Global climate change is an imminent threat to sea levels. Earth’s ice sheets continuously melt due to greenhouse gases. If both the Greenland Ice Sheet and the Antarctic ice sheet were to completely melt, the sea level would rise 66 m according to the National Snow and Ice Data Center. With the constant melting of these two Ice Sheets, glaciologists need to detect either their melting rate or rate of depreciation. The problem is that Glaciologists often spend extensive hours ‘Ground Truthing’, manually detecting and outlining desired layers of ice sheets within echograms, x-ray images of ice sheets. Is there a way that this process can be modified in order to produce accurate results in a fraction of the time? Using an active contour methodology, we will (1) compare several different approaches: levelsets, snakes, and hidden markov model to the previously outlined ground truth layers. We will then use these results to answer the question: (2) “What is the best method to use in finding/creating an automated system for ice sheet layer detection?” In addition, we will (3) use genetic algorithms to find the optimum layer detection parameters. With genetic algorithms, each individual image will be able to gather a set of its very own optimum parameter data for desired layer outlines. Currently, we are continuing research and are beginning our work with coding the snakes approach and next we will use genetic algorithms to modify this approach. At the end of our research project, we will hope to find an automated process to accurately, and efficiently identify distinct ice sheet layers (e.g. bedrock, surface, etc.). Our research efforts will affect the glaciology community in a revolutionary fashion and will no longer require enduring hours of ground truthing, but easily identify glacier rate of depreciation from any given echogram.
The Center for Remote Sensing of Ice Sheets (CReSIS) at the University of Kansas hosted the International Glaciological Society’s (IGS) International Symposium on Radioglaciology in Lawrence, Kansas, September 9-13, 2013. Representatives from the Center of Excellence in Remote Sensing Education and Research (CERSER) at Elizabeth City State University (ECSU) gave presentations on their research. CERSER Director and CReSIS Associate Director of Education and ECSU Operations, Dr. Linda Hayden led the ECSU contingent at the symposium.

The IGS Symposium included presentations from international researchers and provided a forum for participants from around the world to exchange scientific information. The symposium involved technological improvements in radars and signal processing techniques for exploring ice-sheets, glaciers and their geophysical settings. CReSIS co-hosted the symposium with the University of Kansas, the KU School of Engineering and the National Science Foundation (NSF).

Maya Smith - WSSU
Mentor: Dr. John Paden
Analysis Functionality to enhance MATLAB default interpolation schema using mGstat

The Center for Remote Sensing of Ice Sheets (CReSIS) has a large database of data that is examined by many researchers. This project consists of two enhancements to the CReSIS toolbox. The first, was the need for extended analysis functionality in MATLAB. The objective of this project was to enhance MATLAB’s default interpolation schema by using the mGstat package for the interpolation of point data. To accomplish this we needed to download and install the mGstat package then review the mGstat documentation and functionality. We then tested the mGstat interpolation methods by using the mGstat examples and later tested the mGstat interpolation methods using CReSIS data. The second project is a JavaScript viewer for echogram data that will be integrated into the web interface for the CReSIS geospatial database.

Change the World: Education Outreach

On September 27th and 28, 2013, representatives from Elizabeth City State University’s Center of Excellence in Remote Sensing Education and Research (CERSER) presented at the National Science Foundation’s “Change the World” Science and Engineering Career Fair as part of the Center for the Remote Sensing of Ice Sheets (CReSIS) Education Outreach program. CERSER staff and students presented interactive lessons ranging from “Ice, Ice, Baby” lessons utilizing “Goo” to represent glacier movement to online tutorials and quizzes presenting knowledge of the Antarctic, Arctic, and Greenland ice masses. Dr. Linda Hayden, director of the CERSER program and CReSIS Associate Director - Education and ECSU Operations supervised the presentation and assisted a group of elementary, high school, college students, and teachers from the Elizabeth City area who arrived on Saturday for the presentations.
Seaspace and Elizabeth City State University (ECSU) signed a Memorandum of Understanding (MOU) in February of 2012. Seaspace is the world’s leading provider of satellite ground stations and processing software for remote sensing applications. The MOU stated that ECSU would provide a training site for Seaspace’s technology and data products along with integration of the products into classroom curriculum. In return, Seaspace would provide ground stations for receiving direct broadcast data from various telemetries. The ground stations include a 3.7 m X/L band, a 3.6 m C band, and a 5.0 m L band dishes, along with accompanying computing hardware. The purpose of this project was to generate a training curriculum focused on the K-12 classroom, along with college courses, and outside governmental agencies. The curriculum contains one hour modules which as a whole could be presented as a 10 hour course that qualifies as one continuing education unit (CEU) for K-12 teachers and administrators. Example modules for “Introduction to Remote Sensing” and “Introduction to the TeraScan” were also created.

X-Informatics MOOC: Web Development and Design

Online learning is an upcoming trend in the education world today. As there is a rise in technology, so do different institutions create online classes online using sites like Massive Open Online Course (MOOC), Coursera and so on. Indiana University, school of Informatics and Computing, is one of the many schools that have chosen to get students enrolled in online classes. One of these classes is the Big Data X-informatics MOOC, which our research is based on. The main problem we are faced with that we are finding the best methods to eradicate is how to make online learning much more effective to the students.

Therefore, we are to invent ideas to create features that will improve interaction between the educational content and the user (students and professors). Firstly, surveys were made on other online educational sites like Coursera, Udemy, edX, Udacity, Duolingo, course builder, and Khan Academy. This was to observe features on these sites that enabled effective interaction with the different calibers of students and the sites, and features that did otherwise. Our findings enabled us to create new features or modify old features that enhance student-service interactivity. Furthermore, having gained knowledge from articles like “Design Principles for Visual Communication” Visual Communication,” and “Peer Instruction in CS: Research and Experience,” we are using AXURE to create the near perfect design / wireframes, with the observed features, that will interact effectively with the student; hence, catalyzing efficient learning.
The Pasquotank River Watershed is found in Northeast North Carolina beginning in the Great Dismal Swamp at the Virginia/North Carolina border and flows into the Albemarle Sound. The watershed provides a transition between spawning grounds and the waters of the Albemarle Sound. The sound serves as a nursery area for many fish species and is home to numerous sport and commercial species. The watershed is supplied by tributaries enclosed by various landforms such as swamp, farmlands, and housing development. These landforms make both negative and positive contributions to the water quality of the watershed.

The research team completed tests of five tributaries and the river itself. These test points were derived from a 2012 research project in order to compare the results. Streams tested were Newbegun Creek, Knobbs Creek, Areneuse Creek, Mill Dam Creek, and Sawyers Creek. This test area covered a large area of the watershed and provided a variety of shorelines.

Tests performed on this year’s samples included pH, salt, total dissolved solids, and conductivity. Air/water temperature, dissolved oxygen, wind speed/direction, and turbidity/clarity measurements were taken in the field. The results from these readings were placed into an online database and correlated to the location of the sample using Google Maps®. The data were then compared to the 2011 project data and analyzed for any variations or similarities.

In the past decade, online learning initiatives have become increasingly comprehensive and have allowed students to be unburdened from learning complex subjects in a traditional teach-learn environment. Universities have recognized the need to adapt new teaching-learning approaches for meeting students’ diverse inadequacies. Cloud computing, which offers a scalable and flexible approach to storing, processing, and analyzing big data, has benefited from a variety of science applications except for remote sensing.

The research explored the potential for a cloud computing and remote sensing curriculum through the use of video resources and hands-on assessments. This research discusses a curriculum for coupling two diverse research areas, cloud computing and remote sensing. The solution acquired information about cloud computing and remote sensing in order to develop five 15-20 minute self-contained modules. Understanding the challenges recognized by minority serving institutions in adapting from a teaching-learning environment to an online environment were also explored.

Sea level is strongly linked to the growth and shrinkage of the large ice sheets in Greenland and Antarctica. There is an urgent need to improve both knowledge of ice dynamics and accuracy of ice-sheet models to predict the ice-sheets’ response to a warming climate and their contribution to sea level rise. A key component to improve the ice sheet models through the use and interpretation of radar data is the knowledge of the dielectric properties of the ice. Most of the measured data on the dielectric properties of the ice available today is based on measurements performed at low frequencies with the technology available in the 1960s. In this project we will design and fabricate a set of test fixtures to characterize permittivity of dielectric materials using a network analyzer. One technique to be used relies on a planar transmission line in contact with the sample. The second technique relies on an open ended coaxial transmission line in contact with the sample. These methods will serve as a basis for dielectric measurements on dielectric materials in the 60-600 MHz range and will be used as a test bench for future measurements on ice cores.

The Pasquotank Watershed in northeastern North Carolina was also explored.
The earliest English colonial populations in the new world spread rapidly through southeastern Virginia and northeastern North Carolina in the late 16th and early 17th centuries. These peoples had to overcome insufficient food sources, threat of attack by hostile indigenous peoples, and even hostile European powers. Early, mutually beneficial, contact and relations with non-hostile Native Americans were often sought by European colonists as a survival strategy. Sites characterized by close proximity between colonists and natives are well known in northeast North Carolina. Opportunities for participating in the archaeological investigations of early historic colonial sites became possible with a collaborative research effort undertaken with the Museum of the Albemarle (MOA) and the Elizabeth City State University’s Center of Excellence in Remote Sensing Education and Research (CERSER) in June 2012. Students in a summer research program for undergraduates have engaged in a Ground Penetrating Radar (GPR) survey of a site related to the Culpeper Rebellion of 1677. This summer, in collaboration with MOA, a high-resolution GPR survey was performed of a known Native American settlement site that existed in close proximity to early colonial habitations near Edenton, NC, on the Chowan River. The survey was designed to reveal the presence of any buried remnant structures that might indicate adoption by Native Americans of cultural features of colonial life such as defensive fortifications, or structures that may have served either religious or commercial purposes such as a church or trading post. Alternatively, evidence for the presence of dwellings might indicate a closer affiliation between struggling colonists and the indigenous population. The survey team used the Geophysical Survey Systems SIR-3000 Utility Scan GPR and the associated RADAN 6.6 data processing software. It performed a GPR survey at 0.5 meter spatial resolution of the most promising areas for colonist and Native American interaction as defined by prior MOA archaeological studies in collaboration with the museum’s archaeologist. Data collected was processed and examined for any evidence of buried structural features. Surveying such sites with GPR is important due to modern threats to the maintenance of their pristine state. Threats to such sites include residential development, forestry operations, agricultural, and increasing shoreline erosion.

Renee Butler - HINU
Mentor: Dr. David Braaten
Accumulation Layer Picking

Radar data collected with a FWCW CReSIS radar operated on a 375 km surface traverse along the ice divide in North-Central Greenland in 2007 is being used along with ice core data along the traverse to better understand the layers detected by radar. The layers being picked are from two 10 km segments of the radar data set. The segments are deeper than 30 m to a maximum depth of 100 m and date back more than 400 years. The layers are used in a similar manner as tree rings to understand whether or not annual layers are missing and if the vertical distance between layers (slab thickness) includes more than one year of snowfall. The slab thickness is related to the annual accumulation of snowfall; thicker slabs mean more snow and thinner slabs mean less snow during the year. Nearby ice core data will be used to understand the chronology (the science of arranging events in their order of occurrence in time) of the layers. The ice core data also provides ice density profile measurements; which will be used to more accurately calculate the radar signal propagation speed through the ice. This will provide increased accuracy of determining the internal layer depths, and this increased accuracy will be quantified in my paper.
Justin Deloatch - ECSU  
Mentor: Dr. Geoffrey Fox, IUB  
**Utilizing HUBzero to Create an Educational Hub for CReSIS Educational Data Sets**

HUBzero is an open source software package used to construct web sites for scientific research and educational activities. Hubzero was originally created by researchers at Indiana University – Purdue University Indianapolis (IUPUI) in conjunction with the National Science Foundation (NSF) who sponsored the Network for Computational Nanotechnology to support nanoHUB.org. The HUBzero platform currently supports over 40 hubs across a variety of disciplines, including cancer research, biofuels, climate modeling, water quality, and education.

This project utilized data from the Center for Remote Sensing of Ice Sheets (CReSIS), which was established by the NSF as a Science and Technology Center in 2005. CReSIS has a mission of developing new technologies and computer models to measure and predict the response of sea level change to the mass balance of ice sheets in Greenland and Antarctica. Their website offers enormous amounts of ice sheet data that includes thickness, dates, latitudes, and longitudes. Also the website offers educational data sets which this project has utilized.

The goal of the project was to create a Hub that has the ability to access CReSIS educational data that has been stored on a server on the campus of Elizabeth City State University (ECSU). This Hub will allow students and educators to have access to this information for the use of education and scientific collaboration. HUBZero requires that the administrator uses Joomla, HTML, CSS and PHP code to create the template. HUBZero also uses an application called Rapture to create a Graphical User Interface (GUI) that is capable of deploying new tools without having to rewrite special code for the web. Tools in a hub have been created to be interactive, which means its capable of zooming in on a graph, rotating a module, probing surfaces of a 3D volume, without having to download the application to the client’s computer. Do to the fact that HubZero supports Grid Data management, it is capable of sending jobs off to TeraGrid, DiaGrid, and RedCloud to process the data faster and more efficiently. This Hub is the first science gateway implemented at Elizabeth City State University that is meant for the public.

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Derek Morris - ECSU  
Mentor: Dr. Gregor van Laskewski, IUB  
**From 0 to 100: Cloud computing for the Non-Programmer**

This project will be demonstrating that it is possible to use and program a cloud within seven weeks, even though the student has no prior research and programming experience. The student will be faced with identifying what a cloud is as an abstract concept. The student will be exposed to an absolute minimum level in programming needed to program the cloud. Small programming exercises and lessons will be given to not only learn abstractly about the cloud, but will allow the student to experience using the cloud in a production setting. We will demonstrate that the student at the end of this period will be capable of using hundreds of virtual machines and controlling...
On December 9-13, 2013, representatives from various Historically Black Colleges and Universities attended the 2013 American Geophysical Union (AGU) Fall Meeting in San Francisco as representatives of the NASA Innovations in Climate Education (NICE) program. The AGU Fall Meeting is the largest conference in the geophysical sciences with earth and space scientist, students, teachers, and others in attendance.

NASA NICE Representatives
- Dr. Linda Hayden - ECSU
- Dr. Darnell Johnson - ECSU
- Dr. Loretta Jaggers - GSU
- Dr. Edward Hill - FVSU
- Dr. Sheryl Bradford - ECSU
- Dr. Suseela Reddy - JSU
- Mr. Ervin Howard - ECSU
- Mr. Kaiem Frink - VUU

**ORAL PRESENTATION**

Dr. Linda B. Hayden; Dr. Stephen R. Hale; Dr. Darnell Johnson
Engaging Minority University STEM Education Professors in the Science of Climate Change: Recruitment, Implementation, Evaluation, and Dissemination

**POSTER PRESENTATIONS**

Dr. Loretta Jaggers
The NASA Innovations in Climate Education Project: Instructional Strategies for Expanding Climate Change Concepts within Reading/Literacy Skills

Dr. Darnell Johnson
The Impact of 2006-2012 CReSIS Summer Research Programs that Influence Student’s Choice of a STEM Related Major in College

Mr. Kaim Frink; Mr. Ervin Howard; Dr. Edward Hill
NASA NICE Climate Change Education: Best Practices for Incorporating Climate Change Pedagogy
ECSU RESEARCH WEEK 2013

The School of Mathematics, Science and Technology welcomed honored guests and participants to the 9th Annual Research Week 2013. This week enabled the Elizabeth City State University family, the citizens of Elizabeth City, and surrounding counties to participate in informative presentations by student researchers and their mentors, workshops and seminars featuring government officials, and private industry representatives. There were also outstanding demonstrations from departments within the School of Mathematics, Science and Technology and from scientific organizations.

This year’s theme was “Celebrating STEM Success”. Oral and poster presentations representing research, lectures, panel presentations for academic discussions, and prominent speakers including Dr. Gamaliel Cherry of the NASA Langley Research Center, were all part of the week.

GENDER SUMMIT 3 NORTH AMERICA

Dr. Linda Hayden, Director of the Center of Excellence in Remote Sensing Education and Research (CERSER) and Associate Director - Education and ECSU Operations for the Center for Remote Sensing of Ice Sheets (CReSIS), recently attended the Gender Summit sponsored by the National Science Foundation and others in Washington DC.

The aim of the 3rd Gender Summit is to join all relevant participants in a Call to Action to achieve positive change towards greater diversity in the Science, Technology, Engineering and Mathematics (STEM) workforce and leadership, and greater inclusion of biological sex and gender considerations or the “gender dimension” in research content and process. The event was held on the 13 - 15 November 2013 at the Washington Hilton in Washington DC.

Attendees pictured below left to right:
Linda Hayden, Elizabeth City State University
Loretta Moore, Jackson State University
Cynthia Winston, Howard University
Sonya Smith, Howard University
Kelly Mack, University of Maryland Eastern Shore

2010-2013 PARTICIPATING INSTITUTIONS

Minority Serving Institutions (MSI)
- Elizabeth City State University (ECSU)
- Fayetteville State University (FSU)
- Hampton University (HU)
- Haskell Indian Nations University (HINU)
- Jackson State University (JSU)
- Mississippi Valley State University (MVSU)
- Norfolk State University (NSU)
- Spelman College (SC)
- St. Augustine’s College (SAC)
- Virginia Union University (VUU)
- Winston-Salem State University (WSSU)

Non-Minority Serving Institutions (Non-MSI)
- Cornell University (CU)
- Dartmouth College (DC)
- Gettysburg College (GC)
- Kansas State University (KSU)
- Macalester College (MC)
- Rice University (RU)
- Rochester Institute of Technology (RIT)
- Texas A&M University (TAMU)
- Towson University (TU)
- Unity College (UC)
- University of Alaska Fairbanks (UAF)
- University of California, Los Angeles (UCLA)
- University of Maryland (UM)
- University of Pennsylvania (UP)
- University of Utah (UU)
- University of Vermont (UVM)
- University of Washington (UW)

For more information visit http://nia.ecsu.edu/ur.html or http://nia.ecsu.edu/ureomps2012/
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