

EXECUTIVE SUMMARY:

The NOAA Cooperative Remote Sensing Science and Technology Center (NOAA CREST) is now halfway through the fourth year of a \$15 million five year award from NOAA to conduct an integrated education/research in remote sensing science and technology. CREST activities follow its Five Year Strategic and Science Plan that is aligned with NOAA's Next Generation Strategic Plan (NGSP) and Education Strategic Plan. CREST work is also in line with its Five year Implementation Plan that was approved by NOAA, reflecting the research and education road map for the current 5 Year Cycle. CREST research has evolved in close consultation with NOAA, is pursued along four well defined main themes: **(1) Climate; (2) Atmosphere and Weather; (3) Water Resources and Land Processes; and (4) Ocean and Coastal Waters.** CREST's integrated Education-Research activities run across all four themes, which are designed to support NOAA's Goals and Missions. CREST is a consortium, led by City College, New York and includes Hampton University, VA, the University of Puerto Rico, Mayaguez, the University of Maryland, Baltimore County, MD and Cal State, Los Angeles, CA.

In this fourth year, CREST continues its very productive record both in terms of integrating education with its research, and the quality of that research, (highlights below). CREST has continued to evolve its relationships and contributions to NOAA in a variety of ways. The most important of which were the scientific contributions to NOAA's research interests and direct collaborations with NOAA scientists (see below). There were also additional venues in which CREST/NOAA collaborations were reported on and fostered, these included participation in the NOAA Cooperative Research Programs (CoRP) Symposium in September 2014 at the NOAA-CREST Center, The City College of the City University of New York, and the 7th Biennial EPP Forum hosted by LMRSCSC at the University of Maryland Eastern Shore with broad participation by CREST scientists and students. 20 NOAA CREST student won best paper presentation awards in various categories (see NOAA-CREST newsletter 2014) In addition CREST held 5 professional seminars and 3 Students Technical Seminar Series during the reporting period with a total of 90 seminars and 28 Students seminar since 2011 (current funding cycle) in NOAA related areas.

The **Semi-annual Report** for the period September 1, 2014 – February 28, 2015 highlights NOAA-CREST education and research as summarized below:

Education and Research: The stated NOAA CREST **Education Objective** is to train a diverse STEM professional workforce, primarily at the graduate level, with a competency in NOAA relevant sciences. This is achieved through integration of education with NOAA CREST research for students at all levels. The CREST research is carried out as a partnership between academic and government agency and private sector participants aimed at supporting of NOAA's goals and objectives in Climate Adaptation & Mitigation; Weather-Ready Nation; Healthy Oceans; and Resilient Coastal Communities & Economies that can contribute to NOAA mission.

Graduations: In this report period, CREST graduated 9 students (Leveraged 2 - 1 BS, 1 MS and CREST 7 - 1 MS, 6 PhD). At the present time CREST has 117 students in the pipeline of which 67 CREST Funded (27 Undergrads, 15 Masters, 25 PhD) and 50 Leveraged (24 Undergrads, 9 Masters, 17 PhD)

Publications. During this period CREST also had 17 peer-reviewed Journal Publications, and 53 refereed conference proceedings by CREST students and scientists, most of which had students as authors or co-authors.

CREST/NOAA collaborations. CREST research and research collaborations with NOAA made

a number of significant scientific and operational contributions in the following categories: (i) Algorithm Developments, highlights include: near real time cloud detection from weather satellites; improved high resolution satellite AODs in urban areas; new VIIRS algorithms for harmful algal bloom detection in the West Florida Shelf. (ii) Environmental Modeling and Applications, highlights include development of NWPMs for urbanized regions; air quality impact applications on health. (iii) Observations and Monitoring, highlights include CREST LIDAR network observations on aerosols, plume transport, identification and climatology and estimations of PM2.5 for air quality applications Integrated Data Products and Research to Operations, highlights, inventory of climate data products; stratospheric composition products; cloud-top pressure. Calibration/Validation Activities, highlights include calibration of visible-IR channels of weather satellites, CREST Long Island Coastal Observatory (LISCO) support for VIIRS cal/val, and participation in the JPSS VIIRS Ocean Color Cal/val team. While these are just a few examples for CREST collaborations with NOAA, and primarily NESDIS, there are currently over 40 CREST projects which have active participation by NOAA scientists, and details may be seen under each thematic area report below. It also should be noted that the LIDAR group at NOAA-CREST is responsible for organizing and hosting the 27th International Laser Radar Conference (ILRC) which is to be held at City College, in July 2015.

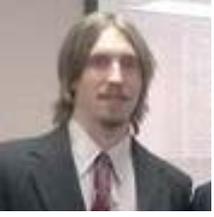
Strategic Partnerships and Leveraged Funding. From its inception, CREST has been strongly encouraged by NOAA to leverage its core activities by seeking additional funding and support. Toward this end CREST has pursued strategic partnerships and funding, both within NOAA and with other Federal and State agencies where synergistic interests overlap with NOAA/CREST, and where additional leveraged funding may contribute to CREST/NOAA objectives and student training. The total level of such external funding at present is as follows: During this reporting period, \$3 million from other from sources (Federal, State & Industry) was received by the NOAA-CREST Faculty and scientists. Details on external funding and its connections with NOAA/CREST projects are shown in each thematic area reported below.

Education – Student and Postdoc Highlights (Reporting Period)

Post-Doctorate Scientists	
	<p>Dr. Nathan Hosannah, NOAA-CREST post-doc was awarded the prestigious 2-year NSF Postdoctoral Fellowship to expand doctoral research on Climate research in tropical regions such as Caribbean islands.</p>
	<p>Dr. Ioannis Ioannou, CREST Research Associate joined Morgan Stanley, as a quantitative analyst, to work on the next generation global trade surveillance algorithms using machine learning (i.e. neural networks), for the improved detection of Insider Trading and Front Running.</p>
	<p>Dr. Lina Cordero accepted a position at the United States Patent and Trademark Office in Alexandria, VA. She is currently a patent examiner and one of her job functions is to analyze patents focusing on sensors, their calibration and measurements.</p>

	<p>Dr. Narges Shahroudi recently graduated with a PhD degree in Electrical Engineering. While at CCNY, she worked under the direction of William Rossow, Climate Theme Lead. Her research was focused on the Microwave remote sensing of snow. Currently she is working as a Research Associate at the Joint Center for Satellite Data Assimilation, NOAA Center for Weather and Climate Prediction.</p>
	<p>Dr. Dugwon Seo, a CUNY student graduated and was working as an adjunct faculty in CUNY and Kean University. Dr. Seo has recently been appointed as Assistant Professor in the Engineering Technology Department in the Queensborough Community College and will start Fall 2015.</p>
	<p>Dr. Barry Baker graduated from the University of Maryland, Baltimore County with a PhD degree in Physics. His thesis was titled “Physical Processes Influencing the Mid-Atlantic Planetary Boundary Layer with Applications in Air Quality.” After graduation he received the National Research Council Postdoctoral Fellowship. He is now conducting research at NOAA-ATDD in Oak Ridge, TN.</p>
	<p>Dr. Amir Ibrahim also recently graduated with a PhD degree in Electrical Engineering. His dissertation was titled "Polarimetric Light Fields in the Open Ocean and Coastal Waters and Retrieval of Water Parameters from Polarimetric Observations." He developed an inversion algorithm to retrieve macro- and micro-physical properties of oceanic hydrosols. He was an eager and mission-oriented student and able to produce an ample amount of NOAA-relevant data. Recently he accepted a position of a Postdoctoral Researcher at NASA Goddard Space Flight Center where he will be responsible for the atmospheric correction of the planned Pre-Aerosol, Clouds, and ocean Ecosystem (PACE) mission.</p>
<p>Graduate Students</p>	
	<p>Carlos Carrizo, NOAA-CREST PhD candidate from CUNY was awarded the prestigious NOAA EPP Graduate Research and Training Scholars Program (GRTSP) scholarship. He is expected to collaborate with top scientists at NOAA/NESDIS as part of his NOAA EPP training during summer 2015. His research focuses on better understanding of underwater light propagation using polarization features as well as methods for improving image quality, hence, increasing visibility for ecosystems near and beyond the mesophotic depth zone (i.e. coral reefs).</p>
	<p>Andrea Gomez, NOAA-CREST MS Student and recent recipient of the Graduate Research and Training Scholars Program (GRTSP) scholarship from NOAA, has been accepted into the PhD program by the Earth and Environmental Sciences department at CUNY. Her research focuses on understanding the impact of temperature stressors on coral species. She is using point-specific hyperspectral remote sensing measurements to evaluate the response of coral fluorescence and reflectance signatures to temperature stress.</p>

	<p>Estatio Gutierrez, CREST Leveraged PhD Student, published a paper titled “Simulations of a heat wave event in New York City using a multi-layer urban parameterization” in the Journal of Applied Meteorology and Climatology. Estatio is expected to graduate in June 2015 and would join private sector in the field of sustainable energy.</p>
	<p>Pedro Sequera, CREST Leveraged PhD Student, will be defending his thesis in spring 2015. His doctoral research topic is Detection and Modeling of California Summer Coastal-Cooling. Pedro already has a job offer as Analytics Analyst at Accenture, a leading private management, consulting and technology driven organization. His job primarily will be to assess and provide consultancy and support financial decisions for large infrastructural projects.</p>
	<p>Chowdhury Nazmi presented at the AMS 2015 in Phoenix, AZ and won the Best Graduate Student Presentation award. Her presentation was titled "Analysis of New York City traffic data, land use, emissions and high resolution local meteorology for the prediction of neighborhood scale intra-urban PM2.5 and O3." She will work with Shobha Kondragunta in an SSIO (student scholarship internship opportunity) position at NESDIS STAR.</p>
	<p>Denisse Hernandez Lara, CREST Leveraged Student, graduated with an MS degree in Earth Systems and Environmental Engineering with focus on water resources systems. Her research topic was Mapping Palm Swamp Wetlands using UAVSAR Data in Peru. Currently she is applying for jobs in research and academia.</p>
	<p>Zaw Thet Han, CREST PhD Student, spent three weeks at the Albany Science Research Center (ASRC) with Prof. Qilong Min (member of NCAS CSC). Submitted Paper to JARS on Aerosol Cloud Interaction. He is expected to defend in May 2015 and already accepted a research position as a Research Analyst at the 22nd Century Technologies, Inc in Washington, DC.</p>
	<p>Ricky Vargas, NOAA-CREST Master’s student, spent the summer at the Emergency Management team at Con Edison, under the supervision of Brandon Hertell, a meteorologist. He worked on updating weather forecasts sent from the vendors, updating a New York City climate database involving past storms, temperatures, precipitation, and heat waves. Ricky is interning with ConEdison with a possibility of culminating into a full time position.</p>

	<p>Emmanuel Ekwedike, CREST MS Student in Applied Mathematics, has been accepted into the PhD program by the Department of Operations Research and Financial Engineering at Princeton University. He also received a presidential fellowship to study there.</p>
	<p>John Sullivan won Graduate student 1st prize for an oral presentation in the Weather Ready Nation in NOAA’s Educational Partnership Program 7th Biennial Education and Science Forum held at the University of Maryland, Eastern Shore. He also won 3rd place in the 7th Symposium on Lidar Atmospheric Applications at 95th American Meteorological Society Annual Meeting in Phoenix, AZ.</p>
<p>Undergraduate Students</p>	
	<p>Olivia Poon, CREST CCNY Student majoring in Earth Systems Science and Environmental Engineering, interned as a NOAA Undergraduate Scholar during the Summer 2014. Olivia will be interning this summer at one of the NOAA labs on the West Coast.</p>
	<p>Jessica Izumi graduated with the degree in Chemical Engineering. While at NOAA-CREST, she worked on the investigation of Aerosol Acidity Through the Use of Thermodynamic Equilibrium Models. Upon graduation she accepted a position of a chemical engineer at Dow Chemicals in Louisiana. (Jessica is in the middle on the picture to the left conducting LIDAR experiments during summer 2014)</p>
	<p>Kathy Ammari was recently honored with a best poster award at the Emerging Researchers National Conference in Washington, DC. Her research project is focused on investigating the urban hydrology in the Jamaica Bay Watershed. Her objectives are to determine where pollutants affecting the bay originate and the consequences of contaminated runoff for the Jamaica Bay Watershed.</p>

Performance Metrics	During the reporting period (September 1, 2014 to February 28, 2015)		Total (September 2011 - February 2015)	
1. Number of students who participated in experiential research at NOAA facilities annually	None in this reporting period		4 Students One SSIO each from UMBC, CUNY and UPRM; and One AEROSE expedition on NOAA Vessel from HU	
2. Number of students who are trained and graduate in NOAA-mission sciences annually (BS,MS,PHD)	TRAINED/PIPELINE 117 <u>67 CREST</u> 27 Undergrads 15 Masters 25 PhD <u>50 Leveraged</u> 24 Undergrads 9 Masters 17 PhD	GRADUATED 9 <u>7 CREST</u> 1 Masters 6 PhD <u>2 Leveraged</u> 1 Undergrad 1 Masters	TRAINED/PIPELINE 117 <u>67 CREST</u> 27 Undergrads 15 Masters 25 PhD <u>50 Leveraged</u> 24 Undergrads 9 Masters 17 PhD	GRADUATED 116 <u>62 CREST</u> 23 Undergrads 24 MS 15 PhD <u>54 Leveraged</u> 31 Undergrads 14 Masters 9 PhD
3. Number of students from underrepresented minority (URM) communities who are trained and graduate in NOAA-mission sciences annually; (BS,MS,PHD)	TRAINED/PIPELINE 72 out of 117 <u>41 CREST</u> 16 Undergrads 14 Masters 11 PhD <u>31 Leveraged</u> 13 Undergrads 7 Masters 11 PhD	GRADUATED 5 out of 9 <u>4 CREST</u> 4 PhD <u>1 Leveraged</u> 1 Masters	TRAINED/PIPELINE 72 out of 117 <u>41 CREST</u> 16 Undergrads 14 Masters 11 PhD <u>31 Leveraged</u> 13 Undergrads 7 Masters 11 PhD	GRADUATED 61 out of 116 <u>37 CREST</u> 14 Undergrads 15 Masters 8 PhD <u>24 Leveraged</u> 14 Undergrads 8 Masters 2 PhD

4. Number of EPP funded students who are hired by NOAA, NOAA contractors and other natural resource and science agencies at the Federal, State, local and tribal levels	4 (in this reporting period)	12						
5. Number of NOAA science and administrative personnel engaged in CSC Education and Outreach, Scientific Research, and Administrative functions								
6. Number of students and faculty who participate and complete postdoctoral level programs								
7. Number of Peer Reviewed papers published in NOAA-mission sciences by scientists (faculty and students) sponsored by NOAA EPP	Peer reviewed publications: 17 Proceedings/presentations: 53	Peer reviewed publications (Sept 2011 - Aug 2014): 168 + 17 = 185 (169 number got from last report for period since Sept 2011 to Feb 2014) and added 53 to that number.						
8. Number of meetings attended by the students, faculty and scientists in NOAA-mission sciences sponsored by NOAA EPP and leveraged by other programs	5 major events (AMS, AGU, SPIE, IGARS, LAESA SHPE)	About 8 major events each year						
9. Funds leveraged with NOAA EPP funds (including student support)	<table border="0"> <tr> <td>6 Month Period</td> <td>Total Dollars</td> </tr> <tr> <td>\$3,056,789.25</td> <td>\$ 17,024,767.00</td> </tr> <tr> <td>6 Month Submitted & Pending</td> <td>\$ 5,509,666.00</td> </tr> </table>	6 Month Period	Total Dollars	\$3,056,789.25	\$ 17,024,767.00	6 Month Submitted & Pending	\$ 5,509,666.00	\$33,777,563.84 (since 2011)
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\$3,056,789.25	\$ 17,024,767.00							
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10. Number of Seminars hosted/organized during the reporting period	5 Seminars + 3 STSS	90 Seminars + 28 STSS
11. Number of new students, staff and scientists (including postdocs) recruited during the reporting period (BS,MS,PHD)	<p><u>*11 new students</u></p> <p>10 CREST 1 Leveraged</p> <p>BS/BE: 7 MS/ME/MPhil: 3 PhD: 1</p>	<p><u>*172 new students</u></p> <p>93 CREST 79 Leveraged</p> <p>AS: 2 BS/BE: 89 (Incl. 17 Withdrawn) MS/ME/MPhil: 51 (Incl. 7 Withdrawn) MBA: 1 (Withdrawn) PhD: 29 (Incl. 2 Withdrawn)</p>
12. Number of students (HS; UG; MS and PhD) graduating during this reporting period and the academic year	<p><u>9 students</u></p> <p>7 CREST 2 Leveraged</p>	<p><u>197 students</u></p> <p>63 CREST 58 Leveraged 76 CREST HS Students</p>
13. Number of collaborative research projects undertaken between NOAA and MSI partners in support of NOAA operations	18 (104 tasks)	18 (104 tasks)