



*Old Dominion University
Climate Change and Sea Level
Rise Initiative*

Summer 2013



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Old Dominion University Climate Change and Sea Level Rise Initiative

Summer 2013

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Mayflower Road in Norfolk's Colonial Place neighborhood was mostly underwater as high tide approached in November 2009. (Stephen M. Katz | Virginian-Pilot file photo)

<http://hamptonroads.com/2012/06/lawmakers-avoid-buzzwords-climate-change-bills>

Thoughts from the Co-Directors

CCSLRI to the Next Step

By Larry Atkinson, Slover Professor of Oceanography, Department of Ocean, Earth and Atmospheric Sciences

The Old Dominion University Climate Change and Sea Level Rise Initiative (CCSLRI) is now moving into its next stage. The initial step was to see if faculty saw this as an area of research and education and to determine if there was going to be funding available. The answer to both questions is yes.

Now we are going to the next stage in the development of CCSLRI.

The first step was to hire a person who had national and international climate change and sea level rise leadership experience. This has now been accomplished with the hiring of Dr. Hans-Peter Plag. Dr. Plag will be the first senior faculty hire for the CCSLRI and we look forward to his insights on how to grow the Initiative and make it a permanent part of ODU's education, research and service portfolio. Dr. Plag and I will co-lead the Initiative, and Elizabeth Smith will continue in her role as part-time Coordinator.

<http://www.odu.edu/research/initiatives/ccslri>

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The second key action is integration of the Initiative into the new ODU Strategic Plan. The planning process begins this fall. Those who have participated in CCSLRI will have the opportunity to help plan its future through the formal process the university uses.

Comments from Hans-Peter Plag

Co-Director of the Climate Change and Sea Level Rise Initiative and Professor of Oceanography,
Department of Ocean, Earth and Atmospheric Sciences

Since my time as a student, understanding the processes that cause sea level to fluctuate on a wide range of temporal and spatial scales has been a focus in my academic and work life. At the time of my initial studies more than 35 years ago, present-day sea-level rise (SLR) was not of concern and SLR research was limited to a rather small group of somewhat exotic researchers. Since then, SLR has gained in societal relevance, and during the last decades, the number of people concerned about SLR has rapidly grown. Today, telling people that I do research on climate change and sea level rise most of the time generates positive reactions and results in comments that reflect some level of worry. And these worries are more than justified: during this century, sea level likely will change more rapidly than it has ever done during the time of human civilization, a civilization that is heavily depending on coastal settlements and the many benefits of living in the coastal zone. However, a “normality bias” prevents many of us from accepting the challenge: since sea level was stable during all recorded history with century-scale changes limited to a few centimeters, we cannot imagine what it will mean for us when this period of exceptionally stable sea levels comes to an end and we are faced with rapidly changing sea levels and coast lines.

Learning to live with, and adapt to a changing sea level will be a difficult and sometimes painful process. For this, the importance of linking research in climate change and SLR to societal decision making at all levels can hardly be overestimated. There is an urgent need for integrated research activities that look at coastal zone management in a holistic way, and these activities inherently have to be transdisciplinary. As I see it, the Climate Change and Sea Level Rise Initiative (CCSLRI) at ODU is such a trans-disciplinary program aiming to create the Science, Technology and Innovation (STI) knowledge that is needed to cope and live with a changing sea level. In order to succeed, co-design and co-creation of this knowledge with societal stakeholders is mandatory and will ensure that the knowledge corresponds to their needs and is actionable in the context of a sustainable development of the coastal zone in the region.

Taking a risk-based approach, where risk is the product of hazard probability, vulnerability, and exposure, the STI knowledge has to comprise an understanding of these three factors in the risk equation. For most natural hazards, we have little control over the hazards, and sea-level hazards are no exception. However, we can reduce vulnerability and have almost full control over exposure. An example where this approach has resulted in significant disaster risk reduction is the seismic hazard. Today, we have the knowledge of seismic vulnerability to develop resilient urban areas in regions with high seismic hazards, and in a number of high-risk areas such as the Western US and Japan, this knowledge has been used to reduce the disaster risk dramatically.

Climate and sea-level related hazards have two distinct parts, one being the potentially destructive extremes such as storms, droughts, floods, and storm surges, and the other being slow changes in the means, which have cause slowly developing impacts, but most of all change the frequency and magnitude of the extremes. With respect to extreme sea-level events, increasingly we have short-term predictive capabilities and early warning systems that can help to reduce the impacts on human beings and, to some extent, infrastructure. The changes in mean sea level that we expect for the next few decades and the 21st Century would lead to significant long-term impacts on many coast lines, coastal ecosystems, built environment, and the social fabric embedded in the built environment. And they would change the probability density functions (PDFs) of the sea-level extremes significantly to the worse. Understanding these PDFs is hampered by this complex interaction of climate change impacting magnitude and frequency of storms and SLR changing the extreme sea levels associated with these storms.

In the past, a main goal of SLR research was to provide predictions of future sea levels with narrow uncertainty ranges as a basis for the planning of coastal land use and infrastructure. Increasingly, we understand that this deterministic approach is not leading to sound actionable knowledge because the range of plausible future trajectories of sea level is rather wide. A shift is taking place away from deterministic attempts to predict future sea levels to a statistical approach based on a PDF for decadal to century-scale sea-level changes. Coastal zone governance can then take an “insurance approach” and be based on informed deliberations about the acceptable risk. Since sea level is more or less the output of the complex climate system, quantifying the SLR PDF requires an integrated look at all the processes forcing sea level on global to local scales. The CCSLRI brings together the expertise to do this.

For the risk assessment, it is important to understand the vulnerability of coastal ecosystems and human communities to sea-level extremes and SLR. Here the STI knowledge is in its infancy. The knowledge

how to reduce vulnerability and increase resilience urgently needs to be developed. The transition to coastal urban areas that are resilient under extreme events requires a transdisciplinary approach to STI creation. Resilience is a characteristic of the integrated social, environmental and economic system and too often we learn about the degree of resilience only through disasters. The CCSLRI can play an important role in assessing vulnerabilities so that future extreme events are not the only way of finding out about our resilience.

The current SLR in the region is already changing the experience of the people living here, and it is challenging our adaptive capabilities. Keeping up with current SLR and a potentially much more rapid future change in mean sea level is a complex task involving economic, social and environmental aspects. Here, too, the CCSLRI can help to create the knowledge how to live with a variable and rising sea level. A linkage between science and society is mandatory in order to put this knowledge to work.

Reducing disaster risk by reducing exposure is not a complex issue in terms of the understanding, but it is complex in terms of its social and economic implications. Reducing exposure is difficult when it equates to giving up options with high economic and recreational values. The economic and social value of the coastal zone makes it particularly difficult to reduce exposure to sea-level hazards.

Risk awareness is a fundamental prerequisite for the willingness to reduce risk by reducing exposure. Behavioral research shows that we seldom base our decisions on rational facts, if we are not worried. Finding ways to communicating the results of scientific risk and vulnerability assessments that connect with the worry of the people is challenging. The CCSLRI brings together expertise to address this challenge, and the many links of the CCSLRI to societal stakeholders are invaluable for getting the message out.

During the 21st Century, we cannot exclude scientifically the possibility of a global SLR of 2 m and greater on regional to local scales. On the one hand, planning for such large changes is economically not reasonable and feasible unless we are quite sure that they will actually happen. On the other hand, the consequences of a rapid SLR of this magnitude would be disastrous on a global scale if this would happen without any preparation and adaptation – considering the importance of the coastal zone for humanity, it would challenge our civilization to the core. In my opinion, it would be crucial to detect an increased probability of a large rapid SLR in a timely manner. Such a large SLR rise could only result from a rapid melting of parts of the huge land-based ice masses in the Greenland and Antarctic ice sheets. We need a monitoring system, a “smoke detector,” that can alert us if an increased melting takes place, and

we need models that can predict the trajectory of this melting on decadal time scales. Having an early warning of a coming rapid sea level rise would leave us on the order of a decade to prepare the coastal zone for such an unlikely, high-impact mega event. It is important to me that the CCSLRI works with other groups towards such a decadal sea level forecasting.

Topical Updates

Promotions and Tenure

A number of faculty members who have been involved in CCSLRI from the beginning just received tenure. Congratulations to all:

- **Michael McShane**, College of Business and Public Administration-Finance;
 - **Robyn Bluhm**, College of Arts and Letters-Philosophy and Religious Studies;
 - **Petros Katsioloudis**, Batten College of Engineering and Technology-Science, Technology, Engineering and Mathematics Education and Professional Studies;
 - **Holly Gaff**, College of Sciences -Biological Sciences;
 - **Poornima Madhavan**, College of Sciences-Psychology;
- AND
- **Maura E. Hametz**, College of Arts and Letters, **was promoted to Professor**;

Climate Change Adaptation Specialist

ODU and the Virginia Sea Grant Program have signed a Memorandum of Understanding to equally support a new Faculty of Practice position focused on climate change adaptation issues.

Visiting CCSLRI Fellow in Insurance

Dr. Diane Horn from Birkbeck College in London spent a fruitful few weeks here collaborating with Dr. Michael McShane. They compared flood insurance systems in the US and UK. They also met with many local decision makers to get the local perspective on changes in flood insurance. They are finalizing a paper with the tentative title "Flood Insurance: A Tale of Two Countries." A copy of their collaboration report can be found here:

http://www.odu.edu/content/dam/odu/offices/ccslri/docs/16578_HornVisitingProfessor_Report_7-24-2013.pdf

ODU CCSLRI Continues Productive Partnership with Virginia Sea Grant and the Hampton Roads Planning District Commission on Sea Level Rise Adaptation/Flooding Forum

The Hampton Roads Sea Level Rise/Flooding Adaptation Forum, a partnership among ODU CCSLRI, VA Sea Grant and the Hampton Roads Planning District Commission is a regional dialogue among municipalities committed to adopting effective adaptation designs and plans, tailored to meet the needs of our communities in the face of rising sea levels due to climate change. CCSLRI Director, Larry Atkinson, is project PI along with Ariel Pinto from the Department of Systems Engineering. Liz Smith (CCSLRI/OEAS) is the coordinator of the project. The Forum is composed of academic institutions and local, regional, state, and Federal agency officials with authority and responsibility for critical infrastructure and facilities in Hampton Roads (e.g., engineers, planners, facility managers, administrators, etc.). Through regular Forum meetings, and public conversations, we are building a professional network to share information and adaptation lessons-learned through communication and information management. The first meeting of the Forum took place at VMASC on November 16, 2012 and was attended by about 50 officials from almost all Hampton Roads localities. The 2nd and 3rd meetings of the Forum took place on March 13, 2013 at VMASC and July 10, 2013 at the Virginia Beach Higher Education Center. Read more about the July 10th meeting of the Forum here:

<http://vaseagrant.vims.edu/coastal-flooding-072013/>. The agendas and notes from these Forum meetings can be found here: <http://www.odu.edu/research/initiatives/ccslri/2013>



Members of the Hampton Roads SLR/Flooding Adaptation Forum get to know each other during an icebreaker led by ODU's Jenifer Alonzo from Theater Arts (Foreground left to right: Russell DeYoung, NASA LARC; Katherine Rowan, George Mason University; Liz Smith, ODU CCSLRI; Latoya Vaughn, City of Norfolk and Shannon Hulst, Wetlands Watch)



AccessEU –European-American Conference - Transatlantic Solutions to Sea Level Rise Adaptation: Moving Beyond the Threat

ODU will host this international conference on sea level rise adaptation on October 30-31, 2013. The event will be held at the Ted Constant Convocation Center and will include a Presidential Lecture in the evening of October 30 by Admiral (Retired) David Titley, now with the Penn State University.

Panels will include:

1. The Physical Threat: State of the Science of Rising Sea Levels and Extreme Storms
2. Political, Psychological and Ethical Challenges to Adaptation
3. Sea Level Rise Implications for National Security and the Urban, Working Waterfront
4. Flood Insurance and Adaptation

For more information, please contact Dr. Regina Karp, Director of the Graduate Program in International Studies and AccessEU Principal Investigator (rkarp@odu.edu) or Larry Atkinson, Co-Director of the CCSLRI (latkinso@odu.edu).

ODU's Ezer and Colleagues Published Most Viewed Paper for April 2013

The paper by Tal Ezer, Larry Atkinson, William Corlett and Jose Blanco, entitled "*Gulf Stream's induced sea level rise and variability along the U.S. mid-Atlantic coast,*" was published in the Journal of Geophysical Research: Oceans February 2013 edit and became one of the most viewed articles in April 2013. This research was covered by a large number of popular news outlets. A complete list can be found here: <http://www.ccpo.odu.edu/~tezer/>. The full paper may be downloaded from here: <http://onlinelibrary.wiley.com/doi/10.1002/jgrc.20091/full>

Atkinson, Ezer and Smith Published in Law and Policy Journal

The Winter 2013 issue (Vol. 5, No. 2) of the *Sea Grant Law and Policy Journal* is comprised of the papers presented at the *History, Property & Climate Change in the Former Colonies* symposium in October 2012. Larry Atkinson presented the following paper at this symposium and the associated paper, co-authored with Tal Ezer and Liz Smith is entitled "*Sea Level Rise and Flooding Risk in Virginia.*" The issue is available at: <http://nsglc.olemiss.edu/SGLPJ/SGLPJ.htm>.

CCSLRI Sponsors Faculty Travel to Conferences

The Initiative covered the travel costs for the following faculty to attend and in most cases present papers at climate change-related conferences around the nation:

Jenifer Alonzo and Victoria Hill– Science Alliance Live: Climate Change and Performance in a Conservative Area. Workshop. *Performing the World*. New York, October 2012.

Larry Atkinson was an invited panelist representing CCSLRI at the *2013 Rising Seas Summit: Understanding Sea Level Rise in the Face of Extreme Events and an Uncertain Economy*. Fort Lauderdale, FL, June 2013.

David Earnest represented CCSLRI at the *National Sea Grant Climate Network Workshop: Sharing our Successes and Challenges on the Path toward Climate Resilient Communities*. Santa Monica, CA, March 2013.

Burton St. John, Wie Yusuf, Ivan Ash and Katharine Neill – Virginia Legislators’ Knowledge, Awareness, and Perceived Risks Concerning Sea Level Rise. Paper presented at *Culture, Politics and Climate Change*. Boulder, CO, September 2012.

Wie Yusuf, K. Neill, B. St. John, I. Ash, T. Vandecar-Burdin, J. Richman and L. Atkinson - Policies to Address Sea Level Rise: The Role of Legislators’ Knowledge, Awareness and Perceived Risks. Paper presented at the *Southeastern Conference on Public Administration*. Coral Springs, FL, October 2012.