Progress Report on a demonstration of the Alaska Ocean Observing System in Prince William Sound

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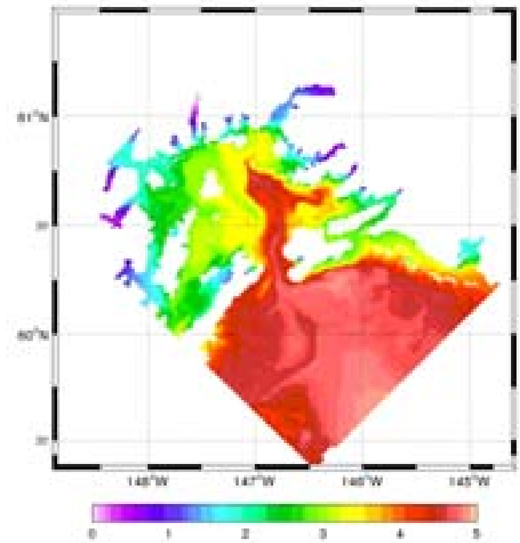
Anchorage, Alaska



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A Demonstration of the Alaska Ocean Observing System in Prince William Sound

Introduction

Alaska's Prince William Sound (PWS) includes over 6000 km of shoreline and contains an extensive system of tidewater glaciers descending from the highest coastal mountain range in North America. The Trans Alaska Pipeline carries oil to the Port of Valdez in northern PWS. The oil is then shipped to southern refineries on large tankers, making the environment of PWS highly vulnerable to oil spills, as evidenced by the 1989 Exxon Valdez spill. The Oil Spill Recovery Institute (OSRI) and its partner organizations conduct research in PWS to enable detection and prediction of oil-spill related impacts and subsequent recovery. This mission led to the development of a PWS ocean circulation model coupled to a regional atmospheric circulation model. These early efforts resulted in a much better understanding of PWS but more information was needed to resolve smaller scales of time and space. The modeling program has now been integrated with the Alaska Ocean Observing System (AOOS) to take better advantage of real-time data streams from satellites, weather stations, and an enhanced observational oceanography program consisting of moored buoys and seasonal hydrographic surveys.

The observing system in PWS observing has two primary goals. The first goal is to provide physical and biological information to the major user groups in PWS including the coastal communities, oil and gas transportation industry (tanker traffic and oil spill response), air taxis, commercial fishermen, recreational and commercial boaters, and Coast Guard search and rescue operations. For example, the high-resolution wind, wave and ocean current forecast products will provide improved weather forecasts to commercial and recreational vessel and aircraft operators, as well as enhance the safety of oil tanker traffic in PWS. The improved physical and ecological forecasting products will enable resource programs and managers (e.g., PWS hatchery and commercial fishing organizations, AK Department of Fish and Game) to make better management decisions on food supply, predation, and human activities such as commercial, recreational and subsistence fishing.

The second goal is to combine long-term monitoring with short-term hypothesis-driven process studies to understand mechanisms underlying the dynamics of the interactions between the major coastal currents and the production of flora and fauna of the Pacific Ocean, the Gulf of Alaska, and PWS. Of particular interest is the understanding of predominant mechanisms of ecological variability. Understanding the circulation patterns and dynamics of water exchange will provide a solid scientific foundation for addressing fisheries management and ecosystem needs related to long term oceanic and climatic variability.

On January 20, 2008, a meeting was held in Anchorage, Alaska, to discuss the progress of a major demonstration project for the Alaska Ocean Observing System in Prince William Sound. The purpose of the meeting was to facilitate discussion and interaction among the current group of principal investigators, the general public and specific information users. This document provides a progress report of each major component of the observing system.

IOOS Funding: Molly McCammon, Alaska Ocean Observing System, and Scott Pegau, Oil Spill Recovery Institute

The demonstration project in PWS is primarily funded by AOOS and OSRI but there are many other entities supporting this effort through in-kind contributions, equipment purchases, and annual maintenance support. The AOOS budget has seen reduced levels of funding from the national Integrated Ocean Observing System (IOOS) program from $1.9M in 2005 to $1.5M and

$.75M in 2006 and 2007 respectively and a projected amount of $.75M in 2008. The AOOS proposal now in review requested $2.1M, $3.1M and $3.2M in 2008, 2009, and 2010 respectively. The AOOS planning grant that supports the directorate has been flat funded at $400K per annum.

The ocean observing system components in the OSRI Science Plan continue to be supported by the OSRI Board, which is expected to contribute funds for the observational oceanography program at the Prince William Sound Science Center, the maintenance and logistical support of the weather stations, and limited data management through 2010.

SNOTEL Weather Stations and Precipitation Gages: Rick McClure, Natural Resources Conservation Service

The observing system in Prince William Sound (PWS) includes weather observation stations that provide accurate real-time data on winds, temperatures and precipitation. These data are used as part of a new PWS weather forecasting system. Snowpack Telemetry (SNOTEL) stations were first set up in the western states in the early 1970s by the National Resources Conservation Service (NRCS), a division of the U.S. Department of Agriculture, to measure precipitation from snow and rain throughout the year and feed drought predictions. They are fully-automated, land-based stations that are usually set up in remote locations. In 2004 the state of Alaska had 46 stations, but starting in the summer of 2005, five new stations were deployed at sea level in PWS, and five additional stations were planned for deployment at alpine elevations. A new station was deployed on Mt. Eyak above Cordova in 2005.

A new Snotel weather station was deployed on the south side of Valdez Arm at an elevation of about 800 meters on Sugarloaf Mountain above the Solomon Gulch fish hatchery in 2007. This station is now providing real time data feeds to the AOOS web site. U. S. Forest Service permitting issues have caused delays in deploying the remaining alpine stations, but as of January 2008 the stations at College Fjord and Naked Island are permitted and scheduled for deployment. The last station planned for SW PWS has been moved to a site near Main Bay and permit applications have been filed with the State of Alaska. A new station sponsored by the PWS Regional Citizens' Advisory Council was also deployed at Nuchek and is transmitting via Starband satellite internet service.

Each Snotel station in PWS measures wind speed and direction, air temperature, air pressure, precipitation from rain and snow, and solar radiation. The station on Mt. Eyak also has a snow pillow to measure the water volume of the snow pack. The stations at Esther Island, Port San Juan, Tatitlek, and Nuchek have digital cameras that transmit pictures every fifteen minutes to the internet so the actual weather conditions in each area can be seen. Data transmitted by the weather stations will be accessible through the AOOS web pages and archived at the University of Alaska Fairbanks.

National Data Buoy Center weather stations: Mike Burdette, National Data Buoy Center

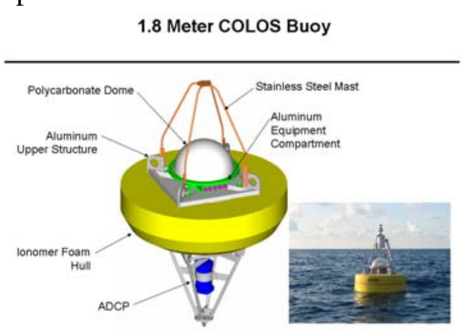
One of the first steps in implementing the Prince William Sound Observing System (PWSOS) was to determine what observations were already being made. One such network of existing observation platforms includes the weather buoys and coastal weather stations of the

National Data Buoy Center (NDBC). This program of the National Oceanic and Atmospheric Administration (NOAA) has weather buoys throughout the waters of the United States, which are used to support the National Weather Service forecasting system and the NOAA marine environmental database.

Recently, the NDBC expanded its services in Alaska, including Prince William Sound. The NDBC already had two weather buoys in the Sound – one at Hinchinbrook Entrance (46061) and one in the central basin at Orca Bay (46060) – as well as one in the Gulf of Alaska at Cape Suckling (46082). The expansion allowed for placement of a new buoy in the northwest Sound at Port Wells (46081) and another at the southern end of Montague Island near Cape Cleare (46076). In addition to these buoys, the NDBC maintains three automated weather stations at Bligh Reef, Potato Point, and Middle Rock along the vessel traffic lane leading to the Port of Valdez oil terminal

The weather buoys in PWS are typically three meters in diameter, although larger six meter ones are used for stability in rougher or more open waters such as Hinchinbrook Entrance. The buoys carry an array of instruments that measure wind speed and direction, air pressure, air temperature, and sea surface temperature. They also provide a platform on which other organizations can place instruments. For example, AOOS has upgraded each of the three buoys in PWS with instruments that measure ocean temperature, salinity, and current velocity.

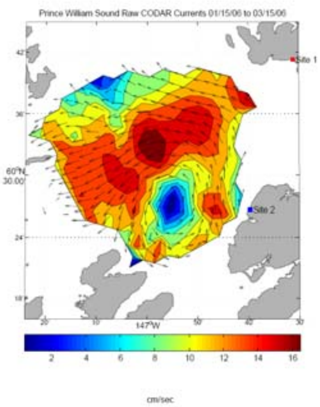
Current velocity is measured with an Acoustic Doppler Current Profiler (ADCP). An ADCP is an electronic instrument used to measure currents through the entire water column. ADCPs rely on a measure of the Doppler shift to calculate the speed of moving water. The Doppler shift can be experienced regularly in everyday life: think, for example, of the change in sound of passing cars when walking on the side of the road. ADCPs emit a sound at a given frequency and listen to the echo of this sound after it has bounced on small particles naturally present in sea water. The distance between the instrument and the reflecting particles is estimated from the delay between the emission of the sound and the arrival of the echo. Should the echo from a given distance arrive with a higher frequency than the emitted sound, then the volume of water at this distance is moving toward the instrument; should the echo arrive with a lower frequency, then this volume of water is moving away. Larger shifts in frequency indicate larger current speeds.



The NDBC will deploy an experimental buoy in Montague Strait in the July 2008. This buoy will measure directional waves and water currents in this important entrance to the Sound. The new buoy will include an ADCP provided by AOOS and will transmit data in near real-time.

The measurements made by the NDBC buoys help provide better data on weather patterns in PWS and the Gulf of Alaska. They are the first step toward understanding the variability of weather patterns around PWS, and will allow for more accurate weather forecasting by computer models being developed by AOOS (see below).

Surface current measurements with HF radar: Jim Alanko, University of Alaska Fairbanks

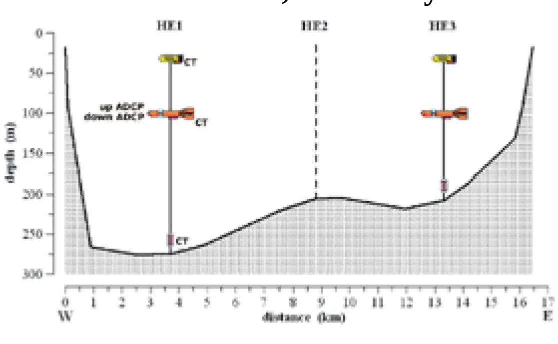


Since the mean tidal range in PWS is about 3 meters, all mariners need to consider the currents created by the ebb and flood of the tides. When winds and waves are also factors, the velocity of the currents can magnify waves to dangerous heights. Currents are important for understanding the PWS ecosystem as well as for the set and drift of vessels in the tanker traffic corridor leading to the Port of Valdez, and the trajectory of drifting debris, icebergs and oil spills. HF radar is one tool that can be used to directly measure surface current velocities. An array of instruments in PWS measures the direction and speed of surface currents in the central basin of PWS and transmits this information to the internet.

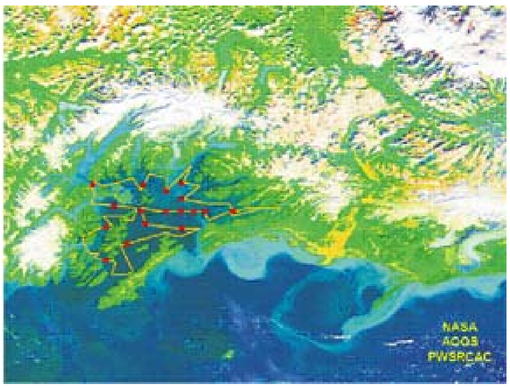
The HF radar is, essentially, a combination of a powerful radio wave transmitter and receiver that use the Doppler shift to determine how fast surface currents are traveling. Two HF radar stations were set up in Prince William Sound in 2004 at Knowles Bay and Shelter Bay. The stations transmit and receive radio waves that travel as far as 60 km across the Sound in all directions. As each radio wave reflects off the ocean and returns to the receiver, changes in the waves' Doppler frequency shift is determined and then used to estimate the surface currents. Two sites combine to determine the surface horizontal velocity field. In mid-summer of 2004 the stations began to reveal something that had never been directly measured before; the counter-clockwise flow that include inflow through Hinchinbrook Entrance and outflow into the head of Montague Strait. The HF radar data from 2004 along with a series of drifter trajectories also from 2004 are now being more thoroughly analyzed at UAF. The cyclonic circulation pattern is likely a consequence of the inflow of dilute Alaska Coastal Current water through Hinchinbrook Entrance, inflow of freshwater from the Sound's surrounding coast, and the basin-like bathymetery of the central Sound.

The status of the HF radar stations in PWS is uncertain due to the funding issues, but at this point the stations have been demobilized and are no longer operational. Further data analysis is ongoing especially with regard to comparisons with modeled circulation patterns. In 2008 and 2009 there is a plan to redeploy the HF radar for a limited period in the summer to provide more data for model validation. The longer term outlook of this array in PWS is uncertain, primarily because of the issues related to the remote power source.

Ocean moorings and hydrography: Jennifer Ewald, Prince William Sound Science Center and Steve Okkonen, University of Alaska Fairbanks



The goal of this observational program is to monitor the long term seasonal and interannual variability of exchange between the Gulf of Alaska and PWS, and to improve our understanding of the magnitude and frequency of water exchange and the forces driving these exchanges. To provide this information, ADCPs are deployed in the two main entrances of PWS to obtain measurements that allow volume estimates of water transport. Subsurface moorings are instrumented with one upward looking and one downward looking ADCP mounted on hydrodynamically streamlined buoys. Each of the subsurface moorings has three conductivity-temperature recorders (CTDs) mounted at three different depths. These instruments periodically sample temperature and salinity and thus track changes in water properties over time. Used in conjunction with the ADCP current measurements, they help identify periods of deepwater exchange (which tends to be colder and saltier) between PWS and the Gulf of Alaska. The data also help to determine the amount of freshwater coming into the Sound from the Copper River Delta or any of the many glaciers around the Sound. Data from these moored instruments are being combined with hydrographic data collected by NOAA in the summer of 2007 to improve forecasts of tides, tidal currents, and circulation patterns.

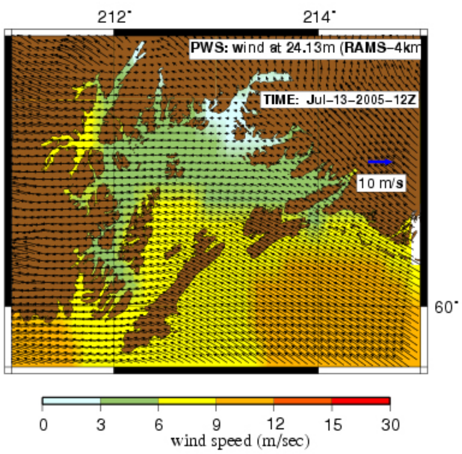


Supplemental hydrographic data are being collected with periodic boat-based surveys since the spring of 2007. The *F/V Alena K* is instrumented with a thermosalinograph to acquire underway measurements of near-surface temperature and salinity, a fluorometer to measure chlorophyll, and a transmissometer to quantify turbidity. From spring 2007 to January 2008, the *F/V Alena K* also conducted CTD casts at seventeen locations during each survey with the goal of estimating the seasonal cycle of freshwater content in the sound. The University of Alaska in Fairbanks was contracted to develop software that combines these measurement values with a GPS position and record to a computer hard drive. Surface salinity mapping will help quantify fresh water inputs to PWS for assimilation by the ROMS model. Chlorophyll fluorescence was also measured in PWS to provide an estimate of interannual and seasonal phytoplankton variability.

Nearshore moorings: Rob Campbell, Prince William Sound Science Center

This project provides better information of the spatial and temporal variability of ocean water in the nearshore zones of PWS and provides telemetered water quality data for assimilation into the ROMS model (see below). The data will also be made available for the NPZ (nitrate-phytoplankton-zooplankton) modelling effort and for hatchery management as well. A pilot mooring has been installed on an existing oil spill response buoy (with permission from the Alyeska Pipeline Service Company) adjacent and approximately 1 km offshore from a salmon hatchery. The mooring instrumentation consists of a Seabird SBE16 (temperature and conductivity) and a Wetlabs ECO FLNTUSB (fluorescence and turbidity), cage-mounted at 5 metres depth. Both instruments are interfaced through a Campbell Scientific (CS) CR1000 data logger mounted on the buoy in a waterproof enclosure, which also contains batteries, power management hardware and a radio modem (CS RF401, available). A 20W solar panel and antenna are mounted on the buoy gantry to keep the batteries charged. Data are telemetered via radio modem from the buoy to a Starband upload center located at the nearby hatchery. Data will be archived on a CS Loggernet server maintained by Micro Specialties Inc., and made available to AOOS via the internet. Raw data (temperature and conductivity frequency), battery voltages and instrument status will be uploaded in raw form from the SBE16, and calibration equations applied server-side. Salinity (PSS-78) will be determined with the standard UNESCO equation of state. Similarly, raw digital values for fluorescence and backscatter will be converted to chlorophyll fluorescence ($\Phi g\ l^{-1}$) and turbidity (NTU). The target sampling frequency is 6 samples hr^{-1} (i.e. every 10 minutes). The mooring will stay in place for up to one year: the SBE16 is projected to have sufficient power from its internal batteries to sustain a ~400 day deployment at that sample rate and the fluorometer is powered from the buoy-mounted battery and solar panel. We are proposing to deploy two additional units in 2008 and another two in 2009 in preparation for the 2009 field experiment. The ROMS model will be used to inform the optimal placement of these moorings, but we anticipate deploying them in close proximity to existing weather stations at Chenega, Tatitlek, Nuchek, and Esther Island.

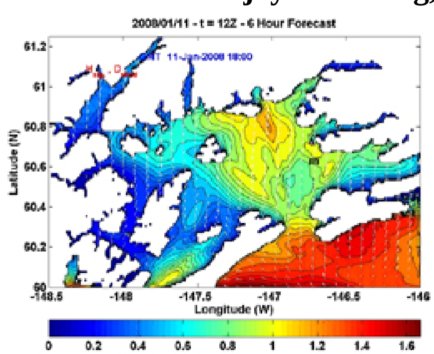
Weather forecasts: Peter Olsson, Alaska Experimental Forecast facility



The PWS Observing System provides for many weather observations within a relatively small area. With over 20 weather stations reporting real time data within an area of 100 square km, PWS has one of the densest networks of marine and terrestrial weather observation platforms in the world. Using this data, the Alaska Experimental Forecast Facility operates two weather models for PWS that have much finer resolution than the current National Weather Service model. Where the NWS now only has forecasts for areas of about 12 km, the models developed by AEFF allow for forecasts of areas as small as 4 km.

The Weather Research and Forecasting (WRF) system is now being primarily used for the atmospheric modeling in PWS and is compatible with NWS requirements. The WRF modeling system is intended to be a next-generation mesoscale assimilation and numerical model system. The model is in continuing development by a group of agencies including NCAR, NOAA, DOD AFWA, FAA, University of Oklahoma, and others. The North American Mesoscale WRF or NAM-WRF is currently (as of June 13, 2006) one of the main workhorse models for the National Centers for Environmental Prediction (NCEP). The NAM-WRF is run at 12-km horizontal grid-point spacing, the same as its predecessor the NAM-Eta and shares the same domain. The AEFF runs the WRF model twice per day on the supercomputer at the Alaska Regional Supercomputer Center. Comparisons between model forecasts and point observations are now being analyzed.

Wave forecasts: Vijay Panchang, Texas A&M University



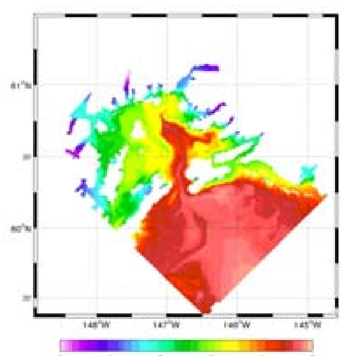
Wave simulations in the Gulf of Alaska now generate relatively coarse scale forecasts that are of little value at the scale of PWS. Using SWAN (Simulating WAves in the Nearshore) modeling in PWS allows for forecasts that are accurate to within 500 meters. The SWAN model was developed in Holland and is being used in more than 50 countries to predict wave heights in nearshore and inland waters. It has been used to accurately predict waves in the Gulf of Maine for nearly two years.

Surface waves constitute an extremely energetic component of the physical oceanography affecting coastal Alaska. Waves create turbulent effects that can be orders of magnitude larger than baroclinic and barotropic currents that can overwhelm the latter to the extent that even the identity of the currents can periodically be destroyed. From a practical standpoint, information about the wave conditions in the Alaskan coastal areas is needed to assess the fate of oil spills and related recovery efforts and safe boat/ship operations. Because buoy and satellite altimeter measurements of waves in coastal waters suffer from spatial and/or temporal sampling limitations, grid-based wave modeling SWAN is being employed to make wave predictions for both oil spill response and marine safety applications in PWS. We are using satellite and in situ wave observations for validation of model results and satellite wind and wave observations for data assimilation to enhance model results. Besides traditional data assimilation schemes, we will explore techniques of artificial intelligence to incorporate satellite measurements into wave model results.

The SWAN model uses data collected from the three NDBC buoys for validation in PWS, as well as the Cape Suckling and Cape Cleare buoys to validate Gulf of Alaska waves. The model runs every twelve hours to track and predict wave heights. In addition, new technology is being developed by the research group at Texas A&M that will allow for real-time wave forecasts that are nearly exact for up to six hours at a time. Once it is fully developed, this technology can easily be added to the SWAN modeling system.

In the summer of 2005 the NDBC buoys tracked waves in PWS with maximum wave heights of six to seven meters during peak wave periods. The results presented demonstrated the modeling scheme's ability to predict such events with reasonable accuracy. Accurately forecasting these tall waves, or waves of any magnitude, could help prevent future disasters. It could also help researchers determine the importance of waves in sediment transfer, and especially how the movement of sediments affects marine life around the Sound.

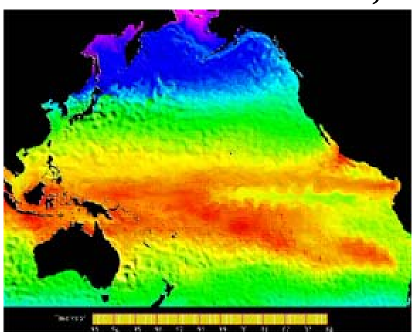
Ocean forecasts: Francois Colas, University of California Los Angeles



In September 2004, UCLA and JPL ocean labs were asked to design a numerical framework to help advance the knowledge of Price William Sound (PWS) ocean dynamics. Ocean circulation forecasts and error estimates are based upon a nested series of spatial domain models using the Regional Ocean Modeling System (ROMS). ROMS uses a terrain-following vertical coordinate and represents the current state-of-the-art. Specifically, UCLA's responsibility is to build a PWS configuration of ROMS nesting capability. 3 nested grids have been generated with a mesh size of 11, 3.6 and 1.2km encompassing respectively the whole Gulf of Alaska, the central coast of Alaska and PWS (the latter extends to the Copper River delta to make sure this important source of freshwater for PWS is included at the finest scale).

The circulation in the Sound is driven by an intricate mixture of buoyancy, wind, tidal and remote forcing. A number of technical issues have been overcome and we are currently in the early phase of validation of all grid levels. Further requirements (synoptic winds, improved bathymetry for the region of PWS) will be needed but the numerical solutions (1 year for the 3 grid levels) already reproduce some interesting features. The eddy present in the central part of the Sound during most of summer 2004 is also a robust feature in the model even when forced by climatological monthly winds and in the absence of freshwater inputs. The mechanisms responsible for the occurrence of this eddy will be investigated. Also, the structure of the currents across Hinchinbrook Entrance shows strong baroclinicity and temporal variability in relation to the mesoscale activity present outside PWS on the slope. After a validation procedure that will heavily rely on the existing dataset across Hinchinbrook entrance, a full quantification of the PWS/open ocean exchanges (residence time in the sound, mean fluxes through Hinchinbrook entrance) will be undertaken. Our preliminary ROMS implementation for the PWS/CI and the nearby Gulf of Alaska coastal oceans shows very encouraging results when compared to observational data from moorings and drifters.

Data assimilation: Yi Chao, Jet Propulsion Laboratory

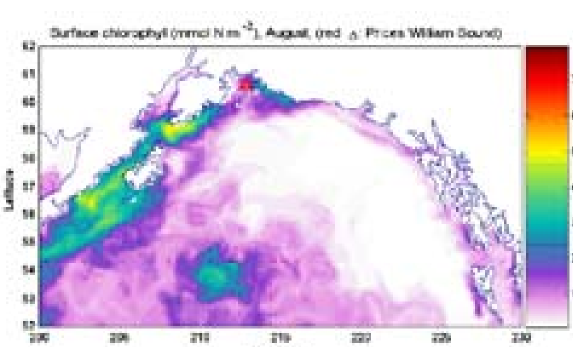


A major goal of the observing system in PWS is to develop an operational system that delivers information on physical and biological conditions in real-time to research and application users. This information includes raw data on environmental conditions, such as wind speed, air temperature, precipitation, ocean currents, ocean temperature, tide height, and water salinity as well as modeled forecasts of anticipated conditions. Forecasts for the atmospheric conditions in the Prince William Sound region have been developed using a Regional Atmospheric Modeling System (RAMS) with a 4 km resolution. The JPL/UCLA group has the responsibility of developing a real-time forecasting capability for oceanographic conditions.

The JPL/UCLA group will apply the Regional Ocean Modeling System (ROMS) to PWSOOS. ROMS has been successfully used for the California coast and it represents an evolution from the family of terrain-following, vertical coordinate models. ROMS solves the primitive equations under the hydrostatic and Boussinesq approximations. ROMS is discretized in coastline- and terrain-following curvilinear coordinates.

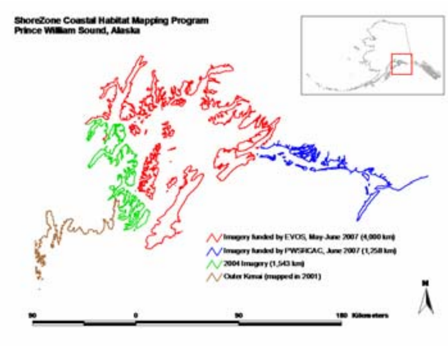
A major new feature of ROMS is the 3-dimensional variational (3DVAR) data assimilation system in ROMS. A Pacific basin-scale ROMS has been developed with a resolution of 12.5-km. The Pacific basin-scale ROMS will provide the needed boundary conditions for the PWS ROMS configurations, which consist of three nested ROMS domains (Figure 2) with 12-km, 4-km, and 1.3-km over the Pacific Northeast, Gulf of Alaska, and PWS, respectively. We are also in the process of developing a tidal modeling component in ROMS, so the real-time sea level can be predicted in addition to circulation fields.

Modeling nutrients and phytoplankton in PWS: Fei Chai, University of Maine



Understanding and modeling ecosystem dynamics is an important component in establishing any ocean observing systems. The nowcast-forecast modeling program has potential in advancing our understanding of how marine ecosystems respond to climate variability, and these physical and ecological predictions can be used to make better management decisions on marine living resources. Within the observing system in PWS, the circulation nowcast-forecast system is well underway with a goal to issue predictions of physical conditions. We are incorporating ecosystem models into the PWS ocean nowcast-forecast system based on the nested ROMS domains. Our long-term modeling goals are to establish coupled circulation-ecosystem models that are capable of producing real-time and forecasts of nutrients, plankton, and marine habitat for key fisheries for the PWS and northern shelf of Gulf of Alaska. The ecosystem model for PWS is based upon the CoSINE (Carbon, $Si(OH)_4$, Nitrogen Ecosystem) ecosystem model. The CoSINE model includes silicate, nitrate and ammonium, two phytoplankton groups, two zooplankton grazers, two detrital pools, TCO_2 and recently oxygen has been added to constrain remineralization processes in the model. The CoSINE model has been applied to North Pacific, the equatorial Pacific, and the California coastal upwelling system. Below the euphotic zone, sinking particulate organic matter is converted to inorganic nutrients by a regeneration process, in which organic matter decays to ammonium and then is nitrified to NO_3. Incorporating oxygen into the ecosystem model adds extra constraints on the treatment of regeneration processes in the model, and there are many dissolved oxygen measurements for the Prince William Sound. Silicate regeneration is modeled through a similar approach but with a deeper regeneration depth profile, which reflects the tendency of biogenic silica to have higher preservation efficiency compared to other particulate organic matter.

Shorezone mapping in PWS: Jodi Harney, Coastal and Ocean Resources Inc.

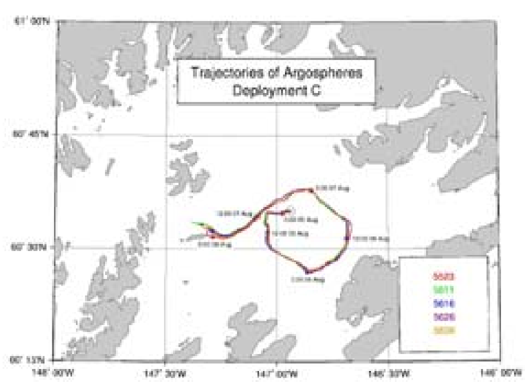


The land-sea interface is a crucial realm for terrestrial and marine organisms, human activities, and dynamic processes. ShoreZone is a mapping and classification system that specializes in the collection and interpretation of aerial imagery of the intertidal zone and nearshore environment. Its objective is to produce an integrated, searchable inventory of geological and biological features which can be used as a tool for science, education, management, and environmental hazard mitigation on local and regional scales. Mapped regions include 21,000 km of coastline in the Gulf of Alaska and 45,000 km of coastline in British Columbia and Washington state. Imagery exists for nearly 40,000 km of shoreline in Alaska, and much of it can be viewed online at CoastAlaska.net and www.fakr.noaa.gov/maps/szintro.htm. ShoreZone Coastal Habitat Mapping is accomplished through the interpretation of oblique aerial video and digital still imagery of the coastal zone collected during summer low tides, usually from a helicopter flying at <100 m altitude. The flight trackline is recorded at 1-second intervals using electronic navigation software, and time-synchronization provides images with latitude and longitude position. Video imagery is accompanied by continuous commentary by a geologist and a biologist aboard the aircraft.

Forage fish surveys in PWS: Mandy Lindeberg and Scott Johnson, NOAA Auke Bay Labs

The need to understand the population dynamics, life histories, and sources of mortality (including hatchery salmon) of forage species has been identified consistently by several groups that recognize the value of these animals in support of all higher trophic levels of the ecosystem (i.e., carrying capacity). In particular, to enable ecological forecasting there needs to be a better understanding of the dynamic coupling between NPZ and forage species. Forage species tend to aggregate in space and time and these aggregations are an important food source for higher trophic level animals including fishes, marine mammals, and seabirds. Therefore, data assimilation models need to be developed that can forecast the location and timing of these critical prey aggregations. Higher trophic level animals also have great potential as indicators of forage species aggregations for model validation or data assimilation through use of real-time telemetry tags or acoustical tracking devices. Information on life histories, behavior, sources of mortality, and spatial and temporal distributions of key forage species is currently inadequate for making meaningful forecasts of their abundance relative to climate variability. The ability to accurately forecast the effects of climate variability on all higher trophic levels, including humans, will depend largely on a better understanding of these key issues.

Field experiment and model validation: Yi Chao and Jen Ewald



AOOS and OSRI are sponsoring a field experiment between April and August of 2009 to evaluate regional forecast models for wind, waves and ocean circulation in Prince William Sound. This field experiment will be preceded in the summer of 2008 by a desk-top experimental model run utilizing real-time data streams from PWS. *The objective of these experiments is to quantitatively evaluate the performance of forecast models in Prince William Sound including the WRF atmospheric and ROMS ocean circulation models, the SWAN wave model, and the SAROPS search and rescue trajectory model.* Model performance evaluations will be based on comparisons with 1) observational data collected during a four week field experiment in August 2007, and 2) model performance during the 2004 experiment. The overarching questions are 1) How well are the models able to predict atmospheric and oceanic water properties, wave conditions, and circulation patterns in different areas of PWS?, 2) Have the model forecasts for the central basin improved from those in 2004?, 3) What is the cost/benefit of the AOOS for weather and ocean forecasting?

The Alaska Ocean Observing System is now providing access to real-time and historical observational data for PWS from one data portal (http://ak.aoos.org). These data are available to the developers of the atmospheric and ocean circulation models and a wave model to facilitate assimilation and validation. During the field experiment, drifting buoys will be repeatedly deployed, retrieved, and redeployed during a two to four week period. There will be an emphasis on model validation of surface and deeper currents in the central basin, so the majority of drifter deployments will occur within the field of view of an existing HF radar system. Additional deployments will occur around the perimeter of the Sound to validate the velocity of surface currents forced predominantly by fresh water runoff and track the fate of Lagrangian drifters that mimic Coast Guard Search and Rescue targets as well as oil spill trajectories. Wave gauges will be deployed at locations of specific interest to wave modelers. The experiment will provide the opportunity for individuals and institutions to test new sensors, platforms, and models. Discussions are ongoing with potential partnerships regarding the exact timing of the experiment in 2009.

Meeting participants (registered)

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Torie	Baker	Alaska Sea Grant	torie@sfos.uaf.edu
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