NOAA Cooperative Science Center for Earth Systems Science and Remote Sensing Technologies (CESSRST)

Cooperative Agreement # NA16SEC4810008
Six-Month Performance Progress Report
(September 1, 2017 to February 28, 2018)

SUBMITTED BY
The City College of New York, NY
(Lead Institution)
Hampton University, VA
San Diego State University, CA
University of Maryland, Baltimore County, MD
University of Puerto Rico, Mayaguez, PR
University of Texas, El Paso, TX

SUBMITTED TO:
NOAA Educational Partnership Program with Minority Serving Institution (EPP/MSI)

March 30, 2018
Table of Contents

Executive Summary....................................................................................................................................... 2
I. Accomplishments.................................................................................................................................. 3
I. Products of Award .............................................................................................................................. 40
III. Participants in Award Performance................................................................................................. 42
IV. Impacts of Award.............................................................................................................................. 48
V. Changes / Challenges ......................................................................................................................... 52
VI. Special Award Conditions .............................................................................................................. 52
VII. Financial Information....................................................................................................................... 61
   a. Total NOAA funding breakout..................................................................................................... 61
   a. Total leverage funding breakout................................................................................................. 62
Executive Summary

The new center – NOAA Cooperative Science Center for Earth System Sciences and Remote Sensing Technologies (CESSRST), funded by NOAA in response to the solicitation - FFO NOAA-SEC-OED-2016-2004758 was created on September 1, 2016. The current report provides updates for the reporting period – September 1, 2017 to February 28, 2018, submitted by the City College of New York, NY (lead Institution) and the partner institutions – Hampton University, VA; San Diego State University, CA; University of Maryland, Baltimore County, MD; University of Puerto Rico, Mayaguez, PR; and University of Texas, El Paso, TX. The new center continues to provide education and training opportunities to a large cadre of post-secondary students, particularly from underrepresented minority group, in NOAA mission sciences, with a focus on Earth System Sciences and Remote Sensing Technologies. The new center’s activities that fall under three major program elements: (1) Education and Training; (2) Collaborative Research and (3) Center Management which is being monitored and internally assessed by the management team and the Center Dr. Director Reza Khanbilvardi and will be evaluated by an external evaluator. During the timeframe September 1, 2017 to February 28, 2018, the center team designed, developed, piloted and evaluated several seminal components of its 2016-2021 Implementation Plan that addresses the overarching program goals of education and training of a diverse workforce in support of NOAA-mission related research and products. The six-month performance progress report provides an update on all the activities - Recruitment, Student Cohort Building, iSDP development, Core Competency & Professional Development, Summer Bridge/Undergraduate training, Collaborative Research, Early NOAA Engagement, Graduate research and NERTO synopsis, Communications and Social Science Integration as solicited in the FFO and the Special Award Condition. The report also addresses the monitoring/assessment and findings and steps to be taken to accomplish what the center proposed for the send year of the award as per the Implementation Plan.

During this reporting period, the new Management Information System (MIS) was launched in Fall 2017. The content-based management system (CMS) website continues to serve as a critical information dissemination and communication outlet for sharing Center accomplishments with NOAA and external stakeholders. The MIS will serve as a universal web-based data collection and entry system for use by the center funded students, staff, researchers, scientists and NOAA collaborators. A rest-ful API (Application Programing Interface) integrates the data from this system to the main center website www.noaacrest.org.
I. Accomplishments

There is the option to indicate “not yet started” and include the expected start date in this section. NOTE: Images, tables, charts, or other graphics may be submitted in support of the Accomplishments section. This section - accomplishments and its sub-sections - activities, objectives, results and key outcomes, will be reported under three major elements – Education, Collaborative Research and Management.

As indicated in the Implementation Plan, the Center met the critical program goals during this reporting period - (1) conduct NOAA mission-aligned collaborative research; (2) recruit, train and graduate increased number of students – particularly from underrepresented and undeserved minority community in NOAA related STEM fields; and (3) increase/attain institutional capacity by generating leveraged resources to sustain center education and research. CESSRST is committed to achieve the program outcomes and outputs as indicated in the plan in the next five years (2016-2021) keeping in line with NOAA’s strategic (Science & Research Memorandum, Social Science, Education and Diversity and Inclusion) Plans.

In order to achieve the program priorities, goals and the outcomes as outlined in the FFO and the Special Award Conditions, a five-year revised CESSRST Evaluation Plan is under further revision to incorporate the overarching evaluation questions suggested by the program office that will be incorporated and submitted to NOAA via Grants Online in spring 2018.

What are the major goals of the project?

The overarching goals of the center is to increase CSC capacity to conduct research and increase number of students particularly from URM group trained and graduated in NOAA sciences by conducting collaborative research in NOAA mission aligned sciences.

EDUCATION - Major Activities:

The current six-month report focuses on six major elements of our Center-Wide Education and Training Framework. Progress updates on each of these elements (a) Recruitment; (b) Professional Advancement & Career Engagement (PACE); (c) Core Competency; (d) NERTO; (e) Evaluation and Assessment; and (f) Longitudinal Post Graduate tracking below.
a. Recruitment:

During the current reporting period, NOAA CESSRST accomplished the successful recruitment and building of COHORT I pool of post-secondary students who are the primary beneficiaries of the program and its priorities. The candidates were selected based on the center-wide recruitment strategy (figure 1). During the period from CESSRST participated in ten (10) recruitment events in and outside of New York City. Some of the events include Women of Color (WOC) (October 2017); Latin American Engineering Student Association- Society of Hispanic Professional Engineers (November 2017); Columbia University’s All IVY and Earth Institute (February 2018); American Meteorological Society (AMS) (January 2018); University of Texas, El Paso Career EXPO (September 2017) and City College of New York Career and STEM Fair (October 2017), to name a few. At these recruitment events, approximately 329 students learned about the opportunities offered by the NOAA-CESSRST (CREST) program, 187 of which are US citizens with an average GPA of 3.0 or higher. Approximately 42% (141) of these students were female; 58% (188) were male.

Targeted outreach/recruitment activities have proven to increase the number of applications submitted for program consideration. Compared to the last performance period, 100 more students were targeted. In turn, it has also empowered the outreach/recruitment team to develop dynamic ways to introduce the program to its diverse audiences. A program brochure was revised and professionally mass-produced. In addition, theme-related flyers and a targeted community college flyer was added to the recruitment materials to address the unique opportunities for funding and research training for those attending two-year institutions. All materials were distributed to our partner institutions.

The Outreach/Recruitment team continuously identifies local and national recruitment opportunities to expand its recruitment goals for the remainder of 2018 and next year.

Cohort I student recruitment successfully closed with 34 students: 25 (74%) from URM communities and nine (26%) non-URM communities; 15 of which are Undergraduates (9 males, 6 females); 10 in Master’s program (7 males, 3 females); and 9 in Doctorate program (4 males, 5 females).

NOAA CESSRST added one (1) student to the original COHORT I roster since the last reporting period, making the final count 34. Efforts during the current reporting period have

Cohort II student recruitment successfully recruited 19 students: 16 (84%) from URM communities and 3 (16%) non URM communities; 7 of which are Undergraduates (5 males, 3 females); 8 in Master’s program (5 males, 3 females); and 4 in Doctorate program (2 males, 2 females). The cohort II recruitment is on target so far – with additional 15 to be recruited as Summer Bridge Interns (potential UG applicants to prepare for NOAA Hollings and Undergraduate Scholarship applicants for 2019)
focused on the recruitment and placement of COHORT II fellows, with the goal of achieving a target number of 32 post-secondary fellows upon completion.

b. **Professional Advancement and Career Engagement – PACE**

During this reporting period, PACE continued to drive the overall engagement of the students, faculty advisors and NOAA mentors center-wide. During the last six months, our work together has focused on supporting students in their academic, professional and research training activities. Professional Advancement and Career Engagement to advance a holistic, robust and measurable education and training program. PACE with its 4 sub-elements *(i) Individualized Student Development Plan (iSDP); (ii) Professional Networking and Career Planning; (iii) Research training; (iv) Summer-bridge Undergraduate Research Experience (SURE); and (v) peer-based mentoring and community outreach* align with the FFO with an intention to create long-term impacts through development of a 21st century NOAA mission-related STEM workforce (Figure 2)

I. **The Individualized Student Development Plan (iSDP)** as the title suggests, is a “road-map” that each student creates within 90 days of his or her admission to the program. All cohort I and II students have completed their iSDP by creating an online e-portfolio on the new MIS system. iSDP helps students and their faculty advisors to articulate important areas of students’ education and professional aspirations and goals; while facilitating designing students’ career pathways to successful NERTO, training, graduation and future workforce.

II. **Professional Networking and Career Planning**: During this reporting period, cohort I and II students attending CESSRST monthly seminars and orientation/information webinars; OneNOAA seminar and other professional development seminars.

III. **Research Training**: Each student within cohort I and II have identified their research project and theme placements and faculty advisors. All student in cohort I have identified their NOAA mentors and Graduate Synopsis. All cohort I students have completed their RCR training and cohort II are in the process of completing their training, and will be reported in next report. Most graduate students in cohort II are in the process of working on their graduate synopsis and will complete their NERTO requirements which will be updated in the next six month progress report.

IV. **Summer-Bridge Undergraduate Research Experience (SURE)**: All summer bridge students from year I have been admitted into the Cohort I, one of the Cohort I UG student from Bronx Community College is planning to transfer to City College to finish 4-year college. Another Cohort I UG Aye Phyu successfully applied for both Hollings and Undergraduate Scholarship program and if selected will become a NOAA scholar in summer 2018. Planning and recruitment process is
underway to recruit year II SURE students center-wide to participate in summer 2018 summer outreach and preparation for the 2019 NOAA scholarship applications. Summer outreach program updates will be provided in the next progress report.

V. Peer-based mentoring and community outreach: All graduate students from cohort I and II will engage in the summer-bridge research training and mentoring program. Graduate students will serve as mentors based on their availability this summer (some graduate students will be doing their NERTO in summer 2018), In addition, our 2017 Lautenbacher Fellow and UTEP doctoral student continues to do community outreach on his STEM program in Barrow, Alaska.

c. Center-Wide Core Competency framework:
The CESSRST Core Competency (CC) Committee was engaged in the following activities during this reporting period.

Synthesis: The CC completed the first skeleton of the CC that includes Four Technical Cores, and Professional Development. The Technical Cores included; Remote Sensing, Environmental Modeling and Data Analysis, and Social Sciences. The CCs are comprised of two components; Basic Level and Advanced Level. The Basic level consists of 45 contact hours for all four cores listed. All CESSRST students are required to take the Basic Level. Advanced Levels is for graduate students and is aimed for them to acquire advanced proficiency on subjects germane to their dissertation topic via graduate courses, research and/or NERTO.

Internal Changes: The CC was first delivered in summer 2017. During this reporting period, the CC Committee assessed the effectiveness of this delivery based on student feedback and then adjusted them accordingly. A key change is streamlining the Social Sciences and Professional Development Components. Dr. Valerie Were, recently recruited by CESSRST to strengthen Social Science research and education, has reviewed the Social Sciences Basic Core. The revised Social Sciences Core is now directly tied to NOAA’s Goals in this subject. At the Basic Level, students will demonstrate knowledge and/or have basic skills in:

- Defining social science
- Identify social and behavioral dimensions to NOAA science
- Name different social science disciplines
- Identify common NOAA issues addressed by social science
- Explain how validity is determined
- Identify ethics and stakeholder issues
- Interpret social science research
- Distinguish between research and application

NOAA Feedback: The proposed CC plan was presented to NOAA EPP Program Managers, Jacqueline Rousseau and Audrey Trotman and Technical Monitor Harry Cikanek during the year II site-monitoring visit in NY on December 1, 2017. The site monitoring team members praised the CC curriculum as comprehensive and made recommendations to incorporate basic training in Satellite Operations and project management. Project management is now a key element of the Professional Development basic module. The CC Committee is now in conversations with NOAA NESDIS-OSPO staff to provide content for this module at the Basic Level. The total hours will remain 45.

Next Steps: The CC Committee is completing the assessment rubric, which will verify that students reached the desired competency. This will be a combination of on-line surveys, student records, and faculty advisor feedback. The completion of the CC’s by each student will be a key element of their ISDP’s. We also plan to include the Satellite Operations Basic Module in collaboration with NOAA NESDIS-OSPO. The revised full Basic Core will be delivered during summer 2018, mostly via on-line modules to facilitate transferability to all campuses.
d. *Early NOAA Engagement – NOAA Experiential Research and Training Opportunities (NERTO)*

During this reporting period, twelve (12) cohort I graduate students identified their NOAA Mentors, NERTO locations and successfully applied to the SSIOs positions created by their NOAA Mentors. Below Table 1 provides the details on the NERTO activities in summer 2018. Owen Parker is already doing his NERTO in NCWCP lab, College Park, MD since February 2018. Equisha Glenn and Cassandra Calderella will be doing their NERTO in fall 2018. A detailed Graduate (NERTO) synopsis is available on the CESSRST website – [http://noaacrest.org/education/graduatesynosis](http://noaacrest.org/education/graduatesynosis). In addition, the students profile pages are located on the website - [http://noaacrest.org/about/our-people/category/cohort-i](http://noaacrest.org/about/our-people/category/cohort-i). The Students Letter of Understanding (LoU), NOAA Mentoring Agreement was created and all uploaded on our new MIS. NOAA MoU has been signed by the NOAA mentor to ensure there is a proper communication and comprehension of the NERTO requirement per the special award condition. A new Standard Operations Procedure (SOP) and CESSRST Handbook (for students and faculty) is being created and will be made available to all the CESSRST members and NOAA mentors by end of summer 2018.
<table>
<thead>
<tr>
<th>Name of the student (NERTO Intern)</th>
<th>Campus</th>
<th>Degree</th>
<th>Faculty Adviser</th>
<th>NOAA NERTO Mentor</th>
<th>NERTO Location</th>
<th>SSIO/ NERTO Title</th>
<th>NERTO time period (start-end date)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owen Parker</td>
<td>CCNY</td>
<td>MS</td>
<td>Maria Tzortziou</td>
<td>Winston Luke</td>
<td>OAR College Park, MD</td>
<td>Surface and total column NO2 dynamics in urban coastal regions</td>
<td>Feb. 5, 2018 - April 29, 2018</td>
</tr>
<tr>
<td>Eder Herrera</td>
<td>CCNY</td>
<td>MS</td>
<td>Alex Gilerson</td>
<td>Mike Ondrusek</td>
<td>STAR/SOCDOC- College Park, MD</td>
<td>Multi-and hyperspectral above surface radiometric observations of the ocean in various atmospheric and ocean environments</td>
<td>May 2018 - July 2018</td>
</tr>
<tr>
<td>Yoribaldis Olivo</td>
<td>CCNY</td>
<td>MS</td>
<td>Prathap Ramamurthy</td>
<td>Yunyue Yu</td>
<td>STAR Camp Springs, MD</td>
<td>GOES-16 LST Derived Products for land surface temperatures for Urban Areas</td>
<td>June 2018 - August 2018</td>
</tr>
<tr>
<td>Adedoja Adeyeye</td>
<td>CCNY</td>
<td>MS</td>
<td>Reza Khanbilvardi / Tarendra Lakhankar</td>
<td>Xiwu Zhan</td>
<td>NOAA/NESDIS/STAR-College Park, MD</td>
<td>Inter-comparison and Validation of Remote Sensing Satellite based Soil Moisture Product</td>
<td>June 2018 - August 2018</td>
</tr>
<tr>
<td>Stephany Paredes-Mesa</td>
<td>CCNY</td>
<td>MS</td>
<td>Peter Romanov / Tarendra Lakhankar</td>
<td>Ralph Ferraro</td>
<td>STAR College Park, MD</td>
<td>Inter calibrated satellite microwave water vapor measurements</td>
<td>June 4, 2018 - Aug. 24, 2018</td>
</tr>
<tr>
<td>Aris Fernandez</td>
<td>CCNY</td>
<td>MS</td>
<td>Fred Moshary / Marc Arend</td>
<td>Alan Brewer</td>
<td>ESRL/CSD Boulder, Colorado</td>
<td>Doppler Lidar profiling of tropospheric winds and Aerosols with applications to Atmospheric Dynamics, Weather, and Air Quality</td>
<td>May 30, 2018 Aug. 22, 2018</td>
</tr>
<tr>
<td>Anna Vaculik (Cohort II)</td>
<td>CCNY</td>
<td>MS</td>
<td>Hamidreza Norouzi</td>
<td>Yunyue Yu</td>
<td>NESDIS/STAR College Park, MD</td>
<td>Estimating High Spatio-temporal Resolution Land Surface Temperature Using Satellite and Ground Observations over Urban regions</td>
<td>June 2018 - August 2018</td>
</tr>
<tr>
<td>Andrea Gomez</td>
<td>CCNY</td>
<td>Ph.D.</td>
<td>Kyle McDonald</td>
<td>James Hendee (OAR), Karsin Shein (NESDIS), &amp; Mark Eakin (NESDIS)</td>
<td>OAR/NESDIS Fort Lauderdale, FL</td>
<td>Satellite measured sea temperatures and comparison with vertical temperature profiles near a coral reef ecosystem in south Florida</td>
<td>June 2017 – August 2017</td>
</tr>
<tr>
<td>Joshua Hrisko</td>
<td>CCNY</td>
<td>Ph.D.</td>
<td>Prathap Ramamurthy</td>
<td>Yunyue Yu</td>
<td>NESDIS/STAR-Camp Springs, MD</td>
<td>GOES-16 LST Derived Products for Urban Areas</td>
<td>June 2018 - August 2018</td>
</tr>
<tr>
<td>Michael Trunkhill</td>
<td>SDSU</td>
<td>MS</td>
<td>Donatella Zona</td>
<td>Lauren Jarlenski</td>
<td>NMSAS Pago Pago, AS</td>
<td>The effect of coral reef health on near shore air-sea exchange of CO2 in American Samoa</td>
<td>June 1, 2018 August 30, 2018</td>
</tr>
<tr>
<td>Tyler Tucker</td>
<td>SDSU</td>
<td>MS</td>
<td>Sam Shen</td>
<td>Russ Schnell</td>
<td>NOAA/OAR Hilo, Hawaii.</td>
<td>Calibration of World Ozone Standard and Balloon Radiosonde Releases from Hawaii</td>
<td>June 1, 2018 August 31, 2018</td>
</tr>
<tr>
<td>Andrea Fenner</td>
<td>SDSU</td>
<td>Ph.D.</td>
<td>Walter Oechel</td>
<td>Lauren Jarlenski</td>
<td>NMSAS Pago Pago, AS</td>
<td>The effects of land cover and land use on runoff and CO2 flux in American Samoa</td>
<td>June 4, 2018 August 27, 2018</td>
</tr>
<tr>
<td>Carlos Wah-Gonzalez</td>
<td>UPRM</td>
<td>Ph.D.</td>
<td>Rafael Rodriguez-Solis</td>
<td>Gary A. Wick</td>
<td>NOAA ESRL PSD</td>
<td>Definition and Characterization of an Airborne Sensor for Ocean Salinity and Soil Moisture Sampling</td>
<td>June 1, 2018 August 31, 2018</td>
</tr>
</tbody>
</table>
### Evaluation and Assessment

During this reporting period – the Center-Wide Evaluation plan was revised to incorporate the

#### CESSRST Evaluation Questions

1. **To what extent are the Education and Training components of CESSRST being implemented as planned?**
   a. Are underrepresented minority (URM) students being effectively recruited into CESSRST undergraduate and graduate programs?
   b. To what extent is the Summer Bridge Program preparing new students for the academic and research experiences in CESSRST?
   c. How does the ISDP process support and advance the student-learning program?
   d. What evidence is there that PACE helps students to achieve their learning and professional objectives?
   e. Are undergraduate and graduate internship opportunities exposing students to meaningful learning experiences in NOAA mission related sciences?

2. **To what extent is the Science and Research component of CESSRST being implemented as planned?**
   a. How does CESSRST research align with NOAA mission and priorities?
   b. What is the nature (qualities, quantity, and impact) of established collaborations between NOAA and CESSRST faculty, staff and students?
   c. To what extent has CESSRST integrated social science issues into research projects?
   d. To what extent are NOAA scientists serving as mentors and advisors for student research?
   e. What is the nature of the collaborative partnerships being established in support of NOAA’s mission?
   f. How has CESSRST research training increased students’ competencies related to the Center’s four collaborative research themes?

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Degree</th>
<th>Mentor 1</th>
<th>Mentor 2</th>
<th>Mentor 3</th>
<th>Project Description</th>
<th>Start Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nia Rene</td>
<td>CUNY/ Brooklyn College</td>
<td>MS</td>
<td>Jennifer Cherrier</td>
<td>Steven Morton</td>
<td>TBD</td>
<td>Controlled Meso-Cosm experiments and HAB incubation studies</td>
<td>June 1- August 31, 2019</td>
</tr>
<tr>
<td>Cassandra Calderella</td>
<td>CCNY</td>
<td>Ph.D.</td>
<td>Reza Khanbilvardi / Tareendra Lakhankar</td>
<td>Xiwu Zhan</td>
<td>NOAA/NESDI/STAR</td>
<td>TBD</td>
<td>Projected for June 1, 2019-August 31, 2019</td>
</tr>
<tr>
<td>Breahna Gillespie (moved to cohort III)</td>
<td>SDSU</td>
<td>Ph.D.</td>
<td>Walter Oechel</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>Summer 2019</td>
</tr>
<tr>
<td>Geselle Coleman</td>
<td>HU</td>
<td>MS</td>
<td>John Anderson</td>
<td>Jamese Sims</td>
<td>OGS Greenbelt MD</td>
<td>Satellite Product Management Study</td>
<td>May 2018- August 2018</td>
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<tr>
<td>Stephen Escarzaga</td>
<td>UTEP</td>
<td>Ph.D.</td>
<td>Craig Tweedie</td>
<td>Nicole Kinsman</td>
<td>NGS Anchorage, AK</td>
<td>DSM Production from NOAA RSD Coastal Imagery in Alaska</td>
<td>May 2018- August 2018</td>
</tr>
</tbody>
</table>
g. What are the CESSRST research outputs and tools and how have NOAA and the science community used them?

3. **To what extent is the CESSRST Center Management able to support and sustain Education and Training and Research components of the CESSRST program?**
   a. How are administrative data and management processes used to enhance the implementation of the project?
   b. How has center management made use of assessment and evaluation results to improve project outcomes?
   c. How has the CESSRST program increased engagement with the URM communities to enhance the mission workforce pipeline?
   d. How has the center promoted and nurtured partnerships that advance the center’s goals and NOAA’s priorities?
   e. *How has the center made use of evaluation results to ensure effectiveness in the accomplishment of the Center’s NOAA EPP-funded award goal and objectives?*

   **f. Longitudinal Postgraduate Tracking**

   The longitudinal postgraduate tracking dashboard is an integral part of the new MIS system. Each student from cohort I and II have created an e-portfolio within the MIS ([https://mis.noaacrest.org](https://mis.noaacrest.org)) that include primary information such as (1) their LinkedIn account; (2) home address; (3) personal phone and email address and (4) their future career goals. The students will participate in an exit survey prior to their graduation and will sign-up for participating in an annual alumni survey data collection. Additionally the system will also integrate information through the University Institutional Research Offices to track the student soon as they graduate with a degree (UG; MS or a PhD). Students will also be tracked using their LinkedIn profiles. The soon-to-be graduating cohort I Masters students will be participating in the exit surveys and the update will be provided in the next report.
EDUCATION - Objective of Activities

The overall education objectives accomplished during this reporting period were:

- Create and implement a center-wide recruitment plan;
- Create a summer Bridge Program to increase the number of successful applications for NOAA scholarships; and
- Implemented and initiated the Professional Advancement and Career Engagement (PACE) and career success pathways for all cohort I and II through the New MIS – [https://mis.noaacrest.org](https://mis.noaacrest.org)

Over the six-month timeframe, PACE was used to focus NOAA-CESSRST’s education and training specifically on FFO stipulated Outcomes 1, 2 and 3 and their respective Outputs.

During this reporting period – the focus/objective was to address Education Outcome 1, 2 and 3 (Per FFO) to increased number of CSC supported post-secondary students, trained annually.

The focus was on the following select outputs:

- Increase competence in using satellite data and GIS, statistical analysis, computer modeling and algorithm development
- Increase number of students (total an URM) participated in Professional Development
- Seminars, webinars and summer bridge workshops to develop skills and functional competencies to support NOAA mission STEM workforce.
- Created a community of practice between NOAA mentor, NOAA EPP Program office, CSC Faculty Advisors, CSC students and CSC educators through collaborative engagement to accomplish the 12-week NERTO training for the CSC graduate students.

EDUCATION - Key Outcomes/Achievement of Activity

- During this reporting period – the key outcomes were (1) creation of the new MIS system; (2) revision of the core competency modules – particularly the social science component to ensure proper center-wide integration; (3) creation of the students e-portfolios that will be an active data collecting system from the beginning (creating Individualized Student Development Plan (iSDP) till the end of the students training and graduation (Longitudinal tracking); and finally creation of successful NERTO internships for eleven graduate students (cohort I and one (cohort II)
- As of February 28, 2018, Cohort I comprises of 34 students (15 Undergraduate, 10 Masters and 9 Doctoral Students) and Cohort II comprises of 19 students (7 Undergraduates, 8 Masters and 4 Doctoral students). Tables 2 & 3 details the numbers of students and their institutions.
Table 2: Center-Wide COHORT I Fellows as of August 31, 2017

<table>
<thead>
<tr>
<th>Number of Fellows (33)</th>
<th>The City University of New York</th>
<th>Hampton University</th>
<th>University of Maryland Baltimore County</th>
<th>University of Puerto Rico, Mayaguez</th>
<th>San Diego State University</th>
<th>University of Texas, El Paso</th>
<th>Total Across all campuses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate</td>
<td>7</td>
<td>2</td>
<td>4</td>
<td>-------</td>
<td>1</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Masters</td>
<td>7</td>
<td>1</td>
<td>-------</td>
<td>-------</td>
<td>2</td>
<td>-------</td>
<td>10</td>
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<tr>
<td>Ph.D</td>
<td>4</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>2</td>
<td>1*</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>34</td>
</tr>
</tbody>
</table>

* Includes one (1) Ph.D student at UTEP who received the Lautenbacher Public Service Fellowship – for FY 2017-2018

Table 3: Center-Wide COHORT II

<table>
<thead>
<tr>
<th>Number of Fellows (33)</th>
<th>The City University of New York</th>
<th>Hampton University</th>
<th>University of Maryland Baltimore County</th>
<th>University of Puerto Rico, Mayaguez</th>
<th>San Diego State University</th>
<th>University of Texas, El Paso</th>
<th>Total Across all campuses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
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Cohort I student recruitment successfully closed with 34 students: 25 (74%) from URM communities and 9 (26%) non URM communities; 15 of which are Undergraduates (9 males, 6 females); 10 are Master’s program (7 males, 3 females); and 9 in Doctorate program (4 males, 5 females).

Cohort II student recruitment successfully closed with 19 students: 16 (84%) from URM communities and 3 (16%) non URM communities; 7 of which are Undergraduates (5 males, 3 females); 8 in Master’s program (5 males, 3 females); and 4 in Doctorate program (2 males, 2 females).

Education - Key Outcomes for this reporting timeframe:

- Build the COHORT II – fully supported by NOAA EPP/CESSRST funding
- Recruited applications for second Lautenbacher fellowship and in the process of recruiting the 2nd fellow,
- Core Competency modules are being modified based on NOAA review, comments and suggestions received in December 2017. The CWCC will be implemented in summer 2018 to cohort II student,
- Revised Social Science core competency has been created by the new center social science lead Dr. Valerie Were. Graduate students have begun identifying social science research problem that aligns with their research projects.
- Twelve (12) graduate students successfully completed their SSIO application process and will begin their NERTO in summer 2018.
- Standard Operations Procedure for CESSRST is being created and to be shared with all CESSRST members.
- The new MIS system has been launched in February 2018. The system is a unique data collection system that will help with assessment, and program evaluation and collecting and analyzing the data as needed.
COLLABORATIVE RESEARCH: Major Activities

Research is an integral part of training the next generation of scientists, engineers, natural resource managers, and social scientists in NOAA mission sciences, and primary way that the Center engages students with NOAA missions and scientists and engineers. CESSRST research provides experiential learning opportunities for undergraduate students and is a key component of graduate training leading to Masters and PhD degrees.

Based on the suggestions and advise provided by CESSRST Technical Advisor – Vanessa Griffin and Technical Monitor – Harry Cikanek, CESSRST now has three research themes (1) Coastal Resources (2) Weather and Atmospheric Hazards, and (3) Water Prediction and Ecosystem Services. Across all themes, CESSRST collaborative research is in direct alignment with NOAA’s leading role in environmental stewardship and addressing economic and societal progress and problems through integration of remote sensing technologies with multidisciplinary research.

THEME I: COASTAL RESILIENCE:

NOAA Relevance and Societal Impacts: Improving coastal resilience depends critically on coastal intelligence and developing a deeper understanding of coastal processes and potential impacts of extreme weather and climate-related hazards on coastal communities, businesses, natural resources, ecosystems and the services they provide. Theme I addresses this high research priority for NOAA through a combination of coastal observations, advanced modeling, development of new remotes sensing tools, and assessment of environmental and socioeconomic efficacy of developed approaches for mitigating the impacts of coastal stressors on nearshore habitats and coastal communities. Theme I supports NOAA’s research priority to improve “Coastal Intelligence Capabilities”: provide timely, actionable information that can be used by governments, businesses, and citizens to make decisions that support healthy ecosystems, strong economies, and resilient communities along our coasts. The research directly aligns with NOAA’s long-term mission of Resilient Coastal Communities and Economies; Weather Ready Nation; Climate Adaptation and Mitigation; Healthy Oceans. The research also aligns with the NOAA’s social science mission of NOAA’s impact on society is defined and measured; NOAA’s products and services strengthen societal decision-making. The NOAA line office and collaborators/mentors engaged in the Theme I research and training activities include Christopher Brown (NOAA/NESDIS); James Hendee (OAR), Karsten Shein (NESDIS), Mark Eakin (NOAA/NESDIS/Coral Reef Watch/STAR); Xinrong Ren (NOAA/ARL); Menghua Wang, NOAA/NESDIS/STAR; Rick Stumpf (NOAA/NOS); Mike Ondruscek (NESDIS); Robert Warner (NOS); John Walker (NOAA UAS Program); Xinrong Ren (ARL), Guangming Zheng (NOAA/NESDIS).

Other stakeholder/partners include EPA/Long Island Sound for collaboration and coordination of field activities, NASA/GSFC for access to instrumentation, and USGS/WHOI collaboration in planning of field activities, and USDA.

Theme I research and student cohort have been working closely with our NOAA Collaborators to refine the Theme I project/tasks objectives and ensure relevance to NOAA’s strategic priorities. All recruited students have met with their NOAA advisors, and planning their NERTO activities.
for summer 2018. CESSRST postdoc scientist Dr. William Hernandez continued his PD fellowship and mentored theme I students.

**Project I: CESSRST Coastal Ocean Observing Systems**

- Training on the use of a number of sensors (in-situ and remote sensing instruments) for measurements of atmospheric trace gases. Analysis of atmospheric trace gas (NO2 and O3) datasets collected by a network of ground-based in-situ and remote-sensing sensors across a range of coastal environments. Comparison of field measurements of atmospheric trace gases with satellite datasets from Aura-OMI and Suomi NPP OMPS. Results are currently being compared with measurements of atmospheric nitrogen pollution performed as part of NOAA ARL (Air Resources Laboratory) field activities (ongoing NERTO program).

- Interpretation of atmospheric aerosols is critical in the process of the derivation of the water leaving radiances from the Ocean Color (OC) imagery for ocean monitoring. For the current sensors like MODIS, and VIIRS atmospheric correction procedures include assumptions about the characteristics of atmospheric aerosols based on relative humidity and particle size distributions. At the sea level, SeaPRISM radiometric instruments which are installed on ocean platforms and which are part of the NASA Aerosol Robotic Network (AERONET) and AERONET-OC networks make direct measurements of the water leaving radiances from the ocean throughout the day, as well as observations of sky radiances from which aerosol parameters such as Aerosol Optical Depth (AOD), single scattering albedo, fraction of fine and coarse aerosols and others are determined. The discrepancies between satellite and AERONET data are usually significant in coastal areas that are primarily due to the more complex vertical changing atmospheres near the coast than in the open ocean, therefore associated with less accurate atmospheric correction. Using NASA SeaDAS software for OC satellite data processing, characteristics of aerosols in atmospheric correction models for VIIRS and MODIS sensors are retrieved and compared with AERONET-OC data in terms of AOD, Angstrom coefficients at the several AERONET OC sites around the Northern Hemisphere. The impact of the Sun-sensor geometry such as the sensor angles, and scattering angles, along with wind speed on the differences in aerosols parameters are evaluated and correlated with the accuracies in retrieval of the remote sensing reflectance spectra from ocean waters.

- We continued with the regular field sampling of coastal water optical and biogeochemical properties at the CREST Puerto Rico Coastal Ocean Observatory in southwestern Puerto Rico. These data are being used for calibration/validation of VIIRS satellite products in tropical coastal waters and for developing regional watercolor algorithms for Landsat-8 OLI and Sentinel 2 and 3 sensors. In September 2017. Hurricanes Irma and Maria caused catastrophic damage to Puerto Rico including coastal ecosystems. Major results from these sampling campaigns are reported here.

**Project II Development of Environmental and Coastal Quality Indicators**

Previously created synthetic datasets of reflectance in various coastal waters were used for the retrieval of water properties and chlorophyll fluorescence for MODIS and MERIS band sets. Retrievals were also tested on the field data from the Chesapeake Bay.

- The team focusing on coral reef research has started using very low-cost sensors built by Mana Ammornhammarong to measure sea temperature at very high spatial resolution along a line of mooring buoys on southeast Florida shelf, near Broward County. This field trial will contribute to research on the effects of sea temperature on coral reefs, and to an ongoing project to study upwelling on the shelf.
In situ temperature datasets have been retrieved from sensor networks established near Fort Lauderdale, Florida, in collaboration with the NOAA Atlantic Oceanographic & Meteorological Laboratory (AOML) in Miami, Florida (Dr. James Hendee). Datasets have continued to be retrieved and assembled from in situ stations installed during summer 2018 in Puerto Rico, in collaboration with CREST investigators at UPRM (Roy Armstrong). Andrea Gomez finished her internship at AOML on October 27. As part of her internship, Andrea worked with the AOML team on November 22, a team from AOML retrieved 28 temperature loggers that had been placed on Broward county recreational mooring buoys. This deployment was an operational test of the low cost temperature sensors developed by Dr. Natchanon Amornthammarong. The temperature sensors were placed at the top and bottom to the morning lines to measure temperature variability across the reef tract. Analysis of this data will be performed by Dr. Lew Gramer and by Andrea Gomez as part of her CREST internship at AOML.

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**Key Activities – Theme I (Research and Training)**

- During reporting period, six (6) CESSRST supported cohort I students [one Undergraduate (Stefanos Spiratos) and three Masters (Eder Herrera, Nia Rene and Owen Parker) and two Doctoral candidates (Andrea Gomez and Suhey Ortiz)] continued their research training.
- One Cohort II student Ysabel Banon (Masters) was recruited during this reporting period. Ysabel is in the process of completing her iSDP. Her faculty advisor Dr. Kyle McDonald and CESSRST management are working with Ysabel to identify NOAA mentor (potential Dr. Ruhul Amin at USGS).
- Dr. William Hernandez continued his research and professional development with a focus on Theme I research. He mentored graduate student – Andrea Gomez in field data collection of temperature loggers in La Parguera, PR for Coral Reef research; Suhey Ortiz-Rosa in field data collection of water optical data in Guanica/La Parguera and he serves on her graduate thesis committee. William also mentored 2017 NOAA Undergraduate Hollings Scholar Brianna Craig at University of Hawaii, Maui Community College.
- Owen Parker, initiated his 12-weeks NERTO in February 2018 at NCWCP, College Park, MD.
- Eder Herrera will start his 12-week NERTO in summer 2018.
- During this reporting period, Andrea Gomez, Eder Herrera and Owen Parker, prepared for their research presentation at the ninth EPP Science and Education Forum.
- All student completed their RCR training.

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**THEME II: WEATHER AND ATMOSPHERIC HAZARDS**

*NOAA Relevance and Societal Impacts*

Severe weather and air quality events have major ecological, human-health, and socio-economic impacts. Anthropogenic and natural emissions drive air quality. Theme II researchers will use innovative technology and integrative observations to study weather and atmospheric processes and trace constituents, validate satellite products, and improve model predictions. Theme II contributes to NOAA’s long-term goal of a “Weather Ready Nation” and is well aligned with NOAA’s vision of **healthy and resilient ecosystems, communities, and economies**. With emphasis on observing system optimization, research under Theme II will result in novel sensor technologies and applications, and improvement of data products leading to refinement of forecast models and decision support tools in support of the two social science areas: (1) *Planning and Policy* and (2) *Population Science*. The research aligns with NOAA’s social science mission -
Institutionalize social science to further NOAA’s mission. The CESSRST scientists and NOAA collaborators for each project are listed in Section II of this report unless otherwise noted.

PROJECT I. Weather Hazards

Task 1: Storm and Storm Prediction
- A key piece of work at CUNY is designed to improve the representation of severe storms in the GFDL seamless forecasting system. However, the initial focus of Veeshan Narinesingh’s research is on understanding the physics of atmospheric blocking and its representation in the GFDL models. This is motivated by two knowns: (1) there is a strong link between severe storms and atmospheric blocking, and (2) there are known model deficiencies in representing blocking.
- The work at UC San Diego involved developing a real-time daily snow-cover monitoring system for weather hazard information based on the NOAA data integrated from both satellite remote sensing and in situ stations. The system has the best resolution of 1 km and can be customized to any region, such as the Third Pole region of Tibetan Plateau. A paper on the system was published.
- In the Caribbean and surrounding region, sea-surface temperature (SST) analysis has been updated to 1982-2017 in order to observe the most recent, strong El-Nino event and the warmest year on record without El-Nino. SSTs have continued to increase in this region, while precipitation has continued a decreasing trend. Previously, the link between warming SSTs and annual precipitation were demonstrated, but per season, influence is reduced by other climate variables. Principal component analysis of both SSTs and precipitation reveal north-south and east-west gradients in variance. These patterns suggest atmospheric effects and lay the foundation for the next trend analysis for wind shear and convection. A multivariate analysis method has been established for SSTs, precipitation and atmospheric components in the Caribbean and surrounding region.

Task 2: Heat Stress and Urban Modeling
- We managed to receive GOES-R data directly to our servers, specifically LST at 5 minutes resolution.
- Cal/Val of GOES-R was initiated for thermal storage against flux towers installed in CCNY.
- Basic algorithm for humidity was developed, and tested using GOES-13. The transition to GOES-South was started. This will lead to the heat index product.
- We are producing high spatial and temporal resolution Land Surface Temperature (LST) maps using a combination of Landsat 8 and infrared based satellite platforms such as Moderate Resolution Imaging Spectro-radiometer (MODIS) and the recently launched Geostationary Operational Environmental Satellite-R Series (GOES-16). Methods used to blend the products of the three satellites include aggregating (up-scaling) the high-resolution data to a coarser one to examine the systematic differences between them.
- Moreover, a field campaign has been started to obtain Land Surface Temperature (LST) from in situ, and unmanned aircraft systems (UAS) measurements. Specifically, drone-based infrared cameras and in situ measurements from flux towers over New York City have been used for the evaluation of satellite-based data. The data are collected from urban surface types (concrete, asphalt, rooftop, and urban regions in general) using infrared cameras and flux towers.
- An ensemble for the NWM model, WRF, was started to test against observed mean and extreme cases, and the sensitivity to urban parameterizations and boundary layer scheme.
- We conducted monthly meetings with NOAA Partners, via phone, and maintained continuous communication.
- We arranged for three NERTO experiences for summer 2018, at NESDIS. Several statistical methods including Principal Component Analysis (PCA are applied to down scale MODIS observations to higher resolution. The aggregated LandSat-based surface temperatures have been compared to MODIS data over New York City and discrepancies have been identified between products.
PROJECT 2: CREST Observing Systems for Weather and Atmospheric Process and Dynamics

Task 1: The CREST Earth System Observing Network (CESON)

- To develop an approach based on multi-spectral data fusion for detecting aerosols and study the use of pattern recognition algorithms in multispectral data for the detection of aerosols.
- To assess the fusion of multisensor data from a CIMEL system, MODIS, VIRRS and/or LANDSAT satellites with data collected with UAV driven multispectral system.
- Active remote sensing measurements (lidar, ceilometer, radiometer, etc.) of multiple events of smoke plume transport to the eastern US coast. Measurements allow to determine impact of particle pollution aloft to surface air quality and monitoring evolution of mixing layer dynamics (0-3 km) during Air Quality Action days.
- Planning and coordination of air quality and boundary layer dynamics field campaigns that will take place in the summer of 2018 in the state of Maryland and New York. Campaigns will aid in the impact of coastal boundary layers dynamics in coastal urban air quality. Maryland Campaigns: Ozone Water Land Environmental Transition Study: Enhanced Monitoring of Atmospheric Pollution of the Chesapeake Bay Using Vertical Profiles of Ozone, Wind, Temperature and Aerosols (OWLETS) and Ad-hoc Ceilometer Evaluation Study (ACES). New York Campaign: Long Island Sound Tropospheric Ozone Study (LISTOS). Researchers/Science Teams consist of multiple federal agencies (EPA, NOAA and NASA) and university partners in NOAA’s Cooperative Centers CREST and NCAS-M (CCNY, UMBC, Hampton University and Howard University).
- Development of lidar instrumentation for vertical retrieval of gases (e.g. O$_3$, SO$_2$ and NO$_2$) with the troposphere. Multi-wavelength aerosol optical and physical properties from fusion of column combining sun photometer and lidar measurements.
- Long-term measurements of MLH from various remote sensing platforms and determination of height from several mathematical formulations. Results from this effort help guide the EPA Photochemical Assessment Monitoring Sites (PAMS) program implementation for new hourly MLH requirement and supplement current efforts under NWS ceilometer test bed.
- Developing Neural Network (NN) tools that combine Satellite Remote Sensing products and model forecast metrology to obtain 24-48hr fine particulate pollution (PM2.5) fields over New York State. PM25 comparisons have been made and show considerable improvement over Chemical Transport Models such as CMAQ under most conditions. This includes incorporation of NOAA’s HRRR Weather meteorology forecasts including Temperature, Wind Speed and Direction, Planetary Boundary Layer (PBL) height etc. Efforts to extend to severe events are underway using Satellite AOD maps and HYSPLIT Lagrangian Trajectories and a parcel intercept method.
- NOAA Total Ozone Assimilation of Stratosphere and Troposphere (TOAST) profiles for more than 5 years of Ozone Mapping and Profiler Suite Limb Profiler (OMPS-LP) data were created. These newly created TOAST files are an important first step in developing a new a-priori input for the NOAA Unique Combined Atmosphere Processing System (NUCAPS). This was done by modifying code supplied by Dr. Jianguo Niu, an associate of Larry Flynn.
- Comparisons of ozone measurements between OMPS-LP and the new Stratospheric Aerosol and Gas Experiment III in the International Space Station (SAGE III-ISS) for the entire initial release of the SAGE III-ISS data. SAGE III-ISS measurements will be used in comparisons with the new NUCAPS product once it is produced. Ozone data from Aura MLS were also used to examine differences in SAGE III-ISS and OMPS-LP profiles.
Aris Fernandez worked with Drs. Mark Arend and Fred Moshary (CCNY), and undergraduate student Mark Campmier (leveraged) in deployment and application of a wind lidar at CCNY. The students evaluated scan strategies for profiling winds. Algorithms were developed to obtain Velocity azimuthal display (VAD) and up/down drafts. The students prepared and presented their work at AMS annual meeting. Aris worked with NOAA mentor to develop NERTO plan for summer 2018. Victor Dominguez worked with Adrian Diaz and Anjeza Arapi (leveraged) on vertical and horizontal aerosol profiles in NYC using lidar, to understand boundary layer dynamics and transport of plumes and pollution. Satellite observations (VIIRS and GOES) together with NOAA Hysplit tool was used to understand transport of fire smoke plumes to the North East.

**Key Accomplishments of Theme II Students: Research and Training**

- **Thirteen students** [seven Undergraduates (Chris Luger; Christiana Sasser; David Barnes; Matthew Glover; Maurice Roots; Meredith Sperling, Victor Dominguez); four Masters(Aris Fernandez; Geselle Coleman; Tyler Tucker; Yoribaldis Olivo); and two doctoral students (David Melecio-Vasquez and Joshua Hrisko)] from cohort I continued their research and training during this reporting period.

- **Eleven students** were recruited in cohort II [four undergraduates – Sujeily Fonseca; Sergio Vazquez-Cortes; Mathew Wood; Justin Johnson; four Masters – Harold Gamarro; Anna Vaculik; Carlos Iturrino; Matthew Hilding; and three doctoral students – Equisha Glenn; Veeshan Narinesingh; and Steven Buckner

- Four graduate students (Aris Fernandez, Tyler Tucker, Yoribaldis Olivio and Joshua Hrisko) successfully completed their SSIO and will be participating in 12-week NERTO internship this summer 2018.

- Two peer-reviewed paper published by cohort I students as first author

- Veeshan Narinesingh applied for the Conrad Lautenbacher Public Service Scholarship. Out of 5 applications, Veeshan’s application was outstanding and based on the selection committee’s recommendation, Veeshan will be awarded with the 2018 Lautenbacher Public Service Scholarship (April, 2018- March, 2019).

- All cohort I and II students completed their RCR training.

**THEME III: WATER PREDICTION AND ECOSYSTEM SERVICES**

This work aligns with the NOAA’s “Water Prediction” research priority. This theme aims at creating unified water prediction and modeling methodologies to aid the development of operational products and services. The theme includes climate-informed integrated water and ecosystems modeling, socio-economic impacts and vulnerability assessments, that directly aligns with NOAA’s Integrated Water Prediction. The work also supports NOAA’s mission to provide improved protection of life and property from natural hazards, and for a better understanding of the total environment. Theme III focuses on developing a unified water prediction system using...
remote sensing of earth systems, and aligns with NOAA’s social science mission of NOAA’s products and services strengthen societal decision-making. Co-led by Naresh Devineni and Tarendra Lakhanakar, the research is conducted in collaboration with Xiwu Zhan (NOAA/NESDIS/STAR); Ralph Ferraro (NOAA/NESDIS/STAR); Satya Kalluri, (NOAA/NESDIS/STAR), Yunyue Yu(NOAA/NESDIS/STAR); Michelle Stokes (NWS), Roger Pierce (NWS), Tim Brown (NWS); Felix Kogan (NOAA/NESDIS); Jeff Key (NOAA/NESDIS/STAR), Colm Sweeney (NOAA/OAR/ESRL), Pieter Tans (NOAA/OAR/ESRL), James Butler (NOAA/OAR/ESRL), Robbie Hood (NOAA UAS Program), Gary Wick (NOAA/OAR/ESRL).

During this performance period, new NOAA collaborations were identified: Lauren, Jarlenski, Mareike Sudek (NOS/ NMSAS) Rob Cifelli, Roger Pulwarty (NOAA/ESRL), Russell Schnell, Bryan Thomas (ESRL/GMD), Alex Tardy, Dennis Atkinson and Jack Harlan (NWS) and Ernesto Rodriguez (NWS-San Juan), Nicole Kinsman (NOAA/NOS/NGS) and new project being discussed to be added in theme III.

Task 1. Demand sensitive drought risk assessment for the continental United States
• A discussion has been initiated between Theme 3 scientists with NOAA researchers Rob Cifelli and Roger Pulwarty (NOAA/ESRL) on new project task aimed at improved understanding of physical processes represented in NOAA's National Water Model and to guide future model development. This research would include assessing the efficacy and impacts of atmospheric forcings used to drive the National Water Model for both too wet and too dry extreme events and in applications to monitor and predict drought and flood conditions to inform risk management.
• Cassandra Calderella (PhD student) designed algorithms required for developing the demand drought indices. She continued assembling data sources for the water demand catalog. Cassandra Calderella writing codes in Python and Matlab to process the vegetation and soil moisture (AMSR2) data.
• Abraham Rubel (UG Student) has conducted analysis on the drought database, specifically, explored extreme value distributions for fitting the data. He investigated distinct spatial variability for the drought parameters depending on what type of crop
• Ariel Avgi (UG Student) has collected global daily temperature, SPEI and PDSI datasets and extracted concurrent dry and hot conditions for the countries where we grow wheat crops. She has identified impacts of concurrent extremes in the same crop productions and discovered that it is the cooler tropical Pacific conditions (La-Nina) that impacts global wheat grain availability, more than the warmer counterpart (El-Nino).
• Jahnelle Howe (UG Student) interviewed survivors of Hurricane Maria from Puerto Rico to study social and infrastructure impacts of the hurricane. She started writing blog posts on her research findings and beyond that communicates science to non-scientific audiences.

Task 2: Flood risk assessment using in-situ and remote sensing products
• Based on discussion with faculties and researchers with addition of new projects, the title of this task is changed from “Urban flood modeling using in-situ and remote sensing products”. During performance period, based on discussion with NOAA-Collaborator Ernesto Rodriguez (NWS...
San Juan) a new project deliverable “flash flood forecasting system for Puerto Rico” added to this task. Jean P. Valle (MS Student), Cohort II student is recruited during with performance period to work in collaboration with Ernesto Rodriguez.

- Jean P. Valle was selected to participate of NCAR Training Workshop: The Community WRF-Hydro Modeling System. Student was selected to participate of CUAHSI - Summer Institute at NOAA’s National Water Center.
- Adedoja Adeyeye (MS student) worked on installing weather stations, for urban Hydro meteorological Testbeds (uHMT) across the city. Total 15 weather stations were has been installed during summer and fall 2017, and data is being processed in real-time.
- Aye Phyu (UG Student) investigated the spatial dependence in extreme rainfall in New York City. She used historical precipitation data collected hourly from John F Kennedy (JFK) airport, LaGuardia (LGA) airport and Central Park (CP) from 1948 to 2011 to understand the dependence among the stations using basic exploratory graphic techniques and quantitative measures such as correlation and tail dependence coefficients.
- Cesar Hincapie has worked on building a hybrid model that incorporates physical and statistical methods. The hybrid model will incorporate rainfall intensity and duration along with land-use characters.

Project II. Water Resource Assessments

Task 1. Automated System for Evapotranspiration Mapping

- Prof. Trent Biggs (SDSU) leads this task in NOAA collaboration with Michelle Stokes (NWS), Roger Pierce (NWS), Tim Brown (NWS), Satya Kalluri (NOAA/NESDIS/STAR). During this period, Dr. Biggs recruited MS students to begin work on the project in summer 2018 and fall 2018. Extramural funding will be leveraged to fund an MS student (Garrett McGurk) in summer 2018 to evaluate automated ET algorithms implemented in Google Earth Engine (EEFlux), including updating previous work by MS student Maegan Salinas (SDSU). Matching funding from the University has been extended to prospective MS student Gabriela Morales, and 2 URM students have applied for Bridge for summer 2018.
- Corrie Monteverde (MS Student), implementing a regional climate model (WRF/SSIB-2) over Southern California that includes a land surface model capable of simulating evapotranspiration. The model estimates will be compared with ET data from eddy flux correlation towers and EEFlux maps of ET. The work will contribute towards scenario development of how climate variability and change alters the spatial and temporal distribution of ET, with a focus on southern California. She recently received a Provost's Award for her presentation at the SDSU Student Research Symposium.

Task 2: Development and validation of Snow Water Equivalent data product

- Stephany Parades Mesa (MS Student) worked on development of scripts and codes to reprocess and quality control the historical AVHRR and SSMI data and to derive long-term time series of global snow and ice cover maps. She found that available AVHRR Climate Data Records (CDR) still require some calibration adjustment for the data in AVHRR reflective bands. This adjustment is require to achieve temporal stability and consistency of time series of snow and ice derived from the AVHRR data.
- The key deliverable will be 30-year dataset of daily gridded snow and ice maps derived from AVHRR and SSMI/SSMIS sensor data. The dataset is preliminary, the quality and accuracy of the derived parameters will be improved by further enhancements of the retrieval algorithm.
Project III. Synoptic and Seasonal Monitoring of the Earth Systems

Task 1. Phenology

This task is led by Prof. Craig Tweedie (UTEP) to analyze a time series of coastal terrestrial lidar data to determine spatial-temporal characteristics of coastal erosion in Arctic Alaska. Stephen Escarzaga, a doctoral student and 2017 Lautenbacher Public Service fellow is conducting research on understanding the coastal erosion along the 33.5 KM coastline of the Barrow Environmental Observatory using different in-situ methods (GPS tracking and aerial laser scanning (ALS) techniques).

Task 2. Land-Atmosphere Fluxes

Prof. Walter Oechel (SDSU) leads this task with NOAA collaborators Lauren Jarlenski and Mareike Sudek, and Bryan Thomas from NOAA/ESRL. Student recruitment for COHORT II and III is completed. We recruited Undergraduate student Jessica Montes, to SDSU/CESSRST program funded by CUNY, working on the effects of the soil properties on net ecosystem CO2 exchange in semi-arid chaparral ecosystems. The NERTO work plans for Andrea and Michael have been finalized under Lauren Jarlenski and Mareike Sudek mentorship for summer 2018 in National Marine Sanctuary of American Samoa (NMSAS). Mike has done more measurements and survey on patterns and controls on CO2 fluxes using boat-based pCO2 measurements in San Diego bay to test the system for further runs in American Samoa during summer 2018. He also completed building the eddy covariance boat based system to measure the Air-Sea fluxes in AS summer 2018. Michael has been preparing to propose his Master thesis in March 2018. The integration of NOAA data sent by Mareike in his research has been accomplished.

Task 3. Development of sensors for UAS platforms for Environmental Intelligence and Satellite Product Validation (crosscutting and collaborative with NCAS)

- A new project task has added based on discussion with NOAA Researchers Dennis Atkinson and Jack Harlan (NWS) and Ernesto Rodriguez (NWS-San Juan) on application of UASs and Radars Technology for Vulnerability Risk Assessment of Coastal Areas prone to Storm Surge.
- A prospective doctoral student is being recruited by Profs. Doug Stow and Donatella Zona (SDSU) to work on characterization of landscape properties and conditions within eddy covariance towers based on UAV images and digital surface models.

Key Activities Theme III – Research and Training:

- **Twelve students** [four Undergraduates (Abraham Rubel, Ariel Avgi, Jahnelle Howie and Aye Phyu); three Masters (Adeyeye Acedoja, Stephany Parades Mesa, Michael Trunkhill); and four doctoral students (Cassandra Calderella, Carlos Wah-Gonzalez, Andrea Fenner and Breanna Gillespie)] in cohort I continue to be trained in research pertinent to theme III research themes.
- **Seven students** [three undergraduates (Cesar Hincapié, Jessica Chiu, Daniel Hernandez); 3 Masters (Nicolas Maxfield, Corrie Monteverde, Jean Vallie Pierre) and one doctoral (Rose Jimenez)] were recruited during this reporting period.
- Five graduate students will be participating in their 12-weeks identified their NERTO internship this summer
- All student completed their RCR training.
COLLABORATIVE RESEARCH: Specific Objectives:

CESSRST scientists and students continue to engage with NOAA Collaborators to refine the project/tasks objectives and ensure relevance to NOAA's strategic priorities. Recruited students have met with their NOAA advisors, and started working on planning NERTO activities.

Specific Objectives for Theme I during this reporting period were:

- Conduct NOAA mission-aligned collaborative research - Increase NOAA Collaboration and Engagement with NESDIS and other Line Offices
- Conduct NOAA mission-aligned collaborative research - Increase and create NERTO opportunities for all NOAA CREST graduate students
- To develop a deeper understanding of coastal processes and potential impacts of extreme weather and climate-related hazards on coastal communities, businesses, natural resources, ecosystems and the services they provide
- Continue detailed analysis and expansion on the satellite retrievals of HABs, including examination of false negative and positive statistics, and on temporal impacts and extending the work to include, consecutive satellite overpasses.
- Set-up greenhouse mesocosm and HAB time series incubation experiments to help establish relationships between chlorophyll fluorescence and main water bio-optical parameters in coastal waters.
- One of the long-term goals of the project is to improve NOAA’s understanding and prediction of the contribution of severe storm to snow cover.

Specific Objectives for Theme II during this reporting period were:

- The long-term goals of the Project II Task I is to improve NOAA’s understanding and prediction of the contribution of severe storm to snow cover, and in coastal convective processes.
- The Goals of this Project II Task-II are; a) to develop satellite remote sensing products for cities, specifically heat-index nowcast and thermal storage of urban environments derived from new satellite GOES-East, and b) with these products improved urbanized numerical weather forecasting products including sub-kilometer parameterizations. These goals aligned with NOAA’s Weather Ready Nation goals, and with the Weather Bill.
- Integrative ground and satellite remote sensing observations, and algorithm development to study weather, atmospheric processes and trace constituents, validate satellite products, improve model predictions and decision support tools in support of Social Science areas of Planning and Policy and Population Science.
- CESON provides a galvanized framework, which gauges the impact of atmospheric particulate and trace gases in major ecological, human-health and socio-economics.

Specific Objectives for Theme III during this reporting period were:

- Address the modeling, and prediction of floods and droughts, and how these may affect interlinked human activities at multiple scales of cities and river basins.
- Investigate drought risk for the United States using variations in both water supply and demands.
- Investigate modeling and prediction of floods using both in-situ and remote sensing data products.
- Utilize the previously developed Global Multi-Sensor Automated Snow and Ice Mapping System, modify it and apply to historical satellite data to generate a long-term dataset of daily global maps of snow and ice extent.
- Develop a global scale multi-year phenology dataset, derived from multiple satellite remote sensing datasets characterizing land surface, ocean, and cryosphere cyclic phenomena, providing a comprehensive characterization of phenology measures, and supporting investigation of trans- domain
phenomena and teleconnections associated with regional feedbacks and global climate processes. Specific focus is on arctic and dryland landscapes that have increasingly been recognized for their role in the global carbon cycle.

**COLLABORATIVE RESEARCH - Significant Results:**

**Overarching Objectives for Research and Training includes:**
- Recruiting students to fill in Cohorts I and II post-secondary students to be trained in NOAA mission aligned science projects developed by CESSRST faculty advisors in collaboration and engagement with NOAA scientists and mentors.
- Students will be provided training on basic CESSRST center-wide core competencies in summer 2018.
- Graduate students will then acquire advanced competencies through training, advance core-competencies unique to the specific objective they are working on.
- Theme III graduate students are working in social science problem to be integrated in their research in coordination with CESSRST Social Science Lead – Dr. Valerie Were.
- These advanced skills will be augmented by training gained in their associated project/task specific NERTO experience and mentorship from NOAA scientists collaborating on the project.

**Significant Results from Theme I during this reporting period were:**
- Analysis of ground-based and shipboard remote sensing measurements of atmospheric trace gas (ozone and NO2) showed strong spatial and temporal variability in the total column amount of ozone and nitrogen dioxide along coastal waters, and demonstrated the impact of anthropogenic emissions on coastal and offshore marine air quality.
- Near infrared inaccuracies in aerosol optical depth (AOD) are more pronounced for increased wind speeds with the coastal site showing higher discrepancies. This effect is most likely related to the state of the ocean surface, characterized by the reflectance coefficient of skylight from the ocean surface.
- Remote sensing technologies were used to monitor water quality trends in southwestern Puerto Rico, including the effects of Hurricanes Irma (6-7 Sept.) and Mara (20-21 Sept.) in 2017. Kd490 increase from 0.20 m-1 before the hurricanes to 0.28 right after Hurricane Irma, and to 0.38 m-1 in October 2017.

**Significant Results from Theme II during this reporting period were:**
- CCNY is conducting a preliminary testing of the Spatial NN ingesting the MAIAC AOD and efforts to turn the single PM2.5 maps into time profiles using PM25 time profiles from AIR NOW stations are underway.
- UPRM students, Carlos Iturrino and Sujeily P Fonseca, completed a literature review on the use of multispectral imaging for aerosol detection and identified possible data sources to be used for the project.
- HU has a near operational multi-wavelength tunable Mie-Raman-DIAL that can measure ozone, nitrogen dioxide, and sulfur dioxide.
- UMBC development of a universal mixing layer height algorithm to be used heterogeneous aerosol profiling network such as the new EPA PAMS ceilometer network and the NWS ASOS ceilometer network. Algorithm for overlap correction in aerosol backscatter was developed and currently is being evaluated in several commercial ceilometer units.

**Significant Results from Theme III during this reporting period were:**
- Andrea Fenner (PhD student) reprocessed and analyzed the long-term CO2 fluxes and other
environmental parameters such as: precipitation, soil moisture, air/soil temperature, and PAR for nearly two decades and presented to the department as well as the visiting professors from UK at San Diego State University.

- Adedoja Adeyeye (MS student) processes the NY-uHMT weather station data in conjunction with NWS weather station data for summer and early fall 2017 in New York City.
- Nicolas Maxfield (MS Student) has completed a comprehensive review of literature that connects meteorological drought with river drying or intermittency. His research will be focus on the attribution of low flow occurrence to the climate, catchment properties and the human made infrastructure, such as dams and diversions.
- Stephen Escarzaga (PhD Student) found that change analysis provided a high-resolution figure of volumetric change while suggesting a large amount of spatial and temporal variability in coastal bluff change stressing the importance of geomorphology and precipitation (among other terrestrial drivers) as being controls on erosion.
- Carlos Wah Gonzalez (PhD Student) and his advisor Rafael Rodriguez Solis were worked on the development of the dual-band shared aperture concept. They were successfully integrated a waveguide slot array on substrate integrated waveguide (SIW) technology on a thick-metal microstrip patch. They are also been working on the development of the digital receiver portion of the radiometer, focusing on reducing the power consumption.
- Aye Phyu (UG Student) demonstrate that the extreme events in New York City between JFK, CP and LGA are all semi-independent depending on the duration of interest. She now plans to extend this work using the newly installed weather stations. The new weather stations will provide much more diverse rainfall information.
- Jessica Chiu (UG Student) has been using Matlab and ArcGIS to assess the accuracy of MSPPS, MIRS, and IMS products over mountainous terrain and forested areas over the continental United States.

**COLLABORATIVE RESEARCH - Key outcomes or other achievements:**

**Theme I:**
- Assessment of spatial and temporal variability in atmospheric NO2 and Ozone across coastal areas and over estuarine/coastal waters.
- Coupled ocean-atmosphere effects should be further analyzed in details to improve atmospheric correction, especially in the coastal zones.
- Retrievals of water properties which include fluorescence component produce better results.
- Field data for 2017 show a high correlation (N = 34) between Kd490 and CDOM350 absorption coefficient (R=0.93) and a lower correlation with TSS values (R= 0.65) and Chl a (R= 0.59) parameters. Coral bleaching was observed at one site after Hurricane Maria.

**Theme II:**
- Classical power law vertical wind profile formulation is reasonable for higher wind speeds, when above the surface roughness level. Exceedance of NAAQS for PM2.5 in the area is primarily due to smoke transport in the summer. Models underestimate the boundary layer and over estimate PM2.5 at night.
**CESSRST MANAGEMENT: Major Activities**

The Key Personnel positions identified, recruited and updated during this reporting period:

<table>
<thead>
<tr>
<th>KEY PERSONNEL</th>
<th>Name</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center Director</td>
<td>Reza Khanbilvardi, PhD P.E</td>
<td><a href="mailto:khanbilvardi@ccny.cuny.edu">khanbilvardi@ccny.cuny.edu</a> 212.650.8009</td>
</tr>
<tr>
<td>Center Assistant Director</td>
<td>Shakila Merchant, PhD</td>
<td><a href="mailto:smerchant@ccny.cuny.edu">smerchant@ccny.cuny.edu</a> 212.650.8379</td>
</tr>
<tr>
<td>Distinguished Professor</td>
<td>William Rossow, PhD (Retd.)</td>
<td><a href="mailto:wbrossow@ccny.cuny.edu">wbrossow@ccny.cuny.edu</a></td>
</tr>
<tr>
<td>Data Manager</td>
<td>Paul Alabi</td>
<td><a href="mailto:kalabi@ccny.cuny.edu">kalabi@ccny.cuny.edu</a> 212.650.5025</td>
</tr>
<tr>
<td>Communications and Outreach Manager</td>
<td>Olga Joseph</td>
<td><a href="mailto:ojoseph@ccny.cuny.edu">ojoseph@ccny.cuny.edu</a> 212.650.8121</td>
</tr>
<tr>
<td>Education Specialist/ Coordinator</td>
<td>Nancy Degnan, PhD</td>
<td><a href="mailto:degnan.nancy@gmail.com">degnan.nancy@gmail.com</a></td>
</tr>
<tr>
<td>Recruitment and Student Affairs Manager</td>
<td>Cesar Ortiz</td>
<td><a href="mailto:cortiz@ccny.cuny.edu">cortiz@ccny.cuny.edu</a></td>
</tr>
<tr>
<td>Social Science Lead*</td>
<td>Valerie Were</td>
<td><a href="mailto:vwere@ccny.cuny.edu">vwere@ccny.cuny.edu</a></td>
</tr>
<tr>
<td>CESSRST External Evaluator</td>
<td>Janice Easton, PhD (new</td>
<td><a href="mailto:jeaston@ufl.edu">jeaston@ufl.edu</a></td>
</tr>
<tr>
<td></td>
<td>Mark Howse)*</td>
<td><a href="mailto:mark.howse@stellarachievement.org">mark.howse@stellarachievement.org</a></td>
</tr>
</tbody>
</table>

* New team members recruited during this reporting period

Venn diagram that illustrates relationship between three major CESSRST committees to increase internal communication and coordination of the events across the center and its partner institutions

During the current reporting period, all CESSRST Committees met regularly to ensure:
- Integration and coordination between the three elements of CESSRST - Science, Education and Management;
- Collaborative communication and engagement of the CESSRST members across all partners institutions;
- The Core Competency sub-committees is in the process of revising the center-wide frameworks for core competency and social sciences, based on the comments/suggestions provided by NOAA Technical Monitor, Advisor, and NOAA EPP program office.
- An all hands-on committee meeting has been planned in April 2018.

**a. Center-wide communication Matrix**

A center-wide communication strategy is being evolved to communicate the center events, activities and success stories (figure 3). The quarterly newsletter depicting Center activities and success stories are located on the website - [http://noaacrest.org/publications](http://noaacrest.org/publications)

![Figure 2: Center-Wide Communication Matrix](image)

CESSERT communication efforts focused on improving the flow of information and ideas between groups on two distinct levels: 1) Internal Stakeholders and 2) External Stakeholders.

**1. INTERNAL**

Internally, three key groups were identified within the organization (Figure). It is CESSRST management which leads the effort, in collaboration with Staff/Faculty members. Together they serve the needs of Students (Cohort members) and deliver a beneficial fellowship experience. The goals driving this communication effort are to **engage, inspire and support** CESSRST Fellows through their program.

- (Internal Stakeholders)
- Management to Staff/faculty
- Management to Students
- Staff/Faculty to Students
- Staff/Faculty to Management
- Students to Staff/Faculty
- Students to Management

**2. EXTERNAL**
CESSERT engages multiple external stakeholders including Prospective Students, College Advisors and Consortium Partners, with the key group identified as its Prospective Students or future cohort members. Effective messaging to this group is integral to ensuring recruitment success.

(a) Messaging
Both internal and external stakeholders were reached through multiple channels including Email/Text/Phone, Web/Social media the use of Print Materials and Events.

(b) Social Media Results
During the reporting period from September 2017 to February 2018, increased its social media engagement primarily through Facebook and Twitter with limited use of Instagram (Table 5 below). A total of 28 Facebook posts were made, nearly all contained an accompanying photograph, flyer or other artwork. Overall Facebook likes increased by 16 for the six-month period ending on February 28, 2018. Twitter engagement fell slightly by 0.2% while link clicks jumped significantly.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>TWITTER</strong></td>
<td>YEAR AGO</td>
<td>PREVIOUS Six Months</td>
<td>CURRENT Period</td>
</tr>
<tr>
<td>Engagement</td>
<td>0.4 %</td>
<td>0.8 %</td>
<td>0.6 %</td>
</tr>
<tr>
<td>Link Clicks</td>
<td>13</td>
<td>11</td>
<td>31</td>
</tr>
<tr>
<td>Retweets</td>
<td>14</td>
<td>68</td>
<td>15</td>
</tr>
<tr>
<td>Likes</td>
<td>14</td>
<td>13</td>
<td>24</td>
</tr>
<tr>
<td>FACEBOOK</td>
<td>Page Likes = 568</td>
<td>Page Likes = 620</td>
<td>Page Likes = 636</td>
</tr>
</tbody>
</table>

Next Six Months
The communications strategy over the next six months will target student engagement through active social media campaigns, which connect stakeholders to the CESSRST brand. Our current methodology has been a one-way channel from the CSC to its audience. Time sensitive announcements and events will continue to be published. However, students and researchers will produce digital content (videos, blogs, links to portfolios, etc.) which amplifies the CESSRST brand.
<table>
<thead>
<tr>
<th>Date</th>
<th>Institution</th>
<th>Event Description</th>
<th>Learn more</th>
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</table>
| 6 Sep 2017 | HU          | **SEMINAR: JOURNEY FROM THE EARTH’S LOWER ATMOSPHERE TO THE THERMOSPHERE/IONOSPHERE**  
Dr. Jia Yue, Research Associate Professor at Hampton University, presented a talk on his investigation of the theoretical, numerical and experimental investigation of the dynamical, electrodynamical and energetical coupling processes between Earth's lower and upper atmosphere.  | [here](#) |
| 7 Sep 2017 | CCNY        | **CCNY’S ESE PROGRAM EARNES ABET ACCREDITATION THROUGH 2023**  
The (Bachelor of Engineering program in) Earth System Science and Environmental Engineering (ESE) at The City College of New York earns its second six-year certification in 2017 by the Accreditation Board for Engineering and Technology (ABET). The ESE was granted its first accreditation in 2010 by the board’s Engineering Accreditation Commission.  | [here](#) |
| 12 Sep 2017| CCNY        | **2017 FALL SCHOLARSHIPS & SPECIAL PROGRAMS FAIR**  
Career Fair where CESSRST recruiters offered information about CESSRST scholarships/fellowships and NOAA educational opportunities to CCNY students were.  | [here](#) |
| 13 Sep 2017| CCNY        | **LAUTHENBACHER FELLOW RECAPS SUMMER RESEARCH**  
The PhD Fellow summarizes his third three-month research trip to Barrow (now Utqiagvik), Alaska, where he completed extensive fieldwork on the dynamics of this Arctic coastal and nearshore region. Local science outreach and educational opportunities were included in his endeavor.  | [here](#) |
| 14 Sep 2017| CCNY        | **CCNY UNDERGRADUATE FELLOW RECAPS SUMMER RESEARCH**  
The EPP/MSI Undergraduate Scholar summarizes her internship at NOAA’s Pacific Islands Fisheries Science Center in Honolulu, HI. She joined a team focused on development of seafloor depth algorithms for bathymetry and geomorphology basemaps.  | [here](#) |
| 14 Sep 2017| CCNY        | **SEMINAR: EXPLOITATION OF SATELLITE PRODUCTS TO MONITOR THE HYDROLOGICAL CYCLE**  
Dr. Ralph Ferraro of NOAA/NESDIS/Center for Satellite Applications and Research (STAR) spoke to students about NOAA’s most recent satellites, evolution of the sensors and algorithms and highlighted current and future product development.  | [here](#) |
| 15 Sep 2017| CCNY        | **CESSRST FACULTY PUBLISHES PAPER ON THE CONVECTION, AEROSOL, AND SYNOPTIC-EFFECTS IN THE TROPICS (CAST)**  
Dr. Nathan A. Hosannah and colleagues published an article in The Bulletin of the American Meteorological Society (BAMS). Their study focuses on Building an Understanding of Multiscale Impacts on Caribbean Weather via Field Campaigns.  | [here](#) |
<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Event Title</th>
<th>Details</th>
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<tbody>
<tr>
<td>20 SEP 2017</td>
<td>HU</td>
<td>SEMINAR: GSICS: THE GLOBAL SPACE-BASED INTER-CALIBRATION SYSTEM</td>
<td>Research Scientist, Dr. Lawrence Flynn, discussed the Global Space-based Inter-Calibration System (GSICS) which is an international program to assure the comparability of satellite measurements taken at different times and locations by different instruments operated by different satellite agencies. Learn more here</td>
</tr>
<tr>
<td>21 SEP 2017</td>
<td>UTEP</td>
<td>CONNECTIONS: UTEP ENGINEERING &amp; SCIENCE CAREER EXPO</td>
<td>Exclusive career fair for the university’s Engineering and Science majors. Representatives from CCNY and UTEP staffed the recruiting booth. A special information session about CESSRST scholarships/fellowships and NOAA educational opportunities was held.</td>
</tr>
<tr>
<td>4 OCT 2017</td>
<td>HU</td>
<td>SEMINAR: SENSING IMAGE FUSION IN WEST NILE VIRUS STUDY</td>
<td>Dr. Hua Liu is an Assistant Professor of Geography at Old Dominion University. Her research interests include remote sensing, GIS, urban environmental change, climate change and sea level rise, public health, and flooding assessment and monitoring. Learn more here</td>
</tr>
<tr>
<td>5 OCT 2017</td>
<td>DETROIT, MI</td>
<td>WOMEN OF COLOR CONFERENCE</td>
<td>Women of Color (WOC) magazine's annual Science, Technology, Engineering, and Math (STEM) Conference is designed as a collaborative learning environment where WOC focus on career, personal and professional development. Recruiters provided information about CESSRST scholarships/fellowships and NOAA educational opportunities.</td>
</tr>
<tr>
<td>5 OCT 2017</td>
<td>CCNY</td>
<td>FALL STEM CAREER FAIR</td>
<td>Career Fair where CESSRST recruiters offered information about CESSRST scholarships/fellowships and NOAA educational opportunities to CCNY students were.</td>
</tr>
<tr>
<td>11 OCT 2017</td>
<td>HU</td>
<td>SEMINAR: IMPACT OF ENSO &amp; PACIFIC DECADAL OSCILLATION ON REGIONAL &amp; GLOBAL SEA LEVEL</td>
<td>Dr. Se-Hyeon Cheon’s discussion centered on research using climate data records to better understand the causes of global and regional sea level variability and change. Learn more here</td>
</tr>
<tr>
<td>18 OCT 2017</td>
<td>HU</td>
<td>SEMINAR: TIDES, PLANETARY WAVES, AND THEIR ROLES IN COUPLING ATMOSPHERIC REGIONS</td>
<td>Dr. Ruth Lieberman presented her latest research on global-scale atmospheric tides and planetary waves generated in the lower atmosphere. Learn more here</td>
</tr>
<tr>
<td>19 OCT 2017</td>
<td>CCNY</td>
<td>NOAA-CESSRST RESEARCHER AWARDED DOE GRANT</td>
<td>The Office of Science of the Department of Energy selected Dr. Naresh Devineni as one of 59 researchers to receive its 2017 Early CAREER Award. A total of $750,000 over the next five years will support his project: &quot;Multi-scale Modeling of Extreme Events and Impact Information.&quot; Learn more here</td>
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<tr>
<td>Date</td>
<td>Location</td>
<td>Event Description</td>
<td>Learn more</td>
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<tr>
<td>19 OCT 2017</td>
<td>CCNY</td>
<td><strong>SEMINAR: WATER AND CARBON CYCLE COUPLING: CHALLENGES AND OPPORTUNITIES?</strong> The water and carbon cycles are intrinsically coupled. Professor Pierre Gentine of Columbia University discussed the implications of this coupling for climate change and our capacity predict those two cycles.  Learn more here</td>
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<tr>
<td>25 OCT 2017</td>
<td>HU</td>
<td><strong>SEMINAR: CALIFORNIA BASELINE OZONE TRANSPORT STUDY (CABOT)</strong> Dr. Sen Chiao of San Jose State University discussed how aerosols impact air quality with students at Hampton University and other CESSRST campuses via livestream.  Learn more here</td>
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<tr>
<td>25 OCT 2017</td>
<td>TUSCALOOSA, AL</td>
<td><strong>NOAA CSC DIRECTORS AND PARTNERS MEETING WITH NATIONAL WATER CENTER LEADERSHIP</strong> Members from NOAA CESSRST joined other CSC for a site visit to the National Water Center at the University of Alabama-Tuscaloosa to tour the state-of-the-art facility and discuss future partnership endeavors.  Learn more here in our SEP-OCT newsletter</td>
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<tr>
<td>1 NOV 2017</td>
<td>HU</td>
<td><strong>SEMINAR: VIRGINIA CLIMATE FEVER</strong> Stephen Nash discussed how Global Warming will transform our cities, shorelines, and forests.  Learn more here</td>
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<td>2 NOV 2017</td>
<td>CCNY</td>
<td><strong>EIGHTH ANNUAL MAJORS JAMBOREE: CONNECTING TO A MAJOR AND/OR MINOR</strong> Campus event where students networked with representatives from a diversity of academic departments and professional alumni.</td>
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</tr>
<tr>
<td>3 NOV 2017</td>
<td>CCNY</td>
<td><strong>ANNOUNCEMENT: APPLICATIONS NOW OPEN FOR THE ADMIRAL LAUTENBACHER FELLOWSHIP AWARD</strong> NOAA CESSRST is seeking applications from eligible graduate students (Masters and PhD) for its prestigious Conrad Lautenbacher Public Service Graduate Scholarship.</td>
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<tr>
<td>3 NOV 2017</td>
<td>KANSAS CITY, MO</td>
<td><strong>LATIN AMERICAN ENGINEERING STUDENT ASSOCIATION-SOCIETY OF HISPANIC PROFESSIONAL ENGINEERS (LAESA-SHPE) CONFERENCE</strong> LAESA-SHPE is the largest technical and career conference for Hispanics in the country. Recruiters provided information about CESSRST scholarships/fellowships and NOAA educational opportunities.</td>
<td></td>
</tr>
<tr>
<td>21 NOV 2017</td>
<td>CCNY</td>
<td><strong>SEMINAR: WHAT IS IMPORTANT FOR THE PUBLIC TO KNOW ABOUT CLIMATE CHANGE?</strong> Dr. Rachel Shwom of Rutgers Energy Institute presented a lecture about her research which links sociology, psychology, engineering, economics, and public policy to investigate how social and political factors influence society’s responses to energy and climate problems.  Learn more here</td>
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<tr>
<td>29 NOV 2017</td>
<td>HU</td>
<td><strong>SEMINAR: DEVELOPING FUTURE AIR QUALITY &amp; OBSERVING STRATEGIES, CONTRIBUTIONS FROM NASA AIRBORNE FIELD STUDIES</strong></td>
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</table>
James Crawford, research scientist at NASA’s Langley Research Center, discussed the factors that affect air quality, how surface emissions, atmospheric transport, and chemical transformations interact, and how they’re changing over time. Learn more here

### DECEMBER 2017

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Event Description</th>
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</thead>
<tbody>
<tr>
<td>5 DEC 2017</td>
<td>CUNY</td>
<td>SUSTAINABILITY AND GREEN TECHNOLOGY GRADUATE INFORMATION SESSION</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Graduate Center gathering where CESSRST recruiters offered information about CESSRST scholarships/fellowships and NOAA educational opportunities to prospective CUNY students.</td>
</tr>
<tr>
<td>7 DEC 2017</td>
<td>CCNY</td>
<td>WEBINAR: NOAA UNDERGRADUATE SCHOLARSHIP OPPORTUNITY</td>
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<tr>
<td></td>
<td></td>
<td>Special online session open to current and prospective fellows interested in opportunities, information and application tips for NOAA’s competitive scholarships and fellowships. Learn more here</td>
</tr>
<tr>
<td>8 DEC 2017</td>
<td>CCNY</td>
<td>STUDENT HOLIDAY GATHERING</td>
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<tr>
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<td>CESSRST students marked the end of the fall semester with an evening of fun, food and fellowship at an establishment near the CCNY campus.</td>
</tr>
<tr>
<td>11 DEC 2017</td>
<td>WASHINGTON, DC</td>
<td>2017 AGU FALL MEETING</td>
</tr>
<tr>
<td></td>
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<td>Students and faculty traveled to New Orleans, Louisiana, to attend the meeting from December 11 – 15 and participate in sessions.</td>
</tr>
<tr>
<td>16 DEC 2017</td>
<td>HU</td>
<td>SEMINAR: OWLETS CAMPAIGN: OVERVIEW, PRELIMINARY RESULTS, AND FUTURE PLANS</td>
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<tr>
<td></td>
<td></td>
<td>Tim Berkoff explained how the Ozone Water-Land Environmental Transition Study, known as OWLETS, helps improve air-quality forecasts for the Chesapeake Bay. Learn more here</td>
</tr>
<tr>
<td>19 DEC 2017</td>
<td>CCNY</td>
<td>NOAA-CESSRST MANAGEMENT HOLIDAY PARTY</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Management, faculty, staff and friends gathered at the Grove School of Engineering to celebrate the season and reflect on the accomplishments of the semester.</td>
</tr>
<tr>
<td>20 DEC 2017</td>
<td>CCNY</td>
<td>CESSRST RESEARCHERS PUBLISHED IN JOURNAL &quot;ENERGY&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The study, “Spatiotemporal variability in building energy use in New York City,” seeks to better understand and map building energy consumption and quantify its impact on the urban environment with New York City as a test case. Read more here</td>
</tr>
<tr>
<td>31 DEC 2017</td>
<td>CCNY</td>
<td>STUDENT WELCOME WEBINAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Center-wide information session for Cohort I &amp; II students to understand the requirements and procedures for fulfilling their fellowship. CCNY students attended in person.</td>
</tr>
</tbody>
</table>

### JANUARY 2018

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Event Description</th>
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<tbody>
<tr>
<td>1 JAN 2018</td>
<td>CCNY</td>
<td>CESSRST RESEARCHER PUBLISHED IN JOURNAL OF CLIMATE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Saman Armal, a PhD candidate at CCNY, published his paper “Trends in Extreme Rainfall Frequency in the Contiguous United States: Attribution to Climate Change and Climate Variability Modes” in the (AMS) Journal of Climate. Read more here</td>
</tr>
<tr>
<td>Date</td>
<td>Location</td>
<td>Event Description</td>
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</tr>
<tr>
<td>6 JAN 2018</td>
<td>AUSTIN,</td>
<td>CESSRST STUDENTS, FACULTY AND MANAGEMENT ATTEND AMS IN AUSTIN</td>
</tr>
<tr>
<td></td>
<td>TX</td>
<td>Students and faculty traveled to the Lone Star State to attend the 98th AMS Annual Meeting in Seattle from January 7–11. This year’s theme, “Transforming Communication in the Weather, Water, and Climate Enterprise Focusing on Challenges Facing Our Sciences”.</td>
</tr>
<tr>
<td>12 JAN 2018</td>
<td>HU</td>
<td>TWO CESSRST UNDERGRADUATES AWARDED HOLLINGS SCHOLARSHIPS</td>
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<tr>
<td></td>
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<td>NOAA Office of Education has awarded two Hampton University students, David Barnes and Maurice Roots, with the prestigious Ernest F. Hollings Undergraduate Scholarship. Learn more here</td>
</tr>
<tr>
<td>12 JAN 2018</td>
<td>CCNY</td>
<td>WEBINAR: NOAA UNDERGRADUATE &amp; HOLLINGS SCHOLARSHIP</td>
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<td></td>
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<td>Special online session open to current and prospective fellows interested in opportunities, information and application tips for NOAA’s competitive scholarships and fellowships. View video here</td>
</tr>
<tr>
<td>17 JAN 2018</td>
<td>HU</td>
<td>SEMINAR: AN OVERVIEW OF THE NASA GSFC TROPOSPHERIC OZONE DIAL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Researcher John Sullivan presents “An Overview of The NASA GSFC Tropospheric Ozone DIAL.” Learn more here</td>
</tr>
<tr>
<td>21 JAN 2018</td>
<td>CCNY</td>
<td>RESEARCHES VISIT PR FOR POST HURRICANE MARIA ASSESSMENT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A group of four scientists from CCNY traveled to UPRM where they are conducting research on land recovery impacts/implications on convection post Hurricane Maria.</td>
</tr>
<tr>
<td>24 JAN 2018</td>
<td>HU</td>
<td>SEMINAR: SAGE III-ISS FIRST RESULTS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M. Pat McCormick of Hampton University spoke about &quot;SAGE III-ISS First Results&quot;. Learn more here</td>
</tr>
<tr>
<td>31 JAN 2018</td>
<td>HU</td>
<td>SEMINAR: CUAD: CONSTELLATION FOR UPPER ATMOSPHERE DYNAMICS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Guest speaker Larry Gordley of GATS, Inc. joined students at the Hampton University campus for a discussion on &quot;Constellation for Upper Atmosphere Dynamics&quot;. Learn more here</td>
</tr>
</tbody>
</table>

**FEBRUARY 2018**

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 FEB 2018</td>
<td>UTEP</td>
<td>INFORMATION SESSION FOR ENGINEERING &amp; SCIENCE STUDENTS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A special information session about CESSRST scholarships/fellowships and NOAA educational opportunities was held prior to the Career EXPO at UTEP.</td>
</tr>
<tr>
<td>2 FEB 2018</td>
<td>UTEP</td>
<td>CONNECTIONS: UTEP ENGINEERING &amp; SCIENCE CAREER EXPO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exclusive career fair for the university’s Engineering and Science majors. Representatives from UMBC and UTEP staffed the recruiting booth.</td>
</tr>
<tr>
<td>7 FEB 2018</td>
<td>CCNY</td>
<td>EPP VIDEO: FINAL VERSION RELEASED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Video presentation recapping the events of the NOAA EPP/MSI 8th Biennial Education and Science Forum hosted by CESSRST at the City College of New York, August 29-31, 2016. View video here</td>
</tr>
<tr>
<td>7 FEB 2018</td>
<td>HU</td>
<td>SEMINAR: ION ESCAPE: HOW PLANETARY MAGNETIC FIELDS INFLUENCE AND ARE INFLUENCED BY THEIR ATMOSPHERES</td>
</tr>
</tbody>
</table>
Katherine Garcia-Sage of GSFC, explained her research on the way planets interact with their host star. Learn more here

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 FEB 2018</td>
<td>NEW YORK, NY</td>
<td>2017 ALL IVY ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT CAREER FAIR (COLUMBIA UNIVERSITY) Eight Ivy League schools collaborate for a career fair that provides companies unparalleled access to undergraduate, graduate and Ph.D. level students who have the skills and knowledge to address the complex sustainability challenges of our global economy.</td>
</tr>
<tr>
<td>9 FEB 2018</td>
<td>WASHINGTON, DC</td>
<td>BEYA STEM CONFERENCE Large scale conference where students and professionals meet top employers, take advantage of onsite resources designed to enhance job search, to enhance their academic career, as well as to get tools for a successful STEM career. NOAA CESSRST recruiters provided scholarship/fellowship information to pre-college, college and graduate students.</td>
</tr>
<tr>
<td>10 FEB 2018</td>
<td>CCNY</td>
<td>CARLOS PEREZ DIAZ JOINS SSAI AS RESEARCH SCIENTIST The CESSRST Fellow and PhD graduate from CCNY has been hired by SSAI as a research scientist specializing in water resources. His assignment is with the MODIS Characterization Support Team.</td>
</tr>
<tr>
<td>14 FEB 2018</td>
<td>HU</td>
<td>SEMINAR: THINKING BEYOND THE POLAR VORTEX: IMPLICATIONS OF SEASONAL CLIMATE CHANGE Dr. T. Agami Reddy, sustainable engineering expert and professor at Arizona State University, presented examples of how satellite data is being used to enhance energy efficiency. Learn more here</td>
</tr>
<tr>
<td>15 FEB 2018</td>
<td>CCNY</td>
<td>RESEARCHER PUBLISHED IN EARTH'S FUTURE JOURNAL PhD Candidate and Research Assistant Ehsan Najafi and collaborators have published their paper “Understanding the Changes in Global Crop Yields through Changes in Climate and Technology” in the prestigious (AGU) Earth's Future Journal. Read more here</td>
</tr>
<tr>
<td>22 FEB 2018</td>
<td></td>
<td>SEMINAR SERIES: BUILDING ENERGY DATA ANALYTICS: STATUS AND FUTURE RESEARCH DIRECTIONS Dr. Ralph Ferraro of NOAA/NESDIS/Center for Satellite Applications and Research (STAR) spoke to students about NOAA’s most recent satellites, evolution of the sensors and algorithms and highlighted current and future product development. Learn more here</td>
</tr>
<tr>
<td>28 FEB 2018</td>
<td>HU</td>
<td>SEMINAR: SEMINAR: CONSTRAINING AIRLESS BODY SURFACE COMPOSITION WITH MID-IR SPECTROSCOPY Dr. Cindy Young presented a talk on her research involving planetary satellite observations. Learn more here</td>
</tr>
</tbody>
</table>

**a. Center-Wide Social Science Framework - update**

In December 2017, Dr. Valerie Were joined the Center as the Social Science Lead. She will focus on addressing the social science requirements of the grant award. Experienced not only in the social sciences, but also as NOAA contractor in the Office of the Chief Economist, Dr. Were also took over as chair of the Social Sciences Committee.
Dr. Were is spearheading the effort to redesign the Social Science Core Competency and determining the best delivery mechanisms for a geographically dispersed study body, at various stages of their educational and career readiness process. In March 2018, NOAA released an online course that provides basic social science training for non-social scientists. To meet the Basic Competency requirements, students will take this course and attend the Social Science Seminar Series on how social science is applied that Dr. Were is developing. For the Advanced Competency training and to enhance social science integration Center-wide, Dr. Were will work with the scientists and students in each of the Center’s Research Themes to develop social science questions for the projects to address.

**Social Science Activities and Milestones**

- A Social Science Committee meeting focused on the Social Science Competency redesign
- Incorporation of the NOAA Social Science Basics Course into the Basic Social Science Core Competency training. There is both pre-and post-training evaluation to ensure students understand the material
- Dr. Were convened a phone conversation with her counterparts at the other NOAA Cooperative Science Centers. The goals were to understand how social science integration occurs at the other Cooperative Science Centers and to start conversation about a cross-CSC approach to social science integration so all the students, regardless of CSC affiliation, leave with similar training and competency.

<table>
<thead>
<tr>
<th>NOAA Story Maps by the graduate students (partial list)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suhey Ortiz: <a href="http://arcg.is/2AuNi6T">http://arcg.is/2AuNi6T</a></td>
</tr>
<tr>
<td>Joshua Hrisko</td>
</tr>
<tr>
<td><a href="http://arcg.is/1n0fLe">http://arcg.is/1n0fLe</a></td>
</tr>
<tr>
<td>Carlos Wah Gonzalez</td>
</tr>
<tr>
<td><a href="http://arcg.is/2AuNi6T">http://arcg.is/2AuNi6T</a></td>
</tr>
<tr>
<td>Stephany Mesa Paredes</td>
</tr>
<tr>
<td><a href="http://arcg.is/2zSu6QU">http://arcg.is/2zSu6QU</a></td>
</tr>
<tr>
<td>Adedoja Adeyeye</td>
</tr>
<tr>
<td><a href="http://arcg.is/2itz4w0">http://arcg.is/2itz4w0</a></td>
</tr>
<tr>
<td>Stephen Escarzaga</td>
</tr>
<tr>
<td><a href="https://arcg.is/1Cq8zD">https://arcg.is/1Cq8zD</a></td>
</tr>
</tbody>
</table>

**Next Six Months**

Dr. Were will focus on several tasks over the next six months

- Completing the Social Science Core Competency redesign
- Meeting with the Center’s scientists and students in each research theme to discuss and begin integrating social science research questions into projects
- Creating a social science seminar series; and
- Continued conversations with her counterparts at the other institutions regarding cross-CSC social science integration

**b. Center-Wide Data Management and Sharing Plan**

**Website:** status = complete  
Web: [https://www.noaacrest.org](https://www.noaacrest.org)

A new center website has been completed. The contents for the website continues to be updated regularly.

**Data repository and Collection systems:** status = partially completed  
Web: [https://mis.noaacrest.org](https://mis.noaacrest.org)

The web interface and databases for collecting and storing student and administrative data has been completed. FileMaker interfaces for student and faculty information such as the ISDP, research portfolio, leverage funding, campus reporting, finance reporting and other metrics have been built and tested. The system is currently online at the above website.

**Science and Research Data Management:** status = in development
The data publishing and sharing system is still in development. Some research output/results has been transferred to this system. The CREST computational cluster is now online.

**For the next performance period, (March 1, 2018– August 31, 2018)**

- Fully complete the FileMaker based MIS (testing and bug fixes)
- GOES-16 Setup including acquisition and processing.
- Setup interfaces between main website and publishing system
- Add data retrievals such as ftp and API services to the publishing system.
- Transfer TL 7 or greater products to the publishing and sharing system
- Start work on visualization for CREST Data products

**c. Center Postdoctoral Plan**

As per the SAC, one of two postdoctoral scientist was recruited during this reporting period. Dr. William Hernandez joined CESSRST as the first postdoctoral scientist, after his proposal and application was approved by NOAA Program Office. Dr. Hernandez has been appointed for one year and will be extended another year of fellowship based on his performance and availability of funds. His summer activities are reported under section VI-Special Award Condition.

**d. Admiral Lautenbacher Public Service Scholarship Award**

CESSRST Lautenbacher Public Service Scholar continued his research and community outreach work in Barrow (not Utqiagvik). Stephen is working on his SSIO work plan in response to the SSIO posted by his NOAA mentor Dr. Nicole Kinsman, Alaska Regional Advisor for the National Geodetic Survey. He plans to do his 12-week NERTO in summer 2019. During his training, he learned image-processing techniques, valuable to apply to this academic and professional training as CESSRST Lautenbacher fellow. Stephen’s work focuses on the understanding of the Coastal erosion in Barrow Alaska and its impact on the local community. Stephen continues to engage in community outreach STEM events for high school students from native villages across the North Slope of Alaska. Stephen continues to maintain the Barrow Alaska Information Database (BAID) [www.barromapped.org](http://www.barromapped.org) – a site that helps the researchers and local community help understand the coastal erosion and raise environmental awareness about their community and changes due to weather and climate.

**2017 Lautenbacher Public Service Graduate Scholar - Stephen Escarzaga running research and community outreach in Illisagvik a tribal village, in Barrow Alaska**

**e. Center-Wide Evaluation updated during this reporting period**

• Revision of the Evaluation Plan to include NOAA/EPP Overarching Questions and submission to CESSRST Management (Sept 2017).
• Review and comment on Core Competency post survey (Oct 2017).
• Commented on IRB Submission Forms (Nov 2017).
• Discussions with newly appointed External Evaluator in her transition to CESSRST. Gathered and shared data gathering tools and reports (Dec 2017-Jan 2018)

What training and professional development were completed during the reporting period for Center postsecondary students, early professionals, postdocs, and faculty?

The research related training activities are given below:

**Theme I:**
• Training on the use of a number of sensors (in-situ and remote sensing instruments) for measurements of atmospheric trace gases.
• Training on analysis/processing of satellite datasets from Aura-OMI and Suomi NPP OMPS
• NERTO activity at NOAA ARL (Air Resources Laboratory). Student: Owen Parker, NOAA Advisors: Winston Luke and Xinrong Ren
• NERTO activity at NOAA AOML (Atlantic Oceanographic and Meteorological Laboratory). Student: Andrea Gomez, NOAA Advisor: Jim Hendee
• Professor A. Gilerson is on sabbatical with increased participation in fieldwork and conferences.
• Use of Image processing software and GIS tools, basic Python course.

**Theme II:**
• Veeshan Narinesingh continues to take courses towards his PhD requirements. This semester he is enrolled in Climate and Climate Change, Geophysical Fluid Dynamics (at Columbia), and doing an independent study course on midlatitude atmospheric circulation.
• Tyler Tucker was trained to use NOAA datasets, communicate with NOAA scientists, big data processing, math, computer science and statistical skills for NOAA applications, and trained to solve particular problems for NOAA and to seek NOAA employment opportunities.
• Equisha Glenn was trained in PCA and in the use of high resolution SSTs, the Optimized Interpolation product developed by Tom Smith et al.
• Chris Lunger collaborates in extreme precipitation processes in Western Puerto Rico.
• All students gained experience in algorithm development.
• Students and faculty continue to improve their skills in data processing from GOES-R (or GOES-East), via research.
• Sam Lightstone (CCNY leveraged student) has completed his PhD course work and has mastered a number of general and Deep Learning NN approaches.
• Aris Fernandez and Victor Dominguez (CCNY) students attended the Health and Air Quality workshop sponsored by New York State/Columbia U/ and NASA at the Lamont Doherty Earth Observatory.
• Steven Buckner (HU) has refined his Fortran, IDL and MATLAB language skills, which was a requirement to understanding the codes that create the TOAST files.
• David Barnes (HU) is enhancing his IDL programming skill set while working on the OMPS LP and Aura MLS ozone comparisons.
• Maurice Roots (HU) is getting trained on lidar principals and how to determine mixing layer heights from lidar signals.
• Maurice Roots (HU) and Geselle Coleman (HU) were trained on preparation, release and data analysis of a rawinsonde. The launches were part of the HU APS 645 (Atmospheric Physics) course material
covering atmospheric stability analysis. Furthermore, the HU lidar was operated on launch days to compare mixing layer heights measured by the radiosondes and the lidar.

- UMBC students participated in the American Meteorological Society Short Course: A Beginner’s Course to Using Python in Climate and Meteorology. This course was offered during the AMS Annual meeting held in January 2018 in Austin TX.

**Theme III:**

- Andrea Fenner (PhD student) started continued working on the eddy covariance data and meteorological data but this time she included nearly two decades of the dataset in her analysis using advanced R codes and she was able to present the results of her analysis to the SDSU team including some scholars visiting San Diego from UK in February 2018. She also has been maintaining the three eddy covariance sites in Sky Oaks within this period with the help of our undergraduate Jessica Montes.

- Stephen Escarzaga (PhD Student) received (1) four-day workshop on applications of satellite imagery for polar sciences at the Polar Geospatial Center 2) Terrestrial Laser Scanning Data and Processing Short Course at UNAVCO HQ 3) Applied to Neon's 2018 Data Institute: Remote Sensing with Reproducible Workflows in Python.

- Michael Trunkhill (MS student) completed her data analysis using advanced R codes, making maps of the CO2 fluxes measurements of different bays in American Samoa collected in Summer 2017. He has been preparing to propose his master thesis to the department in March 2018 and has been engaged with NOAA collaborator Mareike Sudek to get required information and dataset and feedback to include in his thesis proposal.

**How have the results been disseminated to communities of interest, including NOAA and other stakeholders?**

**Theme I:**

- Results were disseminated via presentations (posters and talks) at international conferences and workshops

- Participation in the conferences with NOAA scientist’s representation, conference calls for the NOAA’s VIIRS validation team.

- Through monthly teleconferences with between NOAA NESDIS and NOS collaborators and William Hernandez (CREST post-doc).

- We continued close collaboration with our NOAA collaborators, including Menghua Wang, Christopher Brown, Michael Ondrusek, and Guangming Zheng from NOAA/NESDIS and NOAA contactor Alan Strong

- We have close collaboration with Dr. Steve Morton of NOAA NOS, Lee Marchman of the Environmental Resources Program at the FL DEP Stormwater Division, Alan Cohn the Director of Climate and Water Quality at the NYC DEP, and Rick Stumpf of NOAA NOS

**Theme II:**

- Researchers González, Nourozi, Moshary, and Ramamurthy and students (Joshua, Yori and Anna) continue to interact with NESDIS Scientist Bob (Yunyue) Yu, lead scientist for GOES-R LST products to discuss collaborations including; data sharing, cal/val, and development of new products. Bob Yu agreed to host two or more students next summer as part of the NERTO program, and co-advise students who engage in this particular collaboration.

- The results of the research are shared directly with NOAA/NESDIS on a regular basis, through monthly meetings and regular email communications. Completed results are shared with the national and international communities in conferences and symposia.

- UMBC students continue to contribute to the Smog Blog, a daily diary of the U.S. air quality. Blog post
require knowledge and assessment of NOAA satellite products such as VIIRS (AOD and smoke/dust flags) and the Hazard Mapping System Fire and Smoke Product.

- CREST faculty participated in “Building a Weather-Ready Nation by Transitioning Academic Research into Operations Workshop,” on November 1-2, 2017, at the National Center for Weather and Climate Prediction, College Park, Maryland.
- Meetings with state air quality management for Maryland and NYC took place, separately, during this reporting period to discuss leveraged remote sensing research conducted at CCNY and UMBC and its impact on policy/monitoring (NYS Department of Environmental Conservation and Maryland Department of the Environment, respectively) and health (NYC Department of Health). CCNY disseminated results to Energy Resources Development Authority (ERDA), and New York City Department of Buildings (DOB) and Department of Health (DOH).
- CREST students gave oral and poster presentations at the 98th American Meteorological Society meeting in Austin TX.
- UMBC PI participated in the 2017 Fall POWER-US Technology Workshop Partnership for Offshore Wind Energy in the United States, in Boulder, CO in October 2017. In addition, he was part of the planning committee of National Academy of Science, Engineering and Medicine workshop on “The Future of Boundary Layer Observing”.
- Steven Buckner (HU) participates in weekly telecoms with the OMPS-LP ozone team, lead by Larry Flynn. During these telecoms, Steven updates the team with progress and issues that he may have come across in his research. He also gleans information from team members on OMPS-LP, TOAST and NUCAPS content.
- UMBC hosts (since October 2017) a Pandora spectrometer. This spectrometer retrieves column concentrations of O3, NOx, SO2 and H2CO.

**Theme III:**

- CREST team along with NOAA leadership visited to National Water Center, Alabama and discussed research collaboration projects on application of satellite remote sensing data in improvement of National Water Model.
- Stephen Escarzaga (PhD Student) given presentations, tech demonstrations and general educational activities based on his research work. He also contributed geospatial data to Alaska's Department of Natural Resources to aid in their efforts to assess coastal infrastructure needs.
- Michael Trunkhill has been collaborating with his NOAA co-mentor in American Samoa, Mareike Sudek, and Michael has provided her with the gathered information and collected data in summer 2017. Mareike Sudek provided him with useful information and data for different bays in AMS for his project.
- Preliminary results on Project 2, Task 2 on snow and ice retrieval were presented at the NOAA-NASA Global Precipitation Measurement (GPM) semi annual meeting in October 2017.

**What actions will be taken by the Center during the next reporting period to accomplish the goals?**

**Theme I:**

- Comparison of satellite and AERONET-OC data will be expanded to the broader range of the AERONET-OC sites.
- Analysis, processing and comparison of atmospheric datasets from a network of ground-based remote sensing sensors, to assess spatial variability in atmospheric trace gas dynamics
- Comparison of remote sensing measurements of total column amount of atmospheric trace gases with surface concentrations of trace gases using in-situ sensors.
• Detailed analysis will be carried out on satellite retrievals of HABs, including examination of false negative and positive statistics, and on temporal impacts. We will be setting up greenhouse mesocosm and HAB time series incubation experiments. For research Task "Development of coastal water quality indicators", we will establish relationships between chlorophyll fluorescence and main water bio-optical parameters in coastal waters.

• Graduate students Eder Herrera will be participating in internships (NERTO/SSIO) in NCWCP, College Park, MD this spring-summer of 2018

**Theme II:**

• We will continue the analysis of the physics of atmospheric blocking as it related to weather hazards.

• We will expand the PCA analysis to include additional atmospheric variables that may explain the precipitation trends in the Caribbean.

• Furthermore, graduate students will participate in NERTO and generate more products for websites based on NOAA data and facilities.

• We will continue Ca/Val for GOES-R for LST, and thermal storage by comparing nearest grid with flux tower measurements, and against measurements from other satellites.

• We will continue the development of the algorithm for heat index.

• We will continue, the numerical ensemble for sub-kilometer uWRF, and for different PBL schemes.

• The CCNY Time forecast NN will be tested and will be used for Cross Validation methods to test accuracy. The development of the algorithm for heat index will continue.

• Atmospheric profiling of particle pollution events for air quality advisory alerts and forecasting model validation/verification. Mixing layer height and atmospheric profiling database for modeling assessment.

• Contacts have been made with NOAA to receive processed intermediate GOES-R land surface temperature before they get released publically. The data will be processed to obtain high-resolution land surface temperature over urban regions (starting with New York City) to the level of Landsat resolution (30m).

• Research work will be exploring high pollution regional events to assess the most important predictor factors using a combination of HYSPLIT back trajectories and integrated satellite AOD from GOES-GASP and potentially GOES-R.

• Work in collaborations with NOAA on transport and air quality model validation. CREST is working on dissemination of observations products to both state and NWS air quality forecasters (i.e. MLH from CREST profilers for verification of forecast atmospheric parameters)

• CREST mentors will continue with weekly meetings with the students to review progress on achievement of the proposed goals. The students will provide weekly written reports and present their progress.

**Theme III:**

• Stephany Parades Mesa (MS Student) has been engaged with NOAA Collaborator Ralph Ferraro, she will be in NESDIS/STAR office for NERTO in summer 2018 and will work with Ralph on developing technique and computer code to combine microwave product to improve characterization of the snow cover. Daily snow and ice retrievals from optical and microwave sensors will be combined to provide continuous (gap-free) characterization of the global snow and ice cover distribution on a daily basis.

• Adedoja Adeyeye (MS Student) engaged with NOAA Collaborators Xiwu Zhan and he will in NESDIS/STAR facility for NERTO in summer 2018. He will be working with Dr. Xiwu Zhan on statistically evaluating the quality of these satellite based SM products for flood assessment and drought monitoring applications.

• Carlos Wah Gonzalez (PhD Student) will do his NERTO in summer 2018 at ESRL facility with Dr. Gary Wick. He will continue work on microwave receiver architecture to complete work on digital receiver. He will involve in building prototype for low-band receiver and test at Civil Engineering Facilities.
Corrie Monteverde (MS Student) will spend her NERTO summer program in summer 2018 at the San Diego National Weather Service office under the supervision of Alexander Tardy.

Abraham Rubel (UG Student) will be working on relating the drought statistics to climatological parameters. Ariel Avgi, an undergraduate student, is working on developing the linkages of drought to food security.

Cesar Hincapie (UG student) will be investigating the causality of this spatial risk based on storm transposition using hybrid model that incorporates physical and statistical methods.

All SDSU cohort I&II students will continue their research under SDSU faculty and scientists’ supervision and continue collecting the required data for their research as well as maintaining the instruments including calibration and sensors’ repairs. In addition, a detailed analysis will be done for all flux measurements and micrometeorological data throughout this period and will be made available to the CESSRST community if requested.

II. Products of Award

There are no limitations to the number of entries a Center submits. In reporting, keyword information can be directly pulled from Thomson Search and on Research.gov. **NOTE:** Recipient may provide images, tables, charts, or other graphics in support of the Products section. Recipient may include high-resolution photos.

Within the Products section, recipient can list any products resulting from the FY16 CSC award, during the specified reporting period, such as:

- **Degrees Awarded:** None during this reporting period
- **Publications in Journals:** 3 (Theme I – 0 and Theme II – 3; Theme III – 0)
- **Books:** None during this reporting period
- **Book Chapters:** None during this reporting period
- **Thesis/Dissertations:** None during this reporting period
- **Conference Papers, Posters and Presentations:** 8 (Theme I – 3 and Theme II – 5)
- **Other Publications:** None during this reporting period
- **Technologies or Techniques:** Modular Hybrid Green Infrastructure
- **Patents:** patent for ecoWEIR technology to be issued spring 2017
- **Inventions:** None during this reporting period
- **Licenses:** None during this reporting period
- **Websites:** None during this reporting period
- **Other Products:**
  - Data that assesses the physics of atmospheric blocks and their relationship to severe storms. This data is being generated for observations and for seamless numerical prediction models.
  - Snow cover information.
  - Data of precipitation trends as function of SSTs; NAO, ENSO, on a seasonal scales.
  - A website for displaying and delivering the data has been developed and is made available to the general public. See the systems website [http://www.itsonlyamodel.us/daily-snow.html](http://www.itsonlyamodel.us/daily-snow.html). It has three different resolutions: 24 km, 4 km, and 1 km.
  - Land Surface Emissivity Product Using AMSR-E and AMSR2 sensors for about 15 years.
  - Robust PM2.5 forecasting system providing state maps of PM25 forecasts.
Monitoring of particle pollution to determine intrusion to planetary boundary layer and its impact to surface air quality measurements and health.
* Profiles of aerosol, temperature and winds in first and lower 10 kms of atmosphere.
* OMPS LP ozone comparisons with Aura MLS and SAGE III ISS measurements.
* Surface Meteorological and Air Quality Measurements.
* Mixing Layer Heights from lidar, microwave radiometer, radar wind profilers and soundings.

**Journal articles:**


**Conference Presentations:**

1. Li, Parker, Tzortziou, "Assessing Spatiotemporal Variability in NO2 and O3 Along the Korean Peninsula Using Remote Sensing and Ground-Based Observations" 2017 AGU

2. Tzortziou, Lamb, Parker, Abuhasan, "Temporal and spatial dynamics of atmospheric trace gases and aerosols in South Korean coastal waters, and impacts on satellite retrievals", 2018 OSM

3. Two posters describing this work were presented by Roy Armstrong at the Ocean Sciences Meeting (Feb. 11-16, 2018) in Portland, Oregon.


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1 **Bold and underlined** authors are CSC funded students
III. Participants in Award Performance

There are no limits on the number of participants listed for this section; however, the Center is required to list all participants who have worked one-person month or more for the project reporting period. *NOTE:* Conversion of percentage of effort to person months is as follows. To calculate person months, multiply the percentage of effort associated with the project times the number of months of the appointment. For example: 25% of a 9 month academic year appointment equals 2.25 (AY) person months (9 x 0.25 = 2.25).

a. What individuals have worked on the project?
b. What organizations have been involved as partners?
c. What other collaborators have been involved?
d. Have NOAA collaborators or contractors been involved?
<table>
<thead>
<tr>
<th>Name</th>
<th>Organization/Location</th>
<th>Project Role/Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THEME I – Coastal Resilience</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CESSRST Advisors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Maria Tzortziou</td>
<td>CCNY/ EAS Dept.</td>
<td>Theme I Coordinator, Task-2/Project-2 Co-Coordinator, Investigator</td>
</tr>
<tr>
<td>Dr. Alex Gilerson</td>
<td>CCNY/ EE Dept.</td>
<td>CESSRST Ocean Observatories in Critical Coastal Regions</td>
</tr>
<tr>
<td>Dr. Roy Armstrong</td>
<td>UPRM</td>
<td>CESSRST Ocean Observatories in Critical Coastal Regions</td>
</tr>
<tr>
<td>Dr. Jennifer Cherrier</td>
<td>Brooklyn College-CUNY</td>
<td>Improved monitoring of HABs and their impacts in coastal eutrophic systems</td>
</tr>
<tr>
<td>Dr. Sam Ahmed</td>
<td>CCNY/ EE Dept.</td>
<td>Improved monitoring of HABs and their impacts in coastal eutrophic systems</td>
</tr>
<tr>
<td>Dr. Jonathan Munoz</td>
<td>UPRM</td>
<td>Investigator</td>
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<tr>
<td><strong>CESSRST Postdoc</strong></td>
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<tr>
<td>Dr. William Hernandez</td>
<td>CESSRST, Postdoctoral Scientist</td>
<td>Researcher, remote sensing and GIS</td>
</tr>
<tr>
<td><strong>NOAA Collaborators/Mentors</strong></td>
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<tr>
<td>Dr. Rick Stumpf</td>
<td>NOAA-NOS/NCCOS</td>
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<tr>
<td>James Hendee</td>
<td>NOAA AOML</td>
<td>New NOAA Mentor</td>
</tr>
<tr>
<td>Karstine Shein</td>
<td>NOAA NCDC</td>
<td>New NOAA Mentor</td>
</tr>
<tr>
<td>Dr. Steve Morton</td>
<td>NOAA-NOS/CCEHBR</td>
<td>NOAA Collaborator</td>
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<tr>
<td>Dr. Michael Ondrusek</td>
<td>NOAA/NESDIS/STAR</td>
<td>NOAA collaborator and NERTO Mentor (Eder Herrera)</td>
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<tr>
<td>Dr. Mark Eakin</td>
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<td>NOAA collaborator</td>
</tr>
<tr>
<td>Dr. Al Strong</td>
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<tr>
<td>Dr. Winston Luke</td>
<td>NOAA/OAR/ARL</td>
<td>NOAA Collaborator and NERTO mentor</td>
</tr>
<tr>
<td>Xinrong Ren</td>
<td>NOAA/OAR/ARL</td>
<td>NOAA Collaborator and NERTO mentor</td>
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<td><strong>THEME II – Atmospheric Hazard</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Fred Moshary</td>
<td>City College of New York</td>
<td>Atmospheric dynamics and remote sensing of aerosols and plume transport</td>
</tr>
<tr>
<td>Barry Gross</td>
<td>City College of New York</td>
<td>Satellite remote sensing of aerosols. Satellite remote sensing of PM2.5 pollution. Statistical PM2.5 estimation and forecasting</td>
</tr>
<tr>
<td>James Booth</td>
<td>City College of New York</td>
<td>Improved P-ETSS storm surge modeling system</td>
</tr>
<tr>
<td>Johnny Luo</td>
<td>City College of New York</td>
<td>GOES-R Storm Now Casting and Validation of GFDL GCM Lightning Simulations with GOES-R</td>
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<tr>
<td>Jorge Gonzalez</td>
<td>City College of New York</td>
<td>Convective initiation products in coastal processes</td>
</tr>
<tr>
<td>Sam Shen</td>
<td>San Diego State University</td>
<td>Heat Stress and Urban Modeling lead</td>
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<td>Prathap Ramamurthy</td>
<td>City College of New York</td>
<td>Lead, supervision, theory development</td>
</tr>
<tr>
<td>Hamidreza Norouzi</td>
<td>City Tech (CUNY)</td>
<td>Faculty, Lead, supervision, theory development</td>
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<tr>
<td>Miguel Vélez-Reyes</td>
<td>University of Texas, El Paso</td>
<td>Multispectral Remote Sensing Products</td>
</tr>
<tr>
<td>John Anderson</td>
<td>Hampton University</td>
<td>CESON Activities</td>
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New NOAA and other collaborator information is provided in blue color code (see above)

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<tr>
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<tr>
<td>Robert Loughman</td>
<td>Hampton University</td>
<td>OMPS Aerosol Analysis and consultant</td>
</tr>
<tr>
<td>Pat McCormick</td>
<td>Hampton University</td>
<td>CESON Activities</td>
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<tr>
<td>Jia Su</td>
<td>Hampton University</td>
<td>Ground-based remote sensing observations and analysis</td>
</tr>
<tr>
<td>Ruben Delgado</td>
<td>University of Maryland, Baltimore County</td>
<td>Remote Sensing Observations and Data Analysis, Algorithm Development of Mixing Layer Height</td>
</tr>
<tr>
<td>Belay Demoz</td>
<td>University of Maryland, Baltimore County</td>
<td>Coordinator of Ceilometer NWS Testbed</td>
</tr>
<tr>
<td>Rafael Rodriguez Solis</td>
<td>University of Puerto Rico, Mayaguez</td>
<td>UPRM DBS point of contact</td>
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<td><strong>CESSRST Research Scientist</strong></td>
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<tr>
<td>Moises Angeles (Leveraged)</td>
<td>City College of New York</td>
<td>Climate Analysis for the Caribbean-Leveraged Postdoc</td>
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<tr>
<td>Brian Vant-Hull</td>
<td>City College of New York</td>
<td>Senior Research Scientist, Urban Heat Island, Satellite thermal products</td>
</tr>
<tr>
<td>Yonghua Wu</td>
<td>City College of New York</td>
<td>Lidar observation and data analysis</td>
</tr>
<tr>
<td>Mark Arend</td>
<td>City College of New York</td>
<td>Urban Observations, meteorological surface and remote sensing Observations and Data Analysis</td>
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<td>Satya Kalluri</td>
<td>NOAA NESDIS STAR</td>
<td>Collaborator/ GOES R Long Wave Products</td>
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<tr>
<td>Jeff McQueen</td>
<td>NOAA (NWS)</td>
<td>Air quality forecast model product – NOAA mentor for Sam Lightstone (leveraged student) - Improving PM2.5 forecasting for New York State</td>
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<tr>
<td>Jiangping Huang</td>
<td>IMS &amp; NOAA (NWS)</td>
<td>Air quality forecast model product</td>
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<tr>
<td>Larry Flynn</td>
<td>NOAA NESDIS STAR</td>
<td>OMPS and NUCAPS Analysis (NOAA Mentor – Steve Bucker – Combining Information from OMPS Limb Profiler and CrIS to produce improved ozone products</td>
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<tr>
<td>Shobha Kondragunta</td>
<td>NOAA NESDIS STAR</td>
<td>Low latency distribution of satellite derived aerosols and air pollution products.</td>
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<tr>
<td>Dennis Atkinson</td>
<td>NOAA NWS</td>
<td>NWS Ceilometer Network A new Surface Wave Height (SWH) project is being designed based on NOAA/NWS and NOS needs at Carolina, NWS, PR; and Mt. Holly, NWS, NJ/NY</td>
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<tr>
<td>Michael Hicks</td>
<td>NOAA/NWS</td>
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<td>Pius Lee</td>
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<td>W. Alan Brewer</td>
<td>NOAA/ESRL</td>
<td>Lidar remote sensing and observations, lidar</td>
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2 New NOAA and other collaborator information is provided in blue color code (see above)
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<tr>
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<tr>
<td>Russell Vose</td>
<td>NOAA/NESDIS/NCEI</td>
<td>Data Products and Data Management</td>
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<tr>
<td>Tom Smith</td>
<td>NOAA NESDIS STAR</td>
<td>Severe Storm Forecasting in Southern California</td>
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<tr>
<td></td>
<td></td>
<td>Will serve as NOAA NERTO mentor and thesis advisor/committee member for</td>
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<tr>
<td></td>
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<td>Equisha Glenn (Cohort II doctoral student)</td>
</tr>
<tr>
<td>Alan Brewer</td>
<td>NOAA/OAR/ESRL</td>
<td>NOAA Collaborator and NERTO Mentor (Aris)</td>
</tr>
<tr>
<td>Yi Ming (new Collaborator)</td>
<td>NOAA/OAR/GDFL</td>
<td>Serves as the NOAA mentor. Ming and Booth designed the research project</td>
</tr>
<tr>
<td></td>
<td></td>
<td>based on the needs of GFDL, the greater needs of NOAA, the skills of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. Booth, and the needs of the CSC funded student Veeshan (Cohort II)</td>
</tr>
<tr>
<td>Yunyue “Bob” Yu</td>
<td>NOAA/NESDIS/STAR</td>
<td>NOAA Collaborator and NERTO Mentor working on GOES-R products (Joshua,</td>
</tr>
<tr>
<td></td>
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<td>Yori and Anna)</td>
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<tr>
<td>Peng Yu</td>
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<td>NOAA Collaborator and NERTO Co-Mentor (Joshua, Yori and Anna)</td>
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<tr>
<td>Wei Wu</td>
<td>NOAA/NOS/Coast Survey</td>
<td>NOAA Collaborator and NERTO Mentor supporting students in Weather</td>
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<td>Development Lab</td>
<td>Forecast Modeling (Harrold and David Melecio-V)</td>
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<tr>
<td>Jameese Sims</td>
<td>NOAA.NESDIS/OSGS</td>
<td>NOAA NERTO mentor (Gesselle Coleman) Satellite Product Management Study</td>
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<td>in support of CESON</td>
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<tr>
<td>Other Collaborators</td>
<td></td>
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<tr>
<td>Mike Ku</td>
<td>NYC DEC</td>
<td>NYS air quality research and modeling</td>
</tr>
<tr>
<td>Hai Zhang</td>
<td>IMSG</td>
<td>VIIRS EPS Aerosol Products for DBS</td>
</tr>
<tr>
<td>Dennis Atkinson</td>
<td>NOAA NWS</td>
<td>NWS Ceilometer Network</td>
</tr>
<tr>
<td>Michael Woodman</td>
<td>Maryland Dept. of Environment</td>
<td>Air Quality Forecast and Management</td>
</tr>
<tr>
<td>Tom Eisel</td>
<td>NYC Office Mayor’s Office</td>
<td>Technical Contact with NYC on applications of Meteorology and remote</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sensing on weather impacts on infrastructure</td>
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</tbody>
</table>

**THEME III – Water Prediction & Ecosystem Services**

**CESSRST Advisors**

- Naresh Devineni
  - City College of New York
  - Faculty, Lead, supervision, theory development
- Tarendra Lakhankar
  - City College of New York
  - Scientist, Lead, supervision, theory development
- Reza Khanbilvardi
  - City College of New York
  - Faculty, Lead, supervision, theory development
- Nir Krakauer
  - City College of New York
  - Faculty, Lead, supervision, theory development
- Balazs Fekete
  - City College of New York
  - Faculty, Lead, supervision, theory development
- Reza Khanbilvardi
  - City College of New York
  - Faculty, Lead, supervision, theory development
- Prathap Ramamurthy
  - City College of New York
  - Faculty, Lead, supervision, theory development
- Jonathan Munoz
  - University of Puerto Rico, Mayaguez
  - Faculty, Lead, supervision, theory development
<table>
<thead>
<tr>
<th>Name</th>
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<th>Role</th>
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<tbody>
<tr>
<td>Rafael Rodriguez</td>
<td>University of Puerto Rico, Mayaguez</td>
<td>Faculty, Lead, supervision, theory development</td>
</tr>
<tr>
<td>Peter Romanov</td>
<td>City College of New York</td>
<td>Scientist, Lead, supervision, theory development</td>
</tr>
<tr>
<td>Craig Tweedie</td>
<td>University of Texas, El Paso</td>
<td>Scientist, Lead, supervision, theory development</td>
</tr>
<tr>
<td>Trent Biggs</td>
<td>San Diego State University</td>
<td>Faculty, Lead, supervision, theory development</td>
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<td>Kyle MacDonald</td>
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<td>Fred Moshary</td>
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<td>Faculty, supervision, theory development</td>
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<td>Alex Gilerson</td>
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<td>Miguel Velez-Reyes</td>
<td>University of Texas, El Paso</td>
<td>Faculty, supervision, theory development</td>
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<td>Walter Oechel</td>
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<td>Donatella Zona</td>
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<td>Rafael Rodriguez</td>
<td>University of Puerto Rico, Mayaguez</td>
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<td>Roy Armstrong</td>
<td>University of Puerto Rico, Mayaguez</td>
<td>Faculty, supervision, theory development</td>
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<td>Jonathan Munoz</td>
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<td>Faculty, supervision, theory development</td>
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<tr>
<td>Belay Demoz</td>
<td>University of Maryland, Baltimore County</td>
<td>Faculty, supervision, theory development</td>
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**NOAA Collaborators/Mentors**

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<th>Name</th>
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<tr>
<td>Felix Kogan</td>
<td>NOAA/NESDIS/STAR</td>
<td>NOAA Collaborator</td>
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<tr>
<td>Xiwu Zhan</td>
<td>NOAA/NESDIS/STAR</td>
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<tr>
<td>Roberto Garcia</td>
<td>NWS – San Juan</td>
<td>NOAA Collaborator</td>
</tr>
<tr>
<td>Edward Clark</td>
<td>National Water Center</td>
<td>NOAA Collaborator</td>
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<tr>
<td>Satya Kalluri</td>
<td>NOAA/NESDIS/STAR</td>
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<td>Ralph Ferraro</td>
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<tr>
<td>Michelle Stokes</td>
<td>NWS</td>
<td>NOAA Collaborator</td>
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<tr>
<td>Tim Brown</td>
<td>NWS</td>
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<tr>
<td>Jeff Key</td>
<td>NOAA/NESDIS/STAR</td>
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<td>Xiwu Zhan</td>
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<tr>
<td>Ernesto Rodriguez</td>
<td>NOAA/NWS/RFO, San Juan, PR</td>
<td>Collaborator</td>
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<tr>
<td>Mareike Sudek</td>
<td>NOAA/NMFS</td>
<td>Collaborator/Mentor (Andrea Fenner and Mike Trunkhill)</td>
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<td>Bryan Thomas</td>
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<td>Alex Tardy</td>
<td>NOAA/NWS/RFO, San Diego</td>
<td>NOAA Mentor (Corrie)</td>
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<td>Lauren Jarlenski</td>
<td>NMSAS</td>
<td>Collaborator/Mentor (Andrea Fenner and Mike Trunkhill)</td>
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<td>Russell Schnell</td>
<td>ESRL/GMD</td>
<td>Collaborator/Mentor (Tyler Tucker)</td>
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<tr>
<td>Nicole Kinsman</td>
<td>NOAA/NOS/NGS</td>
<td>NOAA mentor (Stephen Escarzaga) DSM Production from NOAA RSD Coastal Imagery in Alaska</td>
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**Other Collaborators**

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<thead>
<tr>
<th>Name</th>
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<tr>
<td>Michael Cosh</td>
<td>USDA</td>
<td>Collaborator</td>
</tr>
<tr>
<td>Name</td>
<td>Major &amp; Degree Level (UG, MS, PhD)</td>
<td>Institution (CUNY, UTEP, HU, UMBC, UPRM, SDSU)</td>
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<tr>
<td><strong>Theme I: Coastal Resilience</strong></td>
<td></td>
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<tr>
<td>Rezwon Islam</td>
<td>UG, EE</td>
<td>CUNY</td>
</tr>
<tr>
<td>Claudia Duran Garcia</td>
<td>Undergraduate, ESE, CCNY</td>
<td>CUNY</td>
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<tr>
<td><strong>Theme II: Atmospheric Hazards</strong></td>
<td></td>
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<tr>
<td>Rabindra Pokhrel</td>
<td>PhD</td>
<td>CCNY</td>
</tr>
<tr>
<td>Sam Lightstone</td>
<td>PhD, Electrical Engineering</td>
<td>CUNY</td>
</tr>
<tr>
<td>Anjeza Arapi</td>
<td>UG, Environmental Engineering</td>
<td>CUNY</td>
</tr>
<tr>
<td>Adrian Diaz Fortich</td>
<td>Electrical Engineering, PhD</td>
<td>CUNY</td>
</tr>
<tr>
<td>Mark Campier</td>
<td>CCNY</td>
<td>CCNY</td>
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</table>
What individuals have worked on the project? (Expand as needed)

<table>
<thead>
<tr>
<th>Name</th>
<th>Management (includes budget, data/MIS, Evaluation and internal day-to-day administration)</th>
<th>Education (includes Core Competency, summer bridge, Outreach and Communications)</th>
<th>Collaborative Research (Includes training, coordinating NERTOs, dissemination, reporting and communications)</th>
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<tr>
<td>Reza Khanbilvardi</td>
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<tr>
<td>Shakila Merchant</td>
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<td>William Rossow</td>
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<td>Olga Joseph</td>
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<td>Georgina Fekete</td>
<td>100%</td>
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<td>Paul Alabi (through Microburst)</td>
<td>50%</td>
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<td>Nancy Anne Degnan</td>
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<td>Valerie Were</td>
<td>10%</td>
<td>40%</td>
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<tr>
<td>Janice Easton (through Evaluation by Design) to be replaced with new Evaluator by next reporting period</td>
<td>70%</td>
<td>20%</td>
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<tr>
<td>Maria Tzortziou</td>
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<td>Naresh Devineni</td>
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<td>Tarendra Lakhankar</td>
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<td>Eugene Leykin</td>
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<tr>
<td>Sam Shen</td>
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</table>

IV. Impacts of Award

What is the impact on the development of future workforce candidates for the principal discipline(s) of the award and NOAA mission-aligned support of the project?
Veeshan is developing an understanding of atmospheric physics and numerical model development. Both of which are necessary to work at NOAA GFDL.

Equisha Glenn is making use of SSTs products developed by NESDIS to analyze water resources.

The research projects/tasks are contributing to train the graduate students in NOAA related science by getting hands-on training on how to use new satellite data (GOES-R), and weather forecasting modeling for air quality and health applications. These students will be workforce ready when graduating to join the NOAA workforce if they choose so, and if the opportunities are available to them.

Student conduct activities such as data collection, environmental monitoring, and programming skills as part of their research at CREST and NERTO experience.

What is the impact on other disciplines and Program Level Outputs and Outcomes aligned with the 2016 FFO?

- Number of uses of NOAA satellite data and forecasting model products to conduct research and development of tools/algorithms to improve health sensitive air quality forecasts.
- Number of research collaborations with NOAA and CSC faculty, staff and students.
- Number of NOAA scientists serving as mentors and advisors for student research.

What is the impact on the development of candidates for the NOAA mission future workforce?

- Veeshan, Equisha, and Chris are funded as a NOAA-CESSRST student (i.e., funding from the CSC award). Without that funding, this research project would not be possible.
- CESSRST students gained experience in algorithm development.
- Students are gaining experience in Environmental modeling – weather forecast modeling, ecosystem modeling, and in the use of state of the art satellite remote sensing data and products.
- Students are gaining experience in satellite remote sensing data and products. Presenting research to their peers in conferences and workshops. Active planning and participation of hands on activities during field campaigns focused in snow, soil, air, and water research.

What is the impact of the Center activities to build institutional capacity in support of the objectives of the NOAA FY16 CSC award?

- The AWARD (i.e. CREST Center) facilitates attracting and retaining new students, and in attracting additional research resources. Examples in this reporting period include:
  - Established Urban Hydro-Meteorology (uHMT) network.
  - Through a GRTI funding at City tech, two advanced infrared cameras and one infrared camera on a drone was purchase to perform a field campaign.
  - We secured funding ($175K) from the US National Science Foundation to conduct field experiments in post-Hurricane Maria in coastal convective processes under the RAPID program.
  - We secured funding from the City of New York, to assess extreme winds in the City.
- A far better understanding of the suitability of Satellite AOD products including direct inter-comparisons of MODIS/VIIRS and GOES-16 and how what are the best meteorological factors to include.
- Data products on particle pollution transport for air quality applications: vertical aerosol, temperature and wind profiles.
- EPA funded UMBC to develop universal mixing layer height algorithm to disseminate and train along state air quality agencies because of new Photochemical Assessment Monitoring Sites (PAMS) requirement: report for hourly mixing layer height.
- HU was designated a NOAA Weather Ready Nation Ambassador on October 3, 2017.

What is the impact of the NOAA award on the Center’s data and information resources? To whom and how this is information and the Center accomplishments communicated.

- Theme II Project 1/Task 2 group is producing a wealth of new data in the form of weather forecasts for the New York City metro area, and is being used by NOAA/NWS/Regional Forecast Offices. The daily forecasts is being stored in our servers. Our group is also producing downscaled High Spatial and Temporal Resolution Land Surface Temperature over Urban Regions. These data are being used by NWS/RFO, Upton, NY and New York City Officials (Mayor’s office), Office of Sustainability and Resiliency of New York City; NYC Office of Buildings of New York City. The information is being shared with City officials in weekly and monthly meetings, and in reports to be completed by June 2018 (extreme heat), and in October 2018 (extreme winds).
- Database of atmospheric parameters for validation of satellite retrieval products, and for assessment of weather and air quality forecasts.
- New York City officials: Constant communication with NYSERDA and NYSDEC by both on location meeting, write Quarterly reports and regional conferences.
- Maryland Department of the Environment: Quarterly meetings and annual reports.
- The data produced by the CESON group (theme II project 2 task 1) contributes to satellite validation efforts; product development; validation and verification of numerical weather prediction forecasts, and is being used by several federal, state and local agencies and academia (NOAA/NWS/NCEP; NOAA/OAR/ESRL; NOAA/OAR/NAQFC; NOAA/NESDIS/STAR; NYS, DEC; NYC-DOB; NYC-DOH; Maryland Dept. of Environment; NASA; Columbia University). Observations made by this group are also being used to provide the general public alerts and impact of severe weather and in the justification of exceedance during Air Quality Action day episodes.

How has the Center successfully conducted transfer of research results and new technologies in support of NOAA mission-aligned R2X?

Theme II Project 1/Task 2 group is transferring weather forecasts for New York City Metro region to NWS since fall 2017. The forecasts are being evaluated for further transition as an optatio product. The Technical Readiness Level (TRL) of this product would be a minimum 5.
What were the societal impacts of the Center research activities? How were or are the impact results communicated to the general public.

- Results from Theme I research will lead to the improved retrievals of water optical properties and chlorophyll concentration, parameters which are used in other NOAA for fisheries, NASA for climate studies, Navy models for visibility.

- Atmospheric measurements coupled to satellite remote sensing and surface observations of trace gases and aerosols allows NOAA to improve and validate numerical forecasts for weather and air quality that will minimize the impact of extreme events on public health and property.

- Eventually, this work will contribute to better medium-range prediction of severe storms. At the moment, we are still building the analysis tools. The snow cover research is not yet applicable.

- The work by Equisha, Jorge, and Tom will served to inform sensitive regions of water resources, and of likely extreme precipitation events using SSTs as main proxy.

- Atmospheric Hazards Theme researchers have been in collaborating with the New York City Panel on Climate Change (NPCC3), where our products are being used to develop the next issue of the NYC Climate Change report. Our research outcome has been critical to create/modify policy reforms and city investments. Our specific contributions relate to impacts of extreme heat events, and extreme wind events.

- Severe weather and air quality events have major ecological, human-health, and socio-economic impacts. Sustained remote-sensing observations at local, regional, and global scales are critical to a scientific understanding of the current and future state of Weather. Atmospheric measurements coupled to satellite remote sensing and surface observations of gases and aerosols allows NOAA to improve and validate numerical forecasts for weather and air quality that will minimize the impact of extreme events on public health and property. Theme II project results can save lives by alerting and preparing the public to oncoming severe weather events such as hurricanes and to poor or life-threatening air quality episodes. The spatiotemporal variations of the critical pollutants are essential to advise the public on health impact. Venues of communications include local state agencies such as NYC Department of Health and Mayors Office, NYS DEC, MD Department of Environment, NWS, CREST EAB etc. The Impact of severe weather on infrastructure: Communicated to NYC DOB.

- The discussion on adaptation and mitigation invariably comes to recognize that many of the potential impacts on society are felt through changes in the regional water resources. These changes may manifest as change in the intermittency or frequency and intensity of rainfall events, alteration or extension of the dominant wet/warm/cold season(s), or shift in the inter-annual frequency and persistence of wet and drought years. Such extremes can have adverse impacts on the natural ecosystem, society and the economy of the region. Consequently, it is important to explore strategies for adaptation to natural hazards and to manage the potentially impacted sectors. In this work, we will address this significant area, exploring the modeling, and prediction of floods and droughts, their climate and atmospheric determinants, and how these may affect interlinked human activities at multiple scales of cities and river basins.

- Evapotranspiration and Snow are the key element for many socioeconomic activities.
because of its high significance for agriculture and water management. Long term observing of snow-based indices will provide an additional value for decision-makers, for example when planning investments for tourist infrastructure, protection measures against avalanches, or environmental planning.

- Results from the study will be presented to decision makers (NWS, Emergency Management), residents, and community advocacy groups.

V. Changes / Challenges

If not previously reported in writing to NOAA through other mechanisms, provide the following additional information or state, "Nothing to Report", if applicable.

Changes in performance of the award objectives - approach and reason(s) for change:

Dr. Nancy Degnan our new Education Expert resigned during this reporting period, CESSRST management is working on replacing this position as soon as they find a suitable candidate. The CESSRST evaluator has not been identified yet, but conversation is in progress to hire Dr. Mark Howse as our potential External Evaluator.

Actual or anticipated problems or delays and actions or plans to resolve them:

- The catastrophic impacts of Hurricane Maria in Puerto Rico's power and communication infrastructure caused at least a 2-month delay for most research at the University of Puerto Rico.

- The original plan did not include a focus on atmospheric blocking. However, after talking with model developers at GFDL, we decided that an immensely useful approach to improving severe storm prediction with their model is to test and improve their model representation of atmospheric blocking.

Changes that have a significant impact on expenditures:

None during this reporting period

VI. Special Award Conditions

This report section is intended to provide information on progress under each special award condition for the specific reporting period. This is not cumulative reporting.

Accomplishments (provide evidence) in implementing of:
Center Evaluation – activities completed for the Evaluation Plan that assesses program progress and measures, the impact of activities related to intended education, and training, research and outcomes of the CSC.

Direct Student Support - Participant Beneficiaries

Increase in the number of undergraduate and graduate students who gain NOAA mission-relevant STEM discipline-specific knowledge and skills that are the primary focus of the Center Type award (i.e. Atmospheric Sciences and Meteorology, Coastal and Marine Ecosystems, Earth System Sciences and Remote Sensing Technologies, and Living Marine Resources), enroll and complete degrees, and are prepared to enter NOAA mission-aligned STEM careers or pursue advanced education.

EPP CSC Award Postsecondary Student Cohort(s) Supported (provide for each student by name):

a. Tuition:
b. Stipend:
c. Travel:
d. NERTO:
e. One-time Research:

Student tracker will be submitted for both Cohort I (actual spending) and cohort II (committee and actual spending through the new NOAA student tracker portal.

Professional Development - Award Recipient Must Report Activities Accomplished for

1. Rising Sophomore Experiential Training Program. Provide activities completed for IV. B., 8.1.2 (i) 1. thru 3. (FFO pg. 39). Students must be identified by name, home academic institution, academic year and major.

The NOAA Hollings/Undergraduate scholarship opportunity was widely circulated at CUNY and all CESSRST partner institutions. An information webinar was created and posted on the social media – and is available on the YouTube – https://www.youtube.com/watch?v=xSVnbRMWQC4&feature=youtu.be.

Many eligible sophomores from CUNY and other partner institutions applied for the NOAA Hollings and Undergraduate Scholarship Program in Jan 2018. Below table 6 indicates partial list of applicants that were mentored in putting their application package together.
2. **Individual Student Development Plan.** Center activities to ensure completion, monitoring and student success.

A new CESSRST management information system (MIS) was launched during this reporting period. All CESSRST cohort I and II supported students created their Individual Student Development Plan (ISDP). The CESSRST MIS is web-based interactive system available to CESSRST advisors, NOAA mentors, CESSRST administrators and NOAA Program Office as needed. The MIS has the ability for the researchers (students, faculty) conducting NOAA CESSRST related research to undertake responsible conduct of research (RCR). The system will also tracks, alert and ensure all RCR are completed within the 6 weeks of their admission into the program. The system also collects six months reports, publication, and leveraged funding information by all participants. The core competency online LMS system is being developed and be ready by summer 2018 for cohort II students to undertake core competency training.

Suhey Ortiz applied to participate in the Okeanos Explorer 2018 expedition. She also applied to two specialized courses in remote sensing for the summer of 2018. Field sampling with Suhey Ortiz (CESSRST), William Hernandez (CESSRST post-doc) and several Marine Sciences students has taken place from October 2017 through February 2018 to assess the impacts of the hurricanes in water quality in our study area. Two posters and a short oral presentation addressing some of these results were presented at the ASLO Ocean Sciences Meeting - February 11-15, 2018 - in Portland, Oregon.

3. **Student Preparation for Success in the Career Path Relevant to the Center Award.** Provide Center activities with activity titles, dates completed, participants, outcomes for Center measures of success.

- The student’s preparation for success in the career path relevant to CESSRST is being developed.
by collecting information through (1) ISDP; (2) Core Competency, Professional Development and NERTO tracking; and (3) Self-Assessment during various exit survey tools, which are being developed by our CESSRST Evaluator. These survey tools are being devised and will be submitted for approval by the CUNY IRB prior to their administration. The surveys will help assess and document the learning outcomes of the students and evidence of success.

- Open communication has been established with NWS-SJU, teleconferences are regularly performed.
- The project has been discussed with National Water Center (NWC) leadership, it is expected that the student will perform his NERTO at the NWC. Jean P. Valle was selected to participate in: (1) NCAR Training Workshop: The Community WRF-Hydro Modeling System and (2) CUAHSI - Summer Institute at National Water Center. Both activities will help provide the student with the necessary skills to implement and improve the model for Puerto Rico watershed.

Post-Doctoral Program - Center Process to Recruit and Select Postdoctoral Fellows

For each Fellow provide Approved Postdoctoral Plan including anticipated number and proposed dates for publication submissions; activities; NOAA-facility tenure; and, anticipated products in support of Center priorities for education and training

Post-Doctoral Scientist: Dr. William J. Hernandez
CREST Mentor(s): Dr. Roy Armstrong, Dr. Maria Tzortziou
NOAA Mentor(s): Dr. C. Mark Eakin, Dr. Christopher Brown
NOAA Collaborator(s): Dr. Menghua Wang, Dr. Greg Piniak, Robert Warner
NOAA Offices: NOAA NESDIS STAR, NOAA NOS NCCOS
Period of Performance: September 1, 2017-February 28, 2018
NOAA’s Mission: Healthy Oceans and Resilient Coastal Communities and Ecosystems.

Milestones
- Enhance the VIIRS water quality data products by providing a bottom albedo correction in shallow coastal areas
- Field Data Water Quality Parameters and Optical Properties of La Parguera and Guanica
- Validation of VIIRS Water Quality Products in Coastal Areas
- Time-series and Climatology Analysis of VIIRS Water Quality Data
- Quantifying the Impact of Major Rainfall Events on LBSP and Local Coral Reef

Research Activities

Collected field Data Water Quality Parameters and Optical Properties of La Parguera and Guanica.
- Conducted fieldwork for bio-optical properties to characterize riverine output in the west/southwest coast after hurricane Maria.
Conducted fieldwork for bio-optical properties to characterize coastal/oceanic waters in Guanica/La Parguera area after hurricane Maria.

- Support Theme: Coastal Resilience Project I: CREST Coastal Ocean Observing Systems and Project II: Ecosystem health towards sustainability

**Student Support and Mentoring**
Andrea Gomez, CUNY – Mentoring and support in field data collection of temperature loggers in La Parguera, PR.
Suhey Ortiz-Rosa, UPRM - Support in field data collection of water optical data and in Guanica/La Parguera. Graduate Committee Member.

**Current Collaborations and Networking**
- **Dr. Juan Torres-Pérez (NASA ARC) and Dr. Liane Guild (NASA ARC).** NASA Human Impacts to Coastal Ecosystems in Puerto Rico (HICE-PR): the Río Loco Watershed (southwest Puerto Rico).
- **Ernesto Díaz, Director. Coastal Management Zone, DNR PR.** Data support and technical knowledge for assessing turbidity impacts after extreme rain events.
- **Roberto Viqueira**, Guánica Bay, PR Watershed Manager from NOAA Coral Reef Conservation Program
- **Tova Callender**, West Maui, HI Watershed Manager from Coral Reef Conservation Program. Support ocean color data for West Maui. Field data collection
- Participation in NOAA/NESDIS/STAR/CRW Monthly Megacall (NOAA Lead: Dr. Mark Eakin).
- Participation as a NOAA Small Business Innovative Research Technical Reviewer.

**Conference and Symposia**
Satellite derived coastal water quality over coral reef areas in Puerto Rico after Hurricane Irma and Hurricane Maria, poster presentation in AGU Ocean Science Meeting, February 2018, Portland, OR. 1st author. (Presented by Dr. Armstrong)


**Training**
Southeast Aquatic Resources Partnership (SARP) Assessment for Aquatic Connectivity Training. Sponsored by the Caribbean Landscape Conservation Cooperative (CLCC) in coordination with the USFWS Caribbean Ecological Services Field Office (CESFO). February 6-8, 2018, San Juan, PR.

** Responsible Conduct for Researchers CUNY Researcher.** Citi Program. March 2018.

**Peer-Reviewed Publication (Status)**
High-resolution sensors for water quality in near-shore environments to be submitted for the Journal of Remote Sensing Special Issue on Water Quality. (75% completed)
Inherent optical properties in coastal waters from high-resolution sensors to be submitted to the Journal of Geophysical Research in 2017 (80%).

Proposals and Leveraged Funding

Ocean Remote Sensing (ORS) Ocean Color Proposal FY18 (Approved). CO-PI (Internal NOAA Proposal). Ocean Color Satellite Products for Monitoring the Threat of Land-Based Sources of Pollution to Coral Reefs in Puerto Rico and Hawaii. Proposal Total: $109,654. Leveraged funding: $19,000. Milestone: Conduct field work for VIIRS ocean color validation (post-doc milestone). Meet with local West Maui, HI watershed managers and other key ocean color users to discuss VIIRS products being released for that region. Funding is for lodging, M&IE, and airfare for post-doc and one assistant (graduate student, researcher) and equipment shipping, and boat support.


Pre-Publication Manuscript Submission

Provide anticipated number and proposed dates for Center submissions for both faculty and students

- Forecasting of solar radiation in urban environments; Gamarro, H., and Gonzalez, J.E. (In preparation)
- Melecio-Vazquez, D. Ramamurthy, P., and Gonzalez, J.E. Results from numerical weather prediction ensemble for urban environments: Lessons Learned. (in preparation).
- Hrisko, J., Ramamurthy, P., Impacts of urban surfaces on atmospheric heat transport Submitted to the journal of Boundary Layer Meteorology. (Submitted).
- Preliminary demonstration of PM2.5 neural network forecasting by May 1, 2018 (deadline to submit a paper to the JARS Special Issue Sessions “Air Quality Management). Yonghua Wu, Anjeza Arapi, Jianping Huang, Barry Gross, and Fred Moshary, Intra-continental wildfire smoke transport and impact on local air quality observed by an Elastic-Raman lidar and ceilometer in New York City, under review Atmospheric Environment.
- UMBC student Meredith Sperling currently preparing manuscript to the submitted to Wind Energy Journal on Wind Turbine Power Uncertainty Reduction with Scanning Doppler Wind Lidar Technology.
NOAA Substantial Involvement and Collaborative Engagement

Identify NOAA mentors and collaborators, including: mentor and aligned student mentored; start date and time mentorship time commitment; Line Office affiliation; and, project title.

Several NOAA collaborators have already been identified (see section III). In addition, several collaborative discussions undertook during this reporting period between CESSRST faculty and NOAA mentors to ensure early engagement and involvement of NOAA mentors in graduate student training and NERTO internships.

New collaborations during this reporting period:

- NOAA EPP Program Office (Dr. Audrey Trotman and Jacqueline Rousseau) facilitated a conference call with Mr. Dennis Atkinson, NOAA/NWS with all CSCs in January 2018 to explore the possibility of engaging CSC students on Surface Wave Height Project of high priority to NOAA/NWS. Subsequent conversations with Dennis has been initiated during this reporting period. Potential students will be recruited to work on this project in Carolina, San Juan PR; and Mt. Holly, NJ. A meeting with Ernesto Rodriguez took place in February 2018 to discuss the potential of recruitment and engaging a student from UPRM/CESSRST to work in San Juan, Regional Forecast office and NCOOS scientists. More updates on this project will be submitted in the next six-month report.

- All CSC Center Directors, Assistant Directors and CSC students meeting was convened under the leadership of Ms. Jacqueline Rousseau at National Water Center, Tuscaloosa, AL. the 1.5 days meeting meaningfully engaged center leadership and EPP leadership in potential collaborations and NERTO opportunities for CSC supported graduate students. Jean Vallie-Pierre (CESSRST cohort II at UPRM) master student is selected to attend the summer internship in summer 2018 organized by CUHASI summer institute at NWC, AL. Two other leveraged students (CUNY) Saman and Nasser will also be attending the CUHASI Summer Institute. Plans are underway to send Equisha Glenn to NWC for part of her NERTO training. More updates will be submitted in next reporting period.

- Dr. Jamese Sims (NOAA NESDIS OSGS) has begun her collaboration with NOAA CESSRST by agreeing to be Geselle Coleman's (Cohort 1, MS) NOAA mentor. Dr. Sims has been subsequently sent the NOAA mentor care package. She has signed the LOU, has designed, and submitted a NERTO entitled 'Satellite Product Management Study' for Geselle to be completed this summer.

- Dr. Lawrence Flynn (NOAA NESDIS STAR) has continued his collaboration by agreeing to mentor Steven Buckner (Cohort 2, PhD) and to serve on Steven's PhD dissertation committee. Dr. Flynn was sent the NOAA mentor care package, signed the LOU, and has designed and submitted a NERTO for Steven entitled 'Combining information from OMPS Limb Profiler and CrIS to produce improved ozone products'. Steven will participate in his NERTO within the next 2 years.

- Ernesto Rodriguez (NWS- SJU, SOO) - Project Collaborator & point of contact at NWS, working with student Jean P. Valle and Dr. Jonathan Munoz.

- Suhey Ortiz has confirmed the participation of Dr. Chris Brown as a NOAA mentor and member of her graduate committee. A new collaboration with Jennifer Dover, Benton Solecki and Stephen Lanciani (all NOAA-NWS) was established. We will be collaborating with them in launching and testing new radiosondes in SW Puerto Rico within the next 12 months.

- Gary Wick, from NOAA ESRL, is serving as the mentor for student Carlos Wah. Carlos will spend the summer of 2018 at ESRL for his NERTO.

- We are still working in identifying a NOAA mentor for student Carlos Iturrino. We approached Dr. Gary Wick and Dr. Harry Cikanek to help us in finding a mentor.
W. Alan Brewer (NOAA ESRL) was engaged to request the participation of ESRL Atmospheric Remote Sensing group in the summer research campaigns Ozone Water Land Environmental Transition Study: Enhanced Monitoring of Atmospheric Pollution of the Chesapeake Bay Using Vertical Profiles of Ozone, Wind, Temperature and Aerosols (OWLETS) and Ad-hoc Ceilometer Evaluation Study (ACES) in Doppler wind lidar retrievals. In exchange UMBC will be collaborating in the mixing layer height assessment of the NOAA funded INFLUX campaign in Indianapolis, IN.

Ariel Stein (OAR/ARL) was engaged to discuss CREST capabilities and to identify of potential projects with NOAA scientists. Twelve projects were identified and that include the mentoring of scientists and contractors in ARL.

**CSC Programmatic Special Award Conditions**

Recipient must provide accomplishments for Programmatic Special Award Conditions that address the education and training, scientific research and administrative functions in the award including, for example, outcomes from Advisory Board Meetings, effective management for all key personnel positions, early engagement with NOAA in performance of award, outcomes of Center meetings, integration of human dimensions in all award activities, implementing longitudinal outcomes tracking, and overall Program-level metrics for the EPP/MSI CSC postsecondary awards as a Federal STEM Education Agency-mission Future Workforce, for reporting period (NOT cumulative).

A. Provide FY16 Center award information for:

1. **Number of EPP-funded post-secondary students from underrepresented minority communities** who are trained 41 (15=UG and 26 Graduate) and graduate **None** in NOAA-mission sciences.
2. **Total number of EPP-funded post-secondary students who are** trained 53 (22=UG; 18=MS and 13= PhD) and graduate **none so far** in NOAA-mission fields relevant to this announcement.
3. **Number of EPP-funded graduates who enter the NOAA mission workforce as hires** by NOAA **NONE**, NOAA contractors **NONE**, NOAA partners **NONE**, resource management agencies **NONE**, NGO community **NONE**, academia **NONE** or as entrepreneurs **NONE**.
4. **Number of EPP-funded graduates who participate in and complete NOAA agency mission-related postdoctoral level programs** **NONE**.
5. **Total new funds $3,882,261.99** leveraged with NOAA EPP award (including post-secondary student support).

B. Provide FY16 Center award information to demonstrate contribution to supporting CSC Desired Program level Outcomes and Outputs defined in FFO p. 7 - 10, for this reporting period.

A Center Evaluation Plan has been submitted. In addition – several assessment/monitoring and evaluation tools are being created to help assess and demonstrate evidence of program outcomes (4 Education; 2 Science and 4 Management) and several outputs.
NOTE:
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# VII. Financial Information

a. Total NOAA funding breakout

FY 16 Award Center base funds: Indicate how funds were used for the reporting period, using award budget categories to provide detailed information for reporting period. Unobligated balances will be compared with SF 425 reporting. Postsecondary Direct Student Support:

<table>
<thead>
<tr>
<th>YR 2 Main Grant &amp; SUB-Awards &amp; COHORT-2 Reports (6mos.)</th>
<th>Reporting Period:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st September, 2017 to 28th February, 2018</td>
</tr>
<tr>
<td>Administration/Management</td>
<td>$29,147.50</td>
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<tr>
<td>Research Scientists/Postdocs</td>
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<td>Technician /IT</td>
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<td>Faculty Summer Salaries</td>
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<td>MTA Tax</td>
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<td>Fringes &amp; Benefits (Total)</td>
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<td>Travel -Domestic (Student+ Staff)</td>
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<td>Student Fellowship</td>
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<td>Student Tuition</td>
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<td>Office Supplies General</td>
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<tr>
<td>Computer Supplies &amp; Software &amp; Maintenance</td>
<td>$9,000.00</td>
</tr>
<tr>
<td>Education, Recruitment &amp; Outreach</td>
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<tr>
<td>Seminars/Outreach</td>
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</tr>
<tr>
<td>Publishing</td>
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</tr>
<tr>
<td>Shipping and Postage/Mailing/Communication</td>
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<tr>
<td>Program Evaluators (Evaluation by Design)</td>
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<td>Satellite Receiving Data Manager/Consultant</td>
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<tr>
<td>F &amp; A Costs</td>
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<td>Subcontractors (invoiced so far)</td>
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<td>Subcontractors (Budgeted)</td>
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<tr>
<td>Subcontractors (rollover)</td>
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</tr>
<tr>
<td><strong>TOTAL NET Expenditure</strong></td>
<td><strong>$ 220,199.43</strong></td>
</tr>
</tbody>
</table>
a. **Total leverage funding breakout**
   Indicate funding source, type (grant or contract), amount, Center PI, project title; and, how funding contributed to the FY 16 Center award for:

   Postsecondary Student Support: - **Not Available** Collaborative Research (see below chart)
| RESEARCH |
|-----------------|-----------------|-----------------|------------------|-----------------|
| TITLE | PI NAME | SPONSOR NAME | DEPARTMENT | BUDGET |
| | | | Start Date | End Date | Bud Amount | 6-Month Bud |
| multiplayer Layer Height Algorithm for Environmental Protection Agency Photochemical Assessment Monitoring Sites | DELGADO, RUBEN | EPA/SSAI | Physics Department | 2/1/2018 | 9/30/2018 | $70,000.00 | $53,006.30 |
| Multi-Modeling Of Extreme Events And Impact Informatics for the National Hurricane Center | DEVINENI, NAARESH | Office of Science | Civil Engineering | 9/15/2017 | 9/14/2018 | $762,097.00 | $382,095.34 |
| The CASTor Project | DEVINENI, NAARESH | Office of Water | Civil Engineering | 9/15/2017 | 9/14/2018 | $3,000.00 | $1,504.12 |
| America's Water: THE CHANGING LANDSCAPE | DEVINENI, NAARESH | Columbia University | Civil Engineering | 8/1/2014 | 7/31/2018 | $190,927.00 | $22,615.88 |
| ANALYSIS & VALIDATION OF MICROWAVE EMISSIVITY | DEVINENI, NAARESH | University of Maryland | Civil Engineering | 7/1/2014 | 6/30/2017 | $69,000.00 | $6,629.00 |
| Retrieval of Characteristics of Water Constituents from Near Surface and Satellite Polarimetric Observations | GULERSON, ALEX | Shared Services Center | Electrical Engineering | 8/25/2016 | 8/24/2019 | $469,851.00 | $78,380.08 |
| DEVELOPMENT OF NEURAL NETWORK ALGORITHMS | GULERSON, ALEX | University of Maryland | Electrical Engineering | 7/1/2014 | 6/30/2018 | $76,530.00 | $9,566.25 |
| HYPERSPECTRAL POLARIMETER SYSTEM | GULERSON, ALEX | Department of Defense | Electrical Engineering | 7/15/2016 | 10/14/2018 | $331,088.00 | $73,597.52 |
| OCEAN COLOR LINKS (AERONET SITE) CRUIS | GULERSON, ALEX | University of Maryland | Electrical Engineering | 7/1/2014 | 6/30/2019 | $175,750.00 | $22,321.25 |
| IMPACTS OF URBANIZATION AND CLIMATE CHAN | GONZALEZ, JORGE | Engineering | Mechanical Engineering | 8/1/2014 | 7/31/2018 | $325,835.00 | $40,729.38 |
| Hispanic AGEP Alliance - CCNY | GONZALEZ, JORGE | Engineering | Mechanical Engineering | 7/1/2017 | 6/30/2022 | $1,398,722.00 | $139,872.20 |

| GSAS: Water: Global Center for Advanced Studies on Water | KRKAUER, NIR | UNIVERSITY OF UTAH | Civil Engineering | 1/1/2015 | 12/31/2018 | $200,000.00 | $25,000.00 |
| CloudSat Convection Velocity | LUO, ZHENGHUAO | JET PROPULSION LABORATORY | Earth & Environment Sci | 1/1/2018 | 12/31/2018 | $20,446.00 | $10,251.09 |
| Assessing Impacts of Climate-Induced Change on River Flow and Associated Economic Output in the High Mountain Asia Region | MCDONALD, KYLE | Shared Services Center | Earth & Environment Sci | 8/17/2016 | 8/16/2019 | $591,828.00 | $98,728.16 |
| 17-EARTH17F-0237, Monitoring Tropical Wetlands with GRSS Reflectometry: Integrating CYGNSS with Imaging Radar and Coarse Resolution Microwave Remote Sensing | MCDONALD, KYLE | Shared Services Center | Earth & Environment Sci | 9/1/2016 | 8/31/2018 | $44,625.00 | $22,373.80 |
| ASSESSING & DOWNSCALING SNAP DATA | MCDONALD, KYLE | MICHIGAN TECHNOLOGICAL UNIVERSITY | Earth & Environment Sci | 7/12/2016 | 7/11/2018 | $78,795.00 | $19,725.77 |
| MONITORING SEASONAL SOIL FROST DYNAMICS | MCDONALD, KYLE | Shared Services Center | Earth & Environment Sci | 7/18/2016 | 7/17/2019 | $346,054.00 | $57,728.39 |
| Integrated Air Quality Monitoring for Improved Modeling and Forecasting of Particulate Pollution for Metropolitan New York Area | MOSHARY, FRED | NYS Energy Research & Development Authority | Electrical Engineering | 1/1/2017 | 6/30/2019 | $199,731.00 | $40,055.94 |
| Post Hurricane Shoreline Monitoring Program using UAVs | MUNOZ, JONATHAN | Sea Grant | Department of Environmental Engineering and Surveying | 2/1/2018 | 1/31/2019 | $15,000.00 | $7,520.60 |
| A Multi-Sensor Calibration Algorithm for Improving Emissivity Retrieval by Integrating Microwave Brightness Temperature | NOROUZI, HAMIDREZA | NASA | Construction Management & Civil Engineering Technology | 9/1/2016 | 9/1/2019 | $363,397.00 | $60,566.17 |
| Diurnal Cycle | NOROUZI, HAMIDREZA | POCI | Construction Management & Civil Engineering Technology | 1/25/2015 | 4/1/2019 | $238,375.00 | $37,438.41 |
| RAPID: Impacts of Post-Hurricane Land-Atmosphere Interactions on Convective and Precipitation Processes in the Caribbean Region | RAMAMURTHY, PRAT | Geosciences | Mechanical Engineering | 12/1/2017 | 11/30/2018 | $174,892.00 | $87,687.74 |
| Cooperative Institute for Climate and Satellites | ROSSWELL, WILLIAM | UNIVERSITY OF MARYLAND | Electrical Engineering | 7/1/2014 | 6/30/2018 | $2,281,214.00 | $285,401.75 |
| DIAGNOSTIC ANALYSIS | ROSSWELL, WILLIAM | Shared Services Center | Electrical Engineering | 8/1/2013 | 7/31/2018 | $961,401.00 | $96,160.10 |
| Deputy Applications Lead for Geo-Cape | TARTZIOU, MARIA | Shared Services Center | Earth & Environment Sci | 10/27/2014 | 10/25/2018 | $199,456.00 | $24,932.00 |
| Satellite Ocean Color Observations from NASA's PACE and ACE missions: Applications and Societal Benefits | TARTZIOU, MARIA | Shared Services Center | Earth & Environment Sci | 8/11/2016 | 9/31/2018 | $124,817.00 | $29,544.88 |
| Ecological and Sociodemographic Determinants and Impacts of Urbanization and Restoration on Intertidal Urban-Wetland-Estuarine Systems | TARTZIOU, MARIA | Shared Services Center | Earth & Environment Sci | 7/20/2017 | 7/19/2018 | $1,141,360.00 | $57,247.80 |

| INSTITUTIONAL IMPROVEMENT |
|-----------------|-----------------|-----------------|------------------|-----------------|
| TITLE | PI NAME | SPONSOR NAME | DEPARTMENT | BUDGET |
| | | | Start Date | End Date | Bud Amount | 6-Month Bud |
| Urban Climate and Resilience Workshop | GONZALEZ, JORGE | Engineering | Mechanical Engineering | 1/1/2017 | 11/30/2018 | $50,000.00 | $25,068.68 |
| HSE Conference: Urban-Increasing Access and Success in Urban STEM Programs | GONZALEZ, JORGE | Education & Human Resources | Mechanical Engineering | 1/1/2018 | 12/31/2018 | $100,000.00 | $50,137.36 |

| TRAINING |
|-----------------|-----------------|-----------------|------------------|-----------------|
| TITLE | PI NAME | SPONSOR NAME | DEPARTMENT | BUDGET |
| | | | Start Date | End Date | Bud Amount | 6-Month Bud |
| High School Initiative in Remote Sensing | MERCHANT, SHAKIRA | PINKERTON | Civil Engineering | 6/1/2017 | 6/31/2017 | $95,000.00 | $47,630.49 |
| CCNY Initiative to Promote Academic Success in STEM (CPS22) | GONZALEZ, JORGE | Office of Postsecondary Education | Mechanical Engineering | 10/1/2017 | 9/30/2018 | $1,161,284.00 | $582,237.17 |
| 17-EARTH17F-0099, Improving retrievals of plant canopy variables from remote sensing data | GROSS, BARRY | Shared Services Center | Electrical Engineering | 9/3/2017 | 8/31/2018 | $39,792.00 | $19,950.66 |
| Optical Assessment of Community Multiscale Air Quality (CMAQ) Aerosol Models and Improvement of CMAQ PM2.5 Forecasts Using Neutral-Neutral-Based Tools | GROSS, BARRY | NYS Energy Research & Development Authority | Electrical Engineering | 2/26/2015 | 8/30/2018 | $40,000.00 | $5,698.67 |
| 17-EARTH17F-0347, Wetland inundation and vegetation phenology from space - A novel approach for characterizing ecological health and carbon exchanges in coastal wetlands | TARTZIOU, MARIA | Shared Services Center | Earth & Environment Sci | 9/1/2017 | 8/31/2018 | $45,000.00 | $22,561.81 |

Sub Total Fund: $75,206.04