

OFFSHORE WIND ACTIVITIES AT CCPO as Turbines Rise off the Virginia Coast in 2020

By George Hagerman, Senior Project Scientist

CCPO has been engaged in offshore wind research since 2007, when ODU collaborated with Virginia Tech, James Madison University, Virginia Institute of Marine Science, and Norfolk State to produce Virginia's first study of offshore wind as a renewable ocean energy source. CCPO researchers, **Larry Atkinson**, Jose Blanco, and **Teresa Updyke** participated in those early studies.

Renewed interest in offshore wind energy has placed ODU and CCPO at the center of activities for installation and commissioning in 2020 of the Coastal Virginia Offshore Wind (CVOW) demonstration project 23 nautical miles off Virginia Beach. Two wind turbines will be placed in a research lease held by the Virginia Department of Mines, Minerals and Energy (DMME). Dominion Energy, the DMME-designated operator on the lease, is authorized to operate these two CVOW turbines for 25 years. This will be the first and still only renewable energy research lease in US federal waters on the outer continental shelf.

George Hagerman is the leader of this activity at CCPO, affording us an opportunity to collaborate with researchers inside and outside the University on a variety of ocean observing activities and innovative technology development projects. CCPO can help facilitate economic opportunity and wealth creation in an emerging high-tech industry that when built throughout the Mid-Atlantic region will address a root cause of climate change—CO₂ emissions associated with fossil fuel burning for electric power generation.

George coordinates proposal development with ODU faculty, connecting academic, government, and commercial partners to ensure that research and education are relevant to industry needs while meeting government requirements. This effort is supported by two new CCPO staff, offshore wind data analyst, **Austin Connito**, and offshore wind program specialist, **Rema McManus**.

Austin received his B.S. in Ocean, Earth and Atmospheric Sciences from ODU in May 2018. He worked at CCPO producing flood maps for the Virginia Sea Grant and provided support for the Surface Current Mapping project led by Teresa (www.ccpo.edu/currentmapping). Austin now acquires and deploys instruments to measure meteorological and oceanographic

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OLD DOMINION
UNIVERSITY

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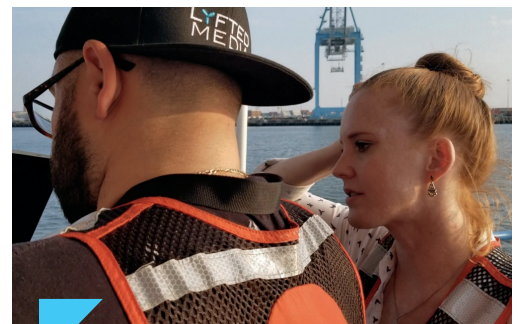


Figure 1. Rema McManus reviews footage of Portsmouth Marine Terminal with Francesco Cordaro, an aerial drone cinematographer with Lyfted Media. (Photo: Aaron Brittain, A.P. Brittain)

OFFSHORE | Cont.

conditions in the lease area. He assures quality and archiving of all measurements. Historical hindcasts and reanalysis datasets characterize meteorological and oceanographic conditions in and around the lease. Austin produces wind and wave climatologies to support planning of projects associated with the lease. He will evaluate new commercial forecast products by comparing them to existing and new wind and wave observations.

Rema has a background in graphic design and computer applications. She is using these skills with the help of local creative talent to produce a video for DMME, describing the unique advantages of Hampton Roads as an offshore wind supply chain hub (Figure 1). Rema is the contact for outreach and media dissemination of CCPO offshore wind research results. She designs, develops and markets digital and printed offshore wind outreach materials including videos, websites, and social media.

Rema, Austin, and George envision an ODU-enabled innovation corridor for offshore wind, where new products and services can be tested to reduce costs and mitigate marine environmental impact. This team at CCPO created Virginia's largest-ever presence at the annual Offshore WINDPOWER Conference and Exhibition of the American Wind Energy Association (AWEA), held in Boston in October 2019. Funding and in-kind support was provided by groups identified in Figure 2. This conference allowed US- and Europe-based offshore wind energy companies to compare experiences and establish business connections. Industry and federal agency representatives discussed graduate and professional education opportunities at ODU.

Austin and George presented a poster **"Developing a Wind and Wave Climatology for Virginia's Renewable Energy Research Lease"** (Figure 3). The poster included a Spotter buoy for measuring waves and surface winds; three will be deployed off Virginia. More accurate predictions of wind and wave conditions on the lease will come from models that assimilate these data. These forecasts will help with the operation of crew transport vessels which will travel between the shore and the CVOW turbines.



Figure 2. CCPO planned and executed Virginia's largest ever presence at AWEA's annual Offshore WINDPOWER conference, held this year in Boston. Logos on the banner represent supporters of the Virginia booth at the meeting. (Photo: Ivy Main, Sierra Club Virginia Chapter)

A Memorandum of Understanding, signed in April 2019, established priorities for ODU to support DMME offshore wind activities. DMME awarded CCPO a 30-month research contract to integrate Virginia's research lease activities into a National Ocean Test Bed for offshore wind. This includes a Web portal for historical data and current forecasts and observations to support offshore access to the research lease. Activities also include shoreside support and safety training for researchers, as well as outreach and public education about research lease activities.

Additional tasks accelerate Virginia's participation in the US East Coast offshore wind supply chain, including workforce development through higher education and technical training. ODU will help to identify additional lease areas to expand commercial wind energy generation.

Dominion Energy began construction of the CVOW demonstration project in July 2019 by directionally drilling for the underground conduit for the submarine power cable to be drawn next summer, enabling electrical connection across the shore at Camp Pendleton in Virginia Beach. This conduit involves no trenching or other surface disturbance to environmentally sensitive dunes and wetlands. In September 2019, Dominion Energy announced plans to build a 2,600-megawatt project on its commercial lease off Virginia—the largest single U.S. offshore wind farm announced to date. It would have more than 200 wind turbines installed over a three-year period, being complete by the end of 2026. Dominion estimates that their commercial project will power 650,000 homes. That is more than all of the homes throughout the Hampton Roads region, including Gloucester and Matthews Counties. There is power to spare for Blacksburg, Charlottesville, and Harrisonburg, a few of our rival college towns!

Dominion will leverage experience from the permitting, design, and development of the CVOW demonstration project to the similar process for commercial offshore wind development. Future projects will consider optimized turbine layout to fit the offshore directional wind rose, wake steering to improve the output of the entire array, and the use of suction-bucket jacket foundations to minimize noise disturbances associated with installation of driven-pile support structures.

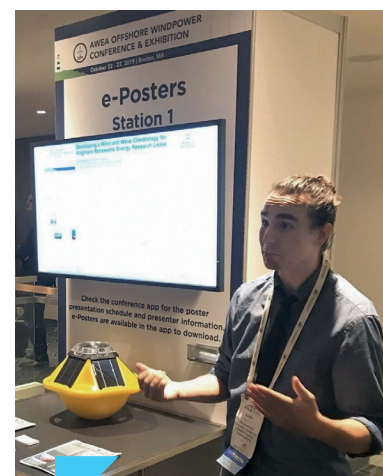


Figure 3. Austin Connito explains our poster, "Developing a Wind and Wave Climatology for Virginia's Renewable Energy Research Lease." A spotter buoy for measuring waves and surface winds is on the table. (Photo: Jennifer Palestrant, DMME)

ADVANCING NUMERICAL OCEAN MODELING CAPACITY

By Eileen Hofmann and Andrea Piñones

CCPO has been actively involved in an initiative to expand numerical ocean modeling capacity. This effort by **Eileen Hofmann** and **John Klinck** is in collaboration with CCPO alumni, Dr. Andrea Piñones (Universidad Austral de Chile) and Dr. Diego Narváez (Universidad de Concepción), as well as other colleagues. CCPO researchers collaborated with colleagues from the Institute of Marine and Limnological Sciences and the Center of Excellence, Dynamics of High Latitude Marine Ecosystems (in Spanish: Centro de Investigación: Dinámica de Ecosistemas marinos de Altas Latitudes or IDEAL) at Universidad Austral de Chile in Valdivia, Chile, the Research Center for the Oceanography of the Southeastern Pacific—COPAS Sur Austral, Universidad de Concepción, Chile, and the U.S. EPA Chesapeake Bay Program, Chesapeake Research Consortium to organize an Austral Winter Institute (AWI). The AWI, held at Universidad Austral de Chile from July 22 to August 9, 2019, was focused on the theme, “Approaches and Tools for Numerical Modeling of High Latitude Ecosystems.” The 2019 AWI is a continuation of numerical ocean modeling training that began as part of the 2018 Austral Summer Institute (ASI) held at the Universidad de Concepción. Support for participation in the 2019 AWI by U.S.-based researchers was provided by the National Science Foundation.

The 2019 AWI was organized around three one-week courses that consisted of overview lectures and hands-on training modules. The lectures introduced general concepts, with specific applications for high latitude marine ecosystems. The hands-on training modules provided opportunities to implement computer codes that illustrated numerical modeling applications. The course participants also worked in groups to develop research projects that used information from the courses.

End-to-end marine food webs, taught by Dr. Ricardo Giesecke (Universidad Austral de Chile), Dr. Sergio Neira (Universidad de Concepción) and Dr. Héctor Pavés (Universidad Santo Tomas Osorno), introduced basic concepts and modeling procedures for the analysis of aquatic ecosystems using the Ecopath with Ecosim (EwE) food web modeling approach. Course participants gained experience with basic end-to-end food web models and implementation of EwE software to quantify food web structure, trophic relationships, and energy and carbon flows.

The focus on food webs continued in the week 2 course on connectivity, sustainability and ecology of marine



Participants in the 2019 Austral Winter Institute course on biogeochemical modeling and data assimilation. (Photos: Lorenzo Palma Morales, IDEAL Center, Universidad Austral de Chile)

planktonic populations taught by Andrea, Diego, Eileen, and John. A range of concepts, modeling approaches, and applications for individual species were introduced and then reinforced with implementation of numerical models that ranged from size and stage-structured zooplankton models to individual-based models for Antarctic krill and Adélie penguins to bioenergetic models for larvae.

Biogeochemical modeling with data assimilation was the topic of the third week. Dr. Danny Kaufman (Chesapeake Research Consortium) did a masterful job of making biogeochemical modeling, model skill assessment techniques, and data assimilation methods understandable and accessible. Course participants started with simple biogeochemical models and by the end of the week had progressed to implementing genetic algorithms for data assimilation.

The group projects provided feedback from the participants about their view of what was learned from the courses. One common theme was that the groups extended the concepts and modeling tools beyond what was included in lectures to address a range of questions for Sub-Antarctic, Antarctic, and coastal ecosystems. The longer-term view is that these projects will provide the start of collaborative research programs that will continue the development of numerical ocean modeling capacity.

Planning is underway for a 2020 AWI and for the 2021 ASI. Information for participating in the 2020 AWI will be forthcoming in March 2020 and information for the 2021 ASI will be provided later this year. National Science Foundation support is available for U.S.-based researchers to participate in the AWI and ASI.

CCPO Alumni Spotlight

MARJY FRIEDRICHS, PH.D. '99

It has been 20 years since my Ph.D. defense at CCPO in December 1999. In some ways it seems like just yesterday; in other ways it seems like ages ago. I first visited CCPO as a prospective graduate student back in 1992. I had recently completed my M.S. from the MIT-WHOI joint program, where my husband, Carl, was finishing his Ph.D. Carl was ultimately offered a visiting professor position at the Virginia Institute of Marine Science (VIMS), and I was thrilled to simultaneously accept a Ph.D. graduate



The Friedrichs family: Elizabeth, Drew, Marjy, Carl and Will

research position at CCPO to work with Dr. Eileen Hofmann on marine ecosystem modeling and satellite ocean color data analysis. My M.S. in physical oceanography focused on North Atlantic meridional overturning and associated heat and freshwater transport. Severe seasickness on a single month-long cruise in the tropical Atlantic had convinced me to search for another focus for my Ph.D. research, and I was excited with the idea of working with Eileen on numerical modeling and satellite data from a land-based office!

After a year deferral to accommodate a maternity leave, I entered the Ph.D. program at CCPO in August 1994. This coincidentally and conveniently coincided with the opening of ODU's Child Development Center where our son, Drew, was immediately enrolled. I will eternally be grateful for the flexibility and acceptance that my professors at ODU showed to me, as I tried to navigate graduate school as a new mother, commuting down from Yorktown. Before our second son, Will, was born, we moved to Norfolk where we lived only blocks from the old CCPO campus on 52nd Street. What fond memories I have of all the Halloween and Easter parties there with the kids!

In all, I spent 12 years at CCPO, initially as a graduate student, then as a post-doc, and finally as an independent SSRP. Immediately after graduation I was very fortunate

that Eileen was able to take me on as a post-doctoral investigator. At the time, Carl was well established at VIMS and not yet overwhelmed by the commute to Gloucester Point, and our sons were enjoying the ODU Child Development Center (Will) and Larchmont Elementary School (Drew), so we were not inclined to leave the area. The post-doc position with Eileen allowed me time to finish publishing my dissertation chapters, as well as begin to work on submitting my own independent research proposals. After a couple of successes on that front, I transitioned into an SSRP position at CCPO. Being on 100% soft money was a challenge of course, but at the time, the flexibility that type of position offered me was much appreciated. During those years our daughter, Elizabeth, joined the family and followed in her brothers' footsteps at the Child Development Center.

Although CCPO had treated me exceptionally well, ultimately the commute between Gloucester Point and Norfolk became too much for the family to handle, and I accepted a research professor position at VIMS. I was more than a little sad to leave CCPO in 2006, but it was also a time of change as CCPO was transitioning from 52nd Street to the new location on Monarch Way. For several years I continued to work

part-time at CCPO, but I eventually transitioned to full-time at VIMS. With 50% hard money funding available at VIMS, I was quickly able to begin hiring post-docs and graduate students and expand my research group, which now includes four Ph.D. students and one M.S. student, as well as Research Scientist Pierre St Laurent (former CCPO post-doc).

My work at VIMS has gradually evolved to become more coastal in focus, with much of my research now focused on Chesapeake Bay hypoxia, acidification, and climate change impacts. I spent nine years on the Science and Technical Advisory Committee for the Chesapeake Bay Program and continue to be heavily involved in their Modeling Workgroup activities. Developing a Chesapeake Bay Ecological Forecast System for the Bay (www.vims.edu/hypoxia) and working with stakeholders, including oyster aquaculturists, fishermen, and charter boat captains, has been a new challenge for me. I am also happy to be able to continue to interact with so many of my colleagues at CCPO through my position as editor of *JGR-Oceans*, steering committee member of the Chesapeake Community Modeling Program (CCMP), Chair of the Ocean Carbon and Biogeochemistry Program (OCB) Scientific Steering Committee, and AGU Chair of the 2020 Ocean Sciences meeting. I hope to see many of you in San Diego for OS2020 in February!

New Staff Profile

RHIANNON BEZORE



Rhiannon Bezore has been the acting Coastal Resilience Outreach Coordinator for Virginia Sea Grant, based within CCPO, since August 2019. Rhiannon works on climate change and coastal resilience issues with Virginia Sea Grant, bridging the gap between researchers and communities across coastal Virginia. She works with MARACOOS as well, sharing coastal ocean monitoring data and tools with local stakeholders. Rhiannon has been working as part of The RAFT (Resilience Adaptation Feasibility Tool), an initiative to assess the resiliency of coastal Virginia localities in the face of climate change and sea level rise impacts. She has also been involved in The Blue Line Project, started by Tom Allen from ODU's Department of Political Science and Geography. This project uses satellite imagery, drone data, LiDAR elevation data, and the best available sea level rise projections to map future high tide lines for the years 2050, 2080, and 2100 in already flood-prone areas across Norfolk.

Rhiannon is originally from Santa Cruz, California, where she grew up surfing and spending time at the beach. It was there that she realized she wanted to study how coasts change over time in relation to changes in sea level, and that she wanted to have a career that allowed her to keep spending time at the beach! She went on to earn her bachelor's degree in Earth Science and Environmental Sciences and later her master's degree in Earth Sciences at the University of California, Santa Cruz. Her master's thesis focused on creating dynamic sea level rise models using tidal data, offshore bathymetry, wave setup and runup, and

sea level rise projections and then mapping future inundation on the island of Kauai, Hawaii. During this time, Rhiannon also worked as a Sea Grant Fellow with Hawaii Sea Grant and the Kauai Planning Department, creating a GIS database of coastal protection structures around the island.

After finishing her master's degree, Rhiannon moved to Victoria, Australia for work on her Ph.D. in Physical Geography at The University of Melbourne. Her thesis focused on the geomorphology of the modern rocky coast of Victoria using LiDAR elevation data, as well as the geomorphology of paleo-shoreline features she discovered 60 m below present sea level using multi-beam sonar bathymetric data. This 60,000-year old, paleo-shoreline included features also found along the modern coast, such as sea cliffs, shore platforms, and sea stacks, which had previously been thought not to exist beneath sea level. Her thesis aimed to quantify the morphological characteristics of both sets of rocky landforms and to use the measurements to provide constraints to the relative sea level curve for Victoria during the Quaternary.

While in Australia, Rhiannon married her husband, Peter, and adopted two dogs, all of whom have joined her here in Norfolk, along with her mother and their three family dogs. When Rhiannon is not working, she is most likely at the beach or hiking with her dogs and family.

Letter from the Director



The rising level of carbon dioxide in the atmosphere and its effect on the global heat budget is a common topic of many media stories. A part of the carbon release is due to burning of fossil fuels to generate electricity. It is exciting to see the development of solar farms and wind turbines in the mountains and coastal areas of Virginia and North Carolina that reduce this release. It will be even more exciting to see offshore arrays of wind turbines on the shallow continental shelf of the Middle Atlantic Bight.

CCPO is playing its part in analyzing the various issues associated with the development of these turbines. We can use our expertise in analyzing environmental conditions to help inform the developers of these arrays of the effects of these turbines on the marine and atmospheric environments. We can also help in the analysis of the impacts of the environment on the offshore structures. These might range from forecasting the frequency of strong wind events (tropical cyclones and northeasters) to estimating the impacts of surface waves on the turbine support structures.

The folks at CCPO have skills in locating and analyzing these observations and forecasts. We are learning about the need of various groups for environmental information. We can apply these skills to the research needed by the various companies. We can also train students in these skills to be a source of employees for companies. We look forward to contributing to this important commercial activity.

— Dr. John Klinck, Director of CCPO & Professor of Oceanography

BRETT BUZZANGA'S SUMMER INTERNSHIP



By Brett Buzzanga

I spent this past summer working at the NASA Jet Propulsion Laboratory (JPL) in southern California. It was an extremely rewarding experience, both emotionally and practically. There is a palpable energy on the campus, undoubtedly stemming from the highly demanding, highly rewarding nature of the work being done. Having only experienced the relative independence of academia, it was valuable to experience the deep vertical supervisory structure, which ensures that even the smallest tasks fit into NASA's larger, long-term goals. However, such an overarching vision does not mean creative approaches are not taken to reach it. A notable example is The Studio at JPL, which is essentially a team of artists who contribute to everything from engineering design to landscaping. I particularly enjoyed the “Visions of the Future”¹ posters, which are a series of mock retro travel ads for celestial bodies created simply to decorate a bare hallway (Fig. 1).



Figure 1. Mock travel advertisement for Enceladus, part of the “Visions of the Future” poster series created by The Studio at JPL. Courtesy NASA/JPL-Caltech.

Maybe the best thing about working at JPL is the inevitability of getting swept up in the excitement of space exploration. My favorite is the search for life on Enceladus, a moon of Saturn covered in several kilometers of ice, rife with geyser-like jets spewing, among other things, hydrocarbons. The ocean under the ice combined with these hydrocarbons probably make Enceladus the best chance at finding life in the solar system, which is why JPL is building the Exobiology Extant Life Surveyor (EELS). Quite literally, it is a robotic eel that can wiggle down through the fissures in the ice until it can prowl through the ocean looking for life. They'll be testing it around Antarctica in the next few years, which may be of interest to some at CCPO.

During this time, I did do some actual work and was able to make significant progress in the use of InSAR to measure subsidence in Hampton Roads. InSAR—the technique of differencing two Synthetic Aperture Radar images to calculate surface displacement—is still young. Only with the launch of Sentinel-1 in 2014 have we had access to the regular (every 12 days), good quality data necessary for time-series analysis, which is needed to reduce the noise such that the millimeter-scale vertical displacement signal can be observed. However, the existing InSAR processing tools are not capable of dealing with this high volume of data, so JPL has developed an automated system² to create a standard InSAR product. The next step has been to create tools for accessing, manipulating, and preparing these products for time-series processing³. In addition to contributing to the development of these tools, I successfully (with substantial help from Dr. David Bekaert and his team) applied them for the first time in a time-series approach

to measuring subsidence in Hampton Roads.⁴

We are now applying this methodology to larger areas, with the eventual goal of mapping subsidence along the entire Atlantic coast. I expect to go back to JPL this coming summer and extend this work by contributing to a finer spatial resolution product capable of estimating subsidence at tide gauges. This will complement the work I am doing with Dr. Ben Hamlington to investigate the effects of North Atlantic interannual weather patterns on coastal flooding, which relies on the quality of the tide gauge measurements.

1. <https://www.jpl.nasa.gov/visions-of-the-future/>
2. <https://aria.jpl.nasa.gov/>
3. <https://github.com/aria-tools/ARIA-tools>
4. Buzzanga, B.A., D.P.S. Bekaert, B.D. Hamlington, and S. Sanga. (in review). Towards Sustained Monitoring of Subsidence at the Coast using InSAR and GNSS: An Application in Hampton Roads, Virginia, *Remote Sensing of Environment*.

JUST THE FACTS

Appointments

Larry Atkinson was Chair of the NSF Ocean Observatories Initiative Facilities Board until November 2019, when he became a Past Chair.

Presentations

Buzzanga, B.A., D.P.S. Bekaert, B.D. Hamlington, and S.S. Sanga. Towards a cost-effective approach for vertical land motion mapping integrating InSAR and GNSS: An application in Hampton Roads, Virginia. American Geophysical Union Fall Meeting, San Francisco, CA, December 10, 2019.

Cambazoglu, M.K., S. O'Brien, J. Wiggert, **M.S. Dinniman**, and T.N. Miles. Seasonal sediment transport in estuarine waters of Mississippi Sound and shelf waters of Mississippi Bight. 25th Biennial Coastal and Estuarine Research Foundation Conference, November 3-7, 2019.

Davis Pecher, B., **E.E. Hofmann**, **J. Klinck**, M. Mulholland, E. Perez Vega, M. Echevarria, I. Flefel, A. Macias Tapia, and K.C. Filipino. Understanding Environmental Controls on *Margalefidinium polykrikoides* blooms in the lower Chesapeake Bay. 25th Biennial Coastal and Estuarine Research Foundation Conference, Mobile, AL, November 3-7, 2019.

Dinniman, M.S., C. Bouchard, M.K. Cambazoglu, and J. Wiggert. The impact of diurnal winds on exchange through barrier island passes into the Mississippi Sound. 25th Biennial Coastal and Estuarine Research Foundation Conference, November 3-7, 2019.

Dinniman, M.S., **P. St-Laurent**, K.R. Arrigo, **E.E. Hofmann**, and G. van Dijken. Direct and indirect contributions of ice shelves to micronutrient supply to the surface waters around Antarctica. 33rd Forum for Research into Ice Shelf Processes (FRISP), Oxford, UK, September 16, 2019.

Hofmann, E.E., **M.S. Dinniman**, **P. St-Laurent**, K.R. Arrigo, and G. van Dijken. Analysis of Iron Sources in Antarctic Continental Shelf Waters. American Geophysical Union Fall Meeting, San Francisco, CA, December 13, 2019.

Kohut, J., H. Statscewich, M. Oliver, E. Fredj, **J. Klinck**, **M. Dinniman**, W. Fraser, K. Bernard, and P. Winsor. Project SWARM: The application of an integrated polar ocean observing system to map the physical mechanisms driving food web focusing in an Antarctic biological hotspot. Oceans 2019 Seattle Conference, October 2019.

Millan, R., E.J. Rignot, J. Mouginot, M. Morlighem, A. Rivera, L. An, **P. St-Laurent**, A.A. Bjork, and P. Dutrieux. Recent contribution of airborne gravity data to the modern observation of the cryosphere. American Geophysical Union Fall Meeting, San Francisco, CA, December 12, 2019.

Riverman, K., D. Sutherland, R. Obermeyer, B. Aguiar-Gonzalez, C. Moffat, **M. Dinniman**, and **J. Klinck**. Grounding zone depth modulates oceanic control on glacier terminus retreat along the west Antarctic Peninsula. 33rd Forum for Research into Ice Shelf Processes (FRISP), Oxford, UK, September 16, 2019.

Schwans, E., B.R. Parizek, R.B. Alley, M. Morlighem, **P. St-Laurent**, and R.T. Walker. Role of the eastern shear margin in Thwaites Glacier's dynamics. American Geophysical Union Fall Meeting, San Francisco, CA, December 13, 2019.

Schwing, F.B., S. Roberts, and **E.E. Hofmann**. Crafting Effective Policy for Basic and Applied Ocean Research: a History of Ocean Science Policy (poster presentation). American Geophysical Union Fall Meeting, San Francisco, CA, December 12, 2019.

St-Laurent, P., M.A.M. Friedrichs, M. Li, and W. Ni. Impacts of sea level rise on Chesapeake Bay and its seasonal hypoxia. 25th Biennial Coastal and Estuarine Research Foundation Conference, Mobile, AL, November 3-7, 2019.

Updyke, T. G., H. Roarty, M. Smith, and L. Nazzaro. The Impact of Reprocessing Efforts on the Mid-Atlantic's Surface Current Product. MTS/IEEE Oceans Conference. Seattle, WA, October 28, 2019.

Wiggert, J., C. Bouchard, **M. Dinniman**, M.K. Cambazoglu, S. O'Brien, P. Fitzpatrick, S. Milroy, and **E. Hofmann**. Influence of Tidal Inlet Exchange on the Marine Ecosystem and Biogeochemistry of the Mississippi Bight. 25th Biennial Coastal and Estuarine Research Foundation Conference, November 3-7, 2019.

Wysession, M.E., N.B. Grimm, **E.E. Hofmann**, T.H. Illangasekare, W. Peterson, E.J. Rignot, R. Zhang, and R. Townsend. AGU Celebrates its Centennial with the Initiation of a New Journal: *Perspectives in Earth and Space Science* (poster presentation). American Geophysical Union Fall Meeting, San Francisco, CA, December 9, 2019.

Yager, P.L., H. Oliver, **P. St-Laurent**, R.M. Sherrell, and S.E. Stammerjohn. How WAIS meltwater and earlier springtime opening may flip the Amundsen Sea Polynya from carbon sink to source. 2019 WAIS workshop, Julian, CA, October 16-18, 2019.

Publications

Brearley, J.A., C. Moffatt, H.J. Venables, M.P. Meredith, and **M.S. Dinniman**. 2019. The role of eddies and topography in the export of shelf waters from the West Antarctic Peninsula shelf, *Journal of Geophysical Research*, 124, 7718-7742, doi:10.1029/2018JC014679.

Bruciaferri, D., G. Shapiro, S. Stanichny, A. Zatsepin, **T. Ezer**, F. Wobus, X. Francis, and D. Hilton. 2019. The development of a 3D computational mesh to improve the representation of dynamic processes: The Black Sea test case, *Ocean Modelling*, doi:10.1016/j.ocemod.2019.101534

Ezer, T., 2019. Analysis of the changing patterns of seasonal flooding along the U.S. East Coast, *Ocean Dynamics*, doi:10.1007/s10236-019-01326-7.

Hofmann, E., L. Maddison, and I. van Putten. 2019. Management strategy evaluation: Transdisciplinary and transparent natural resource management, *APN Science Bulletin*, 9(1), doi:10.30852/sb.2019.895.

Newman, L. and Others (**E.E. Hofmann** 18 of 41 authors). 2019. Delivering sustained, coordinated and integrated observations of the Southern Ocean for global impact, *Frontiers in Marine Science*, section Ocean Observation (OceanObs19), DOI: 10.3389/fmars.2019.00433.

Oey, L.Y., Y. Noh, J. Berntsen, S.Y. Kim, H. Mitsudera, and **T. Ezer**. 2019. Editorial—The 9th International Workshop on Modeling the Ocean (IWMO 2017) in Seoul, Korea, July 3-6, 2017, *Ocean Dynamics*, doi:10.1007/s10236-019-01322-x.

Rogers, A.D., B.A.V. Frinault, D.K.A. Barnres, N. Bindoff, R. Downie, H. Ducklow, A. Friedlaender, T. Hart, S. Hill, **E.E. Hofmann**, K. Linse, C. McMahon, E. Murphy, E.A. Pakhomov, G. Reygondeau, I.J. Staniland, D. Wolf-Gladrow, and R. Wright. 2019 (online); 2020 (print). Antarctic Futures: An assessment of climate-driven changes on ecosystem structure, function and service provision to the Southern Ocean, *Annual Review of Marine Science*, <https://www.annualreviews.org/doi/10.1146/annurev-marine-010419-011028>.



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Center For Coastal Physical Oceanography (CCPO) and Institute for Coastal Adaptation & Resilience (ICAR) Seminar Series

SPRING 2020 SEMINAR SCHEDULE

27 January	Christopher Zajchowski , <i>Dept. of Human Movement Sciences, ODU</i>
3 February	Craig Ramseyer , <i>Virginia Tech</i>
10 February	Luis Hückstädt , <i>University of California Santa Cruz</i>
2 March	Alan Blumberg , <i>Jupiter</i>
16 March	Jane Harrison , <i>North Carolina Sea Grant, North Carolina State University</i>
23 March	Hans Louis-Charles , <i>Virginia Commonwealth University</i>
30 March	Lauren Simkins , <i>University of Virginia</i>
6 April	Praveen Kumar , <i>CCPO</i>
13 April	Ray Toll , <i>ODU/OCEANS '22</i>

MONDAYS at 3:30 PM

Reception at 3:00 PM

Location:

Conference Center, IRB II,
4211 Monarch Way

Contact:

julie@ccpo.odu.edu
757-683-4940

Info and web streaming:

[www.ccpo.odu.edu/
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