Dr. Robert T. Smith  
Dean, School of Science and Mathematics  
P.O. Box 1002  
Caputo Hall Room 206  
Millersville, PA 17551  

February 26th, 2015

Dear Dr. Smith,

This letter will serve as my final report for my Faculty Grant funded Release Time project on Global Change Database Development and Publication with MU Students. This project was to develop a database of in situ measurements collected over the US Eastern Shore Continental Shelf. The data base consists of variables including Temperature, Salinity, and Oxygen, chlorophyll, Nitrate, Silicate, Phosphate, Nitrite and light. The data base development was complicated by irregular spatial and temporal measurements. Statistical interpolation methods were used to build a data base of consistently measured quantities based on time and x,y and z co-ordinates. This allowed us to use standard statistical methods to estimate various parameters. Analysis of the dataset brought out many interesting features of the Delmarva continental shelf.

Based on our analysis and results we wrote an abstract and presented at the international Ocean Sciences meeting in Hawaii, February 22-29th, 2014. The abstract of the meeting is attached. The actual poster presented at the meeting is also attached.

The release time allowed me to spend quality time building the database, analyzing the data and in the making of the poster presented in the International Ocean Sciences Meeting. Another outcome of the release time is the work/study learning program that is providing MU Earth Science students paid time to do research under my guidance and gain valuable professional experiences necessary to launch them into a career in ocean related sciences. The release time allowed me to interact with my student Kaitlyn Colna in the analysis and presentation of the data. Kaitlyn Colna is presently a graduate student at the University of South Florida, Tampa, Florida. Another outcome is a manuscript that is in preparation.

Please do not hesitate to contact me with any questions or concerns regarding this release time award.

Sincerely,

Ajoy Kumar  
Associate Professor of Oceanography  
Millersville University
Adapting to a changing climate along the Eastern Shore
Kaitlyn Colna¹, Ajoy Kumar¹ and Kevin Robinson²
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Wallops Island is part of a largely undeveloped coastal systems of 18 barrier islands. Because of its location on the Atlantic coast, sea level rise and storm surge may be the biggest threats to Wallops Island. Climate data collected over the past 60 years in the Wallops Island area show a long-term pattern of sea level and temperature rise. Data from Salisbury, Maryland indicate that the average annual temperature has risen approximately 1.2⁰ C over the past century. Data from Kiptopeke, Virginia show that sea level has risen about 7 inches during the past sixty years.

To further understand how the waters off Delmarva are changing, we analyzed CTD and nutrient data sampled bi-monthly by NASA Wallops scientist during 2005-2007. We show seasonal variations in the temperature and salinity fields and show how these fields are related to stratification conditions of the mid-shelf region. How the stratification affects the nutrient, oxygen and chlorophyll fields are discussed. The objective of this work is to identify areas of stratification and relate to possible low oxygen conditions in the region. Another objective is to encourage and develop research skills to undergraduate students.
Adapting to a Changing Climate Along the Eastern Shore
Kaitlyn Colna, Nathan M. Murry, Ajoy Kumar and Kevin Robinson
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Introduction

The Eastern Shore, extending from Virginia to New Jersey, is a data-rich, well-investigated region known for its coastal and oceanic features. It is a region of significant importance for understanding climate change, as it is highly sensitive to changes in sea level and coastal processes. This study aims to quantify the effects of climate change on the coastal environment, particularly along the Eastern Shore.

Background

Exposure to rising sea levels due to climate change is a major concern for the Eastern Shore. The region is vulnerable to coastal flooding, erosion, and changes in water quality. Climate change is expected to alter temperature and precipitation patterns, potentially impacting the region's ecosystems and human activities.

Scientific Objectives

To develop a detailed climate model that can simulate the effects of climate change on the Eastern Shore and coastal areas.

To quantify the impact of climate change on coastal flooding and erosion, and to assess the potential for adaptation strategies.

To provide insights into the potential impacts on coastal wetlands and fisheries, and to evaluate the effectiveness of management strategies.

Summary

We have developed a model to simulate the impacts of climate change on the Eastern Shore. The model predicts increased coastal flooding and erosion, with significant implications for coastal ecosystems and human settlements. The model also highlights the importance of adaptive management strategies to mitigate these impacts.

Future Work

Our next step is to integrate the model with field observations to test its accuracy and to refine the projections. We will also explore the potential for adaptation strategies, such as coastal engineering and habitat restoration, to mitigate the impacts of climate change.

References


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A Funding Letter

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