

Summer 1995

# Circulation, Summer 1995

Center for Coastal Physical Oceanography, Old Dominion University

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**Picture Caption:** The state of Alaska superimposed on a map of the rest of the United States showing the large portion United States' coastline that is in Alaska. If you look at charts that include bathymetry, you will see that much of the United State's continental shelf is also in Alaska. Map from the *Alaska Atlas Gazetteer* DeLorme Mapping, Freeport, ME. Reproduced with permission. All rights reserved.

## The U.S. Coastal Ocean is in Alaska!

Yes, it is known that the title of this little homily indulges in hyperbole, but take a look at the accompanying chart (Figure 1) which overlays the state of Alaska on the 48 contiguous states. By tracing the coastline of Alaska (don't forget the Aleutian Islands and other large islands such as Kodiak and St. Lawrence islands), you shouldn't have a hard time convincing yourself that the title is not far off the mark. Since a large part of the Alaskan coast is quite complex, what is said should apply regardless of the minimum length scale that you apply to this analysis. If you get ambitious and consult some bathymetric charts, you will also discover that a large fraction of the United States' continental shelf is also in Alaska.

So why is LOUIS A. CODISPOTI (Lou) bringing this subject up? It is not because he doesn't think that our local coast and Chesapeake Bay are important. They are important areas to study in their own right, and all the more so because of the large human populations that surround them. Nevertheless, it has always been a wonder to Lou that so few U.S. academic oceanographers study polar regions and how much of the existing academic polar oceanography efforts are focused on the Antarctic rather than the Arctic and sub-Arctic, given the fact that most of our continental shelf and coastline lies in the latter two regions! In part, this situation arises from the history of funding agency priorities and policies, but Lou believes that the situation also arises from the insufficient interest expressed in the Arctic by the academic research community. He brings this subject up now because there are two bits of good news regarding the practicalities of Arctic research in the sea of otherwise not so good news about research funding that has been emanating from Washington in recent months. The first bit of good news is that the Office of Polar Programs at the National Science Foundation is making a strong effort to increase the monies that go towards Arctic research. The second is that the end of the Cold War makes portions of the Arctic, that have been heretofore inaccessible, reachable by U.S. scientists. Indeed our colleagues in the Former Soviet Union (FSU) are eager to develop joint projects with us, and they are hoping, with our help, to be able to maintain many of their Arctic research facilities that are in danger of being shut down as a consequence of the FSU's economic problems. Although safety can be a significant issue with respect to using some of the FSU's research facilities, Lou knows several scientists who have had successful joint ventures with FSU scientists.

Here are a few scientific and practical reasons for studying the Arctic: (1) Modeling exercises suggest that the Arctic may have effects on global climate that are significant and unique (Walsh et al., 1990) due to factors such as the deep convection that occurs in the Arctic and the ice-albedo feed-back mechanism. For example, some models suggest that a doubling of atmospheric carbon dioxide may cause the largest tropospheric temperature increases to occur in the Arctic (Stouffer et al., 1989; Wetherald and Manabe, 1986); (2) Although the Antarctic and Arctic share some similarities, some models (e.g., Stouffer et al., 1989) suggest significant interhemispheric differences in response to forcing factors such as increased atmospheric carbon dioxide concentrations, and there are sharp contrasts between the Arctic and Antarctic ecosystems (Codispoti et al., 1991). Therefore, we cannot assume that if we understand a process in the Antarctic, we also understand it in the Arctic; (3) Because major inflows into and out of the Arctic are largely constrained to narrow straits, it is relatively easy to construct budgets that allow one to check the reasonableness of process oriented physical, biological, and chemical studies (e.g., Aagaard and Greisman, 1975); (4) Major United States' fisheries resources occur in the sub-Arctic Bering Sea; and (5) Pollution problems in the Arctic are significant and could impact biological resources and surrounding populations.

Lou and co-authors have expounded on items (2) and (3) in a paper that is available by request (Codispoti et al., 1991).

With respect to item (5), many might think that the Arctic is pristine, but this is far from the case. If you once again take a look at some charts, you will see that several rivers that are larger than the Mississippi drain the industrial heartland of Russia and flow into the Arctic Ocean. It is not unreasonable to suggest that some of these rivers contain a heavy load of pollutants. Recently, many of you have read about a pipeline break in the FSU that has deposited large amounts of oil in the Pechora River watershed, another river that flows towards the Arctic Ocean. You may have also heard about the FSU's dumping of nuclear waste material in the Arctic and sub-Arctic and about accidental releases by the United States near Thule, Greenland. Studies by the international community and the Office of Naval Research's Arctic Nuclear Waste Assessment Program suggest that any effects of these releases are highly localized, but there remains some modest concern about the possibility of future releases, etc. A type of pollution that Lou was not aware of until recently is the global scale "distillation" processes that mobilize semi-volatile materials such as organochlorines in warm portions of the troposphere and "condense" them out in cold regions such as the Arctic (Muir and Norstrom, 1994). This and the fat rich food chains of the Arctic are two reasons why many Arctic animals contain significant quantities of man-made organic compounds. In the Arctic, the situation is probably worse than in the Antarctic because of proximity to heavily populated industrialized regions. The bottom line is that there are significant pollution problems in the Arctic that could use more attention.

Lou's hope is that this brief article may stimulate some readers to think a bit more about doing some research in the Arctic. Feel free to contact him if you want more information.

## References

Aagaard, K. and P. Greisman, "Toward New Mass and Heat Budgets for the Arctic," *Journal of Geophysical Research*, Vol. 80, 3,821-3,827, 1975.

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Walsh, J. E., F. Bryan, H. Cattle, R. Dickinson, R. E. Moritz, and L. Mysak, "Global-Arctic Interactions," In: *Arctic System Science: Ocean-Atmosphere-Ice Interactions*, R. E. Moritz et al., eds., Joint Oceanographic Institutions Inc., Washington, DC, pp. 74-111, 1990.

## A Special Issue of JGR Oceans

As announced in the last issue of CCPO Circulation, CCPO's most distinguished faculty member and one of its founders, GABRIEL T. CSANADY, retired this past June. As a way of honoring Gabe's scientific contributions, several of his students and colleagues are planning a festschrift to appear as a special issue in the *Journal of Geophysical Research*. Guest editors for the issue will be Joseph Pedlosky of Woods Hole Oceanographic Institution and A. D. KIRWAN, JR. of CCPO. Papers should be submitted by the summer of 1996, and publication is scheduled for the summer or fall 1997. Contact either Joe Pedlosky at (508) 289-2534 (jpedlosky@whoi.edu) or Denny Kirwan at (804) 683-4945 (adk@ccpo.odu.edu) for further information.

## Notes from the Director - Why is the Coastal Ocean Ignored?

In the last few years, we have heard talk of the reduction of emphasis on the global ocean and simultaneously heard of increasing interest in the coastal ocean. Since most researchers equate interest with research funding, we expectantly awaited the program announcements and RFP's to appear. We are still waiting.

For a while, we thought the wait was just for funding to be re-allocated. Nevertheless, now we see there was little re-allocation. To make matters worse, we see what little funding there was for coastal ocean research being eliminated by Congress.

So, why is the coastal ocean ignored, and what should we do? We all can come up with the usual answers (the first oceanography labs were blue water, too many agencies, etc.), but I think that is a fruitless exercise that will not solve the problem. For some reason, people do not "see" the coastal ocean like they do the global ocean or the weather. What then can we do to improve their "sight?" It is my impression that the "sight" I mentioned is really a perception of risk. There is just not much public risk associated with the coastal ocean as there is to weather and earthquakes.

The public may be right. Maybe there is not much at risk in the coastal ocean. However, I think this view is dangerously wrong. We are close to losing the recreational and commercial use of many of our coastal waters. Some risks to the coastal ocean are:

Offshore oil exploration and production will be increasing in the coming years as will tankering of foreign oil. Are we really prepared to deal with major oil spill in Chesapeake Bay? No!

We now know that human disease organisms reside in coastal ecosystems. Will Chile's experience with cholera be repeated somewhere else? We hope not.

The climate is changing and so is the coastal ocean. How do we differentiate between natural and man-made effects to the coastal ocean?

Commercial and recreational fisheries compete for depleted resources. How will we develop a rational policy for sustainable resources without research?

The human population along the coast will continue to increase. How will we show that land use policy affects the coastal ocean? And on and on.

So what can we do? While it may be up to the public to decide what is important, it is our job to bring the information to the front. That we have not done. How many news articles have you seen about changes in the coastal ocean vs. changes in the global ocean?

If you know of a change in the coastal ocean, work to get it to the public. When you see a change in the coastal ocean that is either bad or good and resulted from public policy, get that to the public. Science writers need articles; work with them. Groups need talks; talk to them. Policy makers need to hear our ideas; write to them.

Larry P. Atkinson  
Director, Center for Coastal Physical Oceanography

## **To Washington We Go**

CCPO faculty member, EILEEN HOFMANN, was invited to attend a briefing entitled, "Science Leadership Exchange," at the Old Executive Office Building in Washington, DC on March 28. The briefing, initiated by the National Science Board and hosted by the National Science and Technology Council Committee on Fundamental Science, was designed to provoke discussion of how scientific research programs in the United States relate to overall federal support for fundamental research and education. Overviews of federal support for key disciplines of science and major scientific initiatives were given by members of the President's Committee of Advisors on Science and Technology. Following this, leaders of the nine federal agencies that provide primary support for science, described their research missions, key programs and initiatives in fundamental science and engineering. The overview of the current state of science funding, obtained at the Science Leadership Exchange, is useful to CCPO faculty, researchers, and students for planning future programs and careers.

LOU CODISPOTI, research professor, was invited to attend a meeting at the National Science Foundation for bilateral

discussions with representatives of the Russian Foundation for Basic Research on May 24-25. The meeting involved U.S. scientists, personnel from the Office of Polar Programs of the National Science Foundation, and Drs. Boris W. Levin, Igor A. Melnikov, and Igor P. Smiletov from the Former Soviet Union. The major topic of discussion was enhancing opportunities for bilateral research in the Arctic.

## **The First Annual Open House**

The Oceanography Department's First Annual Open House was a big success. With the theme, "Explore New Worlds Through Science and Technology," the Department of Oceanography, along with the Departments of Physics and Geology, opened their doors to the community. Approximately 250 people, more than half of them children, explored the Department and were very interested in what they saw. It couldn't have happened without the hard work of CCPO's outreach coordinator, ANNE S. WEST-VALLE, and without the assistance of the faculty, researchers, technicians, staff, and especially the students.

Graduate student, LISA DRAKE, along with a number of other biologists, set up great displays in the Biology Lab. Visitors enjoyed looking at the live and preserved sea animals. The aquarium filled with fish from the Chesapeake Bay was a big hit. Pre- and elementary school children were thrilled with the submarine ride created by the graduate students. Research technician, BETH FOYLE, and graduate student, ANDREW MUELLER, created an impressive stream table in the Geology Lab. Graduate student, DON SEABORN, helped the chemists show off many types of interesting equipment, and tours were given of the portable Chemistry Lab van. Both children and adults were excited about making fish prints; once the squeamish got over their aversion to touching the dead fish, beautiful fish-print t-shirts were created for visitors to take home as mementos.

Assistant research professor, ARNOLDO VALLE-LEVINSON, was instrumental in assisting a number of physical oceanographers with presentations, and computer systems engineer, BOYD FLETCHER, created several interactive computer displays for the open house. These displays included a computer presentation by BRUCE LIPPHARDT, assistant research professor, on surfing the World Wide Web, and there was another computer presentation by Arnoldo on visualizing data from the Chesapeake Bay. JERRY MILLER, assistant research professor, gave a talk titled, "Chesapeake Bay Bridge-Tunnel on Water Column Stratification in the Lower Bay," and he described how building an additional span of the bridge might change it.

The physical graduate students also participated in the open house by giving very interesting and informative talks. Among these was a slide presentation by MARGARET DEKSHENIEKS on two trips she took to the Gulf of Mexico and the Caribbean to conduct research with the use of two- and four-man submersibles. CATHY LASCARA and DAVID SMITH gave a joint presentation which described CCPO's involvement with a Long-Term Ecological Research project to study physical-biological interactions within the Antarctic marine ecosystem.

It was an educational, informative, and fun-filled day for all involved, especially the visitors, and we are already making plans and looking forward to our 2nd Annual Open House.

## **Student Profile: John J. Holdzkom II**

JOHN J. HOLDZKOM II graduated magna cum laude with a B. S. in physics from Old Dominion University in 1992. During the latter two years of his undergraduate studies, he worked on a Research Experience for Undergraduates (REU) project, investigating dynamical systems properties of a climate model with A. D. Kirwan, Jr. While still an undergraduate, he presented a paper on this research at the International Union of Geodesy and Geophysics 20th General Assembly in Vienna, Austria. Upon graduation, John elected to continue studying with Dr. Kirwan and enrolled in the Ph.D. program in physical oceanography in the fall of 1992.

John's research focuses on mesoscale ocean dynamics. Currently he is developing a particle-in-cell model with Dr. Kirwan and Chester E. Grosch. This model utilizes both a fixed Eulerian grid as well as Lagrangian particles and is able to provide excellent spatial and temporal resolution of ocean fronts, eddies, and related phenomena. To achieve fine resolution in multiple layers, John is developing the model for massively parallel machines such as the IBM SP2. A

goal of this project is to gain insight into cross-shelf transport induced by mesoscale eddies and other coastal processes. The development and implementation of this model will be the subject of his dissertation.

John's other oceanographic interests include dynamical systems, coastal currents, remote sensing, ocean-climate modeling, and time series analysis. He has already authored two papers in these areas. John plans to pursue a career in academia.

## **ADK's Words of Wisdom**

"He who does no research has nothing to teach." Adapted from Charles Demming Courtesy of Joan Grosch

## **CCPO Seminar Series: Fall 1995**

During the academic year, CCPO invites several distinguished scientists to present seminars on topics related to coastal oceanography. The lectures take place in Room 109, Crittenton Hall, Old Dominion University, on Mondays at 3:30 p.m. EILEEN HOFMANN, professor of oceanography, coordinates the lecture series with the assistance of BEVERLY SCOTT. Below is a schedule of lectures for the fall semester 1995. Please contact Beverly at (804) 683-4945 for more information or if you would like to be included on the mailing list for lecture announcements. Specific lecture topics are announced one week prior to each lecture.

September 11  
Arnoldo Valle-Levinson  
Center for Coastal Physical Oceanography

September 18  
Larry Sanford  
Horn Point Environmental Laboratory

September 25  
John Klinck  
Center for Coastal Physical Oceanography

October 2  
Robert Armstrong  
Princeton University

October 9  
Steve Keuhl  
Virginia Institute of Marine Science

October 16  
Walter Boynton  
Chesapeake Biological Laboratory

October 23  
Frank Aikman  
National Ocean Service, NOAA

October 30  
Jerry Miller  
Center for Coastal Physical Oceanography

November 6  
Xiao-Hai Yan  
University of Delaware

November 13  
Robert Edson  
Office of Naval Research

November 20  
Cynthia Jones  
Old Dominion University

November 27  
Larry Harding  
University of Maryland

# Just the Facts...

## Appointments

L. P. ATKINSON, reappointed to chairman of the Department of Oceanography for another three-year term, July 1, 1995.

E. E. HOFMANN, promoted to professor of oceanography, Old Dominion University, Department of Oceanography, July 1, 1995.

E. E. HOFMANN, appointed to term as a member of the National Research Council, Ocean Studies Board, July 1, 1995 to June 30, 1998.

## Graduates

Ph.D.: P. BECKER, dissertation title, "The Effect of Arctic River Hydrological Cycles," August 1995, Advisor: L. P. Atkinson. Dr. Becker took a postdoctoral research associateship at Battelle Pacific Northwest Laboratory, Marine Science Laboratory.

Ph.D.: Y. H. SPITZ, dissertation title, "A Feasibility Study of Dynamical Assimilation of Tide Gauge Data in Chesapeake Bay," August 1995, Advisor: J. M. Klinck. Dr. Spitz took a position at Oregon State University as Research Associate in the Department of Oceanography.

## Grants/Contracts Awarded

G. F. COTA, "Radionuclides in Arctic Marine Food Webs," \$100,731, ONR.

## Presentations

E. E. HOFMANN, "Physical Structuring of Marine Food Webs I and Physical Structuring of Marine Food Webs II," the Food Web Structure and Dynamics in Marine, Terrestrial and Freshwater Environments Summer School at Cornell University, Ithaca, NY, June 26-27, 1995. M. Kobayashi, Yokohama College of Commerce, Yokohama, Japan;

E. E. HOFMANN; E. Powell, Rutgers University; J. M. KLINCK; and K. Kusaka, Okayama Prefectural Institute of Fisheries, Okayama, Japan, "Simulation of the Growth of Cultivated Japanese Oysters with a Time-Dependent Model," the 1995 Annual Meeting of the Japanese Society of Fisheries Oceanography, National Research Institute of Fisheries Science, Yokohama, Japan, July 13-14, 1995.

## Publications

K. R. Tenore, Chesapeake Biological Laboratory; M. Alonso-Noval and M. Alvarez-Ossorio, Instituto Espanol de Oceanografia, Spain; L. P. ATKINSON; J. M. Cabanas, R. M. Cal, H. J. Campos and F. Castellejo, Instituto Espanol de Oceanografia, Spain; E. J. Chesney, Louisiana Universities Marine Consortium; N. Gonzalez, Instituto Espanol de Oceanografia, Spain; R. B. Hanson, Skidaway Institute of Oceanography; C. R. McClain, NASA/Goddard Space Flight Center; A. Miranda, Instituto Espanol de Oceanografia; M. R. Roman, Horn Point Environmental Laboratory; J. Sanchez, G. Santiago, L. Valdes, and M. Varela, Instituto Espanol de Oceanografia, Spain; and J. Yoder, University of Rhode Island, "Fisheries and Oceanography off Galicia, NW Spain: Mesoscale Spatial and Temporal Changes in Physical Processes and Resultant Patterns of Biological Productivity," *Journal of Geophysical Research*, Vol. 100(C6), 10,943--10,966, June 15, 1995.

P. B. Ortner, RSMAS and AOML/NOAA, Miami; T. N. Lee, P. J. Milne, R. G. Zika, M. E. Clarke, G. P. Podesta, and P. K. Swart, all of RSMAS, Miami; P. A. Tester, NMFS/NOAA, Beaufort; L. P. ATKINSON, and W. R. Johnson,

Minerals Management Service, Herndon, VA, ``Mississippi River Flood Waters that Reached the Gulf Stream," *Journal of Geophysical Research*, Vol. 100(C7), 13,595-13,601, July 15, 1995.

M. R. Abbott, Oregon State University; K. H. Brink, Woods Hole Oceanographic Institution; C. R. Booth, Biospherical Instruments, Incorporated, San Diego; D. Blasco, Rimouski, Quebec, Canada; M. S. Swenson, AOML/NOAA, Miami; C. O. Davis, NRL, Washington, DC; and L. A. CODISPOTI, ``Scales of Variability of Bio-Optical Properties as Observed from Near-Surface Drifters," *Journal of Geophysical Research*, Vol. 100(C7), 13,345-13,367, July 15, 1995.

E. E. HOFMANN, E. N. Powell, Rutgers University, J. M. KLINCK, and G. Sanders, Texas AM University, ``Modelling Diseased Oyster Populations I. Modelling Perkinsus marinus Infection in Oysters," *Journal of Shellfish Research*, 14(1), 121-151, 1995.

J. M. KLINCK, ``Thermohaline Structure of an Eddy-Resolving North Atlantic Model: The Influence of Boundary Conditions," *Journal of Physical Oceanography*, Vol. 25(6), 1,174-1,195, June 1995.

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Contact Carole E. Blett, editor, for more information, (804) 683-4945.

Editor .....Carole E. Blett  
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