

Annual Report for Period:01/2003 - 12/2003

Submitted on: 08/06/2003

Principal Investigator: Barth, John A.

Award ID: 9907854

Organization: Oregon State University

Title:

Collaborative Research: Coastal Ocean Advances in Shelf Transport (COAST)

Project Participants

Senior Personnel

Name: Barth, John

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: Allen, John

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: Wheeler, Patricia

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: Abbott, Mark

Worked for more than 160 Hours: Yes

Contribution to Project:

Co-PI with R. Letelier on component to study phytoplankton physiology.

Name: Boyd, Timothy

Worked for more than 160 Hours: Yes

Contribution to Project:

Co-PI with M. Levine and P. M. Kosro on mooring component of COAST.

Name: Caldwell, Douglas

Worked for more than 160 Hours: Yes

Contribution to Project:

Co-PI with J. Moum on turbulence component of COAST.

Name: Cowles, Timothy

Worked for more than 160 Hours: Yes

Contribution to Project:

Co-PI on bio-optical component of COAST.

Name: Desiderio, Russell

Worked for more than 160 Hours: Yes

Contribution to Project:

Research Associate working with T. Cowles on bio-optics component of COAST.

Name: Hales, Burke

Worked for more than 160 Hours: Yes

Contribution to Project:

Co-PI working on macronutrient component of COAST.

Name: Kosro, P

Worked for more than 160 Hours: Yes

Contribution to Project:

Co-PI with M. Levine and T. Boyd on mooring component of COAST.

Name: Letelier, Ricardo

Worked for more than 160 Hours: Yes

Contribution to Project:

Co-PI with M. Abbott on phytoplankton physiology component of COAST.

Name: Moum, James

Worked for more than 160 Hours: Yes

Contribution to Project:

Co-PI with D. Caldwell on turbulence component of COAST.

Name: Peterson, William

Worked for more than 160 Hours: Yes

Contribution to Project:

co-PI on zooplankton component of COAST.

Name: Pierce, Stephen

Worked for more than 160 Hours: Yes

Contribution to Project:

Research Associate working with J. Barth on hydrographic, velocity, bio-optical and bioacoustic mapping component of COAST.

Name: Samelson, Roger

Worked for more than 160 Hours: Yes

Contribution to Project:

Co-PI on atmospheric and oceanic modeling components of COAST.

Name: Spitz, Yvette

Worked for more than 160 Hours: Yes

Contribution to Project:

Co-PI working with J. Allen on ecosystem modeling component of COAST.

Name: Levine, Murray

Worked for more than 160 Hours: Yes

Contribution to Project:

Co-PI working on mooring component of COAST.

Name: Pegau, Scott

Worked for more than 160 Hours: Yes

Contribution to Project:

Assistant Professor involved with bio-optics data collection and analysis. Supported by this grant.

Name: Dale, Andrew

Worked for more than 160 Hours: Yes

Contribution to Project:

Research Associate involved with pilot dye tracking experiment. Supported by this grant and by OSU funds.

Name: Erofeev, Anatoli

Worked for more than 160 Hours: Yes

Contribution to Project:

Research Associate involved with microstructure from SeaSoar (MicroSoar) data collection and analysis. Supported by this grant.

Name: Kurapov, Alexandre

Worked for more than 160 Hours: Yes

Contribution to Project:

Research Associate involved with physical circulation modeling and data assimilation.

Post-doc**Name:** Gan, Jianping**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Postdoc working with J. Allen on ocean modeling component of COAST.

Name: Perlin, Alexander**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Postdoc working with J. Moum and D. Caldwell on turbulence component of COAST.

Name: Bielli, Soline**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Postdoc working with R. Samelson on atmospheric modeling component of COAST.

Name: Karp-Boss, Lee**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Postdoc working with P. Wheeler on characterizing particulate and dissolved organic material as part of COAST.

Name: Klymak, Jody**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Postdoc working on microstructure profiler data collection and analysis. Supported by this grant.

Name: Ott, Michael**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Postdoc involved with microstructure from SeaSoar (MicroSoar) data collection and analysis. Supported by this grant.

Name: Crouch, Scott**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Postdoc working on physical circulation modeling in the CoOP WEST project. Supervised by J. Allen at OSU.

Name: Perlin, Natalie**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Postdoc working with R. Samelson on atmospheric modeling.

Graduate Student**Name:** O'Keefe, Sheila**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Graduate Student working with P.M. Kosro on mapping of surface currents by land-based radar as part of COAST.

Name: Eisner, Lisa**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Graduate student working with T. Cowles on bio-optics component of COAST.

Name: Bandstra, Leah**Worked for more than 160 Hours:** Yes**Contribution to Project:**

Graduate student working on nutrients.

Name: Bosch, Jennifer

Worked for more than 160 Hours: Yes

Contribution to Project:

Graduate student working on organic carbon and nitrogen.

Name: Castelao, Renato

Worked for more than 160 Hours: Yes

Contribution to Project:

Graduate student working on physical circulation and hydrography. Supported by Brazilian government fellowship.

Name: Gunderson, Gunnar

Worked for more than 160 Hours: Yes

Contribution to Project:

Graduate student working with J. Moum on microstructure.

Name: Howard, Cidney

Worked for more than 160 Hours: Yes

Contribution to Project:

Graduate student working with T. Cowles on bio-optics.

Name: Sanders, Rachael

Worked for more than 160 Hours: Yes

Contribution to Project:

Graduate student working with R. Letelier on phytoplankton physiology.

Name: Sutor, Malinda

Worked for more than 160 Hours: Yes

Contribution to Project:

Graduate student working with T. Cowles on bioacoustic detection of zooplankton.

Name: Wetz, Mike

Worked for more than 160 Hours: Yes

Contribution to Project:

Graduate student working with P. Wheeler on organic nitrogen and carbon.

Undergraduate Student

Name: Boehland, Tiffany

Worked for more than 160 Hours: Yes

Contribution to Project:

Undergraduate working on phytoplankton physiology.

Name: Harman, Jennifer

Worked for more than 160 Hours: Yes

Contribution to Project:

Undergraduate working on organic carbon and nitrogen.

Name: Reser, Katie

Worked for more than 160 Hours: Yes

Contribution to Project:

Undergraduate working on organic carbon and nitrogen.

Technician, Programmer

Name: O'Malley, Robert

Worked for more than 160 Hours: Yes

Contribution to Project:

Senior Faculty Research Assistant working with J. Barth on hydrographic, velocity, bio-optical and bioacoustic mapping component of COAST.

Name: Wingard, Christopher

Worked for more than 160 Hours: Yes

Contribution to Project:

Faculty Research Assistant working with T. Cowles on bio-optics component of COAST.

Name: Fleischbein, Jane

Worked for more than 160 Hours: Yes

Contribution to Project:

Senior Faculty Research Assistant working with B. Hales on macronutrients component of COAST.

Name: Jennings, Joe

Worked for more than 160 Hours: Yes

Contribution to Project:

Senior Faculty Research Assistant working with B. Hales on macronutrients component of COAST.

Name: Waldorf, Walt

Worked for more than 160 Hours: Yes

Contribution to Project:

Senior Faculty Research Assistant working with P.M. Kosro on mapping surface currents by land-based radar as part of COAST.

Name: Nahorniak, Jasmine

Worked for more than 160 Hours: Yes

Contribution to Project:

Faculty Research Assistant working with R. Letelier and M. Abbott on phytoplankton physiology component of COAST.

Name: Neeley-Brown, Mike

Worked for more than 160 Hours: Yes

Contribution to Project:

Senior Faculty Research Assistant working with J. Moum and D. Caldwell on turbulence component of COAST.

Name: Kreth, Raymond

Worked for more than 160 Hours: Yes

Contribution to Project:

Senior Faculty Research Assistant working with J. Moum and D. Caldwell on turbulence component of COAST.

Name: Thompson, Greig

Worked for more than 160 Hours: Yes

Contribution to Project:

Faculty Research Assistant working with J. Moum and D. Caldwell on turbulence component of COAST.

Name: Roestad, Anders

Worked for more than 160 Hours: Yes

Contribution to Project:

Research Assistant working with W. Peterson on zooplankton component of COAST.

Name: Barbour, Philip

Worked for more than 160 Hours: Yes

Contribution to Project:

Faculty Research Assistant working with R. Samelson on the atmospheric modeling component of COAST.

Name: Gard, Steve

Worked for more than 160 Hours: Yes

Contribution to Project:

Faculty Research Assistant working with M. Levine on mooring component of COAST.

Name: Faylor, Linda

Worked for more than 160 Hours: Yes

Contribution to Project:

OSU Marine Technician supported by NSF Ship Technical Support.

Name: Martin, Toby

Worked for more than 160 Hours: Yes

Contribution to Project:

OSU Marine Technician supported by NSF Ship Technical Support.

Name: Swensen, Daryl

Worked for more than 160 Hours: Yes

Contribution to Project:

OSU Marine Technician supported by NSF Ship Technical Support.

Name: Willis, Marc

Worked for more than 160 Hours: Yes

Contribution to Project:

OSU Marine Technician supported by NSF Ship Technical Support.

Name: Arrington, Julie

Worked for more than 160 Hours: Yes

Contribution to Project:

Technician working on organic carbon and nitrogen.

Name: Ashe, Amanda

Worked for more than 160 Hours: Yes

Contribution to Project:

Technician working on phytoplankton physiology.

Name: Covert, Paul

Worked for more than 160 Hours: Yes

Contribution to Project:

Technician working on nutrients.

Name: Hubbard, Dale

Worked for more than 160 Hours: Yes

Contribution to Project:

Technician working on nutrients.

Name: Keister, Julie

Worked for more than 160 Hours: Yes

Contribution to Project:

Technician working on zooplankton.

Name: Lamb, Jesse

Worked for more than 160 Hours: Yes

Contribution to Project:

Technician working on zooplankton.

Name: Meredith, Chi

Worked for more than 160 Hours: Yes

Contribution to Project:

Technician working on organic carbon and nitrogen.

Name: Root, Dennis

Worked for more than 160 Hours: Yes

Contribution to Project:

Technician working on mooring deployment and recovery.

Name: Simpkins, Jay

Worked for more than 160 Hours: Yes

Contribution to Project:

Technician working on pumped profiler engineering and construction.

Name: Dorkins, Anne

Worked for more than 160 Hours: Yes

Contribution to Project:

Faculty Research Assistant working on land-based radar data acquisition and processing.

Other Participant

Research Experience for Undergraduates

Organizational Partners

University of North Carolina at Chapel Hill

John Bane is a co-PI on our COAST project. He is providing remote sensing and atmospheric measurements from a small plane. Dr. Bane will participate in the 2001 field experiment staged using OSU facilities.

Columbia University Lamont Doherty Earth Observatory

Dr. Alexander van Geen is a co-PI on our COAST project. He is responsible for iron measurements. Dr. van Geen and his graduate student, Zanna Chase, will participate in the 2001 and 2003 field experiments using OSU research facilities.

Woods Hole Oceanographic Institution

Kathleen Ruttenberg is investigating the role of phosphate in a coastal upwelling system. She is funded by her own NSF grant and participated in our 2001 field work.

Monterey Bay Aquarium Research Institute

Zanna Chase is now a postdoc at MBARI after graduating from LDEO. She is responsible for the iron measurements during COAST. She, Kenneth Johnson (MBARI PI), Luke Coletti (MBARI technician) and Jack Barth collaborated on flying a spectrophotometer aboard SeaSoar for the detection of nitrate. The spectrophotometer was developed and built at MBARI.

Mote Marine Laboratory

Gary J. Kirkpatrick used his DOC instrument during the 2001

R/V Thomas G. Thompson COAST cruises. His instrument provides a second independent optical measurement for DOC and we will be comparing both optical measurements to the direct chemical measurements of DOC.

Other Collaborators or Contacts

Our project is one of two funded under the CoOP Northeast Pacific program. We have had extensive contact with the other project, Wind Events and Shelf Transport (WEST), headed up by John Largier at Scripps Institution of Oceanography. These include a meeting of the PIs at CoOP Scientific Steering Committee meetings, a visit to OSU by two WEST colleagues (April 2000) and a meeting of several COAST and WEST co-PIs at the 2000, 2001 and 2002 Eastern Pacific Ocean Conferences. There have also been many email conversations between COAST and WEST co-PIs who are working on similar aspects under each project (e.g., zooplankton collection, modeling, etc.). The intent of the collaboration is to compare and contrast our results for two different wind-driven west coast shelf regions. We intend to hold a joint WEST-COAST workshop in 2004.

Activities and Findings

Research and Education Activities:

The COAST group successfully conducted a wintertime experiment off central Oregon during January-March, 2003. An ocean circulation model was run before the field experiment, using observed winter stratification and subject to strong southerly wind forcing, to help guide the experimental design. Wind forecasts, surface velocity maps from land-based coastal radar and satellite remote-sensed surface properties were available from a central web server throughout the experiment.

To begin the wintertime downwelling field experiment, four moorings were deployed from the R/V Wecoma from 11-13 January 2003. The moorings were set in a cross-shelf line at 45 deg N in water depths from 50 to 130 meters.

Three of the moorings contained: a number of temperature and conductivity recorders, a Doppler velocity profiler, a spectral radiometer, and several chlorophyll fluorometers and backscatter sensors. The fourth mooring was a meteorological buoy and downward-looking Doppler velocity profiler; some of the data from this buoy was transmitted daily to shore. After the mooring deployments, CTD survey lines were made to help define the hydrography early in the experiment. Also, the crab pot activity was noted for use during the SeaSoar and vertical profiling operations that followed.

The intensive field experiment took place from 19 January to 9 February, when both the R/V Wecoma and the R/V Roger Revelle made measurements in the study region. The winds cooperated beautifully, starting with an extended period of downwelling favorable winds. Wind speeds were a sustained 30 knots and sometimes reached 40 knots during this 12 day period. Both Wecoma and Revelle worked continuously through this time and collected a series of cross-shelf transects and three-dimensional surveys, documenting the shelf and slope response to strong downwelling. We observed a transition at midshelf from a weakly stratified water column due to freshwater input from local runoff to a well-mixed water column under strong wind forcing. The repeated transects and surveys documented the intersection of the downwelling front with the bottom and the movement of that intersection onshore and offshore across the shelf and inner slope as the wind forcing changed. There was considerable resuspension and cross-shelf transport of bottom material near the downwelling front. We observed finite-amplitude internal waves on the near-bottom density interface and made both time series profiles at a point through several tidal cycles and fine-spatial resolution transects to document these features. During the winter storms, the rivers in Oregon's coastal range reached flood stage. We were able to get good measurements of the fresh-water input, including transects through a thin, mud-brown outflow.

For the last week of the experiment, the winds became upwelling favorable with sustained strength of 15 knots. This allowed us to see the switch between the downwelling and upwelling systems. This included the change from strong northward currents over the shelf to a classic southward upwelling jet. The bottom front moved rapidly up the shelf. The pool of local runoff with high values of nutrients and iron, which had been trapped to the coast by the downwelling circulation, was transported offshore across the entire shelf by the upwelling winds. This could serve to fertilize the shelf waters leading to an increase in phytoplankton concentrations as observed.

Zooplankton samples were collected from the R/V Wecoma across the shelf, both in the northern simple-topography region and over the Heceta Bank region.

Although no mature female euphausiids were collected, consistent with the expectation that they only reproduce during spring and summer, a fair number of large adult and juvenile euphausiids were collected, indicating that these zooplankton were not just overwintering. Live net tows were made to conduct copepod egg production rate and euphausiid molting rate experiments. Additionally we made observations of ectoparasitic apostome ciliates of euphausiids.

The vertical profiling was conducted from the R/V Roger Revelle exclusively along the CH line off Lincoln City in the northern, simple topography region. Prior to initiating the profiling we deployed a bottom mooring near CH-5 the mid-point of the 35 km transect. This was successfully recovered at the end of the cruise. Between 19 January and 6 February we completed 12 Chameleon turbulence profiles and all but one of these included the complete suite of chemical and optical measurements. Chemical measurements for calibration of the optical parameters were conducted at 18 pump stations. Other measurements included: one 48 h time series, 5 day/night transitions for fluorometry, and 32 transects for ADCP. Since low salinity colored water was present near the coast we also included 3 transects sampling surface water to monitor organic material in the fresh water. Additional biological experiments were conducted to assess the viability of seed stocks of phytoplankton in the bottom boundary layer. Samples were incubated at three different light intensities and phytoplankton grew in 3 of 4 experiments. We used nighttime hours during the last five days of the cruise to conduct bottom mapping using the R/V Roger Revelle's multibeam system in order to produce higher resolution bathymetry maps of this region.

The quantity of measurements we were able to make in the heavily fished -- it was the height of the Dungeness crab season -- central Oregon region exceeded our expectations. This resulted in part from a series of pre-experiment meetings with several local crab fishermen facilitated by OSU Marine Extension agent Ginny Goblirsch based in Newport. Scientists and fishermen exchanged information about how they each conduct their operations. We asked that the fishermen try and help keep down the number of pots in a 1/2-mile wide cross-shelf strip where we would place our moorings and concentrate the ship sampling. Posters announcing our sampling plans and asking for cooperation to minimize gear conflicts were posted at the docks and distributed by the OSU Marine Extension agent. This strategy evidently paid off, since there were less pots on our main survey line. Both the R/V Wecoma, towing SeaSoar and the HTI bioacoustics sled, and R/V Roger Revelle, towing a turbulence profiler and a pumped vertical profiling system, were able to make measurements while carefully dodging crab pots. We coordinated daylight towing operations with nighttime fixed station work to maximize our sampling time. The crews of both the Wecoma and Revelle did an outstanding job helping us avoid fishing gear, working overtime to insure the success of our project.

The moorings were successfully retrieved in mid-March, marking the end of a very successful COAST wintertime experiment. Of the 60 self-recording instruments only a couple failed. These data are currently being closely examined for accuracy; calibrations are being checked. A mooring data report is being prepared to make data archive and sharing easier; it will consist of a short written version with a more comprehensive CD version. Some preliminary data is already being used by other COAST investigators.

Other activities during 2003 include continued analysis of the 2001 upwelling experiment data sets (see list of publications). A COAST workshop was held in

Corvallis on 7-8 August 2003 and was attended by John Bane (UNC) and Zanna Chase (MBARI) in addition to the OSU COAST participants. A special session entitled 'Coastal Ocean Processes off the North American West Coast: Physical Dynamics and Biogeochemical Transformations' co-chaired by Murray Levine (COAST) and Raphael Kudela (WEST) has been accepted for the January 2004 AGU Ocean Sciences Meeting in Portland, Oregon.

Findings:

See the findings reported under 'Research and education activities' above.

Training and Development:

Three undergraduates (T. Boehland, J. Harman and K. Reser) gained experience in oceanographic research.

Twelve graduate students are receiving training, including extensive sea-going experience: L. Bandstra (nutrients), J. Bosch (organic carbon and nitrogen), R. Castelao (physical oceanography), Lisa Eisner (bio-optics and phytoplankton), J. Gomez-Gutierrez (zooplankton), G. Gunderson (microstructure), C. Howard (bio-optics), M. Meaux (aircraft measurements, UNC), Sheila O'Keefe (land-based radio mapping of ocean surface currents), R. Sanders (phytoplankton physiology), M. Sutor (bio-acoustics and zooplankton) and M. Wetz (organic carbon and nitrogen). During 2003, M. Wetz and C. Howard defended their M.S. theses and L. Eisner defended her Ph.D. thesis.

Ten postdocs are receiving training in oceanic (S. Crouch, J. Gan) and atmospheric (S. Bielli, N. Perlin) modeling, in hydrographic and microstructure measurements (M. Ott), in turbulence measurements and analysis (J. Klymak, A. Perlin), and in assessing the concentration and distributions of iron (Z. Chase, MBARI), particulate and dissolved organic material (L. Karp-Boss, Univ. of Maine) and dissolved organic phosphorus (S. Dyrman, WHOI). S. Bielli has successfully finished her postdoctoral tenure at OSU, with first authorship on one accepted manuscript and co-authorship on a second, and has moved to a research position in the Department of Atmospheric Sciences at the University of Washington.

Outreach Activities:

At the beginning of the second intensive COAST observation period in August 2001, we hosted an Open House with tours of the two large research vessels, R/V Wecoma and R/V Thomas G. Thompson, docked in Newport, Oregon, as they loaded for the COAST cruises. Over 500 people attended and learned about COAST, CoOP and OSU coastal research.

Motivated by the success of the 2001 research vessel tours, several COAST scientists helped guide public tours of the R/V Wecoma during Hatfield Marine Science Center's H.M.S. SeaFest held on June 22, 2002. At that same event, Jack Barth delivered a talk entitled 'Oregon's Dynamic Coastal Ocean.'

Journal Publications

Barth, J. A., P. M. Kosro and S. D. Pierce, "A submarine bank's influence on coastal circulation: Heceta Bank, Oregon", *Eos, Transactions, American Geophysical Union*, p. F662, vol. 81(48), (2000). Conference abstract

Kosro, P. M., J. D. Paduan and L. Washburn, "Time-series mapping of currents in the coastal ocean.", *Eos, Transactions, American Geophysical Union*, p. F661, vol. 81(48), (2000). Conference abstract

Karp-Boss, L., P. A. Wheeler and R. M. Letelier, "Spatial variability of particulate and dissolved material in relation to hydrographic parameters in an upwelling system.", *American Society of Limnology and Oceanography*, p. 1, vol. , (2001). Conference abstract

Bane, J. M., S. M. Haines and M. F. Meaux, "Oceanic and atmospheric structure and evolution observed by aircraft during COAST 2001", *Eos, Transactions, American Geophysical Union*, p. OS41O-01, vol. 83(4), (2002). Conference abstract

Barth J. A. and S. D. Pierce, "The coastal ocean response to summertime downwelling favorable winds off Oregon", *Eos, Transactions, American Geophysical Union*, p. OS41O-02, vol. 83(4), (2002). Conference abstract

Coletti, L. J., K. S. Johnson, C. M. Sakamoto, Z. Chase, F. P. Chavez, J. A. Barth, P. G. Strutton, S. E. Fitzwater, N. Tervalon and P. M. Walz, "New insights from high-resolution and long-term chemical measurements with the MBARI In Situ Ultraviolet Spectrophotometer (ISUS): Optical nitrate and bisulfide determinations", *Eos, Transactions, American Geophysical Union*, p. OS12A-119, vol. 83(4), (2002). Conference abstract

- Edwards, K., P. MacCready, G. Pawlak, J. Moum, J. Klymak, A. Perlin and R. Dewey, "Flow features at a sharp coastal point", *Eos, Transactions, American Geophysical Union*, p. OS41N-04, vol. 83(4), (2002). Conference abstract
- Gan, J., and J. S. Allen, "A modeling study of shelf circulation off northern California in the region of the Coastal Ocean Dynamics Experiment. Response to relaxation of upwelling winds", *J. Geophys. Res.*, p. 3123, vol. 107(C9), (2002). Published
- Gan, J., and J. S. Allen, "A modeling study of shelf circulation off northern California in the region of the Coastal Ocean Dynamics Experiment, 2, Simulations and comparisons with observations", *J. Geophys. Res.*, p. 3184, vol. 107(C11), (2002). Published
- Haines, S. M., J. M. Bane, M. F. Meaux, "Airborne hyperspectral ocean color measurements off the Oregon coast", *Eos, Transactions, American Geophysical Union*, p. OS22D-218, vol. 83(4), (2002). Conference abstract
- Karp-Boss, L., P. A. Wheeler, B. Hales and P. Covert, "Organic matter in the Oregon upwelling zone: distributions and processes", *Eos, Transactions, American Geophysical Union*, p. OS22D-222, vol. 83(4), (2002). Conference abstract
- MacCready, P., K. Edwards, G. Pawlak, J. Moum, J. Klymak, A. Perlin and R. Dewey, "Tidal headland eddies in deep water", *Gordon Conference on Coastal Circulation*, p. , vol. , (2001). Conference abstract
- Newberger, P. A., J. S. Allen, and Y. H. Spitz, "Analysis and comparison of three ecosystem models", *J. Geophys. Res.*, p. 3061, vol. 108(C3), (2003). Published
- Ott, M. W., A. Y. Erofeev, J. A. Barth, J. N. Moum and A. Perlin, "Microstructure measurements from a towed undulating platform and their relationship to mesoscale circulation and bottom topography", *Eos, Transactions, American Geophysical Union*, p. OS41O-05, vol. 83(4), (2002). Conference abstract
- Perlin, A., J. N. Moum and J. M. Klymak, "Observations of the details of coastal upwelling response and relaxation across a simple bathymetry", *Eos, Transactions, American Geophysical Union*, p. OS32D-148, vol. 83(4), (2002). Conference abstract
- Ruttenberg, K.C. and S. T. Dyhrman, "Examining the occurrence of phosphate-stress in coastal phytoplankton communities using a cell-specific enzymatic assay", *Eos, Transactions, American Geophysical Union*, p. OS41O-06, vol. 83(4), (2002). Conference abstract
- Spitz, Y. H., P. A. Newberger, and J. S. Allen, "Ecosystem response to upwelling off the Oregon coast: Behavior of three nitrogen-based models", *J. Geophys. Res.*, p. 3062, vol. 108(C3), (2003). Published
- Sutor, M., J. Lamb, T. Cowles and W. Peterson, "Comparison of acoustic and net sampling systems to determine distribution patterns of zooplankton biomass and taxonomic groups", *Eos, Transactions, American Geophysical Union*, p. OS21N-09, vol. 83(4), (2002). Conference abstract
- Ashe, A. L., M. R. Abbott, P. M. Kosro, B. A. Grantham and R. M. Letelier, "Linking phytoplankton fluorescence patterns in the nearshore and inner shelf off Oregon", *Eos Trans. AGU*, p. OS12K-04, vol. 83(4), (2002). Conference abstract
- Gan, J., and J. S. Allen, "Model simulations of Eulerian and Lagrangian aspects of the upwelling circulation over the Oregon shelf", *Eos Trans. AGU*, p. OS41O-04, vol. 83(4), (2002). Conference abstract
- Kosro, P. M. and J. D. Paduan, "Shore-based mapping of ocean surface currents at long range using 5 MHz HF backscatter", *Eos Trans. AGU*, p. OS21E-101, vol. 83(4), (2002). Conference abstract
- Kurapov, A. L., G. D. Egbert, J. S. Allen, R. N. Miller, S. Erofeeva and P. M. Kosro, "M2 internal tide off Oregon: Inference from data assimilation", *Eos Trans. AGU*, p. OS41E-75, vol. 83(4), (2002). Conference abstract
- O'Keefe, S., P. M. Kosro and J. A. Harlan, "Effects of topography on currents during an upwelling relaxation event", *Eos Trans. AGU*, p. OS41O-03, vol. 83(4), (2002). Conference abstract

- de Szoeké, R. A., and R. M. Samelson, "The duality between the Boussinesq and non-Boussinesq hydrostatic equations of motion", *J. Phys. Oceanogr.*, p. 2194, vol. 32, (2002). Published
- Barth, J. A., D. Hebert, A. C. Dale and D. S. Ullman, "Direct observations of along-isopycnal upwelling and diapycnal velocity at a shelfbreak front", *J. Phys. Oceanogr.*, p. , vol. , (2003). Submitted
- Samelson, R., R. Temam, C. Wang, and S. Wang, "Surface pressure Poisson equation formulation of the primitive equations: Numerical schemes", *SIAM J. Num. Anal.*, p. , vol. , (2003). Accepted
- Wetz, M. S. and P. A. Wheeler, "Production and partitioning of organic matter during simulated upwelling phytoplankton blooms", *Limnol. Oceanogr.*, p. 1808, vol. 48(5), (2003). Published
- Barth, J. A., "The influence of Heceta Bank, Oregon, on the coastal ecosystem", North Pacific Marine Science Organization (PICES) Eleventh Annual Meeting, p. , vol. , (2002). Conference abstract
- Largier, J. and J. Barth, "W.E.S.T. and C.O.A.S.T. - CoOP studies of cross-shelf transport and plankton ecosystems over wind-driven shelves", Southern African Marine Science Symposium, p. , vol. , (2002). Conference abstract
- O'Malley, R., J. A. Barth and A. Y. Erofeev, "SeaSoar observations during the Coastal Ocean Advances in Shelf Transport (COAST) survey II, W0108A, 6-25 August 2001", Oregon State Univ., College of Oceanic and Atmospheric Sciences, Data Rep. 186, Ref. 2002-2, 538 pp., p. 1, vol. 186, (2002). Technical report
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Books or Other One-time Publications

Web/Internet Site

URL(s):

<http://damp.coas.oregonstate.edu/coast>

Description:

This web page contains an overview of our COAST project with pointers to all the subcomponent project web pages. It also contains links to near real-time satellite SST imagery, land-based coastal radio system surface current maps and atmospheric model forecasts.

Other Specific Products

Product Type: Data or databases

Product Description:

Near real-time daily-averaged maps of the ocean surface currents between Newport and Waldport, Oregon. These maps are produced by a network of SeaSonde High-Frequency land-based radio systems.

Sharing Information:

The near real-time ocean surface current maps are available at a website <http://bragg.coas.oregonstate.edu/seasonde>.

Product Type: Atmospheric model forecasts

Product Description:

Experimental daily weather forecasts for Oregon and the Pacific Northwest using the ARPS (Advanced Regional Prediction System) mesoscale meteorological model.

Sharing Information:

The daily weather forecasts are available at a web site <http://www-hce.coas.oregonstate.edu>.

Product Type: Data or databases

Product Description:

Shipboard ADCP data and the ship-based scientific data from the two 2001 R/V Thomas G. Thompson cruises is available on the OSU Ocean Mixing group web page. An improved bathymetry data set compiled by and obtained from Eric D'Asaro (UW) is available on the website.

Sharing Information:

This data is available at the web site <http://mixing.coas.oregonstate.edu/>.

Contributions

Contributions within Discipline:

Contributions to Other Disciplines:

Contributions to Human Resource Development:

Three undergraduates (T. Boehland, J. Harman and K. Reser) gained experience in oceanographic research.

Twelve graduate students are receiving training, including extensive

sea-going experience: L. Bandstra (nutrients), J. Bosch (organic carbon and nitrogen), R. Castelao (physical oceanography), Lisa Eisner (bio-optics and phytoplankton), J. Gomez-Gutierrez (zooplankton), G. Gunderson (microstructure), C. Howard (bio-optics), M. Meaux (aircraft measurements, UNC), Sheila O'Keefe (land-based radio mapping of ocean surface currents), R. Sanders (phytoplankton physiology), M. Sutor (bio-acoustics and zooplankton) and M. Wetz (organic carbon and nitrogen). During 2003, C. Howard and M. Wetz defended their M.S. theses and L. Eisner defended her Ph.D. thesis.

Ten postdocs are receiving training in oceanic (S. Crouch, J. Gan) and atmospheric (S. Bielli, N. Perlin) modeling, in hydrographic and

microstructure measurements (M. Ott), in turbulence measurements and analysis (J. Klymak, A. Perlin), and in assessing the concentration and distributions of iron (Z. Chase, LDEO), particulate and dissolved organic material (L. Karp-Boss) and dissolved organic phosphorus (S. Dyrman, WHOI). S. Bielli has successfully finished her postdoctoral tenure at OSU and has moved to a research position in the Department of Atmospheric Sciences at the University of Washington.

Contributions to Resources for Research and Education:

Contributions Beyond Science and Engineering:

Special Requirements

Special reporting requirements: None

Change in Objectives or Scope: None

Unobligated funds: less than 20 percent of current funds

Animal, Human Subjects, Biohazards: None

Categories for which nothing is reported:

Any Book

Contributions: To Any within Discipline

Contributions: To Any Other Disciplines

Contributions: To Any Resources for Research and Education

Contributions: To Any Beyond Science and Engineering