

## CI-TEAM – Final Report

**Award ID:** 0636361

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**Submitted By:** Hayden, Linda - Principal Investigator

**Grant Title:** CI-TEAM Implementation Project: Cyberinfrastructure for Remote Sensing of Ice Sheets

**The data and details included in this appendix are provided in response to reviewer’s request.** Sections are numbered:

- I. Overview of the final year’s accomplishments
- II. Total numbers of what was accomplished over the life of the grant
- III. Number of participants
- IV. Lessons learned
- V. Sustainable elements

### **I. Overview of the final year’s accomplishments**

The project supported participation of underrepresented graduate and undergraduate students in both Cyberinfrastructure and CReSIS related seminars and training. Partners in the project included Elizabeth City State University (ECSU), The Association of Computer/Information Sciences and Engineering Departments at Minority Institutions (ADMI), Indiana University and The NSF Science and Technology Center for Remote Sensing of Ice Sheets (CReSIS). During the final year of the grant, events included two distinguished lectures, an 8-week research training program for MSI students, ADMI conference support, development of two related master thesis, two publications and webcast of training events. Each of these is described below with associated participation data.

**A. Distinguished Lectures:** During the final year of the grant the two distinguished lectures were conducted. The lectures were webcast to all CReSIS and ADMI partners. Webcast participation indicated below include only the CReSIS and ADMI partners who could be documented.

- a. Dr. Sam Nwaneri, "Dynamics of Water Depletion and Global Warming"
- b. Dr. Yaw Twumasi, "Application of Remote Sensing Technology to Natural and Built Environments: Some Illustrations"

### 2009 Distinguished Lecture Series Participant Demographics

	#On-site	Webcast	Males	#Females	White	Hispanic	Af. Am.	Other
Nwaneri Lecture	54	9	35	28	5	2	55	1
Twumasi Lecture	63	7	43	27	8	1	59	2
Totals	117	16	78	55	13	3	114	3
Demographic info	88.0%	12.0%	58.6%	48.4%	9.8%	2.3%	85.7%	2.3%

**B. 8-week research training program:** An 8-week research training program was conducted for ten underrepresented students from Mississippi Valley State University (MVSU), Elizabeth City State University (ECSU), and Alcorn State University (ASU).

2009 Summer Participant Demographics						
	Students	Males	Females	White	Hispanic	Af. Am.
Summer 2009	10	4	6	0	1	9
Demographic info		40%	60%	0%	10%	90%

**C. ADMI Conference:** Support was provided for 23 underrepresented students from ADMI institutions including ECSU, Hampton University (HU), Spelman College, Winston Salem State University (WSSU), Delaware State University (DSU), Florida A&M University (FAMU), Mississippi Valley State University (MVSU), and Norfolk State University (NSU). The students presented posters and gave oral presentations on their research projects. Each student received a certificate and a check for \$50.00. In addition the cost of registration fees, double occupancy hotel, and in some cases transportation was provided. Students participated in panels on preparing for graduate school, conceptual data modeling (led by Dr. Joan Peckham) and Remote Sensing of Ice Sheets (led by Dr. Andrea Lawrence). <http://www.admiusa.org/admi2009/awards.php>  
<http://www.admiusa.org/admi2009/admi-program-2009.pdf>

2009 ADMI Participant Demographics						
	Students	Males	Females	White	Hispanic	Af. Am.
ADMI 2009	22	10	12	0	0	22
Demographic info		45.5%	54.5%	0%	0%	100%

**D. Master’s Degree Thesis:** Two masters degree thesis were initiated. They include “Multi-Channel Radar Depth Sounder (MCRDS) signal processing: A distributed computing approach” and “Development of a Dynamic Multimedia Interface for Integrated display in a Social Networking Application of Multi-channel Radar Depth Sounder Data Processed through Wiener, Median, and FIR1 Filters in Support of Polar Research.” These projects respectively added Sensor Data to the Grid and integrated CREsis with TeraGrid. Both students are on target to graduate in May 2010.

Master’s Thesis Demographics						
	Students	Males	Females	White	Hispanic	Af. Am.
Master’s Thesis	2	2	0	1	0	1
Demographic info		100%	0%	50%	0%	50%

**E. Publications:** Two publications resulted

Hayden, L. Williams, J., *Leadership Lessons In Science, Technology, Engineering and Mathematics Partnerships, NSF Minority Serving Institutions Technical Assistance and Capacity Building Conference*, Dallas, Texas, September 2009.

Hayden, L., Powell, J., Akers, E., *Establishing Field and Base Camp Servers for Remote Sensing of Ice Sheets in Ilulissat, Greenland*, IEEE-IGARSS Conference, July 2009, Cape Town South Africa.

**F. Virtual Environment, Webcast and Training:** The CReSIS All Hands events were webcast for ECSU and ADMI institutions to participate. In addition, the training events during 2009 included:

22-Jun Intro to Ice Sheets  
24-Jun Seismic/Glaciers  
25-Jun Professional Development - all day  
26-Jun Seismic Cont'd  
29-Jun Ice Core/Paleo  
1-Jul CReSIS Radars  
6-Jul Project Management  
8-Jul Glacier Dynamics  
10-Jul Radars  
13-Jul UAV's  
15-Jul UAV's  
17-Jul RFI issues and radars  
20-Jul Climate Models

**II. Total numbers of what was accomplished over the life of the grant**

A. Over the life of the grant, fellowships were provided for three ECSU graduate students in the amount of \$20,000. The three graduate students (Kaiem Frink, Je'aime Powell and Jeff Wood) were enrolled in a masters degree program with a concentration in remote sensing. Academic year scholarships were awarded to eight underrepresented undergraduate students in the amount of \$28,000.

	Students	Males	Females	White	Hispanic	Af. Am.
Graduate Students	3	3	0	1	0	2
Demographic info		100%	0%	33%	0%	67%

- B. The grant summer program was originally proposed as 4-weeks in length, However, leveraging funds from the Office of Naval Research, an eight-week summer program was conducted for undergraduate students from ECSU and MSI institutions to engage MSI students in polar science and CI related research training. Three cohorts made up of 39 students from 11 MSI institutions participated over the life of the grant.

### 3-year Participating Institutions

Mississippi Valley State University	Winston Salem State University
Elizabeth City State University	North Carolina A&T State University
Spelman College	Fayetteville State University
Hampton University	Alcorn State University
Norfolk State University	St. Augustine College
Delaware State University	

Demographic information for the students participating in the summer research training program can be found in the following chart. Note that 94.9% of the participants were from underrepresented groups.

	3-year Summer Participant Demographics					
	Students	Males	Females	White	Hispanic	Af. Am.
Summer 2007	15	7	8	2	0	13
Summer 2008	14	9	5	0	0	14
Summer 2009	10	4	6	0	1	9
Total	39	20	19	2	1	36
Demographic info		51.3%	48.7%	5.1%	2.6%	92.3%

- C. ECSU has established a minimal 64-node GRID Network configuration and a virtual classroom environment with broadcast and receiving capabilities. With regards to the Grid, access was implemented through web and research portals for computational and data resources. The portals were customized with educational and science interfaces while still allowing access to large amounts of data. Students participating in the summer program were integrally involved in the activities associated with this goal. They learned the fundamentals of GRID computing, documented and created a four-node GRID. Students worked with the GRID manager to setup a documentation platform for a Condor-based GRID to be established at Elizabeth City State University. This documentation platform was a Linux based web sever that

utilized Web 2.0 standards to create a virtual documentation web portal. Current efforts are aimed at design of portals specifically designed for student and faculty use of CReSIS data available on the GRID.

- D. Over the life of the grant three cohorts of underrepresented students were supported to make poster and oral presentations at the ADMI Annual conference.

### 3-year ADMI Conference Participant Support Activities

	Participants	Males	Females	MSIs	White	Hispanic	Af. Am.
ADMI Conf 2007	22	8	14	6	0	0	22
ADMI Conf 2008	17	11	6	7	1	0	16
ADMI Conf 2009	22	10	12	8	0	0	22
Total	61	29	32		1	0	60
Demographic info		47.5%	52.5%	N/A	1.6%	0%	98.4%

### III. Number of participants

Event(s)	3-year Supported Participation	Website Highlights can be viewed at:
ADMI Conference	65	<a href="http://censer.ecsu.edu/admi2008/admi2008.htm">http://censer.ecsu.edu/admi2008/admi2008.htm</a> <a href="http://www.admiusa.org/admi2009/index.php">http://www.admiusa.org/admi2009/index.php</a> <a href="http://censer.ecsu.edu/admi2007/admi07.html">http://censer.ecsu.edu/admi2007/admi07.html</a>
CReSIS Retreats, Directors meetings and Site Visits	22	<a href="http://censer.ecsu.edu/cresis/events/070808retreat/cresisretreat.htm">http://censer.ecsu.edu/cresis/events/070808retreat/cresisretreat.htm</a> <a href="http://censer.ecsu.edu/cresis/events/080325ku/index.html">http://censer.ecsu.edu/cresis/events/080325ku/index.html</a> <a href="http://nia.ecsu.edu/ur/0809/080915clark/clark08.html">http://nia.ecsu.edu/ur/0809/080915clark/clark08.html</a>
Distinguished Lectures	494	<a href="http://censer.ecsu.edu/09events/090302dlstwumasi/index.html">http://censer.ecsu.edu/09events/090302dlstwumasi/index.html</a> <a href="http://nia.ecsu.edu/ur/0708/071009cola/decola.html">http://nia.ecsu.edu/ur/0708/071009cola/decola.html</a> <a href="http://censer.ecsu.edu/07events/cfsp/nov08.html">http://censer.ecsu.edu/07events/cfsp/nov08.html</a> <a href="http://censer.ecsu.edu/08events/080721cdl/munasinghe.html">http://censer.ecsu.edu/08events/080721cdl/munasinghe.html</a> <a href="http://nia.ecsu.edu/ureomps2008/west.html">http://nia.ecsu.edu/ureomps2008/west.html</a> <a href="http://censer.ecsu.edu/07events/071108dls/dls-lampkin.htm">http://censer.ecsu.edu/07events/071108dls/dls-lampkin.htm</a> <a href="http://censer.ecsu.edu/07events/070320dls/07dls.html">http://censer.ecsu.edu/07events/070320dls/07dls.html</a> <a href="http://censer.ecsu.edu/08events/080219dls/dls-moore-08.html">http://censer.ecsu.edu/08events/080219dls/dls-moore-08.html</a> <a href="http://censer.ecsu.edu/09events/091029dlsnwaneri/nwaneri.html">http://censer.ecsu.edu/09events/091029dlsnwaneri/nwaneri.html</a>
8-week Undergraduate Research Training	39	<a href="http://nia.ecsu.edu/ureomps2009/teams.html">http://nia.ecsu.edu/ureomps2009/teams.html</a> <a href="http://nia.ecsu.edu/ureomps2008/teams.html">http://nia.ecsu.edu/ureomps2008/teams.html</a> <a href="http://nia.ecsu.edu/ureoms2007/teams.html">http://nia.ecsu.edu/ureoms2007/teams.html</a>
CReSIS Web Seminars and All Hands Meetings	63	<a href="http://censer.ecsu.edu/cresis/events/2007ybps/may9.html">http://censer.ecsu.edu/cresis/events/2007ybps/may9.html</a> <a href="http://censer.ecsu.edu/cresis/events/2007ybps/april11.html">http://censer.ecsu.edu/cresis/events/2007ybps/april11.html</a> <a href="http://censer.ecsu.edu/cresis/events/2007ybps/march21.html">http://censer.ecsu.edu/cresis/events/2007ybps/march21.html</a>
Greenland Field Support and webcast	23	<a href="http://censer.ecsu.edu/08events/080702greenland/greenland08.html">http://censer.ecsu.edu/08events/080702greenland/greenland08.html</a> <a href="http://mmt.cs.ecsu.edu/nia_photo_library/ureoms/2008/080715jeaime/">http://mmt.cs.ecsu.edu/nia_photo_library/ureoms/2008/080715jeaime/</a>
Supercomputing, Open Grid Forum & TeraGrid Conferences	14	<a href="http://censer.ecsu.edu/07events/071110sc07/sc07.htm">http://censer.ecsu.edu/07events/071110sc07/sc07.htm</a> <a href="http://censer.ecsu.edu/citeam/070604teragrid07/teragrid07.htm">http://censer.ecsu.edu/citeam/070604teragrid07/teragrid07.htm</a>

#### IV. Lessons learned

- A. The Broader Impacts of proposed research activities are important considerations in advancing the mission of many federal agencies. The NSF Strategic Plan provides further background information for Broader Impacts through the NSF Vision, Core Values, Strategic Outcome Goals, and Investment Priorities. Considered as valid broader impact activities are participation in conferences, workshops and field activities where diversity is a priority; encouraging student participation at meetings and activities of professional societies; and identifying and establishing collaborations between disciplines and institutions, among the U.S. academic institutions, industry, government and with international partners.

Within the STEM fields, Minority Professional Organizations have long been committed to mentoring and nurturing the professional development of underrepresented students and the faculty who teach them. This project has offered us the opportunity to explore methods to achieve broader impacts with a particular look at partnerships with Minority Professional Organizations (MPOs) and Minority Serving Institutions (MSIs). This CI-TEAM project has effectively shown how the core values can be achieved for a targeted underrepresented population within a targeted discipline area. For this grant the targeted population was African American and the science within NSF's polar programs has been the targeted research area. In addition, the partnership with Indiana University (IU) has served to enhance the CReSIS project by adding the critical cyberinfrastructure component. As a result of the CI-TEAM project, IU will be a full CReSIS partner in the 5-year renewal phase.

- B. The partnership with IU and ECSU was further enhanced through the funding by NSF of a Polar Grid MRI grant #CNS-0723054. Information on the Polar Grid project can be viewed at <http://cerser.ecsu.edu/polargrid/> and <http://www.polargrid.org/>. The Polar Grid project allowed us to acquire and deploy the computing infrastructure needed to investigate the urgent problems in glacial melting by providing custom designed cyberinfrastructure for both field and base camps. In addition to improving polar science research, the project builds upon existing efforts to help minority serving institutions enhance their research by gaining greater access to technology. The Polar Grid project provided Elizabeth City State University, a historically black college in North Carolina, with a high performance computing cluster and offers ECSU and other MSI students hands-on grid and polar science related internships and field experience. When complete, this will give ECSU a top-ranked 5 Teraflop high performance computing system, building on existing distance education and undergraduate laboratory infrastructure that will enable crucial ice sheet science and educate a diverse workforce in both polar science and cyberinfrastructure.

C. Elements of this CI-TEAM project will be sustained through the continued investment of the NSF S&T Center for Remote Sensing of Ice Sheets and through the Office of Naval Research Undergraduate Research Experience (URE) Program. CReSIS and URE are both interested in leveraging their funding to extend the impacts of the CI-TEAM award. This joint effort between NSF offices and ONR have had a dramatic impact on agency broader impact goals related to involvement of African American students within the NSF Office of Polar Programs (OPP). The data presented confirms this.

**V. Sustainable Elements**

The ability to sustain the indicated elements of this project is explained in column three labeled as “How sustained” in the table below. CReSIS has been approved for an additional five years. The renewal will support many of the program elements. ECSU has absorbed the technician position originally funded through CI-TEAM. ONR funding for summer programs will continue for another year. Indirect cost funds are available for use in software and hardware upgrades.

In addition, ECSU plans to submit a proposal to the new CI-TEAM solicitation NSF 06-548 for a 3-year implementation project to build on the lessons learned in this demonstration project. Should that proposal be awarded then the items listed in column 4 below will be implemented. This includes a curriculum enhancement component to support the efforts of MSI faculty to revise existing courses under their instruction or to develop new courses using CI and polar science data content made available through web portals which are under development at ECSU and IU.

Sustainable Elements	Current	How Sustained	Proposed
Technical Support	1 full time position	The technician hired using CI-TEAM funds has been transitioned to a State Funded Position and will continue to be available to the project.	Request for 2 additional full time positions
Student Support	\$180K/yr CI-TEAM and CReSIS	<ul style="list-style-type: none"> <li>• CReSIS 5-yr renewal continues funding at the \$80K level for student support through scholarships.</li> <li>• ECSU has received a grant for STEM fellowships 10 @ \$18K/yr. for Biology and Math/CS depts.</li> </ul>	Request for an additional \$100K in student support
Distinguished Lecture with webcast	2-3 per year	Partnership with IEEE-Geoscience and Remote Sensing Society will provide \$300/lecture in conjunction with GRSS chapter meeting at ECSU. These will be webcast.	Request funds for 1 additional lecture each year.
8-week summer program for underrepresented undergraduate	10 students jointly funded by ONR and CI-TEAM	ONR funding will last for 1 additional year. NSF Polar Programs has funded a 3-year REU program for 20 students at various CReSIS Partner Sites including	Establishment of a CI-TEAM curriculum enhancement

students		ECSU. ECSU is the lead institution on NSF grant # ANT-0944255.	program with AY year stipends, supplies and training for MSI faculty.
Virtual Environment, Web Seminars and Training	Supported by CI-TEAM and POLARGRID w/ IU	<ul style="list-style-type: none"> <li>• ECSU technical support will be available.</li> <li>• Indirect cost funds will be used for upgrades as needed. CReSIS 5-year renewal funding will include \$125/year for ADMI to continue virtual and conference participation by its faculty and students.</li> <li>• CReSIS All-Hands events will continue to be webcast to ECSU and ADMI partners.</li> </ul>	Request for minimal software and hardware upgrades.
Evaluation	ECSU and CReSIS graduate students provide the major assistance in evaluation. Demographic data is now collected for each event. Sign in sheets are maintained for training events and seminars. For web events social networking software provides records on participants. Data is summarized for reporting purposes. Website highlights are provided online.	ECSU and CReSIS graduate students will continue to be available to this project along with existing data collection methods.	A firm will be hired to conduct a formal evaluation of the project.