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Center for Coastal Physical Oceanography, Old Dominion University

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FALL 2018 SEMINAR SPEAKERS

CCPO CIRCULATION

VOLUME 23, NUMBER 3 | SUMMER 2018

A Look to the Future - Development of Numerical Ocean Modeling Capacity **DR. EILEEN HOFMANN**

In early 2016, the National Commission for Scientific and Technological Research in Chile established a Center of Excellence, Dynamics of High Latitude Marine Ecosystems (in Spanish: Centro de Investigación: Dinámica de Ecosistemas marinos de Altas Latitudes or IDEAL), focused on Antarctic and Sub-Antarctic oceanographic research at the Universidad Austral de Chile in Valdivia, Chile. The IDEAL Center is a collaborative effort with several national and international partner universities and organizations, including CCPO. The IDEAL research programs extend from marine productivity to coastal and marine socio-ecological systems, and are linked through a synthesis and modeling effort, making numerical modeling of ocean processes a priority research area. This priority, coupled with IDEAL's mandate to train students and early career scientists, provides the basis for a collaborative effort between CCPO, Universidad de Concepción, and Universidad Austral de Chile to develop capacity in numerical ocean modeling. This collaboration builds on CCPO strengths

in numerical modeling and on strengths from Chilean colleagues in modeling coastal circulation and high latitude food webs.

Our collaboration is developed around a three-year series of training courses and workshops that focus on modeling of ocean processes with emphasis on high latitude processes and interactions between natural and social systems. The U.S. participation in this collaboration is supported by the National Science Foundation Office of Polar Programs (OPP). The training courses and workshops address a recognized shortcoming in marine science that goes beyond a single activity and are therefore international in scope.

The first numerical ocean modeling training course occurred as part of the 2018 Austral Summer Institute (ASI), which took place in January at the Universidad de Concepción.



OLD DOMINION UNIVERSITY

Center for Coastal Physical Oceanography

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Letter from the **DIRECTOR**



Teaching is an important activity in universities, which is no surprise to anyone. However, CCPO tries to go well beyond the typical image of a professor talking in front of a class. We extend teaching activities to include working with REU students as well as making presentations at local schools, to summer camps at ODU, and at international workshops.

International workshops involve teaching selected students and scientists special skills, such as using computer models. The recent week-long workshop at the University of Concepción in Chile presented classes on numerical models applied to high latitude and polar marine systems. During one week, models of biological processes were presented; during a second week, circulation models using the public ROMS model system were presented. The focus of these workshops was to build expertise, that is, to train researchers, in using numerical models.

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Over the spring, we have made more general presentations at local elementary and middle schools; and helped at summer camps targeting younger students (details in the next newsletter). The purpose of these presentations is to inform young students about environmental issues and encourage them to learn and use math and science. We hope at a minimum that they will become the “educated electorate” envisioned by Thomas Jefferson. More importantly, we hope that some of the students will find science and math to be interesting enough to pursue as a career.

In many ways, these “additional” teaching activities from CCPO are as fulfilling as the traditional university classes and graduate student training that we do as part of our employment at ODU.

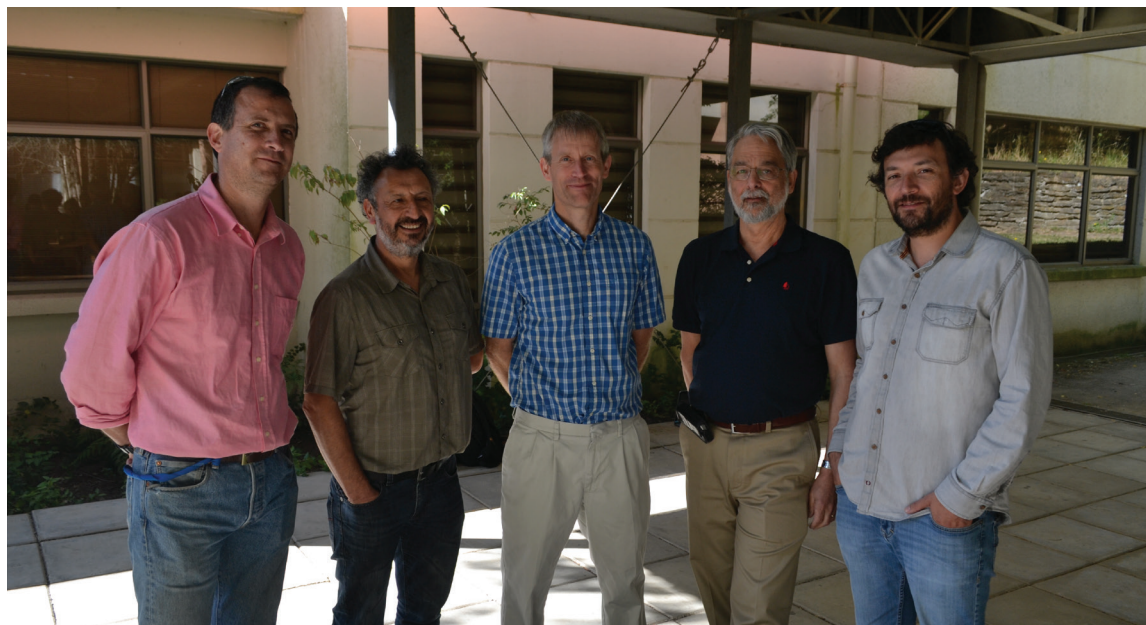
Best Wishes,

A handwritten signature in black ink that reads "John Klinck". The signature is written in a cursive, flowing style.

Dr. John Klinck
Director, CCPO
Professor of Oceanography

Pictured to the Right: *Gathering of lecturers on final day of 2018 ASI: (L-R) Andrés Sepúlveda, Silvo Pantoja (Director of COPAS Sur-Austral and 2018 ASI), Mike Diniman, John Klinck and Diego Narváez.*

Photo credit: *Paul Gomez-Canchong, Universidad de Concepción*





*Above: Participants showing excitement generated by the circumpolar and regional ocean modeling course.
Photo credit: Paul Gomez-Canchong, Universidad de Concepción*

The topic for the 2018 ASI, Numerical modeling tools to understand physical and biological processes in mid and high latitude marine ecosystems, provided a natural structure for lectures, hands-on practical tutorials, and group projects focused on aspects of numerical ocean modeling. The funding provided by OPP allowed six graduate students/early career scientists from U.S. institutions to participate in the ASI. Through the ASI, the U.S.-based participants connected with an international community of early career scientists with interests in numerical modeling.

The 2018 ASI consisted of four one-week courses. The first week was an introduction to numerical modeling and the second week was focused on the Coastal and Regional COmmunity Ocean Model (CROCO), a ROMS-based model developed for fine-scale applications in coastal systems. These two weeks of the ASI were taught by Gildas Cambon (IRD, France), Aldo Montecinos (Universidad de Concepción) and Andrés Sepúlveda (Universidad de Concepción and former CCPO graduate student). Weeks 3 and 4 focused on ecosystem modeling and circumpolar and regional ocean modeling. The ecosystem modeling lectures and hands-on tutorials were developed by **Eileen Hofmann** (CCPO) and Andrea Piñones (Universidad Austral de Chile and former CCPO graduate student). The circumpolar and regional modeling course was

developed by **John Klinck** and **Mike Dinniman** (CCPO) and Diego Narváz (Universidad de Concepción and former CCPO graduate student). The representation of former CCPO graduate students among the ASI lecturers, who are now faculty members at Chilean universities, highlights collaborations that have continued over the years. The nearly 100 ASI participants gained understanding of different aspects of numerical ocean modeling and a community of peers with similar interests. The excellent restaurants and bistros near Universidad de Concepción hosted informal post-class gatherings that encouraged discussion of numerical modeling and research projects. The formal and informal networking that took place during the ASI will hopefully provide the basis for longer-term collaborations.

Planning is now beginning for the second training course in numerical ocean modeling, which will be held in late July-early August 2019 at Universidad Austral de Chile. This course will focus on numerical models for high latitude systems, with emphasis on regional ocean models and Antarctic food webs. The application period for interested graduate students and early career scientists will open in late fall 2018.



Above: The REU students collect water samples from the CTD Rosette aboard the R/V Fay Slover **Photo Credit:** Ryan Glaubke

OEAS & CCPO Summer Research Experience for Undergraduates

RYAN GLAUBKE

dent research projects investigating topics centered on climate change, sea level rise and the various impacts it presents to an urbanized coastal city such as Norfolk, VA. With a variety of diverse perspectives and educational backgrounds, our interns bring different expertise, problem solving skills, and modes of thinking to bear on questions of climate change, itself a multi-faceted and interdisciplinary problem.

One of the core missions for both the Department of Ocean, Earth and Atmospheric Sciences and the Center for Coastal Physical Oceanography is the fostering of undergraduate education. Our instructors make a significant effort to go beyond the traditional classroom setting, creating opportunities for our students to make unique contributions to research at the forefront of ocean and climate science. One means by which this is achieved is through a summer internship, the Research Experience for Undergraduates (REU) Program, funded by the National Science Foundation.

Each summer, undergraduate students from around the country are selected to engage in their own indepen-

Students participate in data collection (both in the field or within the lab), assist in data analysis and interpretation, practice their public speaking skills with periodic presentations to their peers and faculty, attend seminars given by some of the leading researchers in ocean sciences, and refine their skills as research scientists through a series of workshops. The opportunities presented through the REU program ensures that students are exposed to a variety of different disciplines of science and how each is geared towards tackling a central problem: understanding our changing climate. See a full list of the Research undergraduates, their research topics, and advisors on page 5.

Below: During their third week, students were introduced to the other half: sailing out to sea! The undergraduates boarded ODU's research vessel, the R/V Fay Slover, for a trip out of the Bay and into the Atlantic Ocean. **Photo Credit:** Ryan Glaubke





CCPO REU Spotlight: **ANTHONY MEZA**

My name is Anthony Meza and I traveled from Southern California to Norfolk this summer for the OEAS REU program. I will transfer to the University of California, Irvine this fall. At ODU, I have researched how phytoplankton respond to environmental conditions in order to better understand the nature of the summer algal blooms that occur in the Lafayette River. **Dr. Klinck** has been an incredible resource and mentor. Although I came into this program with zero data analysis or modeling experience, his guidance has greatly affected the way I will approach similar problems in the future.

One of the most useful skills that I have developed is how to ask questions. My internship has taught me that the world can be quite a messy place, but to be able to make sense of some of that mess is something that I have found very exciting throughout my research. It's possible that I may not find the insights required

to approach a problem, but it's important to have the ability to take a step back and try to approach this issue from another angle and see a bigger picture. If the sole purpose of research is finding very specific answers to very specific questions without any regard for everything else going on around me, then I may fail to miss important details that may make life much easier or substantially more difficult; either way, I would be missing out on increasing my knowledge and that is something I refuse to do.

In regards to my research, it has been challenging. As previously stated, I had very little experiencing with the skills currently being used in my project. It took some time to adjust myself to the world of physical oceanography. So far, I have learned to program in a different language than I previously used and became familiar with all sorts of statistical tools to better understand the physical and biological processes that occur in the Lafayette River. I am grateful for the opportunity to challenge myself, and I will leave this program more knowledgeable and more curious than I when I first arrived.

SUMMER 2018 REU INTERNS, ADVISORS & RESEARCH TOPICS

Megan Agee | Dr. Matthew Schmidt: Interpreting deglacial multi-proxy temperature records from the Eastern Equatorial Pacific

Ana Grace Alvarado | Drs. Nora Noffke & Rip Hale: Microplastic contamination in the southern Chesapeake Bay

Amber Beecher | Dr. Alexander Bochdansky: How can we accurately measure microbial biomass in aquatic environments?

Hunter Brown | Dr. Margaret Mulholland: Estimating phytoplankton grazing and the impact of *Chocloclodium polykrikoides*

Laura Donahue | Dr. Dreux Chappell: What is the abundance of *Trichodesmium* present at two stations along the West Florida Shelf and how are they distributed among two primary clades?

Jonathan Lucio | Dr. Rip Hale: How can we measure water depth in shallow coastal environments using Synthetic-Aperture Radar (SAR)?

Anthony Meza | Dr. John Klinck: Modeling algal blooms in the Lafayette River, Norfolk, VA

Robin Minch | Dr. Holly Gaff - Dept. Biological Sciences: How does climate change influence the population density of ticks?

Zaynab Taveras | Dr. H. Rodger Harvey: An analysis of lipid biomarkers in particles and sediments from Mackenzie Shelf and the Chesapeake Bay

NyJae Washington | Dr. Alexander Bochdansky: Accurately measuring the biomass and activity of microbes in the ocean

Just the **FACTS**:

PUBLICATIONS:

Ezer, T., On the interaction between a hurricane, the Gulf Stream and coastal sea level, *Ocean Dynamics*, doi:10.1007/s10236-018-1193-1, 2018.

Ezer, T., The increased risk of flooding in Hampton Roads: On the roles of sea level rise, storm surges, hurricanes and the Gulf Stream. In: The Hampton Roads Sea Level Rise Preparedness and Resilience Intergovernmental Pilot Project, Toll, R. and G. F. Kuska (Eds.), *Marine Technology Society Journal*, 52(2), 34-44, doi:10.4031/MTSJ.52.2.6, 2018.

Greer, A.T., A.M. Shiller, **E.E. Hofmann**, J.D. Wiggert, S.J. Warner, S.M. Parra, C. Pan, J.W. Book, D. Joung, S. Dykstra, J.W. Krause, B. Dzwonkowski, I.M. Soto, M.K. Cambazoglu, A.L. Deary, C. Briseno-Avena, A.D. Boyette, J.A. Kastler, V. Sanial, L. Hode, U. Nwankwo, L.M. Chiaverano, S.J. O'Brien, P.J. Fitzpatrick, Y.H. Lau, M.S. Dinniman, K.M. Martin, P. Ho, A.K. Mojziz, S.D. Howden, F.J. Hernandez, I. Church, T.N. Miles, S. Sponaugle, J.N. Moum, R.A. Arnone, R.K. Cowen, G.A. Jacobs, O. Schofield, and W.M. Graham, Functioning of coastal river-dominated ecosystems and implications for oil spill response: From observations to mechanisms and models. *Oceanography*, 31(3), doi:10.5670/oceanog.2018.302, 2018.

Hermann, M., S. Doney, **T. Ezer**, K. Gedan, P. Morefield, B. Muhling, D. Pirhalla, and S. Shaw, Scientific and Technical Advisory Committee Review of the Chesapeake Bay Program Climate Change Assessment, *STAC Publication*, 32pp. 18-001, Edgewater, MD, 2018.

Lawson, G., M. Sosonkina, **T. Ezer** and Y. Shen, Applicability of the Empirical Mode Decomposition for power traces of large-scale applications, In: Wyrzykowski R., Dongarra J., Deelman E., Karczewski K. (eds), *Parallel Processing and Applied Mathematics*, PPAM 2017, 10778, 71-80, Springer, doi:10.1007/978-3-319-78054-2_7, 2018.

Najjar, R.G., **P. St-Laurent** and 28 other authors, Carbon budget of tidal wetlands, estuaries, and shelf waters of Eastern North America, *Global Biogeochemical Cycles*, 32, doi:10.1002/2017gb005790, 2018.

Rueda-Roa, D., **T. Ezer** and F. Muller-Karger, Description and mechanisms of the mid-year upwelling in the southern Caribbean Sea from remote sensing and local data, *Journal of Marine Science and Engineering*, 6(2), 36, doi:10.3390/jmse6020036, 2018.

PRESENTATIONS:

Aguiar-Gonzalez, B., C.F. Moffat, **M.S. Dinniman**, **J.M. Klinck**, D. Sutherland, E.W. Domack, and D.P. Costa, "On the warm water pathways and seasonal cycle of subsurface shelf waters forcing glacier retreat in the west Antarctic Peninsula," Ocean Sciences Meeting, Portland, OR, February 2018.

Brearley, J.A., H.J. Venables, M.P. Meredith, C.F. Moffat, and **M.S. Dinniman**, "Meander driven export of Antarctic shelf waters in the West Antarctic," Ocean Sciences Meeting, Portland, OR, February 2018.

Dinniman, M.S., **P. St-Laurent**, K.R. Arrigo, **E.E. Hofmann**, **J.M. Klinck**, R.M. Sherrell, S.E. Stammerjohn and P.L. Yager, "The ice shelf meltwater pump contribution to vertical exchange over the open shelf in the Amundsen Sea and elsewhere around Antarctica," Ocean Sciences Meeting, Portland OR, Feb.11-16, 2018.

Ezer, T., "The contribution of the Gulf Stream to sea level variability," Ocean Sciences Meeting, Portland, OR, February 12, 2018.

Ezer, T., "Interactions between large-scale ocean dynamics and sub-mesoscale processes: impact on coastal sea level," Workshop of the International Space Science Institute (ISSI), Bern, Switzerland, March 5, 2018.

Ezer, T., "Ocean dynamics and coastal sea level along the US coast, Centre for Coastal and Ocean Science and Engineering," Plymouth University, Plymouth, UK, March 14, 2018.

Ezer, T., "Sea level rise, flooding and the role of the Gulf Stream," College of Sciences Advisory Board Meeting, Old Dominion University, Norfolk, VA, April 18, 2018.

Hofmann, E.E., E.N. Powell, **J.M. Klinck**, D. Munroe, R. Mann, D.B. Haidvogel, D. Narváez, X. Zhnag and, K. Kuykendall, "Factors affecting distribution of the Atlantic surfclam (*Spisula solidissima*), a continental shelf biomass dominant, during a period of climate change, oral presentation," 4th International Symposium on The Effects of Climate Change on the World's Oceans, Washington, DC June 2-8, 2018.

Hofmann, E.E., E. Salmon, **M.S. Dinniman**, W.O. Smith, Jr., "Evaluation of Iron Sources and Sea Ice Variability in the Ross Sea and Implications for Primary Production, oral presentation," Ocean Sciences Meeting, Portland, Oregon, February 12-16, 2018.

PRESENTATIONS, CONT'D:

Hofmann, E.E. and E.J. Murphy, "Critical questions for understanding Southern Ocean ecosystems: how to 'do the science' and timescales for research, invited plenary presentation," Marine Ecosystem Assessment for the Southern Ocean Conference, Hobart, Tasmania, April 9-13, 2018.

Kaufman, D.E., M.A.M. Friedrichs, W.O. Smith, **E.E. Hofmann, M.S. Dinniman**, and J.C.P. Hemmings, "Data assimilative biogeochemical modeling with glider observations: Examining future Ross Sea phytoplankton changes," Ocean Sciences Meeting, Portland, OR, February 2018.

Mack, S.L., M. Dinniman, J.M. Klinck, D.J. McGillicuddy, and L. Padman, "Resolving eddies in regional ocean models of Antarctic shelf seas," Ocean Sciences Meeting, Portland, OR, February 2018.

Moffat, C.F., **M.S. Dinniman, J.M. Klinck**, B. Aquiar-Gonzalez, D.A. Sutherland, and J.A. Graham, "Eddies, submarine troughs, and the heat budget of the West Antarctic Peninsular continental shelf," Ocean Sciences Meeting, Portland, OR, February 2018.

Oliver, H., **P. St-Laurent**, R.M. Sherrell and P.L. Yager, "What controls the massive phytoplankton bloom in the Amundsen Sea Polynya?" Ocean Sciences Meeting, Portland OR, Feb.11-16, 2018.

Salmon, E., **E.E. Hofmann, M.S. Dinniman** and W.O. Smith,

Jr., "Evaluation of Iron Sources and Sea Ice Variability in the Ross Sea and Implications for the Phytoplankton Seasonal Cycle," Poster, 4th International Symposium on The Effects of Climate Change on the World's Oceans, Washington, DC, June 2-8, 2018.

Sedwick, P., S.F. Ackely, **M.S. Dinniman**, B. Loose, C. O'Hara, B.M. Sohst, and S.E. Stammerjohn, "Observations of winter convective processes in the Ross Sea polynyas: Implications for the vertical resupply of dissolved iron," Ocean Sciences Meeting, Portland, OR, February 2018.

Sherrell, R.M., P.L. Yager, **P. St-Laurent, M.S. Dinniman**, S.E. Stammerjohn, M. Lagerstrom, and K.M. Harazin, "High iron in outflow waters from the Dotson Ice Shelf cavity, Amundsen Sea, West Antarctica: is glacial meltwater really the source?" Ocean Sciences Meeting, Portland, OR, February 2018.

Updyke, T. G., Roarty H. J., and **Larry P. Atkinson**, "Real-time Quality Control of High Frequency Radar Data", Ocean Sciences Conference; Portland, OR, February 11-16, 2018.

Wiggert, J.D., C. Pan, **M. Dinniman**, Y. Lau, P.J. Fitzpatrick, S.J. O'Brien, C. Bouchard, L.M. Quas, T.N. Miles, M.K. Cambazoglu, S.L. Dykstra, B. Dzwonkowski, G.A. Jacobs, I. Church, and **E.E. Hofmann**, "Controls on phytoplankton dynamics in the Mississippi Bight by estuarine-shelf exchange processes," Ocean Sciences Meeting, Portland, OR, February 2018.

CCPO & ODURC SEMINAR SERIES SCHEDULE



OLD DOMINION UNIVERSITY

Center for Coastal Physical Oceanography
and the Resilience Collaborative
presents the

Fall 2018 Seminar Series

Join us at the Innovation Research Park Conference Center or stream the seminars live via WebEx for presentations and discussions focused on aspects of our changing climate.

Innovation Research Park II
Conference Center
4211 Monarch Way | Norfolk, VA 23508

Sept. 10	Jonathan Goodall, University of Virginia
Sept. 17	Julia Moriarty, U.S. Geological Survey, Woods Hole Coastal & Marine Science Center
Sept. 24	Anamaria Bukvic, Virginia Tech
Oct. 1	Till Wagner, University of North Carolina Wilmington
Oct. 8	(No Seminar) Old Dominion University Fall Break
Oct. 15	Roger Sayre, U.S. Geological Survey, Washington, DC
Oct. 22	Teresa Updyke, Center for Coastal Physical Oceanography
Oct. 29	Burrell Montz, East Carolina University
Nov. 5	Ed Rappaport, NOAA National Hurricane Center
Nov. 12	Joshua Behr, Virginia Modeling, Analysis & Simulation Center Carol Considine, ODU Engineering & Technology
Nov. 19	Dan Barshis, ODU Biological Sciences



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