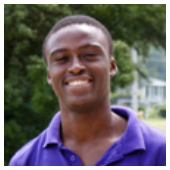
Undergraduate Research Experience

Center of Excellence in Remote Sensing Education and Research

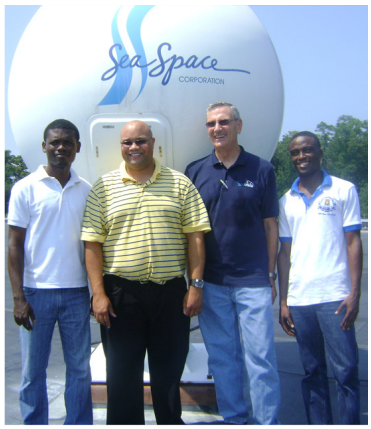
Summer 2011 Research Abstracts :: 2011-2012 Program Highlights

Ignatius Williams , Rockson Armaah - Univ. of Ghana
Mentor: Mr. Je'aime Powell
ECSU REU in Ocean, Marine and Polar Sciences
Using Satellite Ground Operations Training to Develop an Algorithm Using Satellite SST Data from the CERSER Ground Station to predict NOAA NC Coastal Sea Buoy Temperatures



ECSU currently operates a TeraScan Grounding station capable of receiving and processing imagery data collected by satellites managed by NOAA. The imagery received in the Infra-Red spectrum both measures sea surface temperatures and cloud cover for the eastern coast of North Carolina.

Once the data sets were collected, they were statistically analyzed using the analysis of variance methodology and regression. Strong correlations were observed during the AVHRR-Buoy comparison for two of the three areas under the study. The NOAA-16 AVHRR SST emerged as the most consistent with the insitu data from the ORIN7 Buoy. This was due to its high coefficient of determination. TeraScan training received during the period also contributed knowledge on the processing of raw data to suit specific areas of interest. The processed data could then be exported to third party software such as ENVI and Google Earth while maintaining the specific data of interest.



Ryan D. Lawrence - ECSU
Mentor:Dr. Ian Joughin and Ms. Brooke Medley
University of Washington - CReSIS Visulization
Developing a Method for Accumulation Rates Using CReSIS Airborne Snow Radar from West Antarctica

For more than 50 years, scientists have retrieved ice cores from the world's ice sheets to study ice dynamics as well as past and present climatic and atmospheric conditions, including the accumulation rate. The ice-sheet accumulation rate is not only an important climate indicator but also a significant component of ice-sheet mass balance, which is the total mass gained or lost over a prescribed period of time . Snow accumulation is the primary mass contributor while ice flux into the ocean and surface melting are the primary mass loss mechanisms. As concern over sea-level change and ice-sheet stability increases, more accurate and spatially complete estimates of the accumulation rate are required. Therefore, the sparse point estimates of the accumulation rate no longer give sufficient data for regional mass balance estimates because of their limited spatial coverage, but remain important paleoclimate records due to their exceptional temporal resolution. In order to constrain current mass balance estimates at the regional scale, improvement in the spatial resolution of accumulation rate estimates is necessary.

West Antarctica in particular is seriously lacking in point based measurements of the accumulation rate, whether through snow pit or ice core analysis. Climate models show the region along the Amundsen Coast receives snowfall amounts unprecedented across most of the continent, yet these models lack any ground-truthing and are limited in their spatial resolution. Thus, any estimates of mass balance over this region are ill-constrained and are in need of much better estimates of the snow accumulation rate.

Using the CReSIS developed Snow Radar, which is capable of imaging near surface layers in the uppermost part of the ice sheet at a very fine vertical resolution, estimates of very recent firn accumulation rates over the Thwaites Glacier along the Amundsen Coast of West Antarctica were calculated using data from Flight One, Segment 02 of the 10/18/2009 flight. The derived dataset estimates were within range of previous estimates; however, the continent wide published estimates do not correspond well with each other nor the specific dataset for Thwaites Glacier.

Lekedrick Easley - MVSU, Nartezya Dykes - Spelman
Mentor: Mr. Je'aime Powell
ECSU REU in Ocean, Marine and Polar Sciences
Charles Creek Flood Zone Modeling: A Correlation Study of Environmental Conditions Versus Water Level in the Pasquotank Watershed

The Charles Creek area in Elizabeth City, NC experiences frequent flood conditions seemingly unrelated to rain fall amounts. The purpose of this study is to compare barometric pressures, lunar cycles, wind directions and wind speeds with water depth readings of Charles Creek (a tributary of the Pasquotank River). A static remote imaging system will be used to measure water depth through pixel enumeration and referencing through remote sensing techniques coupled with custom image processing software. Environmental data will be collected through Elizabeth City State University's National Renewable Energy Laboratory Weather Monitoring Station. The data will then be correlated using MINITAB (R) to find an equation that will approximate a model of the rise of the creek water level based upon environmental conditions.

Michael Jefferson - ECSU
Mentor: Michael Routhier
University New Hampshire Research and Discover Program
Development of a 3D Model for the Assessment of Vulnerability Due to Sea Level Rise on the Historic Strawbery Bank

The study of climate change is now starting to be widely researched around the world. One prominent exception to this fact is within the discipline of Historic Preservation. With the likelihood of climate change causing sea levels to rise over decades to come, historical preservationists are now looking for data and information which can help them mitigate potential threats to our cultural heritage along our sea coasts. Some such information that can be helpful in understanding these threats includes geographic information such as the locations of artifacts, fossils, and historic structures as well as their vertical elevation above mean sea level. In an effort to build a set of protocols to help preservations study these threats, our work is currently focusing on a historic living history museum site known as Strawbery Banke in Portsmouth, NH. This research features a subset of this work that was completed through undergraduate student internships funded by the Joan and James Leitzel Center at UNH. This subset of work focused on the creation a 3D model of the study site. This model involved the completion of a topographic ground survey and the 3D digital mapping of the site itself. The ground survey was completed with the use of standard surveying techniques and tools and the 3D digital mapping was completed with the use of ArcScene software.

Glenn Koch - ECSU
Mentors: Dr. Xiaofeng Wang, Kehuan Zhang
REU, IU Bloomington
Hybrid Cloud Security: Replication and Direction of Sensitive Data Blocks

The primary focus of this research was to analyze the Hybrid Cloud security platform as proposed by Dr. Xiaofeng Wang and his research team. Large scale data sets in cloud computing environments carry inherent security concerns. The proposed platform involves code implementation and modification within the Hadoop Distributed File System as it pertains to parallel data processing. A hybrid cloud solution involves separating sensitive data which is confined to a private domain (private cloud), from non-sensitive data (public cloud). The specific research task was to create and modify java source code within the Hadoop Distributed File System, to implement alternative replication factors and test to verify that data was replicated to the proper domain (public or private) based on its security tag. Code was modified to change the replication factor of data and tested. Modified code was tested to see that data was distributed to public and private domains as tagged. This project is supported in part by National Science Foundation Grant CNS-0716292.

Jean Bevins - ECSU, Michael Austin - ECSU
Mentor: Xiaoming Gao
REU, IU Bloomington
Testing Windows Azure Cloud Computer Service Efficiency

The primary focus of this research project was to test cloud computer services using Windows Azure. Windows Azure is a Microsoft cloud platform used to host, shape and balance web applications through Microsoft datacenters. Clouds are machines that are accessed via internet to either store or compute files. Cloudberry Explorer manages the files in the Microsoft Azure Blob Storage. The clouds efficiency and effectiveness was tested by sending and receiving data at peak and off peak times. The type of files tested consisted of txt, jpeg, music, video, and software. The upload and download of the files were recorded along with the speed and size.

JerNettie Burney - ECSU, Robyn Evans - ECSU
Mentors: Seung Hee Bae and Jong Youl Choi
REU, IU Bloomington

A Comparison of Job Duration Utilizing High Performance Computing on a Distributed Grid

Parallel computing is defined as carrying out large-scale calculations simultaneously through the use of multiple computing units—such as processors or cores—that work together to devise a solution. During the summer of 2011, undergraduate research students participating in the Science, Technology, Engineering, and Mathematics Initiative at Indiana University Bloomington, were partnered with graduate students to examine the efficiency of parallel computing. To complete this, the team decided to create a program that divides the mathematical computation to multiply large-scale matrices amongst x nodes, or computer cores.

Overall, the team had a goal of three-fold: i) To understand parallel computing and parallel algorithms for large-scale computing in a shared memory system; ii) To understand the cutting-edge computing technologies needed to maximize the power of multi-core processors; and iii) To learn the standard performance measurement methods behind parallel computing. To these ends, the team implemented parallel matrix multiplication algorithms for a shared memory system and compared their computation performances. The team planned to make comparisons between C, C++, and C#, however, due to time constraints, comparisons were only made between C and C#. These comparisons were made to find not only the most prompt program but also to study the efficiency—the measure of how well the execution was performed—of each one.

A program was first developed to compute sequential matrix multiplication and then was rewritten to include multiple workers to solve the problem; the method for including multiple workers in the program is known as threading. Open Multi-Processing (OpenMP) and Task Parallel Library (TPL) libraries were used in C and C# respectively to specify the number of workers needed to compute the program. The code was then submitted the code to the designated compute node—cn04 for C and cn05 for C#—on the cluster system Storm. It was during this step that both the matrix size and the number of desired workers were specified. The maximum number of threads that could have been used were 24, however 16 was decided to be the current maximum for research purposes. The sequence of threads that were used for calculations were 1, 2, 4, 8, and 16 while the matrix dimensions that were multiplied were 2048 x 2048 and 4096 x 4096. Finally, the time in seconds, it took each job to be completed, was recorded and a comparison was made.

Ya'Shonti Bridgers - ECSU, Jessica Brownlow - MVSU
Kirsten Hawk - Spelman
Mentor: Dr. Malcolm LeCompte
ECSU REU in Ocean, Marine and Polar Sciences

Temporal Reduction of the Ice Shelf in Pine Island Bay Antarctica: 1972 - 2003

In an effort to determine whether the Antarctic ice sheet is growing or diminishing over long time intervals, Dr. Robert Bindschadler led an international team of glaciologists and computer scientists, including Elizabeth City State University (ECSU) students, to obtain an accurate measure of the area of the Antarctic ice sheet. Before the ice sheet's area was determined, the grounding line (GL), or boundary dividing the ice sheet resting on land from floating ice, was located by combining 2003 Landsat imagery and satellite-based laser altimetry.

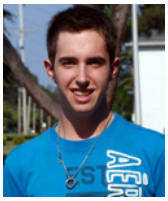
Landsat image data contemporary with that used to create the grounding line was compared to earlier Landsat imagery of the same area. A small ice shelf—now known as the ECSU Ice Shelf—near the eastern entrance to Pine Island Bay was previously identified as having diminished over an approximate 31-year span and the progressive reduction of its area qualitatively characterized. Here, the area loss of the ECSU Ice Shelf is quantified over time from 1972 to its disappearance in 2003.

Departures from perfect geographic pixel registration in Landsat imagery of the ECSU Ice Shelf collected before 2003 was corrected with ITT's Visualization Information Solutions' ENVI image processing software using a 2003 Landsat 7 Enhanced Thematic Mapper (ETM) image as a reference. Older images from Landsat 4,5 Thematic Mapper (TM) and Landsat 7 (ETM) were registered to conform to the common fixed geographic control points visible on both images. By overlaying the GL on the registered (warped) images, the area changes in the ice shelf were computed. An average ice shelf area was determined from four independent measurement trials for each of the pre-2003 Landsat image. Landsat Images from 2003 used in creating the GL were obtained from the United States Geological Survey (USGS) archive. The older, cloud free Landsat 4, 5 TM and 7 ETM images of the Pine Island Glacier region were obtained from another USGS archive.

Results provided: 1. A quantitative description of the disappearance of the ECSU Ice Shelf from 1972 through 2003; 2. Validation of the grounding line's actual location; 3.A survey of Antarctic coastal features that may have experienced climate related change.

Dalesha Cartman - MVSU, Marvin Elder II - MVSU, Sean Leavy - UM
Mentor: Dr. Darnell Johnson
ECSU REU in Ocean, Marine and Polar Sciences
The Use of the Math Sprint in a Tutorial Program for Sixth Grade Students to Improve End of Grade Test Scores





What is the effect of a math sprint tutorial model on Mathematics achievement of sixth graders at Elizabeth City Middle School in Elizabeth City, North Carolina? A math sprint tutorial process was used during a three-week study with a group of 13 sixth-grade students to increase test scores from the previous 2011 Spring end of grade (EOG) test. The data, gathered from the post-test as a result of the series of tutoring sessions, was compared with the scores from the 2011 Spring EOG. Research studied the improvements made in scores on the North Carolina mathematics state test.

The North Carolina Mathematics Standard Course of Study provides a set of mathematical competencies for each grade and high school course to ensure rigorous student academic performance standards that are uniform across the state. It is based on a philosophy of teaching and learning mathematics that is consistent with the current research, exemplary practices, and national standards.

Brandon Scott - St. Aug
Mentor:Dr. Ian Joughin and Ms. Kristin Poinar
University of Washington - CReSIS Visulization
Do strain rates determine the spatial density of crevasses on the Greenland Ice Sheet

To compare spatial crevasse density with an existing strain rate dataset, a Fast Fourier Transform (FFT) algorithm was used to create a one dimensional spatial crevasse density map from a 2.25 km2 area on the western flank of the Greenland Ice Sheet (GIS). Although we find a poor correlation between crevasse density and longitudinal strain rates, the correlation improves significantly when the crevasses are projected five years upstream. This suggests that the crevasse patterns are relicts of strain rates the ice felt five years ago, and that it takes five years for crevasses in the study area to open fully. The stress required to create these crevasses, 111 ± 47 kPa, compares well to the existing body of literature on tensile strength. The average total crevasse life span of twelve years in the study area region was found to vary greatly from those in the Worthington Glacier in Alaska, where crevasses persist for only one to two years.

Cedric Hall - ECSU
Mentor: Michael Routhier
University New Hampshire Research and Discover Program
A Study to Understand the Potential Vulnerabilities to the Foundations of Historic Structures in Coastal Areas

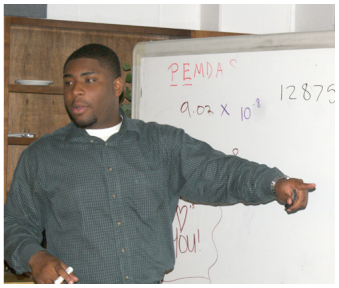
Sea level rise, one of the most important manifestations of climate change, is expected to result in increased coastal erosion and storm surge flooding. This work reports on a project undertaken to assess the vulnerability of foundations of historic structures in coastal areas to the potential consequences of increased storm surge flooding resulting from climate change.

Foundations of historic buildings are especially vulnerable to the seepage and ground water intrusion. Many historic structures themselves are used to house valuable historic collections. Data collected from a field subsurface geophysical survey, geospatial field survey, and a simulation to understand the hydrological conditions of the site useful to build an understanding of threats to foundations of historic structures located on the coast.

The study site was the Strawbery Banke Living History Museum, in Portsmouth, NH. Located very close to the banks of the Piscataqua River at its meeting point with the Atlantic Ocean, it consists of many buildings of historical importance. This site is representative of historic structures, located on the Northeastern coast of the US, that will likely be impacted by climate change. The primary threat to the sub-structures for the site is Puddle Dock; a tidal inlet, that lies at the heart of the facility, that once provided direct river access to Strawbery Banke.

Results from the long term deployment of in situ water level loggers in test wells, temperature and relative humidity sensors, and a ground penetration radar survey of the Puddle Dock, along with the detailed fine-scale elevation survey of the site provide a window into the seasonality of ground water levels and the dynamic equilibrium of fresh and saltwater.

Initial analysis of the data indicates that at present Puddle Dock acts as a conduit for tidal flows, albeit in a restrained manner. This can be attributed to the very unscientific way that it was filled perhaps with garbage, and other waste. It is anticipated the principles applied for this work can be replicated for assessing the vulnerability of other at-risk historical structures in the Northeastern US.

Joyce Bevins - ECSU, Autumn Luke - ECSU
Mentors: Thilina Gunathne, Stephen Wu, Bingjing Zhang
REU, IU Bloomington

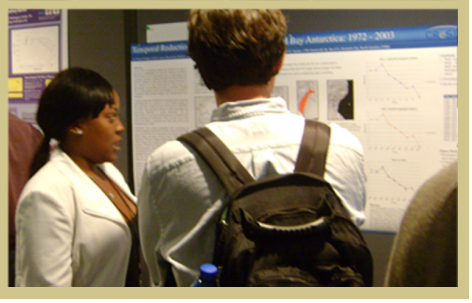
Analyzing MapReduce Frameworks Hadoop and Twister

The primary focus of this research was to analyze the attributes of MapReduce frameworks for data intensive computing and to compare two different MapReduce frameworks, Hadoop and Twister. MapReduce is a data processing framework that allows developers to write applications that can process large sets of data in a timely manner with the use of distributed computing resources. One of its main features is the ability to partition a large computation into a set of discrete tasks to enable parallel processing of the computation. Google, the most popular search engine on the internet, uses MapReduce to simplify data processing on its large clusters. We analyze the performance of Hadoop and Twister using the Word Count application and compare the scalability and efficiency of the two frameworks for this particular application.

West Antarctic Ice Sheet Workshop

On September 21 – 23, Elizabeth City State University was represented at the 18th West Antarctic Ice Sheet (WAIS) Workshop. Representatives included Ya'Shonti Bridgers, and Dr. Malcolm LeCompte of Elizabeth City State University, Jessica Brownlow of Mississippi Valley State University, and Kirsten Hawk of Spelman College. Students presented their summer research from the REU in Ocean Marine and Polar Sciences titled "Temporal Reduction of the Ice Shelf in Pine Island Bay Antarctica: 1972 – 2003. "

This multidisciplinary Earth system science workshop focused on the unique glaciological, geological, oceanographic, and climatic aspects of the West Antarctic Ice Sheet, and related regions elsewhere in the cryosphere. The theme for this year's meeting was Music of the Spheres, underscoring the need to look across disciplines to understand this system.



Aurielle Jones - St. Aug, Shaquetta Hassell - NSU, Antonio Deese - St. Aug
Mentor: Mr. Jeff Wood
ECSU REU in Ocean, Marine and Polar Sciences

Water-Quality Assessment of the Pasquotank River Watershed; Analysis of Dissolved Oxygen, pH, Salt, Total Dissolved Solids, and Conductivity

The Pasquotank River Watershed in Northeast North Carolina is fed by multiple tributaries surrounded by varying landforms such as swamp, farmlands, and urban development. Each of these landforms contributes both negatively and positively to the waters they surround. The watershed itself provides an intermediate between spawning grounds at the headwaters and the more open waters of the Albemarle Sound which serves as a nursery area for many fish species, and home to several commercial species. The Pasquotank River Watershed begins in the Great Dismal Swamp along the Virginia, North Carolina border where acid and significant color from dissolved organic matter is contributed.

The 2011 URE OMPS Pasquotank River Watershed Team performed an assessment of the water quality in the watershed area. Assessments took place in several areas including the main channel of the river from Elizabeth City up to the Dismal Swamp Canal. Tributaries were tested on the south side of the watershed were Newbegun Creek and Knobbs Creek. The tributaries on the north side were Areneuse Creek, Mill Dam Creek, and Sawyers Creek.

Samples were taken at predetermined intervals and returned to the university for testing. Tests included dissolved oxygen, pH, salt, total dissolved solids, and conductivity. Field readings recorded were air and water temperature, wind speed and direction, and turbidity measurements using the Secchi disk.

All measurements were placed on-line and correlated to the location of the sample utilizing GoopleMaps. Readings were then be compared to the landforms around the sample and their distance away from the river to determine if any correlations can be formed.

CReSIS Spring 2011 Distinguished Lecture Series

On Tuesday, March 29, 2011, Dr. Terrencee West of the U. S. Army Aviation and Missile Research Development and Engineering Center presented "Rapid Detection of Agricultural Food Crop Contamination via Hyperspectral Remote Sensing" as part of the continuing Distinguished Lecture Series sponsored by the IEEE-Geographic Remote Sensing Society. Terrance West holds a B.S in electrical and computer engineering, a MS and PhD in electrical engineering from Mississippi State University.

Dr. West's research involves the use of discrete wavelet transforms, multiclassifiers, and decision fusion in an automated target recognition (ATR) system to address the challenges of hyperspectral data as it relates to food crop contamination detection. The experimental results are very promising, resulting in accuracies as high as 90+% for some cases, and demonstrate the efficacy of the proposed system for rapid detection of agricultural food crop contaminations.

L>R
Dr. Linda Hayden, Mr. Orestes Ggoden, Dr. Darnell Johnson, Dr. West, Mr. Je'aime Powell, Mr. Ryan Lawrence, Mr. Willie Brown

ECSU at the University of Ghana

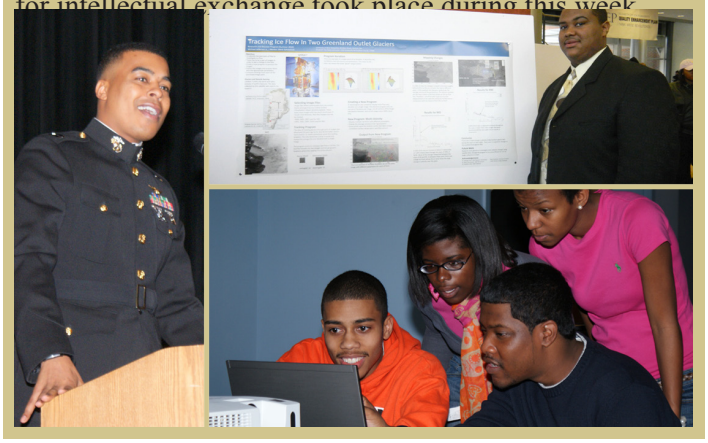
Dr. Linda Hayden met with Dr. George Wiafe and Dr. Francis Nunoo during travel to the University of Ghana, January 2011. Drs. Nunoo and Wiafe are Senior Lecturers in the Faculty of Sciences, Oceanography and Fisheries at the University of Ghana. Dr. Nunoo currently serves as chair of the department.

Dr. Wiafe, who is a collaborator on ONR grant # URE/OMS N00008-1-0832, has research activities which include: Impact of hydrological and climatic factors on marine plankton communities; Assessment of primary productivity using remote sensing; and GIS applications in coastal management. The Department of Oceanography and Fisheries is Ghana's foremost university institution primarily concerned with oceanographic and fisheries

ECSU Research Week 2011

The School of Mathematics, Science and Technology sponsored the 7th Annual Research Week to enable the university and the citizens of Elizabeth City an opportunity to observe the research projects students have been conducting this past year. Three major components of Elizabeth City State University's mission are teaching, research, and community engagement. This week gave the opportunity to observe many accomplishments of both the students and their mentors who together are making a significant contribution to the intellectual wealth of the scientific community.

This year's theme was "A Commitment to Excellence in Research and Education". Outstanding oral and poster presentations representing innovative research, lectures from renowned keynote speakers such as Marine Captain Justin Howe, Pilot to the President, and panel presentations for intellectual exchange took place during this week.



2011 IEEE International Geoscience and Remote Sensing Symposium

VANCOUVER 仙台 2011
IGARSS
24-29 July, Vancouver, Canada

IEEE Advancing Technology for Humanity
GRSS Geoscience and Remote Sensing Society

On July 24-29, 2011 representatives from Elizabeth City State University attended the 2011 IEEE Geoscience and Remote Sensing Symposium in Vancouver, Canada. This was the 31st annual symposium for GRSS which brought together world-class scientists, engineers and educators engaged in the fields of geoscience and remote sensing. The 2011 Symposium theme was "Beyond the Frontiers: Expanding our Knowledge of the World."

Malcolm Blow
North Carolina A&T: Junior

Employing Autonomous Technologies in Global

Brian Mims
Southern University: MS

Gaps in the Spatial Technologies Application Policy for Hurricane Disaster Mitigation in the Gulf Of Mexico

Kaiem Frink
Elizabeth City State University

Compact Reconnaissance Imaging Spectrometer for Mars (CRISM)

Esther Effiong
Howard University: PhD

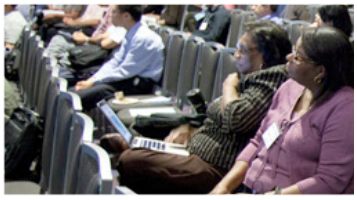
First Measurement of The Henry's Law Solubility Coefficient of Isocyanic Acid (HNCO) in Water and its Potential Health Effects

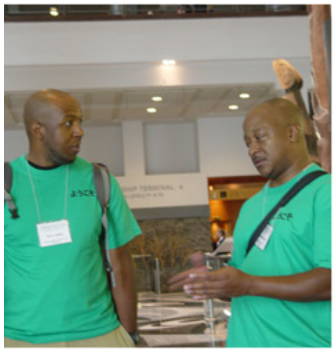
Anthony Cochran
Hampton University

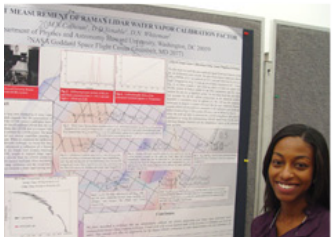
Independent Measurements of Raman LIDAR Water Vapor Calibration Factor

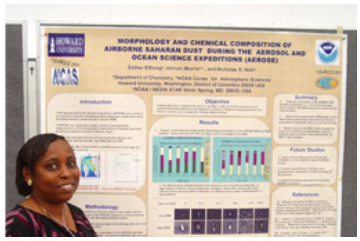
Monique Calhoun
Howard University: PhD

Independent Measurements of Raman LIDAR Water Vapor Calibration Factor









Dates to Remember

http://nia.ecsu.edu/events.html

April 12, 2012
2012 ADMI Symposium
Howard University, Washington, DC
http://www.admiusa.org/admi2012/

April 13-15, 2012
UNH Undergraduate Research Conference
University of New Hampshire
http://www.unh.edu

April 27, 2012
USA Science & Engineering Festival
Washington, DC
http://www.usasciencefestival.org

May 29 – July 15, 2012
URE in Ocean, Marine, and Polar Science
Elizabeth City State University
http://nia.ecsu.edu/ureomps2011/

July 22-27, 2012
2012 IEEE International Geoscience & Remote Sensing Symposium
Munich, Germany http://www.igarss12.org/

MSI Tech Assistance & Capacity Conference

From September 27 -29, 2011, Dr. Linda Hayden, Director of the Center of Excellence in Remote Sensing Education and Research (CERSER) at Elizabeth City State University attended the 5th Annual Minority Serving Institutions Technical Assistance and Capacity Conference in Dallas, Texas. The Conference's theme for the year was Educate Innovate and Cultivate. The conference presented an opportunity to showcase new strategies and methods for partnering with federal agencies. Workshops offered information about acquisition, compliance and regulatory requirements, and information technology. Additionally the agenda featured sessions on technology transfer, education partnerships, mentor protégé, intellectual property, partnerships

URC at UNH 2011

Representatives from ECSU attended the 11th Annual Undergraduate Research Conference (URC) held April 15-30, 2011 at the University of New Hampshire. The URC is a presentation of students research from all academic disciplines. These students presented the results of their scholarly and creative research in one or more of over twenty sites campus-wide. Demonstrations, performances, oral and poster presentations were also presented at the annual conference.

Attending from ECSU were Dr. Linda Hayden, PI, Center of Excellence in Remote Sensing Education and Research (CERSER), research students: Michael Jefferson Jr., Justin

October 16, 2012
Celebration of Women in Mathematics
Elizabeth City State University
http://nia.ecsu.edu/cwm.html

November 10 – 16, 2012
Supercomputing Conference 2012
Salt Lake City, Utah http://sc12.supercomputing.org/

November 21, 2012
International Conference on Appropriate Technology
Pretoria, South Africa
http://www.appropriatetech.net

December 6-12, 2012
2012 American Geophysical Union (AGU) Fall Meeting
San Francisco, California http://www.agu.org/meetings/

SeaSpace Corporation Presentations

On November 8th, 2011, the Center of Excellence in Remote Sensing Education and Research (CERSER) hosted Mr. Eric Baptiste, SeaSpace Manager of the Sales and Marketing department at SeaSpace, presented the latest news and innovations taking place at the SeaSpace Corporation and SeaSpacethe remote sensing arena of operations. Mr. Baptiste presented information on plans for current remote sensing satellites and future imaging platforms to be launched. He also gave information on data sets accessible from other ground stations currently in operation.

Mr. J. Powell, Dr. M. LeCompte, Dr. D. Johnson
Mr. C. Luther, Mr. E. Baptiste, Dr. L. Hayden

The SeaSpace Corporation provides satellite ground stations and processing software for remote sensing applications. CERSER currently runs a TeraScan system with the receiving antenna placed on top of Dixon/Patterson Hall at ECSU. This system was put into place

For more information visit http://nia.ecsu.edu/ur.html or http://nia.ecsu.edu/ureomps2010/
Elizabeth City State University
Box 672 1704 Weeksville Road Elizabeth City, NC 27909 (252) 335-3696/voice (252) 335-3790/fax
ONR - URE/OMS N00014-01-1-0529 NSF REU grant ANT-0944255 CReSIS - NSF FY 2005-108CM1