Observations to Assess and Monitor Ocean Acidification

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NANOOS focuses on delivering data products relevant to a number of activities impacted by

the coastal ocean environment including maritime operations, coastal hazards, ecosystem assessment, fisheries and coastal climate implications. In February, we reported on our work with tsunamis and coastal hazards. Next month, we will tell you about surface current measurements and their use in a number of operational settings. This month, we will introduce work we are doing with NOAA regarding the issue of ocean acidification. We're telling you about this as it's a good example of the breadth of needs being addressed by Northwest Association of Networked Ocean Observing Systems (NANOOS) and because this issue is of significant importance to our region of the country.

First, some background. The United States National Research Council has shown that the chemistry of the ocean is changing due to atmospheric carbon dioxide (CO_2) levels that are now higher than at any time in at least the past 650,000 years. Measurements show that about 30% of the CO_2 released to the atmosphere over the past 250 years from human activities is now dissolved in the ocean. Once dissolved in the ocean, CO_2 interacts chemically with other components in seawater in a complex way to change the very characteristics of the water itself. On a global basis, these changes, commonly referred to as ocean acidification (OA), are larger and are occurring faster than we have ever seen previously. If the acidification effect is strong enough, shells and skeletons of marine organisms, many of which are economically important, actually dissolve.

The distribution of effects from this will be different around the globe. Here in the Pacific Northwest, the domain of NANOOS, our attention is heightened because of a combination of factors that renders the Pacific coast of North America more vulnerable to acidified or "corrosive" water events. First, because of global ocean circulation patterns, the deep waters of the Pacific are the oldest in the world's oceans and, to a degree, are more naturally corrosive than other areas because of chemistry changes occurring over tens of thousands of years in from their formation to arrival here.

On top of this natural increased acidity, our society's addition of CO_2 further increases the acidity of Pacific coast waters. Finally, seasonal upwelling along the coast transports the more corrosive water onto the continental shelf, where in some areas these conditions can reach the surface and may affect organisms.

In coastal estuaries, inputs of nutrients and organic matter from land can increase the water's acidity even further. Consequently, natural processes, additions of CO_2 from man's activities, and additions of nutrients and organic matter to estuaries all combine to intensify ocean acidification in the Pacific Northwest (PNW) and especially in our coastal estuaries.

The same PNW coastal estuaries that are threatened by ocean acidification are the source of highly valued shellfish and shellfish fisheries. Shellfish aquaculture provides an important source of jobs in Washington and Oregon, and revenues directly benefit state and local economies. Loss of shellfish aquaculture from the Pacific Northwest would impose substantial social and economic costs. Therefore, this issue is of importance to the NANOOS region. Over the last several years, NANOOS has evaluated whether it's observing efforts can help in assessing this condition.

NOAA is the nation's lead agency for this issue and has established an Ocean Acidification program office at its headquarters in Washington, D.C. The NOAA Pacific Marine Environmental Laboratory (PMEL) in Seattle has world-renowned expertise in the measurement and evaluation of OA. NANOOS has partnered with PMEL to put their ocean carbon and acidity sensors on several of the NANOOS network of buoys in Washington and Oregon. There are now such data from Newport, OR, and La Push, WA, available for view on both NANOOS' and NOAA's Ocean Carbon websites.

Additionally, the NOAA Ocean Acidification Program Office is working with the University of Washington and NANOOS to host two important PNW workshops regarding this issue, one on integrating ocean acidification (OA) data management for the nation and one on defining a global network for OA monitoring.

The goal of the first workshop is to establish a national framework for the handling of ocean acidification data that makes it possible for users to locate, understand and utilize relevant data in support of scientific research and resource management. Outcomes include a shared vision for integrated OA data management and an initial OA Integrated Data Management Plan with an emphasis on near-term (2-year) goals. This workshop, to be held in March 2012 in Seattle, will involve representatives from NOAA, IOOS, NSF, NASA, USGS, DOE and several other agencies involved in observations, experiments, modeling, and satellite research.

The second workshop, to be held in June in Seattle, will invite representatives from around the world. The principal goals of this international workshop are to: (1) design the components and locations of an international ocean acidification observing network that includes repeat water column surveys, underway measurements on volunteer observing ships, moorings, floats and gliders taking into account existing networks and programs wherever possible; (2) identify measurement parameters and performance metrics for each major component of the observing system; and (3) develop a strategy for data quality assurance and distribution.

With a better coordinated and consistent observing network, we will improve the capability to assess and respond to this important issue. NANOOS is only one of the eleven regional associations working with NOAA IOOS and the OA program offices to make progress on this work.☆

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Arctic Shipping: USCG Icebreaker Program

PHOTO: U.S. COAST GUARD PETTY OFFICER 1ST CLASS SARA FRANCIS.

The Coast Guard Cutter HEALY *approaches the Russian-flagged tanker* RENDA *while breaking ice around the vessel 97 miles south of Nome, Alaska, Jan. 10, 2012. The two vessels departed Dutch Harbor for Nome on Jan. 3, 2012, to deliver more than 1.3 million gallons of petroleum products to the city of Nome.*

Captain Beverly Havlik, slated CAMM PDC speaker, commander of the USCG Icebreaker *HEALY* on a recent mission to deliver fuel to Nome, Alaska, in January.

HEALY, based in Seattle, is the only USCG icebreaker in service. The *HEALY*, deployed for seven months on science missions, sacrificed returning home to Seattle for the holiday to perform the mission. *HEALY* and her crew broke their way through 800 miles of Bering Sea ice to enable the Motor Vessel *RENDA* to deliver 1.3 million gallons of fuel to the 3,600 people of Nome, Alaska after extreme weather and ice formation precluded safe delivery of this vital commodity. The *HEALY* is a medium-class icebreaker, designed to break through four feet of ice at a speed of three knots.

In a press release, Lt. Governor Mead Treadwell commended the crew of the U.S. Coast Guard Cutter *HEALY* and praised the U.S.-Russia cooperation and efforts of all who made the operation possible. A Jones Act waiver was necessary for the Russian-tanker *RENDA* to transport cargo between two American ports.

Lt. Gov. Treadwell testified on Dec. 1, 2011 before the U.S. House Subcommittee on Coast Guard and Maritime Transportation on the immediate need for new polar class icebreakers in the Arctic. Of the Coast Guard's only two heavy icebreakers, the Polar Sea has been decommissioned, and the Polar Star is undergoing renovations that may only add another 7-10 years to its service.

"*We need the HEALY, and we need new Polar class icebreakers,*" Treadwell said. "*We need them to maintain the safety and health of Alaska's coastal communities and environment… We need them to counter risks posed by new ship traffic carrying oil products through the Bering Strait, for science, and for security requirements that cannot be met with current capabilities.*"

USCG Commandant Admiral Papp, Jr. has requested $8M in the FY2013 budget to initiate survey and design of a new Polar Icebreaker to ensure the Nation is able to maintain a surface presence in the Arctic well into the future.

In other USCG news, the FY2013 budget also requests funding for National Security Cutters. Commandant Admiral Papp, Jr. is quoted in *Miltary Officer* in an interview by Tom Philpott: "*The National Security Cutter (NSC) is the flagship of our recapitalization plan. It will replace our high-endurance cutters and carry out missions at sea for the next 50 years. This last year, our acquisition professionals not only awarded a fixed-price contract for NSC 4 but also a contract for NSC 5, only $2 million higher. Given the rise in steel prices, that's unbelievable. All we need is a steady funding stream to build out a total of eight ships (to replace 12 Hamilton-class high-endurance cutters). Three have been delivered. I'm asking for money for NSC 6 in the 2013 budget, for NSC 7 in the '14 budget, and for NSC 8 in the '15 budget. If we get that, we'll have all eight built by (FY) 2018.*"