

CCPO CIRCULATION

Center for Coastal Physical Oceanography

OLD DOMINION UNIVERSITY

SUMMER 2014

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Meeting the Challenge of Climate Change

Dr. Hans Peter Plag on the Mitigation & Adaptation Research Institute (MARI)

Climate change and sea level rise pose unprecedented threats to communities across the world, especially the heavily populated urban coasts. The changes experienced during the last century are unprecedented during the Holocene, the last geological epoch that started 11,700 years ago. The Holocene was characterized by an exceptionally stable climate, and during the last 7,000 years, an exceptionally stable sea level, allowing civilizations to develop. In the last century, this changed. There is increasing evidence that the changes anticipated for the 21st century will push the climate outside the range known to civilization and into a phase of much greater variability. This challenges decision making in all societal sectors, and it requires a new level of preparedness to mitigate the impacts and adapt to the changes.

Hampton Roads is a natural laboratory for climate change and sea level rise. The people in Hampton Roads experience the growing impacts of sea level rise and they are worried. The high rate of local sea level rise, the exposure to extreme weather events, and the complex socio-economic structure are a challenge for a wide range of community stakeholders, including government, military,

private sector, and citizens. Recent scientific news about melting ice sheets published in the last months are not reducing these worries. However, in Hampton Roads, the worries result in action, and the communities are growing together to jointly respond to the challenges.

There is an urgent need to develop adaptation science and to produce the practice-relevant knowledge that addresses all these issues. Old Dominion University has established the Mitigation and Adaptation Research Institute (MARI) as a place where societal stakeholders and university experts can work together to create the practice-relevant knowledge that can help ensure thriving coastal communities in the future. These should be communities where people feel safe and look optimistically into the future, where disaster risk is reduced and people are not just waiting for the next disaster to

happen, where we have a sound economy and a healthy environment, and where we can enjoy living close to the coast.

Making progress towards this vision of thriving coastal communities requires a detailed understanding of the hazards that may occur.

Vision and Mission:

MARI's vision is that of thriving coastal communities. In pursuit of this vision, MARI's mission is engaged in mitigation and adaptation research to provide the practice-relevant knowledge needed by coastal communities to handle the challenges, and utilize the opportunities, of climate change and sea level rise.

Knowing the vulnerabilities of the built and natural environments and the social communities embedded into them helps to assess the risks. Developing a better foresight of what might happen in the future and what impacts our actions might have can inform mitigation and adaptation efforts. We also need to reflect on how we make decisions, and we might have to adapt our underlying value system to the new challenges. Finally, we need to find more options of how we can adapt that are acceptable to our communities. In all of this, MARI aims to support the communities with expertise that ODU

and other academic institutions have to offer. In this sense, MARI is a missing piece, the one-stop place to go to for access to mitigation and adaptation knowledge, and for finding partners to create the knowledge, if it does not already exist.

To ensure that the stakeholders get the knowledge they can apply, MARI works closely with them to ensure a co-creation of practice-relevant knowledge and to support them in the use of this knowledge. Continuous input from stakeholders in climate change mitigation and adaptation enables MARI to create the practice-relevant knowledge society needs to find sustainable solutions to the challenge of climate change and sea level rise, which cannot be found without a solid foundation in solution-focused research. Climate change mitigation and adaptation is cross-sectoral and stakeholders relevant to MARI reside in all societal sectors. MARI is developing infrastructure, organizational frameworks, and procedures that ensure a strong and continuous linkage between them and the institute.

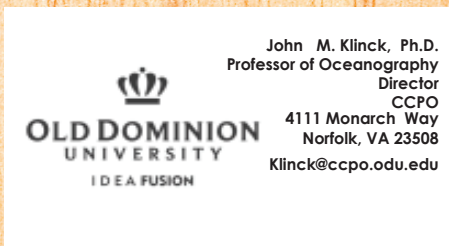
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IDEA FUSION



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Letter from the Director

Dear Loyal Subscribers,

You will notice a number of differences in this issue. These changes are due to the efforts of Miasia Menifee who recently joined CCPO as Office Manager and Newsletter Editor. Some changes are to follow the branding style recently developed by ODU. Other changes are to energize the content.

Change is a constant in our lives. We all adapt to, manage and mitigate change. The central issue for our response to change is our ability to predict it. Change ranges from stasis (no change) which is easy to predict to chaos (seemingly random change) which is very hard to predict. Some changes are pleasant, such as the new newsletter format, while others are troublesome, such as the impending change in local sea level.

All of us at CCPO look forward to the challenges coming our way as we face the realization that our environment (natural, fiscal, and social) is changing. We are analyzing the various ways that we can estimate (predict) some of the coming changes and working to develop responses to these projected changes.

Sincerely,

John Klinck

4111 Monarch Way Norfolk, VA 23508
Old Dominion University is an equal opportunity, affirmative action institution.

Connect with CCPO!

It's quite simple; CCPO wants to keep you connected. Find out what our faculty and students are researching. Stay tuned for the latest updates on news and our fall seminar dates. Follow us as we volunteer in our community. This summer we will be reconstructing our Facebook page to help you stay connected.

Have any suggestions for newsletter topics? Contact the Editor:

Miasia Menifee

Center for Coastal Physical Oceanography
Old Dominion University
4111 Monarch Way, Suite 301, Rm. 3212
Norfolk, VA 23508
Email: mia@ccpo.odu.edu





Michelle Covi joined the faculty of Old Dominion University's Department of Ocean, Earth and Atmospheric Sciences (OEAS) in February as assistant professor of practice. Her position, partly funded

by Virginia Sea Grant, is a non-tenure track, full-time position that was established to provide outreach, scientific synthesis and integration for climate change adaptation. She serves as an

outreach coordinator and stakeholder engagement professional for the new Mitigation and Adaptation Research Institute (MARI), which grew out of the Climate Change and Sea Level Rise Initiative, as well as the climate adaptation specialist for the Virginia Sea Grant Extension.

Michelle recently graduated with a PhD in coastal resources management from East Carolina University, where she also worked in a part-time position as an outreach coordinator for a coastal hazards research center. She grew up in Baltimore, Md and has lived for several years in Georgia, Illinois and most recently, North Carolina. While her bachelor's and master's degrees focused on geology and marine (salt marsh) ecology, she shifted into a career in environmental education, nonprofit administration and taught higher educa-

tion for 15 years, including biology and environmental science courses. Her multidisciplinary PhD program involved courses in the natural sciences, social sciences and policy. Her dissertation focused on sea level rise risk perception, communication and policy-making in northeastern North Carolina.

She enjoys living in Norfolk and is getting to know the Hampton Roads and Virginia coastal community. She also enjoys walking and riding her bike along the Elizabeth River trail and going to see movies at the Naro. After living in rural areas and college towns for most of her adult life, she looks forward to living in the "big city" and visiting the museums, historic areas and unique treasures of the region.

Follow her blog:
Coastal Virginia Adaptation
<http://vaadapts.wordpress.com/>

Meeting the Challenge of Climate Change (Continued)

Dr. Hans Peter Plag

Human population has moved from rural into urban areas, and most of the rapidly growing urban areas are in the coastal zone. During the 1933 flood in Hampton Roads, only 35,000 people were living in Virginia Beach and Norfolk; today 1 million people are exposed in the same area to the risk of extreme weather events. Both on a global scale and in the U.S., an increasing fraction of the population and the most productive infrastructure are in the coastal zone. Accelerating sea level rise is increasing the risk of disasters caused by storms and storm surges, and the frequency and severity of storms is expected to increase and further exacerbate this risk. Because of the dependence of humanity on the coastal zone, these disasters threaten food and water security, supply chains, public health, and crucial parts of Earth's life-support system. The coastal zone thus is a front line for humanity's sustainability. The high economic productivity and importance of the coastal zone rules out a simple retreat to safer areas, and new solutions for living in the coastal zone with a variable sea level need to be found.

MARI focuses on problem-motivated basic and applied research on all aspects of mitigation of climate change and its impacts, as well as adaptation to the changes

climate change on sea level and weather-related hazards and the vulnerability of coastal communities to these hazards and provides risk assessments. The research

research that is motivated by real-world problems and focused on finding solutions. In its research project, MARI ensures a balance between the traditional academic disciplines and ensure that basic research on transdisciplinary methodology is inherently integrated in the research. MARI works with societal stakeholders to develop options to mitigate and adapt to climate change and sea level rise, and in doing so, MARI also researches methodology for sustained co-design, co-creation, and co-usage of practice-relevant knowledge.

A Stakeholder Driven Institute
MARI creates knowledge with continuous input from the stakeholders through:

co-design of the research agenda
co-creation of practice-relevant knowledge
co-usage of knowledge to enable sustainable solutions

that cannot be prevented with a view on sustainable development. Implementation of mitigation and adaptation measures require societal decision making, and MARI researches the opportunities and obstacles in decision and policy making and the institutional framework for mitigation and adaptation. The institute aims to develop a wide range of options for mitigation and adaptation. Doing so in an effective manner requires an understanding of the ranges and probabilities of the hazards and the identification of vulnerabilities.

MARI researches the effect of

covers the robustness of the built environment in the urban coast; the robustness and resilience of crucial services such as food, water, communication, transportation, power, and public health, and the resilience of the social fabric in its socio-economic and socio-ecological settings. MARI compares urban coasts in different cultural, social, economic and environmental settings to gain an understanding of the key factors that can support or limit the adaptive capabilities of coastal communities.

MARI facilitates and engages in collaborative, transdisciplinary

To support, maintain and guide sustainable coastal communities, a work force and societal leadership is needed that can communicate across traditional disciplines and societal sectors. To achieve this, a strong transdisciplinary element in education is needed. MARI engages in the development of transdisciplinary approaches to education related to scientific and societal challenges of climate change, sea level rise, and sustainability in general.

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CCPO SPOTLIGHT

Capt. Eric Jobs (USN, ret)

Eric Jobs retired from the Navy as a Captain in August 2013 and joined the Department of Ocean, Earth and Atmospheric Sciences as a PhD student. His background in the Navy was as a nuclear submariner and diver, although he spent the last decade preparing people for joint ground combat. After many deployments and adventures around

the world, Eric is now breaking new ground for ODU in pursuing a truly interdisciplinary degree: blending oceanography, public policy, and maritime management into his PhD.

He is grateful that Old Dominion University, advisor Dr. Larry Atkinson and the PhD committee have allowed the flexibility to craft such an interdisciplinary degree program. Eric's professional goal is to gain a much deeper understanding of these areas to then add value in an organization like NOAA or a state agency. Eric is from South Carolina, and earned a bachelor of science in

mechanical engineering from the University of S.C. before going through the Navy nuclear power pipeline. He later studied under Larry Mayer at the University of New Hampshire for a master's in ocean engineering, where his thesis involved building then deploying a device known as the "Geoclutter Probe."

Eric also earned a master's of science in national security strategy from National Defense University (with a concentration on Middle Eastern studies) that eventually proved very useful in his helping the Iraqis set up their national joint operations

Who Attended?

Faculty Members:

Dr. John Klinck
Dr. Eileen Hofmann
Dr. Tal Ezer

Research Scientists:

Mike Dinniman

Postdocs:

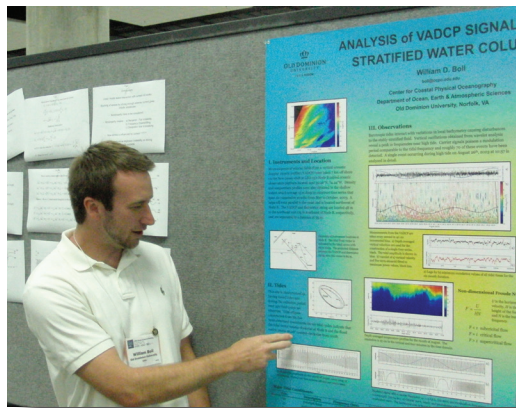
Dr. Jennifer Graham
Dr. Pierre St-Laurent

Students:

Stefanie Mack
William (Bill) Boll
Brynn Davis

Ph.D. student
M.S. Student
B.S. Student

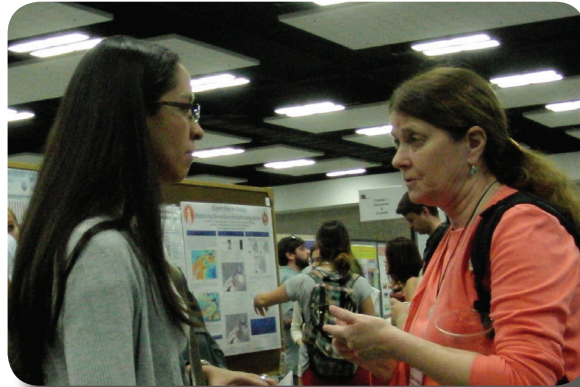
William Boll presented a poster on the "Analysis of VADCP Signals in a Stratified Water Column."



CCPO congratulates William Boll, who has accepted a position in Marion, Mass. as the Physical Oceanographer/EddyWatch & Route Watch Analyst. **Congrats Bill, you will be missed!**

CCPO Goes to the Ocean Sciences Meeting

23-28 February 2014/ Hawaii Convention Center - Honolulu, Hawaii



Dr. Eileen Hofmann talks with CCPO alumna, Dr. Andrea Pinones.



Dr. Jennifer Graham presented on the "Influence of Wind Variability on Water Masses and Transport on the Antarctic Continental Shelf and Slope."

Center in Baghdad.

Eric continues to dive as a volunteer at the Virginia Aquarium. He currently serves on their Diving Safety Board plus on the board of directors for the environmental organization Wetlands Watch.

With the greatest sea level rise on the East Coast (second only to New Orleans) and aggravated by subsidence,

it is well known that recurrent flooding is the No. 1 issue for our city. The community's concern is shared by the multiple federal facilities in the area, to include the biggest Navy base in the world. This concern comes out loud and clear in the myriad animated forums (with lively debates) that Eric has attended—leading him to ask the question: “Isn’t there a need for a comprehensive strategy

for this area?” He is seeking to do a dissertation that will create a truly useful tool that will benefit the Hampton Roads region through both the public and private sectors. Eric considers himself very fortunate to be part of the OEAS, CCPO, MARI, and CCLRI; and is very excited to help research our best course ahead for what lies over the horizon.

CCPO SPOTLIGHT

Miasia Menifee

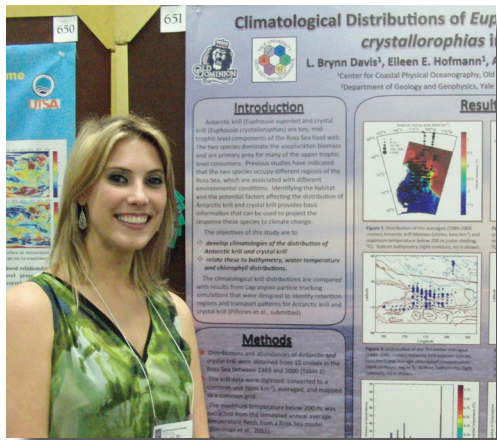
Graduating Senior,
Old Dominion
University



Miasia Menifee, a Virginia Beach native and Ocean Lakes High School honor graduate (Class of 2006) decided to attend Tidewater Community College (TCC) after learning of her eligibility for tuition coverage under the VA War Orphans Act offered through the Department of Veterans Affairs. While at TCC, Miasia discovered her passion for public service as she served as TCC Times copy editor and later became editor-in-chief. Miasia also was SGA president of the and a Student Ambassador for the Virginia Beach campus. She was honored to participate in the 2007 Azalea Festival. This festival commemorated NATO and she served as a diplomat representing Spain and participated in a NATO simulation exercise, where she received an honorary mention for her diplomacy. She worked for Veteran Affairs as a work-study student and also for Financial Aid as a scholarship assistant, both located at the Beach campus. She was quoted in an article by Vahighered.com, saying that attending TCC “was the best decision I ever made. I’ve grown so much as a person here.”

She will graduate from Old Dominion University in August 2014 with a bachelor of arts degree in English concentrating in professional writing. With hopes to better her community within higher education, minoring in Public Service was only appropriate. She is determined to begin ODU’s new MPA online program offered through Distance Learning in spring of 2015. Her ODU work experiences includes: senior fiscal technician and interim liaison for Site Operations and Military Distance Learning. She says her professional experiences within DL have prepared her for undertaking her new journey here at CCPO.

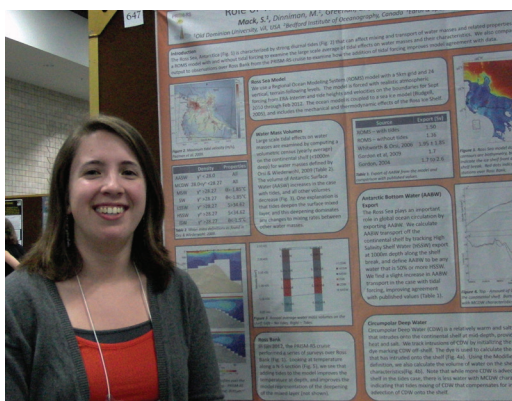
Miasia has been with CCPO as Office Manager and Editor for about eight months. Since her arrival, she’s been focused on updating the Center’s marketing strategies. Her academic and professional efforts fit our goals to educate, research, and give back to our community. Stay tuned as she will lead the upcoming social media campaign in the fall.



Brynn Davis presented a poster on the “Climatological Distributions of *Euphasia superba* and *E. crystallophias* in the Ross Sea.”



Dr. Pierre St-Laurent presented on the “Dispersion of Glacial Meltwater by Eddies in the Amundsen Sea.”



Stefanie Mack presented a poster on the “Role of Tidally-Induced Mixing in the Ross Sea.”

MORE SPOTLIGHT!

Did you know **Brynn Davis** was the only undergraduate student to present at the Ocean Sciences Meeting on behalf of CCPO?

Wow, what an honor! We look forward to seeing more work from her. She graduated with her bachelor’s degree in May and will begin her master’s program this fall. **Keep up the great work, Brynn!**

Meeting the Challenge of Climate Change (Continued)

Dr. Hans Peter Plag

Students are important for the future of our society and engaging them in addressing climate change is crucial for future generations of engaged citizens and a sustainable development. MARI engages students in many different ways in its activities. Linking students to the societal environment is a cornerstone in engaging students. Creating knowledge is just the first step; in order to affect real change, managing that knowledge effectively and efficiently is crucial. Bringing the knowledge to where it is needed is therefore one of the core activities of MARI, with proactive outreach as the front and end stage of MARI's Knowledge Management process.

MARI is based on the recognition that comprehensive knowledge is the basis for solutions, and that this knowledge can only be derived through interdisciplinary and cross-sectoral collaboration. The discipline-based organization in higher education requires new elements outside this traditional environment that can build transdisciplinary education and research programs linking colleges and departments across boundaries. MARI takes a constructionist approach, which requires a framework bringing together different experts, a wide range of tools, comprehensive databases, and project findings and results for a solution-focused outcome that is

practice-relevant. The internal structure of MARI is designed to provide all the functions required to transition from the traditional de-constructionist nature of science providing information to a constructionist approach of providing solutions.

The societal, environmental and economic costs of climate change and sea level rise are expected to grow rapidly. MARI aims to enable a wide range of stakeholders to reduce the costs through mitigation where possible and timely adaptation where needed. Importantly, the institute aspires to be a source of new business opportunities and, in cooperation with the business world, to help generate jobs in the area of mitigation and adaptation.

For the success of MARI, it is important to closely monitor the progress and to evaluate the approaches taken. Evaluation needs to cover all dimensions, including the research carried out and the usefulness of knowledge created, the academic contribution, the economic basis, the linkages to societal stakeholders, and the societal benefits of MARI, including the impact on local businesses and jobs created.

Just the Facts

Publications

Berntsen, J., **T. Ezer**, R. Greatbatch, L.-Y. Oey, H. Xue, and Y. Miyazawa (Eds.) Topical Collection: The 5th International Workshop on Modeling the Ocean (IWMO-2013), Bergen, Norway, June 17-20, 2013, Special Issue of *Ocean Dynamics*, 2014.

Gargett, A.E. and **C.E. Grosch**, Turbulence process domination under the combined forcings of wind stress, the Langmuir vortex force, and surface cooling, *Journal of Physical Oceanography*, 44, 44-67, 2014.

Kempel, M., P. DiGiacomo, **H.-P. Plag**, The Coastal Zone Community of Practice: Supporting Integrated Coastal Zone Management with Earth Observations. In: Djavidnia, S., Cheung, V., Ott, M., Seeyave, S. (eds.): *Oceans and Society: Blue Planet*, Cambridge Scholars Publishing, Newcastle upon Tyne, U.K., 113-121, 2014.

Knutson, T., F. Zeng, A. T. Wittenberg, H.-S. Kim, J.J. Sirutis, M. A. Bender, M. Zhao, and **R.E. Tuleya**, "Recent Research at GFDL on Surface Temperature Trends and Simulations of Tropical Cyclone Activity in the Indian Ocean Region," In: *Monitoring and Prediction of Tropical Cyclones in the Indian Ocean and Climate Change*, New Delhi, India, Capital Publishing, DOI:10.1007/978-94-007-7720-0_5., January 2014.

Martinat, G., **C.E. Grosch** and **T.B. Gatski**, "Modeling of Langmuir circulation: triple decomposition of the Craik - Leibovich model", *Flow, Turbulence and Combustion*, 92, 395-411, 2014.

Paillard, C., F. Jean, S.E. Ford, E.N. Powell, **J.M. Klinck**, **E.E. Hofmann**, and J. Flye-Sainte-Marie. A theoretical individual-based model of brown ring disease in manila clams, *Ruditapes philippinarum*. *Journal of Sea Research*, 91C, 15-34, 2014.

Plag, H.-P., 2014. Risk management - climate vs. car crashes. Column 5 in "On The Edge." *Apogeo Spatial*, 29(2), 12-13, Spring 2014.

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Plag, H.-P. Humanity for Economy or Economy for Humanity? - What to tell your 20-year-old self. Column 4 in "On The Edge." *Apogeo Spatial*, 29(1), Winter 2013-2014, 8-10. 2014.

Saramul, S. and **T. Ezer**, On the dynamics of low latitude, shallow estuarine system: Numerical simulations of the Upper Gulf of Thailand, *Ocean Dynamics*, 64, 557-571, doi:10.1007/s10236-014-0703-z, 2014.

Smith, Jr., W.O., D.G. Ainley, K.R. Arrigo and **M.S. Dinniman**, The oceanography and ecology of the Ross Sea. *Annual Review of Marine Science*, 6, 469-487, 2014.

Smith, Jr., W.O., **M.S. Dinniman**, **E.E. Hofman** and **J.M. Klinck**, The effects of changing winds and temperatures on the oceanography of the Ross Sea in the 21st century. *Geophysical Research Letters*, 41, 1624-1631, 2014.

Stern, A.A., **M.S. Dinniman**, V. Zagorodnov, S.W. Tyler and D.M. Holland, Intrusion of warm surface water beneath the McMurdo Ice Shelf, Antarctica. *Journal of Geophysical Research*, 118, 7036-7048, 2013.

Just the Facts

Presentations

Atkinson, L. P. and **T. Ezer**, “Sea level rise acceleration along the U. S. east coast and increased flooding in the urban coast”, AMS Annual Meeting, Atlanta, GA, February 2-6, 2014.

Boll, W. D., “Analysis of VADCP Signals in a Stratified Water Column”, 2014 Ocean Sciences Meeting, Honolulu, HI, February 2014.

Dinniman, M., “Outstanding Issues in Modeling Aspects of the Open Continental Shelf Circulation that Affect Antarctic Ice Shelves”, ESF Exploratory Workshop on Oceanic Heat Transport to Floating Glaciers in Antarctica, Lerici, Italy, May 2014.

Dinniman, M., J. Klinck and W. Smith, Jr., “Sensitivity of sea ice, water masses and ice shelf basal melt in the Ross Sea to changes in the winds and atmospheric temperatures”, IGS 2014 Sea-Ice Symposium, Hobart, Tasmania, Australia, March 2014.

Dinniman, M.S., L.S. Bai, D.H. Bromwich and **J.M. Klinck**, “Sensitivity of modeled ice shelf basal melt around the Antarctic to the atmospheric forcing”, 2014 Ocean Sciences Meeting, Honolulu, HI, February 2014.

Ezer, T. and J. Ashford, “Study of physical-biological factors that impact the beluga whales in Cook Inlet”, Donald Gilman River Center, Kenai Peninsula Borough, Soldotna, Alaska, January 16, 2014.

Ezer, T., “Climate change, ocean dynamics and uneven sea level rise along the U.S. East Coast”, School of Marine Sciences, University of Maine, April 18, 2014.

Ezer, T., “Sea level rise and increased flooding in the Hampton Roads region”, Research Experience for Undergraduates (REU) Summer Program, ODU, Norfolk, VA, June 12, 2014.

Ezer, T., “Uneven sea level rise along the U.S. East Coast: The impact of ocean dynamics on past changes and future sea level rise projections”, 2014 Ocean Sciences Meeting, Honolulu, Hawaii, February 23-28, 2014.

Ezer, T., “Why are sea level rise and flooding accelerating along the U.S. East Coast”, TechSurge- Technical Support for Coast Resiliency, MTS/ODU, Norfolk, VA, June 3, 2014.

Klinck, J., M. Dinniman, B. Greenan and D. McGillicuddy, “Horizontal structure of ocean properties in the southern Ross Sea”, 2014 Ocean Sciences Meeting, Honolulu, HI, February 2014.

Mack, S., M. Dinniman, B. Greenan, S. Springer, and J. Klinck, “Role of Tidally-Induced Mixing in the Ross Sea”, Ocean Sciences Meeting; Honolulu, HI, February 2014.

Marsay, C.M., P.N. Sedwick, **M.S. Dinniman**, B.M. Sohst, and D.J. McGillicuddy, “An assessment of benthic iron efflux on the Ross Sea continental shelf and its contribution to surface water dissolved iron supply”, 2014 Ocean Sciences Meeting, Honolulu, HI, February 2014.

McCarthy, G., A. Blaker, **T. Ezer**, S. Cunningham and D. Smeed, “Dynamics and impacts of the extreme drops in the Atlantic Meridional Overturning Circulation observed by the 26N monitoring array”, 2014 Ocean Sciences Meeting, Honolulu, Hawaii, February 23-28, 2014.

McGillicuddy, D.J., P.N. Sedwick, **M.S. Dinniman** and K.R. Arrigo, “Iron supply and demand in an Antarctic shelf ecosystem”, 2014 Ocean Sciences Meeting, Honolulu, HI, February 2014.

Plag, H.-P., “Climate change and sea level rise: The social construct of risk and vulnerability”, Webinar on Climate Change and Sea Level Rise in the Hampton Roads, Virginia Water Environment Association, Sustainable Utilities Committee, Norfolk, VA, February 21, 2014.

Plag, H.-P., L. Atkinson, and S. Jules-Plag, “Slow Climate Trends: The Danger in Getting Used to the Changes”, 14th National Conference and Global Forum on Science, Policy and the Environment, Washington, D.C., January 28-30, 2014.

Plag, H.-P., J. Behr, R. Diaz, D. Earnest, and S. Jules-Plag, “Reducing Risk and Social Vulnerability Through Social Capital”, 14th National Conference and Global Forum on Science, Policy and the Environment, Washington, D.C., January 28-30, 2014.

Plag, H.-P., SB-01, “CZCP and the GEOSS User Requirements Registry (URR)”, Joint Meeting of the GEO Task SB-01 and the Coastal Zone Community of Practice, Geneva, Switzerland, January 14, 2014.

Plag, H.-P., “Global Coastal Zone Information System (GCZIS)”, Joint Meeting of the GEO Task SB-01 and the Coastal Zone Community of Practice, Geneva, Switzerland, January 14, 2014.

Plag, H.-P., and P. Digiacomio, “GEO Work Plan Task SB-01: Oceans and Society: Blue Planet and Coastal Zone Community of Practice of the Group on Earth Observations: Servicing the Coastal Zone with Earth Observations”, Joint Meeting of the GEO Task SB-01 and the Coastal Zone Community of Practice, Geneva, Switzerland, January 14, 2014.

Plag, H.-P., S. Jules-Plag, S. Stein, S. Brocklebank, S. Marsh, and P. Campus, “Disaster Risk Reduction for Extreme Geohazards”, Disaster Risk reduction and Earth Observations: A GEOSS Perspective workshop, Geneva, Switzerland, January 13, 2014

Salmon, E., **M. Dinniman** and **E. Hofmann**, “NPZD-Iron lower level ecosystem model”, IGS 2014 Sea-Ice Symposium, Hobart, Tasmania, Australia, March 2014.

Salmon, E., **M. Dinniman** and **E. Hofmann**, “NPZD-Iron lower level ecosystem model of the Ross Sea: A study of the processes controlling the seasonal cycle of biological production”, 2014 Ocean Sciences Meeting, Honolulu, HI, February 2014.

Updyke, T., “A Closer Look at CODAR HF Radar Spectra”, Radiowave Operators Working Group; San Francisco, CA, March 2014.



Center for Coastal
Physical Oceanography

6CN05
CCPO Circulation
4111 Monarch Way, Suite 301
Norfolk, VA 23508 USA

John Klinck, Director
Miasia Menifee, Chief Editor
Julie Morgan, Content Editor
Email: mia@ccpo.odu.edu



22
years

EDUCATION: Training the next generation of ocean scientists

RESEARCH: Investigating ocean processes with observations and models

OUTREACH: Engaging the community in the ocean sciences

