

Summer Sixteen

CCPO CIRCULATION

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Dr. Larry Atkinson
Slover Professor of Oceanography
ODU Resilience Collaborative

*Dr. Atkinson assisting Teresa Updyke with
an HF Radar Antenna installation.*

How Did I Get Here? The Answer: Sea-Level Rise

Dr. Larry Atkinson

CCPO's Circulation is one of the few places that we can publish something without the constraints of a scientific paper. What a relief! I thought I'd jot down some thoughts I'm having at this point in my career.

For students, here is a lesson for you. Fifty years ago I was a chemist measuring methane in the ocean...

I did not even remotely think that I would be studying sea-level rise and its effect on humanity. Many years ago I read somewhere that researchers should change their line of research about every decade. The thinking was that you've learned all you can using the skill set you have in a decade and it is time to move on. Quite often the "moving on" is because of funding opportunities or just plain chance but it sure leads down interesting paths.

So what about sea-level rise and science?

The coolest thing about the research that we are doing at CCPO on sea-level rise is that what we learn is immediately used by the users. And I mean immediately!

In 2013 Tal Ezer published his paper (2) showing that local sea-level rise was related to slowing of the Gulf Stream. Within just a few days that information was headline news and was recognized by the insurance industry. This doesn't happen very often in our career.

The Iconic Statement:

*"By 2040 Hampton Boulevard,
one of the main highways to
one of the largest Navy bases in
the world, will be flooded every
high tide."*

The Iconic Statement

That quote has been used by Governor McAuliffe, and Senators Kaine and Warner, to just name three. I came up with that statement because every day driving to ODU, I pass a low spot in Hampton Boulevard just south of the Hampton Boulevard bridge. When the street flooded, I noted

the height of water level at the nearby Sewells Point NOAA water level gauge. By knowing that level I could project into the future using the linear extrapolation and I found that by 2040, water would be flooding that street every high tide.

ODU's Role in Adapting to Sea- Level Rise

During the fall of 2010 I was called into President John R. Broderick's office where he asked me to "figure out what ODU can do" to help the region deal with sea-level rise and increased flooding. Prior to that, former President James Koch was leading an informal group of regional leaders who discussed the topic.

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OLD DOMINION UNIVERSITY

Center for Coastal Physical Oceanography

IDEA FUSION



John Klinck
Professor of Oceanography
Director, CCPO

Letter from the Director

This newsletter brings to mind career trajectories: how and why we started, where we went, and how we arrived where we are now. Larry provides a good retrospective on his choices through his science career. Some of us have similar abrupt turns of interest along the way, while others of us are still doing mostly what they did as postdocs. The clear message in Larry's article is that change of scientific interest is possible; its even advisable.

Stefanie is experiencing a different transition—from a student to a practicing scientist. Although her science focus as a postdoc is not so different from her PhD work, she is going to a different university working with different people. These sorts of shifts of location and focus can open new avenues which expand and divert our attention. Such changes can be very rewarding both personally and collectively.

The CCPO outreach programs illustrate an even more important transition for young students—whether to study technical subjects at all. To my mind, too many students opt out of science/math/technology and consider these subjects too hard, too confusing, not cool or not fun. We hope the student's interaction with CCPO's active scientists will encourage

students to remain interested in science or pursue science as a career. These efforts are like throwing seeds to the wind; we rarely see the results of these efforts but trust they are ultimately successful.

How Did I Get Here? The Answer: Sea-Level Rise, *cont'd.*

Now was the time to get the University more involved. Over the next few years we brought in speakers such as Adm. David Titley to get the community aware of the concern the Navy had. Liz Smith and I hosted numerous faculty networking events and spent many hours over coffee getting faculty aware of the issue. We called this initial effort the ODU Climate Change and Sea-Level Rise Initiative. Yes, CCSLRI is a lousy acronym but it worked. In 2012, we started Hampton Roads Sea-Level Rise Adaptation Forums to focus on the needs of regional planners, emergency managers and engineers.

These have been unbelievably successful under the leadership of Liz Smith originally and now Michelle Covi (OEAS/Virginia Sea Grant) and Ben McFarlane (Hampton Roads Regional Planning District Commission). With the arrival of Ray Toll in 2014, ODU really started to play a role providing a venue for intergovernmental coordination. Where else could the leading national elected leaders meet to discuss this? In the past two years, ODU, under the leadership of Ray Toll and Emily Steinhilber, have led the Intergovernmental Pilot Project that has brought leaders from all sectors of the region together to formulate plans for adaptation.

The past few years have been a great example of how a university can help a community deal with difficult challenges. At the same time our faculty and students get new experiences in the ways our science can actually be used.

The Iconic Plot

Using the same idea we noted the water level height at Sewells Point when flooding occurred at locations around the area like Hampton Boulevard at the nearby bridge over the Lafayette River (a tidal river). By knowing that height (say 4.3 feet above MLLW) we can calculate how many hours per year water level at Sewells Point was above that level. We have to assume that the water level at Sewells Point is the same as that in the Lafayette River, for example. Obviously, if you do this, you need to pick a water level station nearest the site of interest.

Summation

Ocean sciences is changing because it is again going to be of national and international importance. I say again because oceanography during my early career was funded by the importance of the Cold War with Russia. Now, instead of the Cold War, it is climate change. The changes

in the ocean, which the public hears very little about, will be recognized as critical to the future of earth's climate. Thus we must understand the oceans much better than we do now. Early career oceanographers hopefully will benefit from this the way my generation did. Good luck!

References:

Atkinson, L. P. and Francis A. Richards, The occurrence and distribution of methane in the marine environment. Deep-Sea Research, Vol. 14, pp. 673 to 684. 1967.

Ezer, T. L. P. Atkinson, W. B. Corlett and J. L. Blanco, Gulf Stream's induced sea level rise and variability along the U.S. mid-Atlantic coast, J. Geophys. Res., 118(2), 685-697, doi:10.1002/jgrc.20091, 2013.

Links of Interests:

www.youtube.com/watch?v=rIMkxolv4IQ

<http://vaseagrant.vims.edu/category/coastal-communities/hraf/>

Figure 1.

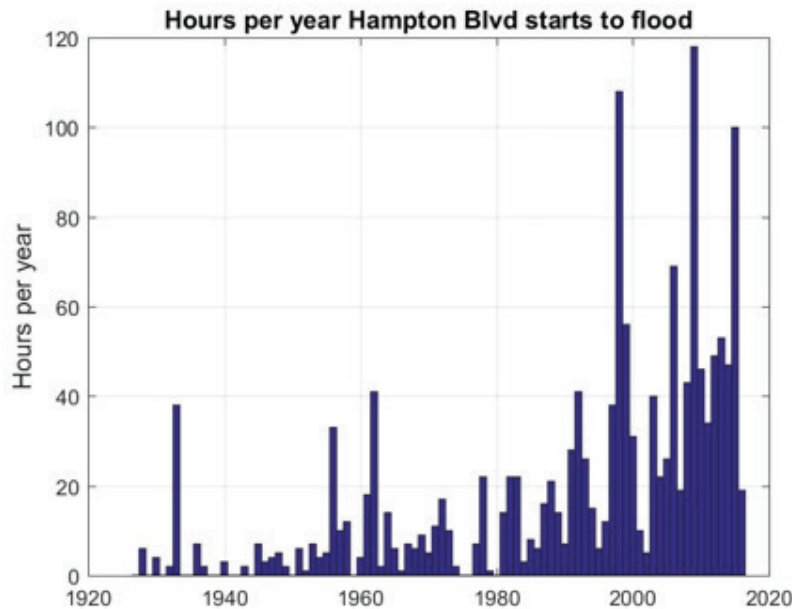


Figure 1 shows the number of hours Hampton Blvd. experienced flooding at the site. This plot shows what we all know: the streets are flooding more often. As sea level rises, it will eventually flood with every high tide.

Figure 2.

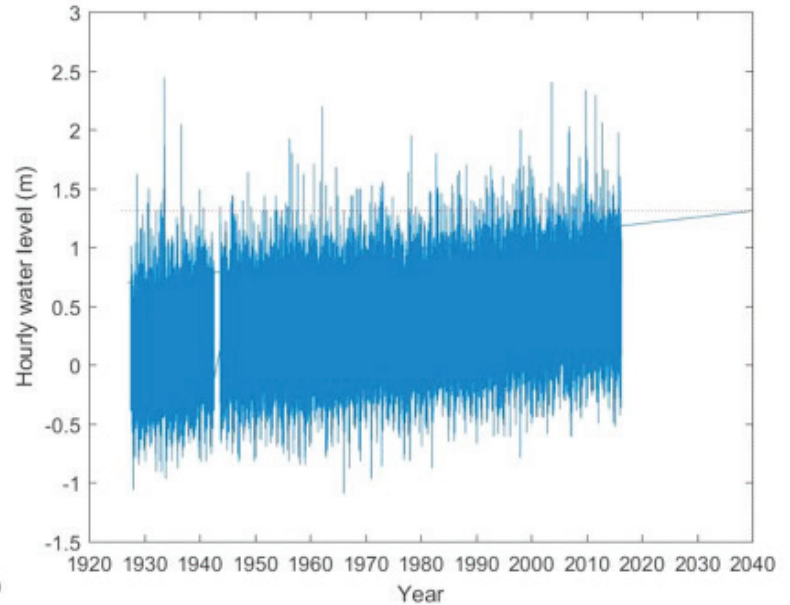


Figure 2 shows the hourly sea level at Sewells Point. I've drawn a line that approximates the high tides. Around 2040, every high tide will be at the height of the low spot in Hampton Blvd. The iconic statement was derived from this data.

ohjustswimmingly.com

Just Swimmingly: A Farewell

Stefanie Mack Presents: Tales of grad student life in oceanography. A mix of science and survival skills.

Dear CCPO, blog readers and followers,

Thank you so much for your support during my time at CCPO! I really enjoyed writing about my life as a graduate student and the interesting science I encountered. The blog is on a temporary hiatus while I complete my dissertation work. I will be defending my thesis, entitled "Influence of tides and mesoscale eddies in the Ross Sea" on June 10, 2016. By the time you read this, it might already be over, and I'll be well on my way to completing my PhD. If you didn't make it to my defense, not to worry; once I'm sufficiently recovered from the ordeal, I will include details about the defense and my last semester at CCPO in my blog.

Defending and graduating also means that I will be moving on from CCPO and Norfolk, Va. I've been offered and have informally accepted a postdoc position at the University of Washington. It's goodbye to the heat, sun, and hurricanes of Norfolk, and hello to the rainy days and mountains of the Northwest. I'll be continuing my Antarctic research, but focusing more on ice for the next few years. Once everything is official, I'll talk more specifically about what I'll be doing on - - you guessed it - the blog.

For now though, it's time for me to pack up my things and say goodbye to the people here at CCPO and ODU, as well as to the greater CCPO-connected community that has supported me throughout my time as a graduate student. Without all of you, my time here would not have gone as "just swimmingly" as it did. I am forever grateful.

See you on the other side of my PhD!

Stefanie Mack

Spring CCPO Outreach Education. Research. Outreach. **STEM4Girls 2016**

Sally Pattison-Cisna

Dr. Eileen Hofmann, CCPO professor of oceanography and **Teresa Updyke**, CCPO researcher, volunteered for the STEM4Girls event held at Tidewater Community College this spring. Read further to learn more about the annual event.

Event History & Purpose

AAUW National's motivation to begin STEM conferences for middle school girls was a growing national concern that our society tells girls and women that they don't belong in science, technology, engineering, and math (STEM) fields. As early as first grade, children have already developed a sense of gender identity, and most have developed unconscious bias associating boys with math. By seventh grade, many girls are ambivalent about these fields, and by the end of high school, fewer girls than boys plan to pursue STEM in college. AAUW National's website elaborates: aauw.org/what-we-do/stem-education/.

In 2014, AAUW National began to empower middle school girls' interest in STEM by initiating a grant program wherein branches could submit proposals for funds to hold middle school girls' STEM conferences in partnership with a local college/university. AAUW Virginia Beach submitted a proposal in 2014 and was one of 10 branches nationwide to be awarded a grant

to hold its first Tech Savvy Conference for middle school girls and their parents or other significant adult. Our college co-sponsor has been Tidewater Community College Virginia Beach. We held another Tech Savvy conference in 2015.

Tech Savvy Conferences were grounded in STEM workshops with a hands-on activity as the heart of the session. Adult workshops concentrated on awareness of STEM importance for their girls as well as guidance about college financing and parenting middle school girls. In 2016 AAUW Virginia Beach decided to use our own funds to hold a STEM4Girls Middle School Conference and therefore had full creative control.

In 2016, we made a few changes. We continued to keep our workshops led, not primarily by STEM teachers, but by women scientists working in STEM careers in our local area. These women scientists created hands-on workshops to illustrate their STEM career paths to middle school girls. Most of our presenters have held workshops in all three of our conferences.

A presenter who held workshops since 2014 and was a keynote speaker this year said our conferences have improved each year! What changed in 2016 is that the adults also had the same workshops in response to their preferences in our 2015 post-event surveys. We learn a bit more every year. Our repeating presenters and the enthusiasm of all show that they think they are making a difference and they appreciate the chance to impact these girls' lives.

STEM4Girls '16 Event Reviews

Anecdotes & Positive Feedback

"I want to do this every month!"

"I think STEM-4Girls is a great experience to learn more about science. I came last year, too."

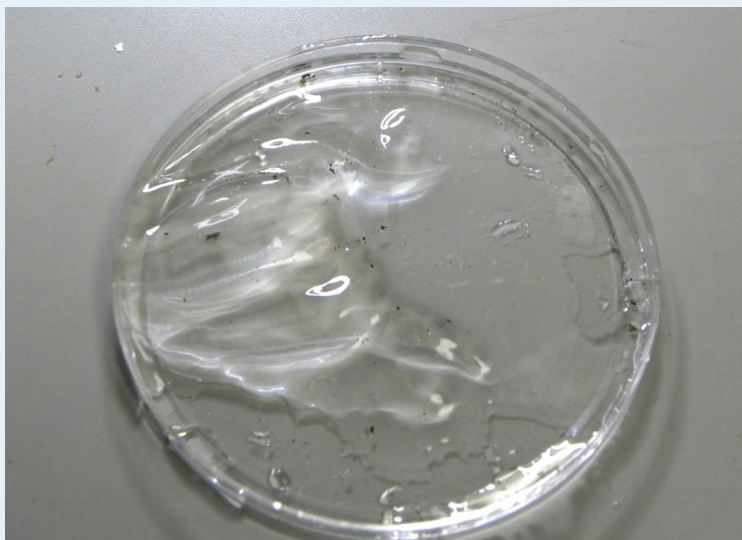
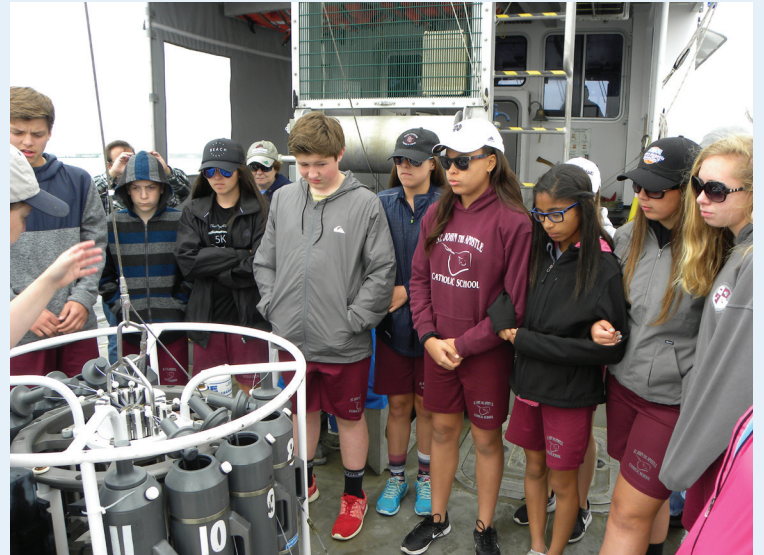
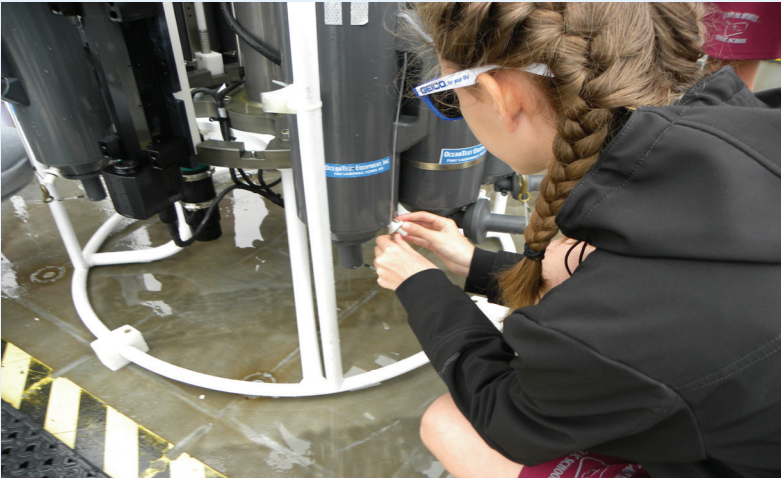
"I want to be a marine biologist. I LOVE marine life!"

"It was fun and helped me learn about different things that could help me in life."

To learn more about STEM4Girls, visit: <http://virginiabeach-va.aauwnet/>.

Spring CCPO Outreach Education. Research. Outreach.

St. John the Apostle School
8th Grade Slover Trip on May 4, 2016



Clockwise from bottom left: Eighth grade students from St. John the Apostle School learning about bottom sediments from benthic sample; A view of ctenophore and other plankton from a net tow to view under a microscope; a student sets a Niskin bottle; Dr. Eileen Hofmann, professor and cruise instructor, showing the students the CTD; the educational outreach activities setup for students to explore.

JUST THE FACTS

Publications

Bidegain, G., E.N. Powell, **J.M. Klinck**, T. Ben-Horin, **E.E. Hofmann**, Marine infectious disease dynamics and outbreak thresholds: pandemic infection and the potential role of filter feeders, *Ecosphere*, 328, 44-61, 2016.

Bidegain, G., E.N. Powell, **J.M. Klinck**, T. Ben-Horin, **E.E. Hofmann**, Microparasitic disease dynamics in benthic suspension feeders: infective dose, non-focal hosts, and particle diffusion, *Ecological Modeling*, <http://dx.doi.org/10.1002/ecs2.1286>, 2016.

Ezer, T., Can the Gulf Stream induce coherent short-term fluctuations in sea level along the U.S. East Coast?: A modeling study, *Ocean Dynamics*, 66(2), 207-220, doi:10.1007/s10236-016-0928-0, 2016.

Ezer, T., Revisiting the problem of the Gulf Stream separation: on the representation of topography in ocean models with different types of vertical grids, *Ocean Modelling*, doi:10.1016/j.ocemod.2016.05.008, 2016.

Ezer, T. and **L. Atkinson**, Sea level rise in Virginia- causes, effects and response. *Virginia Journal of Science*, Virginia Academy of Science Publ., In Press, 2016.

Ezer, T., I. D. Haigh and P. L. Woodworth, Nonlinear sea-level trends and long-term variability on western European coasts, *Journal of Coastal Research*, doi:10.2112/JCOASTRES-D-15-00165.1, In Press, 2016.

Hofmann, E.E., A. Bundy, K. Drinkwater, A.R. Piola, B. Avril, C. Robinson, E. Murphy, L. Maddison, E. Svendsen, J. Hall, Y. Xu, IMBER – Research for marine sustainability: Synthesis and the way forward, *Anthropocene*, doi:10.1016/j.ancene.2015.12.002, 2016.

Lafferty, K., **E. Hofmann**, Guest Editors, Marine Disease, *Philosophical Transactions of the Royal Society B*, 371(1689), 2016.

Lafferty, K.D., **E.E. Hofmann**, Marine disease impacts, diagnosis, forecasting, management and policy, *Philosophical Transactions of the Royal Society B*, 20150200, doi: [10.1098/rstb.2015.0200](http://dx.doi.org/10.1098/rstb.2015.0200), 2016.

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Plag, H.-P., Knowledge Must Translate into Action - "They had all the Knowledge ..." Column 12 in "On The Edge." *ApoGeo*, 31(2), 8-10, Spring 2016.

Presentations

Davis, L., E. Hofmann, J. Klinck, M. Dinniman, and M. Pinoñes, "Comparison of *Euphausia superba*, *Euphausia crystallorophias*, *Pleuragramma antarcticum* and Environmental Distributions in the Western Ross Sea," Ocean Sciences Meeting, New Orleans, LA, February 2016.

Dinniman, M., J. Klinck, L. Padman, "Modeling transport of ice shelf basal meltwater around Antarctica," Climate and Cryosphere's Rising Seas on a Warming Earth II Workshop, Abu Dhabi, May 2016.

Dinniman, M.S., J. Klinck, L. Padman, "Transport of ice shelf basal meltwater around Antarctica," Ocean Sciences Meeting, New Orleans, LA February 2016.

Ezer, T., "Gulf Stream's induced variations in coastal sea level: Can the same mechanism work from daily to decadal time-scales?," Ocean Sciences Meeting, New Orleans, LA, February 26, 2016.

Ezer, T., "Sea level rise and variability along the U.S. east coast and the impact from the Gulf Stream and AMOC," George Mason University, Fairfax, VA, January 21, 2016.

Ezer, T., "Sea level rise for the Chesapeake Bay area: causes, trends and future projections. Workshop on the development of climate projections for use in Chesapeake Bay program assessments", The Scientific and Technical Advisory Committee (STAC), Annapolis, MD, March 7, 2016.

Haluska, J., Wreck Island, Virginia shoreline changes since 1999," 2016 Virginia Academy of Science Meeting at University of Mary Washington, Fredericksburg, VA, May 19, 2016.

Hofmann, E.E., "Modeling Southern Ocean Food Webs - Approaches and Challenges," keynote plenary presentation, ICES/PICES 6th Zooplankton Symposium, Bergen, Norway, May 9-13, 2016.

Hofmann, E.E., E. Svendsen, L. Maddison, A. Bundy, R. Chuenpagdee, "Marine and Human Systems: Addressing Multiple Scales and Multiple Stressors," Oral presentation, Ocean Sciences Meeting, New Orleans, LA, February 22-26, 2016.

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Klinck, J., G Bidigain, E. Powell, T. Ben-Horin, **E. Hofmann**, "Disease transmission by free-drifting infectious particles in sessile filter feeders: a theoretical and model analysis," Ocean Sciences Meeting, New Orleans, LA, February 25, 2016.

Li, Y., D.J. McGillicuddy, Jr., **M. Dinniman, J.M. Klinck**, "Processes regulating formation of low-salinity, high-bio-mass lenses along the edge of the Ross Ice Shelf," Ocean Sciences Meeting, New Orleans, February, 2016.

Mack, S., M. Dinniman, J. Klinck, P. Sedwick, D. McGillicuddy, "Iron transport pathways in the Ross Sea: Physical processes affecting the supply of dFe in a regional ocean model," Ocean Sciences Meeting, New Orleans, LA, February 2016.

McGillicuddy, D., P. Sedwick, **M. Dinniman**, K. Arrigo, T. Bibby, B. Greenan, **E. Hofmann, J. Klinck**, W. Smith, **S. Mack**, C. Marsay, B. Sohst, G. vanDijken, "Iron Supply and Demand in an Antarctic Shelf Ecosystem," Ocean Sciences Meeting, New Orleans, February 2016.

Mu, L., P. Yager, **P. St-Laurent, M. Dinniman**, H. Oliver, S. Stammerjohn, R. Sherrell and **E. Hofmann**, "Investigating the Role of Mesoscale Processes and Ice Dynamics in Carbon and Iron Fluxes in a Changing Amundsen Sea (INSPIRE)," Ocean Sciences Meeting, New Orleans, LA, February 2016.

Plag, H.-P., "Adapting the urban coast to climate change and sea level rise," Contribution to the panel discussion on "The Cities of the Future" VHB Stockholder Meeting, Boston, MA, April 12, 2016.

Plag, H.-P., "Climate change: Understanding the causes, having foresight and developing a therapy," Invited lecture, Great Decisions Seminar, Virginia Beach, VA, February 27, 2016.

Plag, H.-P., "Global and Climate Change and Sea-Level Rise: Understanding and Meeting the Challenge

from Local to Global Levels," Opening Keynote, 2016 Education Seminar of the Virginia Water Environment Association, Richmond, VA, May 11-12, 2016.

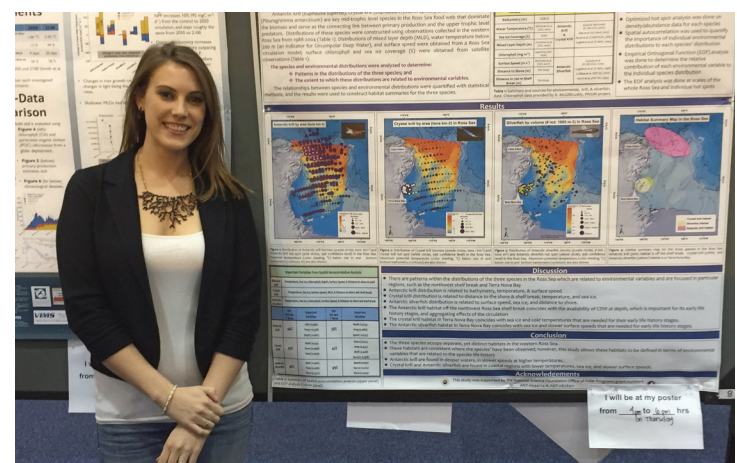
Plag, H.-P., "Living in the coastal zone in times of sea-level rise: How can we prepare the built environment?" Keynote lecture, Annual Meeting of the Construction Specification Institute, Virginia Beach, VA, February 9, 2016.

Plag, H.-P., "Opening Remarks on Global Change and Risks," Annual ODU Model UN Conference, Norfolk, VA, February 12, 2016.

St-Laurent, P., M.S. Dinniman, E.E. Hofmann, R. Sherrell, S. Stammerjohn, P. Yager, E. Randall-Goodwin, "Transport pathways of nutrients in the Amundsen Sea, Antarctic," Ocean Sciences Meeting, New Orleans LA, February 25, 2016.

Updyke, T. G., Dusek G., **Larry P. Atkinson**, "High Frequency Radar Observations of Tidal Current Variability in the Lower Chesapeake Bay," Ocean Sciences Meeting, New Orleans, LA, February 2016.

Updyke, T. G., Larry P. Atkinson, "Extreme and Non-Tidal Events in the Chesapeake Bay High Frequency Radar Surface Currents Record," MTS/IEEE Oceans Conference, National Harbor, MD, October 2015.



***Pictured Above: Brynn Davis**, masters student gave her poster presentation titled, "Antarctic Krill, Crystal Krill and Antarctic Silverfish distributions in the Ross Sea" at the Antarctic poster session during the 2016 Ocean Sciences meeting. **Pictured to the left: PhD candidate, Stefanie Mack** gave her oral presentation, "Iron transport pathways in the Ross Sea" also at the 2016 Ocean Sciences meeting.*



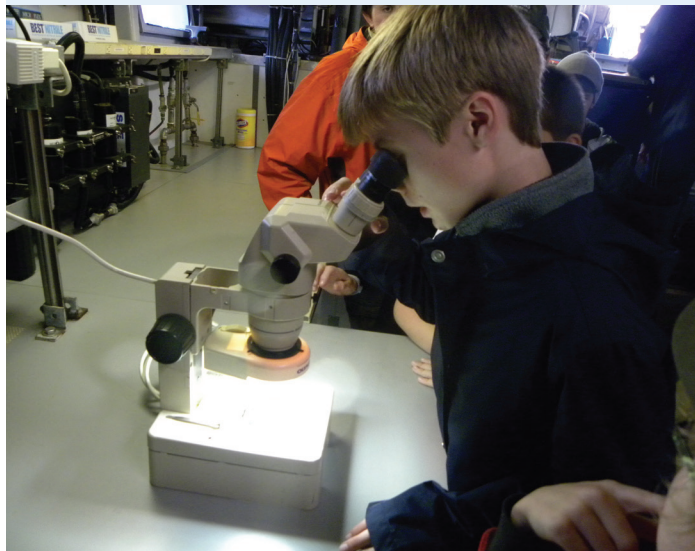
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Boy Scout Merit Badge
Slover Trip on May 21, 2016



Clockwise from upper left: Boy Scout Oceanography badge participant viewing plankton from net tow; R/V Fay Slover at dock; CCPO faculty, Dr. E. Hofmann and Dr. J. Klinck, setting up plankton tow for the oceanography merit badge requirement.