CCPO "... facilitating innovative research in the coastal ocean."

CIRCULATION

Vol. 7, No. 2 Spring 2000

CRUISING THE SOUTHERN OCEAN

by Bettina Fach

The beginning of the new millennium turned out to be quite exciting for me: it started with a trip to England, from where I embarked on a brilliant journey to the Southern Ocean. After meeting the British chaps from BAS (British Antarctic Survey) in Cambridge, England, collecting my survival gear for the cruise, and taking a quick tour of the lovely town of Cambridge, we headed to the Falkland Islands via Ascension Island on a British Royal Air Force plane.

The Falkland Islands turned out to be an amazingly windy but beautiful place, completely devoid of trees due to constant strong winds but filled with penguins, seabirds, seals and other cute critters. Four different penguin species live on the islands: Rockhopper, Magellanic, Macaroni and Gentoo. Due to limited space on the incoming flight, the ship had to stay in the harbor for six days to wait for the remaining crew members and scientists. This created a sudden and unexpected amount of free time that was spent hiking and exploring the island. A Magellanic penguin colony close to Stanley Harbor was the main attraction for us. The penguins seemed quite comfortable with the handful of tourists that came to stare at them and their chicks all day long. The population of the Islands is about 2000 people, with most of them living on the West Island in the little town of Stanley.

There in Stanley Harbor, the RRS *James Clark Ross* was docked. Now that is a NICE ship! (Arnoldo [Valle-Levinson], there is no way you are convincing me to go on one of your *Ferrel* cruises again after this!) I was delighted to see the spacious and comfortable cabins, the fitness facilities plus sauna, the big lounge with its well-stocked bar, and the wonderful dinners. Now I was a bit concerned about the food, being on a British ship and all (no offense!), but I soon realized that there was no need to worry. Have you ever tasted the wonderful puddings that the British make?? At times I had to wonder if I was really participating in a research cruise, since all meals were served by stewards and there was a formal dress code for dinner.

Figure 1. King penguin colony in Stromness Bay, South Georgia.

Finally, after all members of the crew and scientists arrived safely on the ship we embarked on the CCAMLR (Committee for the Conservation of Antarctic Marine Living Resources) synoptic survey cruise on the 13th of January, taking course to South Georgia Island. After three days in the Atlantic and dodging large ice fields, we arrived at Stromness Harbour and Whaling Station (54° 09' S, 36° 41' W), the central of three harbours on the west side of Stromness Bay, South Georgia. We were not there for sightseeing alone but to carry out an acoustic calibration in Stromness Harbour.

Stromness Bay was probably first seen in 1775 by Captain James Cook and named in 1912 by Norwegian whalers. The harbour was subsequently established as a whaling station to provide ship repair facilities and a small floating deck for the whalers. The station has been abandoned since 1932 after severe over-production in the previous seasons and ecomomic crisis.

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Nowadays, an exclusion zone operates around the whaling station due to its dilapidated state. Stromness' claim to fame derives from the arrival of Sir Ernest Shackleton, Frank Worsley, and Tom Crean at the whaling station on May 20, 1916. This was after they sailed 800 miles from Elephant Island in the tiny open boat, "James Caird", and went on an epic 30 mile trek across South Georgia from King Hakkon Bay. Their ship, the *Endurance*, had gotten stuck in pack ice close to Elephant Island and eventually sank. The arrival at the whaling station was their first contact with the outside world in seventeen months. We got the chance to go ashore and roam around the bay for a few hours and enjoy the plentiful wildlife in the form of King penguin (Figure 1) and Chinstrap penguin colonies (with chicks!), lots of elephant and fur seals, and even reindeer that were originally imported by the Norwegians as food supply.

After this early highlight in the cruise, life took on a steady cycle of day and night shifts with little excitement, except for whale sightings every now and then when the mostly foggy or snowy conditions allowed. Of course, on the science side, there was quite a lot going on.

This cruise was part of the CCAMLR multi-ship survey of the Scotia Sea. The main CCAMLR objective was to carry out an acoustic survey to estimate the instantaneous standing stock of Antarctic krill (*Euphausia superba*) in the Scotia Sea region. In addition, the surveys provided data on krill population structure. The *James Clark Ross* collected the core measurements proposed by CCAMLR, including krill acoustics, station net hauls, and CTDs. The cruise track (see Figure 2, the *James Clark Ross*) provided an excellent opportunity to gather information about large-scale processes across the Scotia Sea, as well as additional measurements to estimate the krill transport rates, aspects of energetics and growth of krill, and predation pressure on krill. The survey was multinational in character, involving the participation of four research vessels from different nations (United Kingdom, United States, Japan, and Russia), plus the participation of experts from other CCAMLR nations. The survey was carried out to a set of agreed protocols to ensure that data from the participating nations were as comparable as possible.

Figure 2. Cruise tracks of the RRS *James Clark Ross*. Provided by Mark Brandon, Open University.

An estimate of krill biomass and its variance is needed because it is used in the CCAMLR krill yield model to estimate the precautionary catch limit of krill for the South Atlantic. At the present time, the estimate of biomass is derived from the FIBEX (First International BIOMASS Experiment) synoptic survey, which took place in 1980. Over the last five years, there has been a recognition that more up to date estimates of krill biomass are required. The following data were collected while the ship was steaming at 10 knots along each transect:

-acoustic measurements at three frequencies (38, 120, and 200 kHz);
-observations of marine mammals and birds;
-continuous measurements of sea surface temperature, salinity, chlorophyll biomass from in vivo fluorometry, light levels, and meteorology;
-ADCP measurements; and
-bathymetric measurements.

Vertical water column sampling was also conducted at 38 standard stations. At each station, the following activities were carried out:

-CTD cast to 1000 m;
-ADCP measurements;
-chlorophyll fluorescence profile; and
-RMT8 net haul between 10 and 200 m.

I was part of the physical oceanography team consisting of Mark Brandon, Phil Trathan, Sharon Grant, and Liz Hawker from the British Antarctic Survey. My duties included being responsible for driving the CTD, deploying the XBT, collecting water samples, taking salinity measurements and processing daily CTD, ADCP, and navigational data (and lots of whale watching, of course). The RMT net hauls for collecting krill proved to be either very empty or full of salp, especially during the first two weeks of the survey, which led to a rather frustrated quote from one of the krill biologists, "A curse methinks to seek damn krill through perilous torment, they ne'er come but by wanton mischance!"

A collaboration between the Joint Nature Conservation Committee and BAS resulted in two bird observers joining the cruise. They counted over 19,000 birds of 38 species, including seven species of penguins and five species of albatross during the course of the cruise. This work complements studies conducted at BAS bases, such as Bird Island, where satellite tagging of seabirds and fur seals and diet sample analysis establish where each species feeds and what they are feeding on.

A whale watching team from the International Whaling Commission (IWC) spotted eleven different species of whales and three species of dolphins from the very top of the ship, above the bridge, called "monkey island". These included: baleen whales, such as fin, sei, humpback, minke, and southern right whales (all of which were targets of the 20th century commercial whalers); the sperm whale, which is the largest of the toothed whales and was hunted for its oil; three species of beaked whales (Southern bottlenose, Arnoux's, and strap-

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NOTES from the Director . . . .

When you visit the Antarctic you come away awed. My visit was on the *Hudson* many years ago. I remember just staring at the ice and being unable to scale it to my dimensions; the tabular icebergs are just too huge. I also remember watching the penguins and whales apparently very at home in unbelievably hostile conditions…and it was summer! Those observations made me think how we anthropomorphize our observations when our living conditions are so different. The article by Bettina Fach gives another person's view of the 'real ocean', the Antarctic.

In the coming years, thanks to funding to Eileen Hofmann and colleagues, students and faculty will have numerous opportunities to experience the Antarctic. It is an experience they will treasure.

Our image this issue is the first from the new MODIS on board EOS-Terra. It was submitted by CCPO graduate, James Koziana, who is now with NASA. We all hope the success of SeaWiFS carries on to MODIS.

Larry Atkinson
Director, Center for Coastal Physical Oceanography

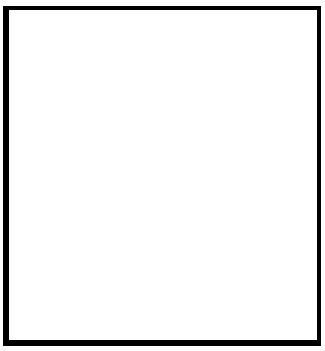
MODIS First Light Image

On February 24, 2000, the Earth viewing door of the Moderate Resolution Imaging Spectroradiometer (MODIS) on the EOS-Terra spacecraft was opened during a pass over eastern North America. The acquisition of science data proceeded nominally and was successfully downlinked and archived at the Goddard Earth Science Distributed Active Archive Center (GES DAAC) in Greenbelt, MD. This image over the Mississippi River Delta region, from Louisiana to Florida, is a subset of the first image sensed by MODIS. This image shows the classic bird's foot shape of the river's channels in the delta and a series of barrier islands, sediment plume associated with the Mississippi River discharge, and sediment plume between the islands north of the discharge plume. Another feature in this image is the difference in ocean color between the shallow bays (light blue) behind the islands and the open waters of the Gulf of Mexico (dark blue). This scene was made by combining three of the visible bands (i.e., 1 (670 nm), 4 (565 nm) and 3 (479 nm)).

Provided by NASA/GES DAAC. Submitted by James Koziana.

STUDENT PROFILE

Cristóbal Reyes-Hernández



CRISTÓBAL REYES-HERNÁNDEZ graduated from Universidad de Colima, México in physical oceanography in 1986. He used a two-dimensional numerical model to predict the tidal and wind-driven circulation for the Puerto Interior de San Pedrito, one of the most important commercial cargo ports along the Pacific coast of México.

After finishing college, Cristóbal started working as a civilian for the Mexican Navy, where he was in charge of routine temperature profile collection using expendable bathythermograph (XBT) launches every degree of longitude between Manzanillo and the Revillagigedo Islands.

Before getting too used to the tropical climate, he moved to arid Ensenada in Baja California, where he got a masters degree in physical oceanography in 1993 from CICESE, the best known oceanographic institution in México. His work focused on analyzing the effect of the autumn-winter atmospheric conditions on the surface heat fluxes and depth of the mixed layer in the Northern Gulf of California by using a one-dimensional turbulent kinetic energy model. Cristobal has had the chance to navigate in the Gulf of California several times since he started his career.

After finishing his masters, Cristobal got a teaching position at the Universidad Autonoma de Baja California. In 1994, he won a Fulbright/Garcia-Robles Ph.D. scholarship and came to CCPO in 1995. He is currently working with **ARNOLDO VALLE-LEVINSON,** looking at the tidal and subtidal temporal and spatial variability of the flow and density fields in the Chesapeake Bay entrance. As in México, he has happily participated in many cruises at the Chesapeake Bay entrance and in two data collection expeditions along the Mexican west coast, though he is still working on a solution to seasickness.

QUOTES FROM THE FIELD

"When oceanographers set forth to observe and explore the ocean they are hampered by many adversities, such as bad weather, faulty instruments, and seasickness. There is often a far more serious handicap: an inadequate design of the expedition as a whole."

Henry Stommel, from Varieties of Oceanographic Experience, Science, Vol. 139, 1-171, 1963.

NOTE: With this issue, the Words of Wisdom will continue under this new guise. Please send in your favorite quote, preferably by or about oceanographers to *mcquay@ccpo.odu.edu* or *julie@ccpo.odu.edu.

GOOD NEWS!

Congratulations to HAE-CHEOL KIM and Eun-Kyung Hong, married December 18, 1999 in Seoul, Korea. Hae-Cheol is a graduate research assistant at CCPO, and Eun-Kyung is a medical doctor.

Congratulations to ELIZABETH (LIZ) SMITH and her husband, Fred Dobbs, on the birth of their daughter, Gemma Wallace. She was born January 18, 2000 at 6:00 a.m. and weighed 8 lbs. 12 oz. Three-year-old Amelia is the big sister. Liz is a research assistant professor at CCPO.

JOE RUETTGERS, CCPO computer systems engineer, married Carol Moore on March 17, 2000. Carol is an elementary school teacher with Virginia Beach Public Schools. Best wishes, Joe and Carol.

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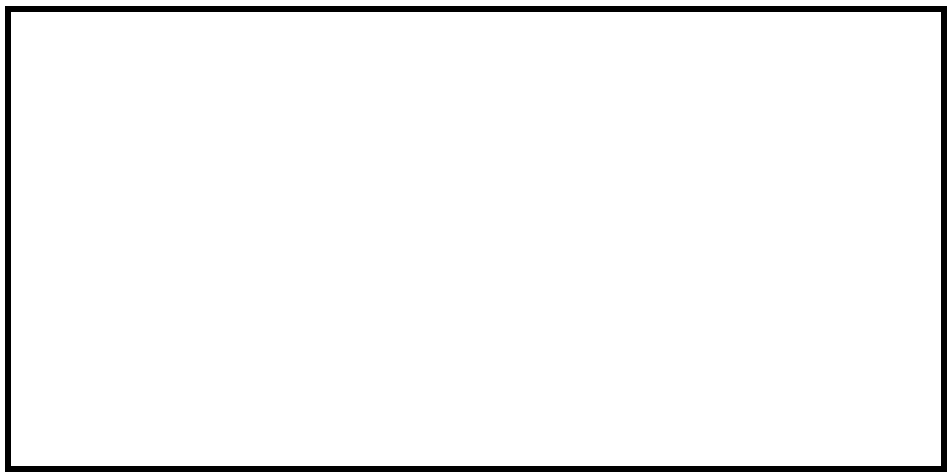


Figure 3. View into Lemaire Channel.

toothed), which are among the least studied of the whales; killer whales; pilot whales; and hourglass, Peale's, and Commerson's dolphins. Wish I could have seen them all!

The end of the cruise brought another great treat: the chief scientist and the captain of the ship gave us the chance to do some up close and personal whale watching and sightseeing! As we approached the Antarctic Peninsula, we passed through Lemaire Channel, which runs between Cape Cloos on the Antarctic Peninsula and Booth Island. During our passage through this narrow channel, we were blessed with a spectacularly sunny day. From a distance, the lower parts of the cliffs appear to join and a way through can only be seen when one is nearly inside the passage (Figure 3). This must have proved a daunting route for the Belgian explorer, Adrien de Gerlache, who navigated it in 1898. We then entered Neumayer Channel, which separates Anvers Island (location of the American base, Palmer Station) from Wiencke Island (where Port Lockroy is found) and Doumer Island.

Following this day of sightseeing, we were due to meet the *Yuzhmorgeologiya*, a Russian research vessel that had been chartered by the American synoptic survey team, at Deception Island. Our mission was to pick up scientific samples from them, since all of the net samples collected by the four participating nations will be held at Cambridge for further analysis. Deception Island is actually an active volcano that collapsed on itself, producing a horseshoe-shaped island. Volcanic activity has been reported as recently as 1994. Most significant for the British Antarctic Survey was the initial eruptions in 1967, which caused the evacuation of the British, as well as the Argentine and Chilean bases. Then, in 1969, another eruption severely damaged the British base.

By this time, almost everyone onboard was out of film and it was time to head home. On the trip back from the Antarctic Peninsula to the Falkland Islands, the most interesting part of the cruise with respect to physical oceanography took place. While everyone else on the ship had already packed and partied day in and day out, the physical oceanography team was busy doing the WOCE transect across the Drake Passage from Elephant Island to the Falkland Islands. This included 29 CTD stations, this time lowering the CTD to the bottom of the ocean. Considering that the lowering speed of the CTD is about 1 m/s and water samples are collected at different depths, a 4200 m deep station took about three hours. Figure 4 shows the temperature cross-section across the Drake Passage. I thought it was quite exciting that we found the exact same features on this transect that I have had to study for classes! To point out a few features on Figure 4, the surface waters on the southern part of the transect include a layer of very cold water just below the surface. This is Antarctic Surface Water (AASW) and its most dominant characteristic is its very low temperature. In winter, a cold deep mixed layer is formed and, by summer, surface heating warms up the cold water close to the surface, leaving a layer of extreme minimum temperature near 125 m, as seen here. To the north of this cold surface water, we can see much warmer Subantarctic Surface Water (SASW). These two water masses are separated by the Polar Front, visible here in the strongly tilted isotherms. Close to the continent, cold, dense Antarctic Bottom water is formed and sinks to the bottom of the ocean. We measured a total transport of 141 Sverdrup through the Drake Passage, which is close to estimates in the literature.

After 36 days at sea, we got back to Stanley on the 17th of February, barely in time to make our flight back to the UK. I must say I was quite glad to get off the ship, as I was utterly exhausted and eager to get home. But it was not without regret that I left the beautiful Southern Ocean and I am hoping to return someday soon!

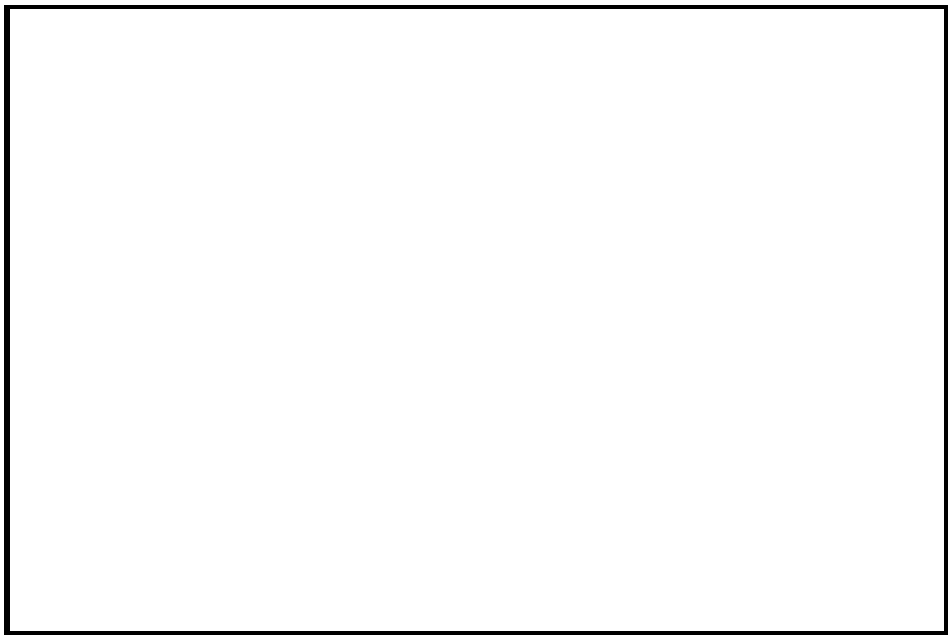
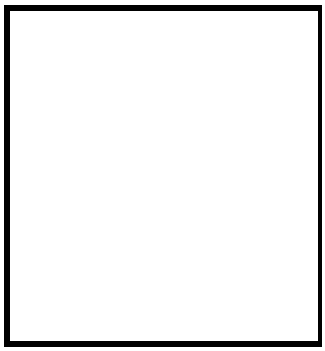


Figure 4. Distribution of temperature versuses depth along the WOCE transect from Elephant Island in the south to Falkland Islands in the north. Provided by Mark Brandon, Open University.

New Co-Editor Profile

Joy Hayes McQuay



JOY HAYES McQUAY came to CCPO in September 1999 as the Center's grants administrator. In this capacity, her responsibilities include planning and managing the Center's budgets, as well as overseeing and coordinating daily operations. She also serves as a co-editor of CCPO's newsletter, *CCPO Circulation*.

Joy has previously held positions at Eastern Virginia Medical School (EVMS) in Norfolk, VA and at Virginia Commonwealth University's Medical College of Virginia (VCU/MCV) in Richmond, VA. Having worked for institutions of higher education for the past eight years, she understands the importance of both quality education and research in today's world. She is therefore committed to helping CCPO fulfill its mission of being an institution dedicated to research and education.

Some of Joy's previous positions have included compensation specialist in the Department of Human Resources at EVMS and program support technician senior in the Department of Pediatrics at VCU/MCV. While working for a research pediatrician, she came to appreciate the importance of research in our society. She also pursued a degree while working full-time at VCU/MCV. Joy graduated *cum laude* with a bachelor's degree in business management in May 1999. Also in May 1999, she married Dr. Nathaniel McQuay, Jr., a surgical resident at EVMS, thus necessitating a move to the Tidewater area.

Joy is a member of the Association of University Administrators. When she is not working, Joy likes spending time with her family, reading, and shopping. She sometimes manages to enjoy more than one of those "hobbies" at a time.

BLUE CRAB BOWL 2000

On Saturday, February 26, 2000, 100 students from across Virginia gathered on Old Dominion University's campus for the third annual Blue Crab Bowl. Twenty teams, comprised of five high school students each, competed in the day-long competition.

During the competition, students were asked two types of questions: toss-up and bonus. The questions were in a multiple-choice or short-answer format in the subjects of biology, chemistry, geology, physics of the oceans, navigation, geography, and related history and literature. Question difficulty increased as the competition progressed

Teams were divided into divisions for the preliminary round-robin rounds in the morning and then teams advanced from the morning sessions to the afternoon double-elimination round. The winner of the last double-elimination round was crowned Bowl champion.

This year, the winning team was from Grafton High School in York, VA. It was their first year competing in the Blue Crab Bowl and, although they are all students in a marine science class at Grafton High School, they were quite surprised to win. As winners of this regional competition, these students advanced to the National Ocean Sciences Bowl (NOSB) on April 16 and 17, hosted by the Consortium for Oceanographic Research and Education (CORE) at the Maritime Institute of Technology and Graduate Studies in Linthicum, MD.

At the NOSB, the 20 winning regional teams competed for the title of NOSB champions. Although the team from Grafton did not win the NOSB, they did very well and had a wonderful time. For the third consecutive year, Lexington High School from Boston, MA won the title.

The Blue Crab Bowl is a joint venture of CCPO, the Department of Ocean, Earth and Atmospheric Sciences, Old Dominion University, the Sea Grant Marine Advisory Program, Virginia Institute of Marine Science, and the College of William and Mary. The fourth annual Blue Crab Bowl will be held in February 2001 at the College of William and Mary. For additional information and photos from both the regional and national competitions, visit the following web sites: www.vims.edu/adv/bcb/ and www.nosb.org.

Just the *facts* ...

GRANTS/CONTRACTS AWARDED

L.P. ATKINSON and G. Magnuson, "Quotation for Research Services of Gary Magnuson," National Oceanic and Atmospheric Administration, $23,966.

G. F. COTA, "High Latitude Bio-optical Algorithms for GLI," NASDA Earth Observation Center, GLI/ADEOS II, Japan, $40,000.

E.E. HOFMANN, "Southern Ocean Global Ocean Ecosystems Dynamics (GLOBEC) Program," Scientific Committee on Oceanic Research (SCOR)-The Johns Hopkins University, $25,000.

A.VALLE-LEVINSON, "CAREER Program: On the Hydrodynamics of the Subtidal Exchange Between Estuaries and their AdjacentWaters," National Science Foundation, $395,303.

APPOINTMENTS

J. M. KLINCK, Coastal Studies Editor of *Journal of Geophysical Research-Oceans*, January 2000 - December 2003.

PRESENTATIONS

L.P. ATKINSON, "Observations of upwelling along the coast of Chile." Universidad Catlica Norte, Coquimbo, Chile, April 6, 2000.

L.P. ATKINSON, **A. VALLE-LEVINSON**, D. Figueroa, R. De Pol-Holz, and V.A. Gallardo, (Universidad de Concepción, Concepción, Chile.) "Oceanographic Observations in Chilean Coastal Waters Between Valdiva and Concepcion." Sixth International Conference on Southern Hemisphere Meteorology and Oceanography, Santiago, Chile, April 4, 2000.

T.D. CLAYTON, **E.E. HOFMANN**, and T.A. Villareal, "A modeling study of carbohydrate ballasting (buoyancy regulation) by *Trichodesmium."* JGOFS 2nd Open Science Conference, Bergen, Norway, April 13-17, 2000.

G.F. COTA and L.R. Pomeroy, "Arctic shelf and basin productivity." Western Arctic Shelf Basin Interactions Meeting, Baltimore, MD, March 20-22, 2000.

G.F. COTA, J.L. Anning, W.G. Harrison, T. Platt (Bedford Institute of Oceanography), **D.A. RUBLE** and S.Sathyendranath (Bedford Institute of Oceanography and Dalhousie University). "Chlorophyll algorithms for the Labrador Sea." Global Line Imager Meeting, Kyoto, Japan, December 6-10, 1999.

M.A.M. FRIEDRICHS and **E.E. HOFMANN**, "Physical Control of Biological Processes in the Central Equatorial Pacific: A Data Assimilative Modeling Study." JGOFS 2nd Open Science Conference, Bergen, Norway, April 13-17, 2000.

PUBLICATIONS

E.E. HOFMANN AND **C.M. LASCARA**, "Modeling the Growth Dynamics of Antarctic Krill (*Euphausia superba*)," *Marine Ecology Progress Series*, 194, 219-231, 2000.

S.E. Ford, E.N. Powell, **J.M. KLINCK**, and **E.E. HOFMANN**, "Modeling the MSX Parasite in Eastern Oyster (*Crassostrea virginica*) Populations. I. Model Development, Implementation and Verification," *Journal of Shellfish Research*, 18, 475-500, 1999.

B.L. Lipphardt Jr., A.D. Kirwan Jr., and **C.E. GROSCH,** "Blending HF Radar and Model Velocities in Monterey Bay Through Normal Mode Analysis," *Journal of Geophysical Research*, 105, 3425-3450, 2000.

M. Paraso, Ford, S.E., E.N. Powell, **E.E. HOFMANN**, AND **J.M. KLINCK**, "Modeling the MSX Parasite in Eastern Oyster (*Crassostrea virginica*) Populations. II. Salinity Effects," *Journal of Shellfish Research*, 18, 501-516, 1999.

E.N. Powell, **J.M. KLINCK**, S.E. Ford, **E.E. HOFMANN**, and S.J. Jordan, "Modeling the MSX Parasite in Eastern Oyster (*Crassostrea virginica*) Populations. III. Regional Application and the Problem of Transmission," *Journal of Shellfish Research*, 18, 517-537, 1999.

Papers Presented at the 2000 Ocean Sciences Meeting
San Antonio, TX, January 24-28, 2000

S.E. Allen, **M. S. DINNIMAN**, **J. M. KLINCK,** and B. M. Hickey, "Dynamics of advection-driven upwelling over a submarine canyon."

L.P. ATKINSON, **T.C. ROYER**, **C.E. GROSCH**, T. Sugimoto, and T.B. Curtin, "Continental Runoff and Ocean Margin Fluxes."

T. Bascunan, J. Moraga-Opazo, W. Argandona, and **A. VALLE-LEVINSON**, "Oceanic exchange in a small and enclosed bay of Chile."

E.A. Bochenek, E. Powell, **E.E. HOFMANN**, and **J.M. KLINCK,** "A Biochemically-Based Model of the Growth and Development of *Crassostrea gigas* Larvae."

T. CLAYTON and C. Mobley , "Remote Detection of *Trichodesmium* Subsurface maxima."

K.O. Coyle, A. J. Paul, T. J. Weingartner, **T. C. ROYER**, A. I. Pinchuk, D. A. Stockwell, T. E. Whitledge, L. J. Haldorson, J. L. Boldt, and R.H. Day, "The Distribution of Zooplankton, Nutrients, Chlorophyll, Fish, and Seabirds Relative to Major Water Masses and Current Regimes on the Shelf of the Northern Gulf of Alaska During 1998 and 1999."

S.L. Danielson, T. J. Weingartner, and **T. C. ROYER**, "Structure and Seasonal Variability of the Alaska Coastal Current."

M.S. DINNIMAN and **J. M. KLINCK**, "A numerical simulation of flow near a submarine canyon: open versus periodic along shore boundaries."

B. FACH, **E.E. HOFMANN**, and E. Murphy, "Krill transport and survival across the Scotia Sea: A modeling study."

M. Framinan, A. Munchow, **A. VALLE-LEVINSON**, and F. Vetere, "Observational Study of Estuarine and Coastal Dynamics in the Rio de la Plata."

M A. M.FRIEDRICHS, "The Assimilation of JGOFS EqPac Data into a Marine Ecosystem Model of the Central Equatorial Pacific."

A.G.E HASKELL, **E.E. HOFMANN**, and **J.M. KLINCK**, "EOF Techniques Integrated In Marine Ecosystem Models."

G.O. Irving, T. J. Weingartner, **T. C. ROYER**, S. R. Okkonen, and D. L. Musgrave, "Freshwater Variability on the Gulf of Alaska Shelf."

R. LOCARNINI and **J. M. KLINCK**, "Particle drift in Drake Passage and the southern Scotia Sea."

J.Moraga and **A. VALLE-LEVINSON**, "Observations of bipolar residual circulation in two semi-arid bays."

A. Munchow, M. Framinan, and **A. VALLE-LEVINSON**, "Wind, Buoyancy, and Topographic Forcing in the Rio de la Plata ROFI."

B.B.Prezelin, **E. E. HOFMANN**, **J. M. KLINCK,** and C. Mengelt, "The linkage between upper Circumpolar Deep Water and phytoplankton assemblages on the west Antarctic Peninsula continental shelf."

C.R. REYES-HERNANDEZ and **A. VALLE-LEVINSON**, "Variability in the subtidal flow at the Chesapeake Bay Entrance."

B. SALIHOGLU, **E.E. HOFMANN,** and W.R. Fraser, "Factors Affecting Fledging Weight of Adelie Penguin (*Pygoscelis adeliae*) Chicks: A Modeling Study."

N. SARKAR and **T. C. ROYER**, "Decadal Mixed Layer Variability in the Northern Gulf of Alaska."

H. SEPULVEDA, **A. VALLE-LEVINSON**, and **K. HOLDERIED**, "Recirculations Around an Island in a Chilean Fjord."

I.D. SCHROEDER, B. L. Lipphardt, Jr., **T. C. ROYER**, A. D. Kirwan, Jr., and **C. E. GROSCH**, "Normal Mode Analysis of North Pacific Sea Surface Temperatures."

A. VALLE-LEVINSON, "Dynamical Balances in Tidal Circulation Near the Chesapeake Bay Entrance."

A. VALLE-LEVINSON, K.C. Wong, and **K. BOSLEY**, "Wind-induced exchange at the mouth of a wide coastal plain estuary during vertically stratified conditions."

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