AOOS
The Eye on Alaska's Coasts and Oceans
www.aoos.org
Update
Fall 2017

The Alaska Ocean Observing System Advancing Technologies

AOOS is uniquely positioned to advance ocean technology in several ways. We focus on supporting projects that fill critical gaps in ocean and coastal observations, and through our extensive network of partners we can move quickly and efficiently to accomplish our mission. Since many of the areas lacking ocean observations are remote and rugged, unique logistical and technological solutions are required to collect quality data. To this end, AOOS facilitates coordination and leverages cooperative efforts to help fill the gaps. Ultimately, the goal is to provide the public, stakeholders and communities with the observational data and data products needed to answer relevant research questions, make decisions, and assist with maritime safety.

The Ocean Data Explorer, AOOS' data portal, allows users to access, view, and download data ranging from real-time observations, satellite imagery, forecast models, GIS layers, and more. The Ocean Data Explorer houses over 700 data layers. AOOS and Axiom Data Science, AOOS's data management team, are now building on years of stakeholder feedback to update the portal through a significant overhaul. The next generation portal will offer advanced visualizations of time series data, charting abilities, comparisons between data sources, binning by time, and the ability for users to create their own personalized interface of sensors and model outputs to spotlight environmental events or geographic locations. The overhaul will be tested through an opt-in option on the portal home page this fall. ■

AOOS projects employ a wide range of ocean technology in delivering real time and historical data observations to the public.

Alaska Ocean Observing System

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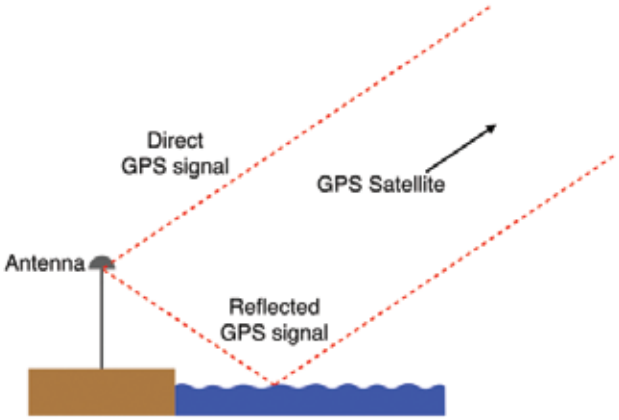
Real-time Water Level Observing Using GPS Reflectometry

AOOS and the National Weather Service (NWS) are researching the efficacy of a land-based, GPS or Global Navigation Satellite System (GNSS) reflectometry water level measurement approach. The approach uses reflected satellite GPS signals to determine the height of a reflecting surface, such as the ocean, relative to a stable GPS antenna of fixed local height. Variations in water level are recorded as changes in the position of the antenna relative to the reflecting water surface. The GPS signal traverses two paths from a satellite to the antenna, where the first is a direct path, and the second path is a reflected path from the antenna off the water surface. It is the interference between the signals that is used to determine the reflecting surface height relative to the antenna height.

Two separate projects are underway with private industry partner ASTRA and private research associate UNAVCO's NSF-funded Plate Boundary Observatory Program (PBO). Both systems are land-based and autonomous, report data in near real-time, and are being assessed for potential remote deployments along low-infrastructure regions across the state.



ASTRA Instrumentation

In 2017, AOOS contracted with ASTRA to install and monitor two discrete dual-frequency GPS receivers in Seward near an existing National Water Level Observation Network (NWLON) station for comparison. The comparison of these data will be used to decide if this new technology will be accurate enough to produce useful water level information.

Leveraging Existing UNAVCO Instrumentation

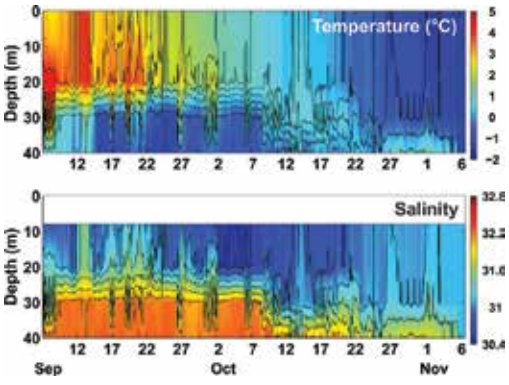
UNAVCO installs sensors using GPS/GNSS reflectometry in their PBO program to measure ground movements and is interested in installing sensors on the coastline of western Alaska where there are significant gaps in water level observations. In 2017, AOOS and UNAVCO performed an assessment of candidate sites for a shared-support installation in western Alaska, and identified Hooper Bay, Stebbins/St Michael, Toksook Bay/Tunnunak, and Quinhagak as potential sites. AOOS is contracting with UNAVCO to complete the first shared-installation at St. Michael in Norton Sound that will satisfy both geophysical research and water level monitoring objectives. ■

The AOOS/ASTRA GPS Antenna installation is located on the University of Alaska (UAF) – Seward Marine Center pier in downtown Seward, Alaska.

New Ice Freeze-Up Detection Buoy Deployed

The IOOS Ocean Technology Transition (OTT) program supported the development of a cost-effective buoy in 2015 that accurately predicted the onset of fall sea ice formation in the arctic. A prototype buoy designed by Pacific Gyre and UAF was deployed in the late summer and successfully reported the real-time temperature and salinity structure of the Chukchi Sea shelf prior to and during the 2015 freeze-up. An expendable surface float was remotely released from the mooring on November 6, 2015 as the entire water column had become isothermal and isohaline, and satellite imagery confirmed that the main ice pack was within a day from over-riding the mooring. The mooring was designed with a subsurface float to support the deeper moored sensors so that they may continue recording data internally throughout the remaining winter/spring/summer months. This mooring was not recovered, likely due to an ice keel drag.

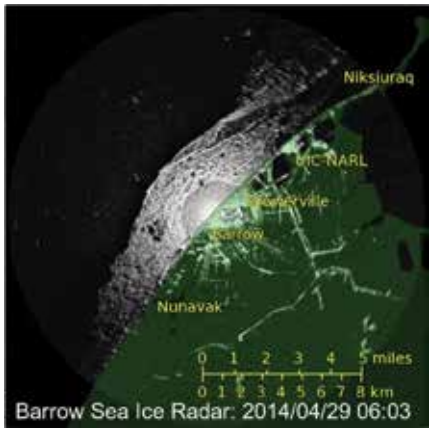
A slightly modified second freeze-up buoy system was deployed, with support from the NWS, in August 2017 adjacent to the Chukchi Sea Ecosystem Mooring Observatory, and data will soon report real-time to the NOAA NWS GTS (Global Telecommunication System) for evaluation in real-time ice forecasting models. ■



Plot showing the 2015 vertical temperature and salinity time series revealing the evolution of freeze-up.

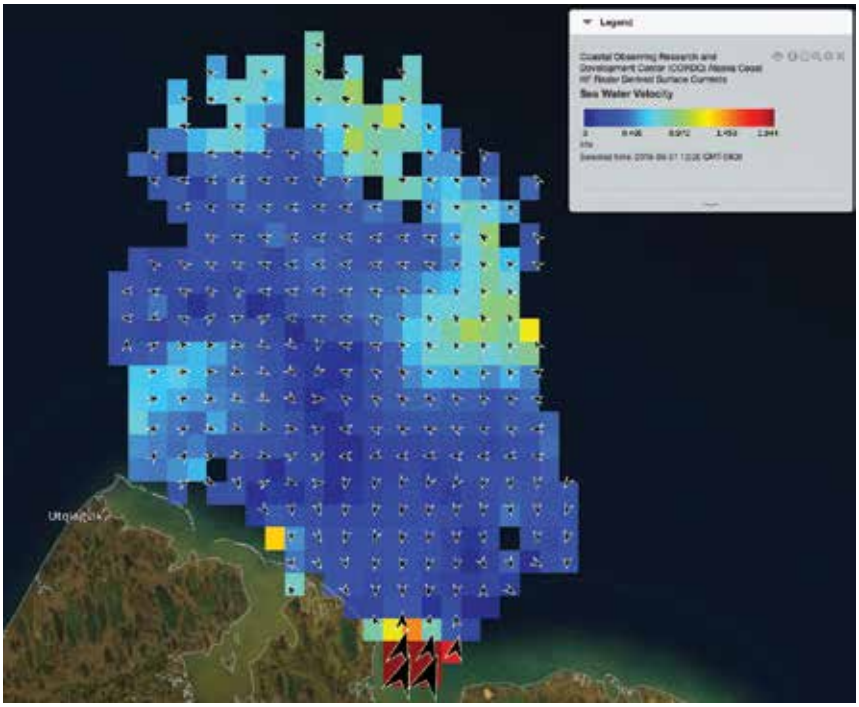
Radars Track Ocean Surface Currents and Sea Ice in Real Time

High Frequency Radar (HFR) systems measure the speed and direction of ocean surface currents in near real-time and can measure currents over a large region of the coastal ocean, from a few kilometers offshore up to 200 km, while operating under any weather conditions. HFR data provide the level of detail required for important applications such as providing input for numerical modeling and prediction of oil spills and circulation, and supporting search and rescue efforts. AOOS currently supports three long-term HFR installations near Utqiaġvik (formerly Barrow). Two of the three systems are powered off-grid by Remote Power Modules (RPMs) that run on renewable energy (wind and solar) for uninterrupted operation.



Sea ice radar image from April 29, 2014 at the onset of ice breakout. *UAF Sea Ice Group.*

The Sea Ice Group at University of Alaska Fairbanks (UAF) has operated a coastal sea ice radar system in Utqiaġvik nearly continuously since 2007. The system operates over a smaller area than HFR, but captures and transmits radar imagery in near real-time, and can detect sea ice at ranges of up to approximately 20 km (11 nautical miles). The data are used to monitor near-shore ice conditions and evaluate the stability of landfast sea ice. Local subsistence hunters and analysts at the NWS Anchorage Ice Desk use the sea ice radar imagery to assess ice conditions. Commercial and civilian mariners have also been using the imagery and animations for navigational purposes during periods of the year when mobile sea ice poses a potential threat to their vessels. AOOS is supporting this coastal sea ice radar system to avoid a gap in this service, and will work with the project leads at finding long-term options for enhancing the system capability. ■



AOOS Ocean Data Explorer showing visualization of HFR data in the Beaufort Sea.

AOOS Sustained Observing Technologies

Autonomous Bridge-Mounted Water Level Sensors

AOOS is supporting the Alaska Department of Natural Resources (AKDNR) and the NWS River Forecast Center (RFC) in maintaining bridge-mounted, Iridium satellite-telemetered, ultrasonic gages (iGage™) to measure water levels on tidal rivers in Chignik River, Tununak, Bethel, Dillingham, Unalakleet and Kotzebue. In 2017, AOOS is helping AKDNR to install and test oblique iGage sensing systems, which can be deployed in areas without bridge infrastructure.

Moorings

AOOS supports the Chukchi Sea Ecosystem Mooring array now in its third year of deployment in the Arctic. This mooring comprehensively monitors the marine ecosystem year-round and is turned around with a refreshed mooring array each year.

The Cook Inlet Wave Buoy, also supported by AOOS, was replaced with a refreshed buoy through assistance from the Coastal Data Information Program (CDIP) office last summer. This buoy continues to provide real-time wave data for lower Cook Inlet mariners since 2013.

AIS Weather Stations

AOOS continues to support weather station additions to AIS vessel tracking station installations in collaboration with the Marine Exchange of Alaska. This project is greatly increasing the amount of localized weather information for mariners.

Marine Mammal Glider

AOOS continues to support deployment of a glider for long-term observing along the Bering Sea coastline. The glider data is used to map and investigate how marine mammals interact with their physical environment in the Arctic. 2017 marked the 5th year of successful marine mammal and oceanographic mapping glider deployments, with completion of a 6-week unattended mission in the Arctic.

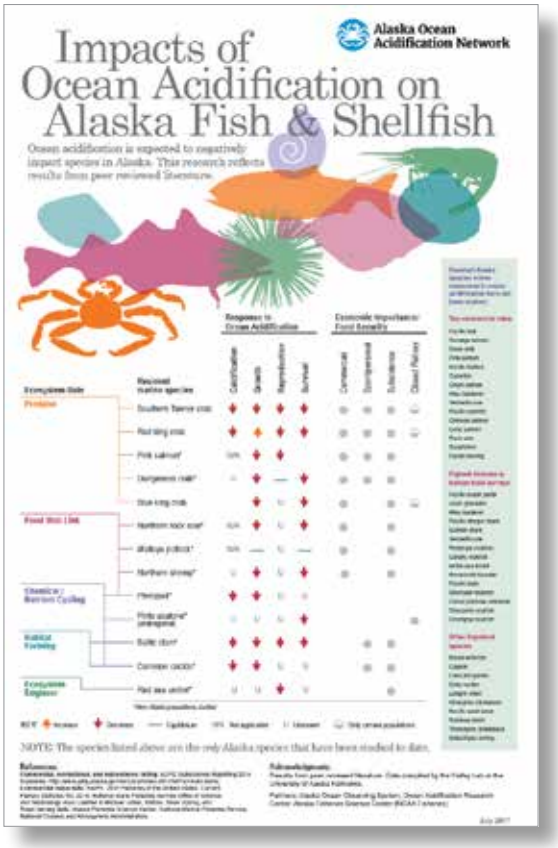
Seward Line

2017 marked the 10th year of AOOS supported ocean acidification (OA) data collection along the biannual Seward Line surveys in May and September. AOOS will continue to support the Seward Line routine monitoring efforts, as well as a reduced OA sampling scheme for mooring validation at the GAK-OA mooring in Resurrection Bay. ■

Poster highlights Ocean Acidification Impacts

The Alaska Ocean Acidification Network, coordinated by AOOS, recently produced a poster showing the known impacts of ocean acidification on Alaska fish and shellfish. The poster lists 13 Alaska species for which ocean acidification research has been conducted, and shows the response to ocean acidification on calcification, growth, reproduction and survival based on peer reviewed literature. In almost all cases, the effect of ocean acidification is negative. The poster highlights the significant changes we are likely to see in our marine ecosystem due to ocean acidification, as well as the need for further research on species response. The vast majority of Alaska marine species, including top commercial, sport, and subsistence species, have not been studied.

An electronic version of the poster can be found at http://www.aoos.org/alaska-ocean-acidification-network/. If you would like hard copies for distribution, please contact Darcy Dugan, dugan@aoos.org. ■

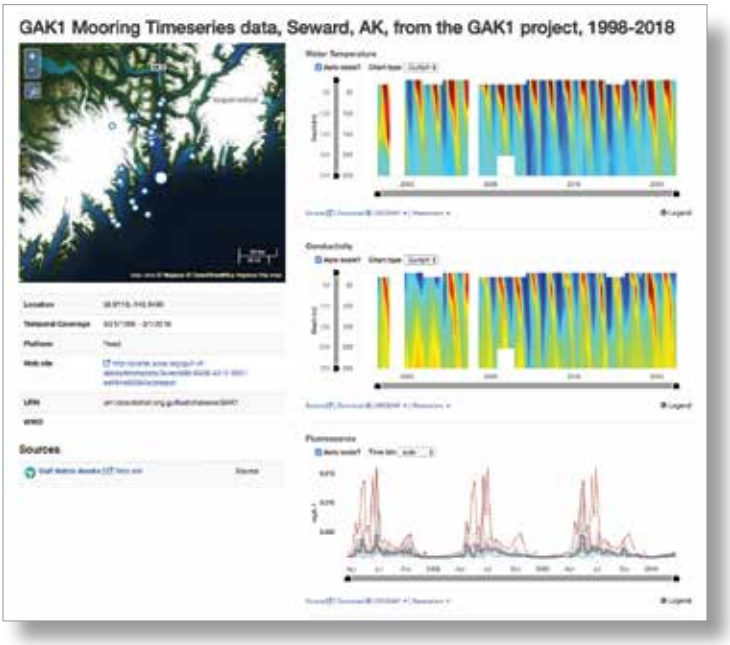


New and Updated Data Sets

AOOS Ocean Data Explorer

AOOS data managers at Axiom Data Science have made the following updates:

- The GAK1 mooring time-series data is now visualized in the historical sensor map (see below).
- The shapefiles and metadata have been updated for the BOEM/BSEE Alaska Oil and Gas: Alaska Active Federal Oil and Gas Leases through Sale 202.
- Two new ShoreZone-based datasets have been added: Lake Clark National Park and Preserve Geomorphological Shoreline Classification and Katmai National Park Geomorphological Shoreline Classification.
- The historical sea ice atlas produced by the Scenarios Network for Alaska and Arctic Planning (SNAP) has been updated through February 2017. ■



Animal Telemetry Network (ATN) Workshop

AOOS is hosting an Alaska-based ATN workshop December 5-6, 2017 at the Marriot Hotel in Anchorage.

This workshop is one in a series of regional meetings and workshops sponsored by the U.S. ATN to identify priorities for regional and national telemetry observations of marine species that could be served by an ATN baseline network, and to examine whether the existing telemetry assets could satisfy these requirements. Information generated at the workshop will be used by the U.S. ATN to develop a plan for funding a national ATN tagging program, including infrastructure and operations, and integration and coordination of these assets. ■

J. Skinner – permits: NMFS 15748 & AEA 2012-003