



Hank Stratszewich photo

Jeremy Mathis (top) and Wiley Evans (below) from NOAA PMEL and the Ocean Acidification Research Center oversee field-work and lab work for the OA monitoring study.

## Monitoring Ocean Acidification Around Alaska's Coast

AOOS has joined forces with NOAA scientists and the University of Alaska Fairbanks' Ocean Acidification Research Center (OARC) to increase the knowledge and understanding about ocean acidification – or OA – in Alaska. Due to relatively shallow shelf seas, cold water temperatures and high rates of primary production (which lead to seasonal manifestations of OA), coastal regions around Alaska can be at risk.

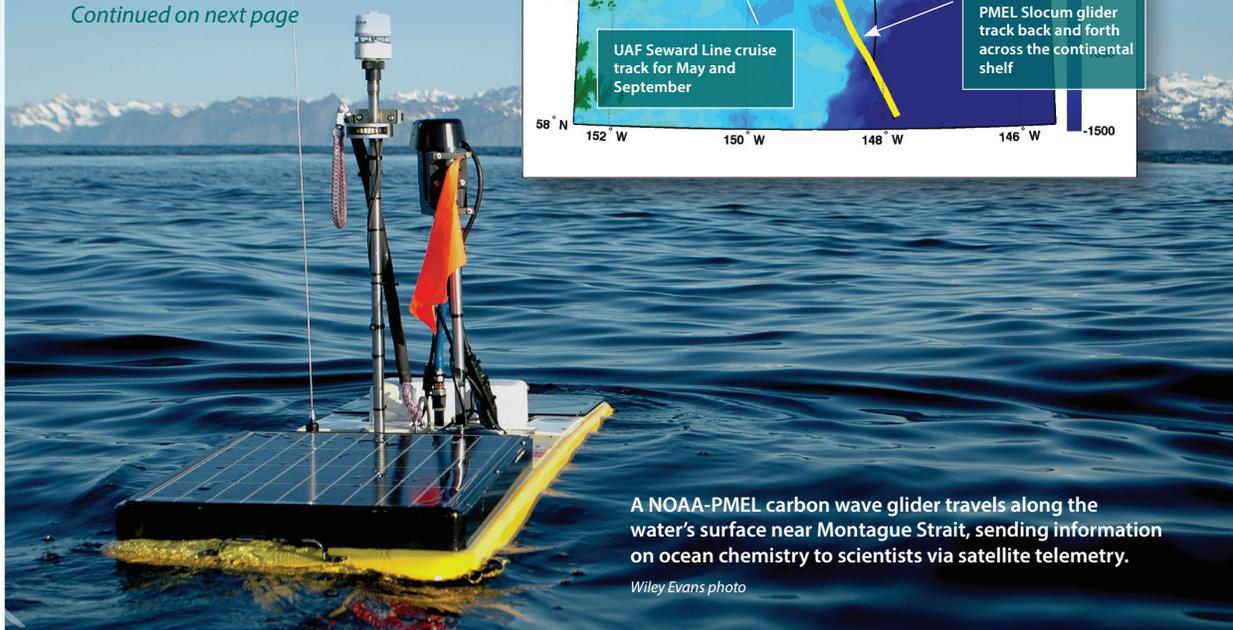
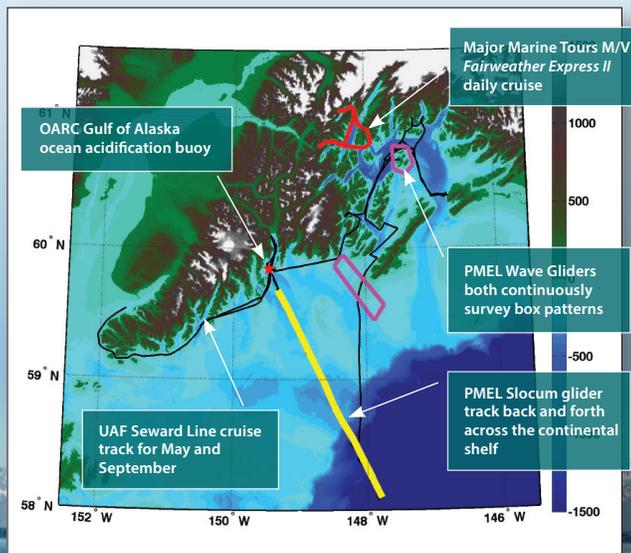
Scientists and resource managers are requesting more information on the temporal and spatial variations in ocean carbon chemistry, as well as the sensitivity of various ecosystems to these variations. Finding answers relies on collecting information from traditional buoys and ship surveys, as well as from new “wave gliders” outfitted with OA sensors.

### What is the effect of melting glaciers on ocean acidification?

This summer, scientists in the Gulf of Alaska are getting a close up look at OA dynamics in Prince William Sound, an ecologically rich embayment in the Gulf of Alaska, and how these chemical processes might be affected by glacial outflow. Since May, two surface wave gliders, built by Liquid Robotics and engineered by NOAA's Pacific Marine Environmental Laboratory, have been cruising around the Sound and adjacent Gulf of Alaska waters. The gliders resemble yellow surfboards, and are part of a five-month monitoring program to measure OA using CO<sub>2</sub> and OA sensors. The gliders are propelled by wave motions and controlled remotely from the Pacific Marine Environmental Laboratory (PMEL) in Seattle.

Simultaneously, state-of-the-art instruments installed on a Major Marine tour boat operated out of Whittier, is tracking glacial runoff from Surprise Glacier. Additionally, an autonomous glider is patrolling beneath the surface over the continental shelf, looking for water that could be harmful to some species. According to project leads Dr. Jeremy Mathis and Dr. Wiley Evans, “Glacial melt plumes have really unique chemistry that can exacerbate

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A NOAA-PMEL carbon wave glider travels along the water's surface near Montague Strait, sending information on ocean chemistry to scientists via satellite telemetry.

Wiley Evans photo

## Alaska Ocean Observing System

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Wiley Evans holds a vial of seawater near of a tidal glacier in Prince William Sound.

ocean acidification and impact the surrounding environment. We're already seeing surface water impacted by glacial melt broadly distributed in the Sound and moving out into the Gulf of Alaska, with potentially greater impacts than we had originally thought." When completed in early September, the study will have provided the longest continuous observations related to OA in Alaska.

**OA sampling along the Seward Line:** 2014 marks the 7th year of sampling for OA during the May and September cruises along the Seward Line and in Prince William Sound. The long-term Seward Line transect is in an ideal location for carbon biogeochemistry measurements in the Gulf of Alaska because it intersects the Alaska Coastal Current (ACC) and is representative of the broader coastal ocean environment in the region (i.e. seasonally intense downwelling with occasionally weak upwelling, high rates of glacial discharge, moderate rates of primary production, and intense winter cooling of surface waters). These data provide the longest seasonal time series of OA data in Alaska.

**Forecasting OA in the Gulf of Alaska:** The Seward Line data is being used to validate a new OA forecast model funded by AOOS. Initial runs from this model, led by University of Washington's Dr. Samantha Siedlecki, have been promising and could lead to similar OA models in other regions of Alaska.

**Monitoring OA at hatcheries:** With AOOS support, the OARC is maintaining an integrated OA monitoring system at the Alutiiq Pride Shellfish Hatchery in Seward. The system provides real-time carbonate chemistry data of the water entering the hatchery and has already provided tremendous value to regional stakeholders. The system is being enhanced with new equipment in August.

**Consortium supports OA buoy network:** AOOS has partnered with the OARC in a consortium to maintain an OA buoy network that is making continuous measurements of pCO<sub>2</sub>, pH, temperature, salinity, DO, and fluorescence at the surface and near the bottom. One of the buoys is located in the Bering Sea, and the other three are in the Gulf of Alaska: Resurrection Bay, Kodiak, and Southeast Alaska. ■

## AOOS Joins Consortium Supporting Sentinel Chukchi Mooring

This year, AOOS is working with the University of Alaska Fairbanks, ConocoPhillips, Shell and Oglooniik-Fairweather to fund a state-of-the-art, multi-instrument mooring in the northeast Chukchi Sea. When fully outfitted, the mooring will record physical, nutrient and carbonate chemistry, particulates, phytoplankton, zooplankton, and fisheries information. These measurements, which also include acoustics, will provide an unprecedented view into the dynamics of the Chukchi shelf ecosystem throughout the entire year. The site of the mooring was carefully chosen to help track climate change trends and help scientists understand how changing wind, waves and sea ice affect the regional oceanography. It will also provide a window into the continental shelf's nutrient and carbon cycles, and contribute to the growing body of information on ocean acidification in Alaska.



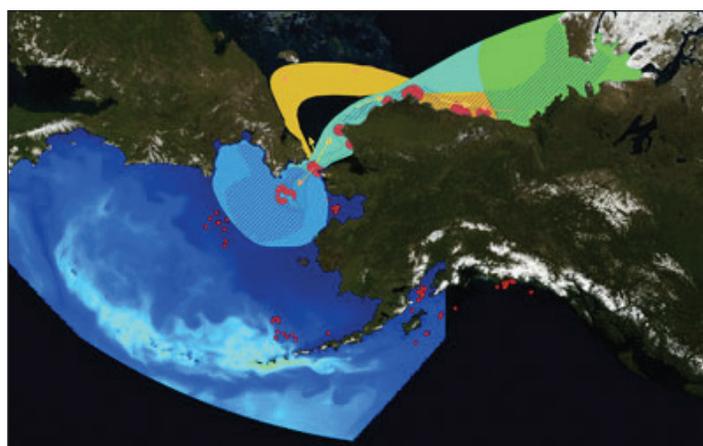
The mooring and its initial instruments will be deployed by Seth Danielson and his team of researchers at UAF, with subsequent instruments added in the following years. Data and scientific findings from the mooring will be available on the AOOS website starting in 2016. Thanks to the North Pacific Research Board, funding for the mooring is secured for the next five years. ■

## New "Ocean Data Explorer" Provides Access to Statewide Data

All of AOOS' publicly available data can now be found and viewed in one integrated statewide portal called the Ocean Data Explorer. Through the portal, you can browse data ranging from real-time wind conditions in the Inside Passage of Southeast Alaska to critical habitat areas in Kachemak Bay to wave height forecasts for the Bering Sea. The interface allows users to toggle between time periods, drop "virtual sensors" to extract data in areas of interest, and change parameter units and base maps.

Recently added data includes

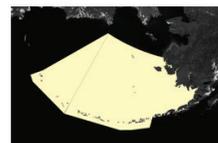
- High resolution sea ice data from Shell and the National Weather Service
- Social & economic data from the University of Alaska Anchorage (UAA) Institute for Social and Economic Research
- Statewide ShoreZone data (biological/geological characteristics)
- Future climate projections from UAF and NOAA's Pacific Marine Environmental Laboratory. ■



Arctic



Bering Sea



Gulf of Alaska



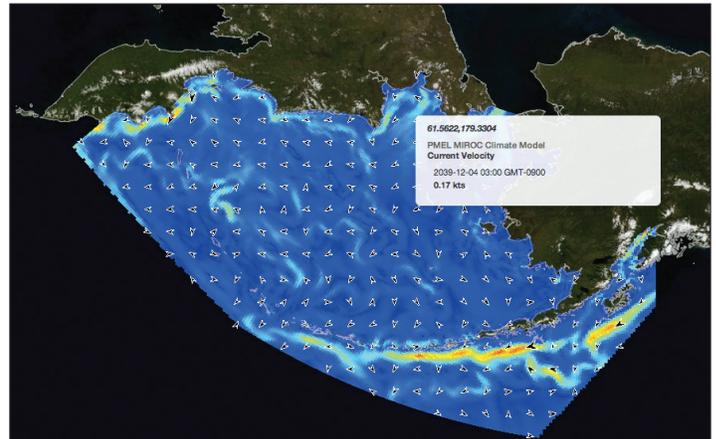
Users can enter the Ocean Data Explorer through a statewide view, or jump directly into the Arctic, Bering Sea and Gulf of Alaska Large Marine Ecosystems.

# Climate Vulnerability Assessment for the Bering Sea Large Marine Ecosystem

A team of researchers examining how climate change might affect the resources of the Aleutian and Bering Sea Islands will share findings and open a dialogue with residents of Unalaska on September 18 and St. Paul on October 9. Over the past six months, teams of experts with knowledge about key resources and ecosystem services (such as seabirds, fisheries and subsistence culture) have volunteered their time to draft short chapters for the Aleutian and Bering Climate Vulnerability Assessment (ABCVA). The assessment details specific vulnerabilities to climate change based on model projections. Climate models use quantitative methods to simulate the interactions of the atmosphere, oceans, land surface, and ice and estimate future changes to variables such as temperature, precipitation, salinity and wind. In Unalaska and St. Paul, project partners hope to learn what local residents are observing, what future climate patterns may emerge, and potential impacts on communities and the natural resources they depend upon.

Find out more at: [absilcc.org/science/sitepages/abcva.aspx](http://absilcc.org/science/sitepages/abcva.aspx).

Aleutian Island and Bering Sea residents interested in sharing observations but unable to attend the community meetings may arrange a brief one-on-one interview by contacting Ellen Tyler at [Tyler@aos.org](mailto:Tyler@aos.org). ■



This screenshot shows projected current velocity from the Model for Interdisciplinary Research on Climate (MIROC) model. MIROC is one of three downscaled climate projections for Alaska produced by NOAA's Pacific Marine Environmental Laboratory for the Intergovernmental Panel on Climate Change (IPCC). The vulnerability assessment project has used these models to help frame their analyses, as well as five downscaled climate projections produced by the Scenarios Network for Alaska & Arctic Planning at the University of Alaska Fairbanks. All of the projections can be accessed through the AOOS Ocean Data Explorer.

## A New View: Kenai River Webcam & Weather Station

Headed down to the mouth of the Kenai? You will soon be able to get a view of the water and check real-time conditions before you go. A high-resolution webcam and weather station will be installed in August, with the primary purpose of providing live footage of freshwater ice as it moves from the river into Cook Inlet. The weather data will be streamed through the AOOS website and also transmitted over the Automatic Information System (AIS) navigation display for mariners.

The webcam is part of the Cook Inlet Ice Forecasting Network, formed seven years ago by the Cook Inlet Regional Citizens Advisory Council, after a large pan of ice stripped the T/V *Seabulk Pride* from its Nikiski mooring. The Kenai River camera will be the first in the network to offer public access to live images, providing a view of freshwater ice movement. Because freshwater ice is more dense than saltwater or brackish ice, the freshwater ice flushing from the Kenai River on the flood tide can move as far north as the Tesoro/KPL dock in Nikiski that services oil tankers transporting crude oil and refined petroleum.

The installation of weather sensors and a transmitter to communicate directly with boaters on their AIS screens will be completed by the Marine Exchange of Alaska (MXAK) as a part of their WX/AIS project. More at: [aos.org/joint-weatherais-stations-installed-to-improved-forecasts-for-mariners](http://aos.org/joint-weatherais-stations-installed-to-improved-forecasts-for-mariners). Special thanks to the Cook Inlet RCAC, City of Kenai, MXAK, and Homer Electric Association for their generous contributions to this project.

Real-time weather information and webcam images from this project will be accessible via the AOOS Real-time Sensor Map as well as the Ocean Data Explorer (see story to left). The Real-time Sensor Map streams data from over 1,300 stations across the state, and was recently updated to calculate summary information based on stations in the user's view. Archived sensor data can be found by adding the "historic sensors" layer from the search catalog. ■



This map shows the location of the Kenai River webcam and weather station. The station will be installed by the Cook Inlet RCAC in August at the back corner of the public restrooms near the Kenai River beach access.

## Buoy Corner

Two AOOS-supported buoys will be afloat and streaming data by late summer. The Lower Cook Inlet buoy, which spent the winter in California undergoing repairs, is set for deployment from Homer in early August. We hope it will remain there indefinitely. The Bering Strait wave buoy, funded by the Western Alaska LCC, is in the water and streaming data 35 miles west of King Island. Real-time data from both buoys are available through the AOOS data portal as soon as they are in the water. ■



Terry Thompson

## Sea Ice Matters



NASA

Starting in the spring of 2015, a new exhibit at the Anchorage Museum will illuminate sea ice from a suite of perspectives. AOOS is excited to be one of the partners developing the exhibit and looks forward to showcasing Arctic sea ice data through interactive kiosks and touch screens. Stay tuned. ■

## Update: Community Based Monitoring Workshop

Thank you to the 100+ community leaders, scientists, teachers and other representatives who participated in the AOOS/Sea Grant community based monitoring workshop held in April to develop guidance for new or active observing programs in Alaska.

The workshop website continues to be updated with presentations and audio recordings from workshop speakers, summary information about CBM programs, and additional resources. Following the workshop, a team of writers convened to draft a handbook to capture “lessons learned” from the presentations and break-out discussions, reflecting on the experiences of presenters and participants. The handbook is currently under review and the final document will be available in the fall.

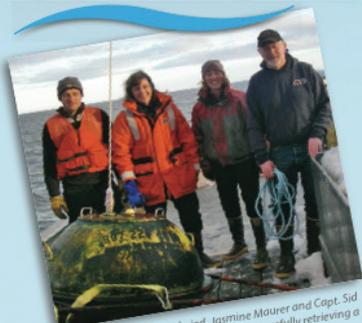
More information: <http://seagrant.uaf.edu/conferences/2014/community-based-monitoring/>.



Ketchikan High School students Hana Oshima and Micah Briola look for invasive tunicates under a dock near the village of Saxman.

Deborah Mercy

## 10TH AOOS ANNIVERSARY FILM CONTEST



Tim Blackmon, Kris Holderied, Jasmine Mauer and Capt. Sid Waitford breathe a sigh of relief after successfully retrieving a fish from the unpredictable waters of Cook Inlet.

## HAPPY 10TH ANNIVERSARY AOOS

2014 marks the 10th Anniversary of AOOS. We are grateful for our partners, collaborators and supporters who have helped expand and strengthen our program since its inception in 2004. To celebrate, AOOS is hosting the following activities:

- **10th Anniversary celebration.** Join friends of AOOS on November 19th at the Anchorage Museum for an evening of reflections on a decade of ocean observing in Alaska, short films from the AOOS film contest, food and drinks.
- **AOOS Ocean Film Contest.** Submit a short film (10 min or less) related to Alaska oceans by Sept 15th and be eligible for a \$1,000 grand prize. More details: [www.aos.org/film-contest](http://www.aos.org/film-contest)
- **Weekly factoids.** Check out notable moments in ocean observing history on the AOOS homepage and Facebook page.