys that run off solar-charged batteries. The directional wave data is available real-time via Iridium satellite and features watch circle and wave threshold alerts.
- Four quad AZFPs 67.5-125-200-455 kHz. This frequency combination is often used for fish studies as the data can help differentiate between species with or without swim bladders.
- Two Onset weather stations. These compact stations have 2 m masts and run off readily available alkaline batteries.

For more information about leasing click here or contact Rick Birch.

Conferences

Upcoming Conferences

Offshore Technology Conference 2022
May 2–5, 2022
Houston, Texas

Canadian Meteorological and Oceanographic Society (CMOS) 2022
June 1–3 & June 6–8, 2022
Saskatoon, SK

H_2O Conference 2022
June 13–16, 2022
Halifax, NS

Canadian Space Exploration Workshop 2022
June 14–16, 2022
Virtual

Canadian Symposium on Remote Sensing 2022
July 11–14, 2022
Quebec City

Recent Past Conferences

Offshore Technology Conference 2021
August 16–19, 2021
Virtual Conference

Association of British Columbia Marine Industries (ABCMI 2021)
November 2–4, 2021
Vancouver, BC

Acoustical Society of America
Nov 29–Dec 3, 2021
Seattle, Washington

ArcticNet ASM 2021
Dec 6–10, 2021
Virtual

Oceans Sciences Meeting (OSM 2021)
February 27–March 4, 2022
Virtual

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