AOOS
The Eye on Alaska's Coasts and Oceans
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Update
Summer 2011

New Buoy Deployed in Lower Cook Inlet

Implementing the National Waves Monitoring Plan in Alaska took a step forward this spring with the successful deployment of a new wave buoy off Anchor Point in Cook Inlet, Alaska. The buoy transmits real-time information about wave height and direction, as well as sea surface temperature.

The buoy is three feet in diameter and weighs 400 pounds. It is equipped with a flashing light, and is anchored with approximately 1,800 pounds of ballast chain.

"Deploying and maintaining this buoy is a great example of collaboration among the Alaska ocean observing community," said Molly McCammon, Executive Director of the Alaska Ocean Observing System (AOOS), the owner and manager of the new buoy. "It's a key component of AOOS' initiative to improve ocean monitoring in Cook Inlet to meet the needs of the inlet's many users, including commercial and recreational fishermen, shipping, resource managers, and the oil and gas industry and oil spill responders. We could not have done this without our partners."

The fishing community is especially excited. "Local mariners can benefit immediately", said Captain Bob Ward, head of the Homer Charter Association. "This data will provide every mariner, commercial, sport charter and private sport vessel operator the opportunity to determine what the sea conditions are before venturing out into these waters. This is one resource that every mariner can access and understand."

The buoy is part of the national Coastal Data Information Program (CDIP) sponsored by the U.S. Army Corps of Engineers. It was built by a Dutch company, prepped at Scripps Oceanographic Institute in San Diego, and then shipped to Alaska on a US Coast Guard cutter with chain provided by NOAA's National Data Buoy Center. The Lake Clark National Park and Preserve research vessel, the Chigmit, was used for deployment. The Kachemak Bay Research Reserve is on call if the buoy separates from its line or has problems. The KBRR phone number is listed on the buoy if mariners see the buoy adrift.

Information from the buoy will be used to assist a wide array of marine operations. Cook Inlet receives high vessel traffic, as 90% of Alaska's goods arrive by barge through the inlet on the way to the Port of Anchorage. Additionally, an active sport fishing fleet departing from Homer and Anchor Point has desired wave information for many years. Circulation patterns are complicated in the inlet, which also experiences high winds, seasonal sea ice, and tides up to 36 feet in places.

Wave height and direction data, as well as sea surface temperature, are available through the following links:

- AOOS data portal *(zoom into lower Cook Inlet)*: http://data.aoos.org/maps/sensors.php
- CDIP *(station ID: 175)* http://cdip.ucsd.edu
- NDBC station page *(station ID: 46108)* http://www.ndbc.noaa.gov

The buoy is the first of at least four that are considered key to implementing the National Waves Plan in Alaska. AOOS will soon be implementing other components of an ocean observing system in Cook Inlet, including a new weather station at the McNeil River bear viewing site, monthly oceanographic surveys in Kachemak Bay, and enhanced wind forecasts. ■

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Cook Inlet

DID YOU KNOW?

- The Cook Inlet watershed covers 100,000 square km
- 11% of the watershed is covered by glaciers
- The total average annual surface-water discharge into Cook Inlet is estimated to be 116,000 cubic feet per second. That's about half the Yukon River outflow and twice the Copper River.
- Half of the annual total discharge comes from the Susitna River basin.
- The annual suspended-sediment flowing into Cook Inlet is more than 44 million tons. Alaska has three of the four highest sediment-discharging rivers in the US with the Copper (80 million tons), the Yukon (65 million tons), and the Susitna (25 million tons). The Mississippi River is first with 230 million tons.
- Cook Inlet is an important transportation route, with the Port of Anchorage handling 95% of all merchandise goods used by Alaskan communities west of Cordova
- Around 30% of the Cook Inlet Basin is Federal land. This includes four national parks (Denali, Lake Clark, Katmai, and Kenai Fjords), 1,800 square miles of the Chugach National Forest, and 3,000 square miles of Kenai National Wildlife Refuge land.

Cook Inlet's Vast Tidal Power Potential

- Cook Inlet has the fourth largest tidal range in the world at 12 meters or 36 feet!
- Current speeds can be as high as 10 knots.
- Tidal power, as predictable as the daily tide, produces no greenhouse gases and can be tied into the electricity grid.
- Tidal resources in Alaska represent over 90% of the total tidal energy potential in the entire United States.

Today, there are several projects in progress to develop tidal power in Cook Inlet. The Ocean Renewable Power Company (ORPC) has secured preliminary permits near Fire Island and the East Foreland areas of Cook Inlet. To harness tidal power, scientists and engineers need substantial oceanographic information. ORPC is collecting data on current velocity, sea floor bathymetry, geophysical information and environmental considerations, and will incorporate circulation modeling performed by UAA to locate optimal sites at the East Forelands. The Department of Energy (DOE) is funding a UAA study that will help ORPC choose the best design and components for use in this unique environment with high suspended sediment contents (silt), by building a laboratory flume for long term testing.

After two full years of environmental monitoring and completion of permitting requirements in 2012, OPRC plans to begin installing the tidal generator in 2013 at the East Foreland site. This will kick off a full year of operations and monitoring as Cook Inlet's first tidal energy pilot project in motion. After completing the pilot project, ORPC hopes to build the power system to a commercial-scale project that includes turbines throughout the Inlet, providing tens of thousands of homes with reliable, clean, renewable electricity. ■

Fig. 1 ORPC's Beta TidGen™project, an example of a tidal-powered electricity system currently used in Maine.

Bill Heubner

Cook Inlet's Complex Bathymetry

Many scientists and other stakeholders are interested in the underwater topography (known as bathymetry) of Cook Inlet. Understanding bottom features allows better understanding of circulation and marine habitats and helps with safe navigation. In Cook Inlet, the bathymetry is particularly complex and dynamic due to strong currents and a heavy silt load that changes the underwater environment with each tide. In addition as there is flooding and drying associated with tides in this region, the bathymetry is melded together with land topography to cover possible inundation zones."

NOAA's Rich Patchen and Lyon Lanerolle are currently assembling the best bathymetry and land topography data available from a variety of different research efforts. Their goal is to develop a model based on this sea and land topography to show how water moves through Cook Inlet. ■

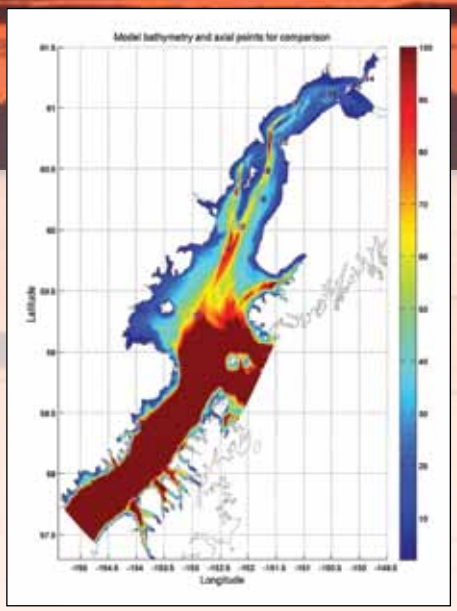


Fig 2. Water level in Cook Inlet modeled by NOAA.

Buoys and Weather Stations

AOOS provides access to almost 100 real-time sensors in the Cook Inlet area, including weather stations, buoys, stream gauges, tide gauges, wind meters, and water level stations. Visit AOOS' real-time sensor map to get timely information on conditions near you. ■

An Inlet View

Over 30 webcams are scattered around Cook Inlet. These real-time images provide boaters, aviators, industry, and recreationists an idea of what to expect before heading out. Check out the AOOS' Real-time Sensor Map and query "webcams" to view these cams in a centralized location: http://data.aoos.org/maps/sensors.php ■

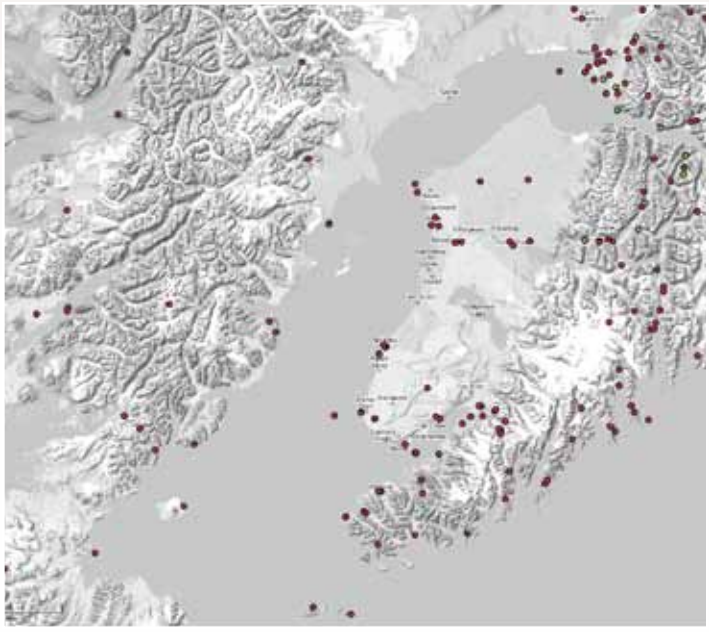


Fig 3. Red dots show real-time sensors in the Cook Inlet region, including wave velocity and direction, air temperature, wind speed and direction, stream gauge height and flow, and other parameters. Green dots are stations that include webcams.

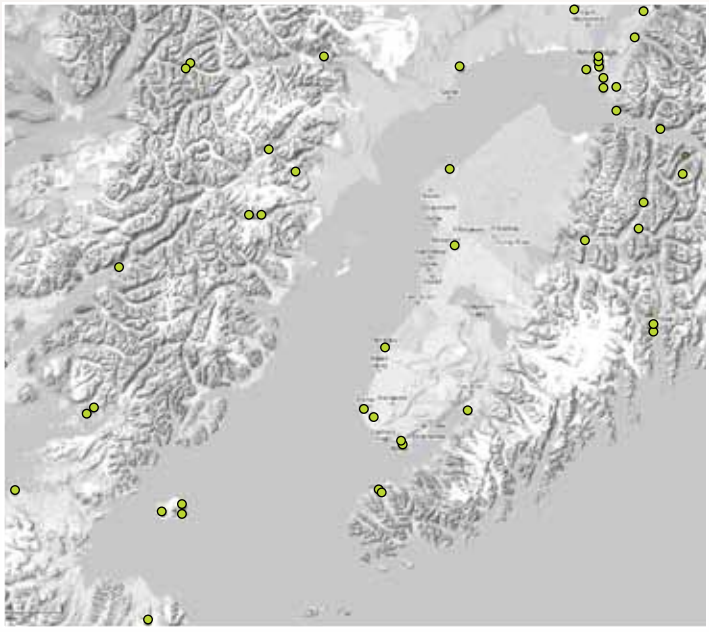


Fig 4. Green dots show webcam locations around Cook Inlet

Alaska Expands Ocean Acidification Monitoring

This spring, the first ocean acidification buoys in Alaska to report information in real time were deployed near Resurrection Bay and in the eastern Bering Sea. The information they collect will help scientists monitor ocean pH levels, and better understand how oceans are being affected by climate change. A third subsurface ocean acidification mooring is currently deployed in the Chukchi Sea – but requires servicing to extract the information collected.

The new buoys have a full package of oceanographic sensors which measure PC02, pH, salinity, temperature, dissolved oxygen, florescence, and chlorophyll A. The data is recorded hourly and streamed to scientists at the University of Alaska Fairbanks and NOAA's Pacific Marine Environmental Lab. It will also be made available through the AOOS website.

Professor Dr. Jeremy Mathis, director of the Ocean Acidification Research Center at UAF, is leading the project with assistance from Dr. Chris Sabine at NOAA's Pacific Marine Environmental Lab.

"These buoys are really going to provide some new insights and understanding for ocean acidification in the Pacific-Arctic region," said Mathis. "We know these areas are going to experience a dramatic change in pH over the coming decades and, given the importance of the fisheries, we have to stay in front of any potential disruptions that could be caused by rising carbon dioxide levels."

Scientists predict that that the ocean is 25 percent more acidic today than it was 300 years ago, and the percentage is on the rise. This can be traced to increasing levels of atmosphere carbon dioxide due to

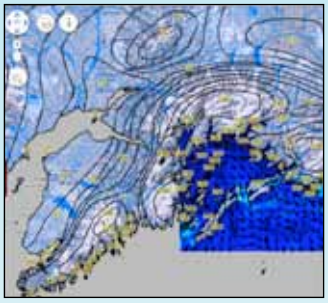
fossil fuel combustion and land use change. While 45% of the anthropogenic CO2 is held in the atmosphere, most of the rest is absorbed by the ocean. The resulting change in ocean chemistry reduces the pH of the sea water, which can destroy calcified organisms such as shellfish, coral, and coccolithophores. Better understanding this process will help scientists and managers prepare Alaskans for potential impacts to fisheries and livelihoods.

Alaska's mooring program has been developed through a consortium of agencies including the National Science Foundation, NOAA, the North Pacific Research Board, and AOOS, and is the centerpiece of the Ocean Acidification Research Center at UAF. ■

Alaska Regional Ocean Observing Round-Up

McNeil Weather Station Coming Soon

AOOS and the Cook Inlet Regional Citizens Advisory Council partnered to purchase and deploy a weather station at McNeil River on the western shore of Cook Inlet. This area receives high summertime visitor traffic due to its internationally known bear viewing site. The weather station also fills a key gap for National Weather Service forecasters, who have little information from the western inlet to estimate winds. Data will be available through the AOOS and National Weather Service sites this fall. ■



What's Next for AOOS Data Portal

The AOOS data management team is hard at work improving and enhancing data access. Starting this fall, users will be able to visualize, query and integrate data from multiple source types (sensors, models, remote sensing, GIS data layers and in situ observations) from a single interface which will be known as the "AOOS Ocean Portal." The team will also launch the "AOOS Ocean Workspace" which will be equipped to store and share project level data sets, allowing researchers to archive and create their own metadata. ■

AOOS/ADFG Partnership Promotes Data Sharing

AOOS has begun a multi-year partnership with the Alaska Department of Fish & Game Division of Commercial Fisheries (ADF&G-DCF) to promote and expand data sharing capacity. The goal of the partnership is (1) to increase access for AOOS users to fishery and biological sampling data held by ADF&G; and (2) to integrate AOOS data streams on real time and historical ocean conditions directly into ADF&G management applications and decisions. The new collaboration identified Bristol Bay fisheries as a pilot project. If successful, similar data sharing strategies with be used with other data providers and agencies in the state. ■

HF Radar Resumes in the Arctic

Surface current mappers are once again deployed in Arctic waters this summer, with three stations off Barrow, Wainwright, and Point Lay. The radar, known as 'High Frequency' radar, measures the speed and direction of surface currents. This information is important for understanding ocean circulation, as well as monitoring ocean conditions for vessel safety. The project is run by the UAF School of Fisheries & Ocean Sciences, and funded by the Bureau of Ocean Energy (BOEMRE), Conoco Philips, and Shell Oil. To learn more, visit http://www.ims.uaf.edu/hfradar/. ■