A. Executive Summary

I. Overview

Howard University's NOAA Center for Atmospheric Sciences (NCAS) has been awarded up to $15 million over five years by the Department of Commerce and the National Oceanic and Atmospheric Administration to conduct educational and collaborative research programs in weather, climate, air quality, and environmental literacy. NCAS, a consortium of six educational institutions led by Howard University, has been supported by core funding from the Department of Commerce since 2001. The partner schools are Jackson State University, the University of Maryland College Park, the University of Texas El Paso, State University of New York Albany and the University of Puerto Rico Mayaguez.

The first half of year four has been very productive. NCAS had a strong showing at the *NOAA Education Partnership Program (EPP) 7th Biennial Education and Science Forum*, October 26-29, 2014 in Princess Anne, MD. A total of 67 participants from NCAS attended the Forum, of which eight (8) students received awards for their presentations. Following the forum, NCAS in partnership with the University of Maryland, and Earth System Sciences Interdisciplinary Center (ESSIC) sponsored a two-day, invitation-only workshop on the future directions of the USWRP Air Quality Forecasting Research Program. The workshop took place at ESSIC, located in the University of Maryland's M-squared research park within walking distance from the NOAA Center for Weather and Climate Prediction. The workshop agenda featured four (4) invited speakers, nineteen (19) panelists, and sixty-two (62) attendees. NCAS co-hosted with the Colour of Weather, Inc., the Howard University Chapter of Graduate Student Association of Atmospheric Science (GSAAS), and the American Meteorological Society (AMS) the 14th annual Colour of Weather - networking and diversity reception at the 95th Annual Meeting of the AMS in Phoenix, AZ January 4, 2015. The Colour of Weather reception went exceptionally well, exceeding our expectations. There were over 200 people in attendance, and often standing room only. The interactive format received raves from students and professionals. Additionally, the reception garnered participation from four (4) AMS past-presidents; the outgoing president, as well as the president-elect of AMS.

The following semi-annual report details the activities conducted during September 1, 2014 – February 28, 2015. In addition, NCAS has included in appendix VI and VII respectively, the updated Performance Improvement Plan (PIP) that was established in response to the third year review along with NCAS updated milestones and schedules as it relates to the PIP. As NCAS finishes the first half of its fourth year of its third five-year cycle, we are pleased to report a number of achievements in both education and research. The Center maintains robust collaborations and educational partnerships with the NOAA National Weather Service (National Center for Environmental Prediction (NCEP), Office of Operational Service (OOS), various Weather Forecast Office (WFOs), Office of Oceanic and Atmospheric Research (OAR), Atlantic Oceanographic and Meteorological Laboratory (AOML), Air Resources Laboratory (ARL), the Earth System Research Laboratory (ESRL) scientists, and National Environmental Satellite, Data & Information Service (NESDIS) (research and joint publications). Several of the highlights from this reporting period are listed below.

NCAS performance is primarily evaluated on the basis of the following measures:

1) Number of students from underrepresented communities who are trained and graduate in NOAA-mission sciences annually [38 trained, 2 graduated]
2) Number of students who are trained and graduate in NOAA-mission sciences annually; [43 trained, 2 graduated]
3) Number of students completing experiential opportunities at NOAA facilities; [5]
4) Number of EPP funded students who are hired
    a. by NOAA, NOAA contractors and other environmental, natural resource, and science agencies at the Federal, State, local and tribal levels, in academia and the private sector; [2 during this reporting period].
    b. by other elements of the STEM professional sector or pursuing advanced degrees [0]
5) Number of collaborative research projects undertaken between NOAA and MSI partners in support of NOAA operations; [23]
6) Number of peer reviewed papers published in NOAA-mission sciences by scientists (faculty, postdoctoral fellows, and students) sponsored by NOAA EPP; [9 papers]

7) Funds leveraged with NOAA EPP funds (including student support) [$4,625,436.00]; and,
8) Number of outreach participants engaged in NOAA mission relevant learning opportunities. [1200]

The performance in each category for this reporting period is listed above in the emboldened brackets. NCAS continues to be a leader on the national stage in the production and training of African Americans and Hispanics in the atmospheric sciences at all levels of education. During this reporting period, NCAS conducted a comprehensive suite of training and outreach events. NCAS sponsored two (2) Community Science Fests with 1100 participants, two (2) facility tours with 95 participants, and two (2) formal interactions with public schools that involved fifty (50) students. The outreach events reached over 1200 students nationally.

II. HIGHLIGHTS AND MAJOR ACCOMPLISHMENTS

NCAS supports student training at undergraduate and graduate levels in the key disciplines of Atmospheric Sciences/Meteorology (HU, SUNYA, JSU, and UMD), Marine Sciences (UPRM), and Environmental Sciences (JSU and UTEP). Additionally, students majoring in other SBE disciplines and basic sciences, including chemistry, biology, engineering, and physics are supported on collaborative research activities.

NCAS Successful Dissertation/Thesis Defenses:

1) NCAS Fellow, **Churchill Okonkwo**, successfully defended his PhD Dissertation entitled: "Characterization of the Relationship between West African Jet Streams and El Niño Southern Oscillation (ENSO): Implications on Lake Chad Level Variability" on November 3, 2014. Dr. Okonkwo earned his doctoral degree in Atmospheric Sciences from Howard University under the direction of Dr. Belay Demoz. The NOAA representative on Churchill Okonkwo's dissertation committee was Dr. Wassila Thiaw (NWS/CPC/OMB). Dr. Okonkwo is currently the director of the African Center for Climate Science and Policy Research, in Washington, DC – a think tank that strives to resolve environmental problems relating to changing climate in Africa, based on sound science and policy formulation.

2) NCAS Fellow, **Richard Medina Calderon**, successfully defended his PhD Dissertation titled: "Light Scattering from Aerosol Particles in the Paso del Norte Region/ The Effect of Humidity" on December 8, 2014. Dr. Medina Calderon has earned his doctoral degree in Computational Science under the direction of Dr. Rosa Fitzgerald from The University of Texas, El Paso. Dr. Medina Calderon is currently searching for a permanent position.

No Bachelor of Science Recipients were generated during this performance period.

NCAS Student Highlights: The students (#1-8) received awards for their participation in the NOAA Education Partnership Program (EPP) 7th Biennial Education and Science Forum, October 26-29, Princess Anne, MD:

1) Mr. Mosissa Fayissa (HU), Second Place - Title: "Cu(II) Complex as a Sensor for Nitric Oxide (NO) using Fluorescence Spectroscopy" - Poster Category: Climate Adaptation and Mitigation Graduate Student

2) Ms. Rosette Gonzales (UTEP), Third Place Honorable Mention - Title: "Valley Fever Studies in the Paso del Norte Region" - Poster Category: Climate Adaptation and Mitigation - Graduate Student

3) Ms. Valerie Keene (HU), Second Place - Title: "Examining the Chemical and Biological Characteristics of Aerosols" - Oral Category: Climate Adaptation and Mitigation - Undergraduate Student

4) Ms. Denna Kowalek-Geppi (HU), Second Place - Title: "Hurricane Sandy: An Analysis of Instagram Photos Using the CAUSE Model to Determine Risk Communication Practices" – Poster Category: Weather-Ready Nation - Graduate Student

5) Mr. Dominique Marshall (JSU), First Place - Title: "Ground Penetrating Radar Survey of Edenton Green for Early Structural Remains" - Oral Category: Resilient Coastal Communities and Economies - Undergraduate Student
6) Ms. Fernanda Ramos-Garcés (UPRM), First Place - Title: " Identifying Soufrière Hills Volcanic Ash Particles and Saharan Dust using Aerosol Robotic Network (AERONET) Sun Photometer, Satellite Imagery and Trajectory Models" - Poster Category: Weather-Ready Nation - Undergraduate student

7) Mr. Jose Rivas (UTEP), Second Place - Title: "Dust Deposition and Biota Dispersal by Wind Storms in the Chihuahuan Desert"- Oral Category: Weather-Ready Nation - Graduate student

8) Mr. Daniel Yeager (HU), Third Place Honorable Mention - Title: "Saharan Dust Particulate Characterization and Source Region Verification" Poster Category: Weather-Ready Nation - Graduate student

9) Ms. Elsa Castillo (UTEP), PhD student supervised by Drs. Morris (HU) and Fitzgerald (UTEP), was awarded the prestigious National Nuclear Security Administration Graduate Fellowship, 2015

10) Ms. Mariana Guereque (UTEP), PhD student supervised by Drs. Morris (HU) and Pennington (UTEP), was awarded a summer EPA Fellowship, 2015. She will work with Dr. Ariel Stein of NOAA/OAR in the Air Resourecs Laboratory during summer 2015.

11) Kafayat Olayinka (NCAS Fellow at HU) and Stephen Demetry (a former CAREERS weather camp student) accompanied NOAA and NCAS scientists aboard the NOAA Roonald H. Brown during the CalWater-2 experiment in the Pacific Ocean during January 14 – February 12, 2015. This was a comprehensive research effort that involved four aircraft (the NASA ER-2 and the P-3, G-I, and G-IV from NOAA), satellite measurements, coastal and inland surface observation networks, and ship-based measurements. The NCAS/Howard University team led the sounding component during the mission.

12) Ms Maria Velez-Qinones, an NCAS fellow receiving her PhD in Biology from Howard University in 2014 published a paper as co-author; A. D. Allen, B. Eribo, M. A. Velez-Quinones, V. R. Morris MALDI-TOF MA and 16SrRNA as Tools of the Evaluation of Bacterial Diversity ***Aerobiologia 31:111-126 (2015)***

13) NCAS doctoral student Maria Cardona participated in E/V Nautilus cruise NA052 during September 4-14, 2014 to explore seamounts south of the British Virgin Islands.

14) NCAS doctoral student Maria Cardona participated in the Okeanos Explorer Expedition to Puerto Rico, February 24 to March 11, 2015, as a mapping intern. She was in charge of processing data from different sonars as well as from oceanographic instrumentation.

15) NCAS Alumni, Isha Renta accepted a Meteorologist position with NWS-WFO in Sterling, VA in February 2015

NCAS Faculty Highlights:

1) Dr. William Stockwell (HU) article co-author with David Parrish (OAR/ESRL/CSD) titled: Urbanization and air pollution - then and now, graces the cover of the inaugural magazine issue of *Eos Earth and Space Science News,* Vol. 96, No. 1, Jan. 15, 2015, pp.12-15.

III. STRATEGIC PARTNERSHIPS AND LEVERAGED FUNDING

NCAS pursues new collaborations, and is pleased to present new contracts obtained during this performance period:

1) Dr. Roy Armstrong and other co-PIs proposal titled: Hybridspectral Alternative for Remote Profiling of Optical Observations for NASA Satellites (HARPOONS) was successfully funded through NASA in the total amount of $4,012,568.00. The dates of the award are October 1, 2014 – September 31, 2017.

2) Dr. Roy Armstrong proposal titled: Hyperspectral Remote Sensing of Water Quality Parameters Impacting Coral Reef Health in Puerto Rico was successfully funded through Sea Grant in the total amount of $52,868.00. The dates of the award are December 1, 2014 – November 31, 2016.

3) Drs. Vernon Morris and Everette Joseph were invited to participate in the multi-institutional CalWater2 campaign from January 10, 2015 to February 14, 2015. This award is equivalent to*$20,000/day x 28 days ($560,000.00)*.

B. Cooperative Performance Report – Table 1

NCAS Activities / Goals	METRICS		NCAS Deliverables	NOAA /NCEP Research Milestones employed by NCAS
1. Measurements in Support of NCAS Research and Training	Collaborators:		Beltsville observational database to support air quality and Planetary Boundary Layer (PBL) model development. Provision of a test-bed facility for NWS and student training AEROSE and AERADNET (Aerosols and Radiation Observing Network) observational databases Caribbean PBL modeling, hurricane landfall simulations, and satellite retrievals	Development of integrated global observation and data systems Development of emerging technologies for NWS operations
	NOAA	7		
	Faculty	3		
	Publications:	0		
	NOAA Collaborative Projects	5		
	Externally Funded Projects:	0		
	Students:	3		
2. Weather and Climate Analysis and Prediction	Collaborators:		Evaluation of current PBL parameterization and cumulus convective schemes used in NOAA forecasting models Provide quality control data sets for assessments of Community Radiative Transfer Model (CRTM) and document results of closure studies Student Training in Weather and Climate Modeling and Analysis	Improving accuracy in precipitation forecasts Improving effective of satellite data in climate and weather analyses and forecasts
	NOAA	7		
	Faculty	9		
	Publications:	2		
	NOAA Collaborative Projects	4		
	Externally Funded Projects:	0		
	Students:	4		
3. Air Quality Analyses and Forecasting	Collaborators:		Provide prototype air quality models for implementing new air quality models to NOAA AEROSE observational databases Student Training in Air Quality modeling and analysis	Improving air quality models for regulatory assessments Improving ozone forecast models Development of enhanced forecast products
	NOAA	19		
	Faculty	9		
	Publications:	7		
	NOAA Collaborative Projects	10		
	Externally Funded Projects:	0		
	Students:	29		
4. SBE Component	Collaborators:		Economic Analysis of Air Quality Forecasts Technical assistance in the design of data elements for service assessments and surveys and examined citizen response to severe weather	Effective translation of NOAA sciences to the public and private sectors
	NOAA	3		
	Faculty	5		
	Publications:	0		
	NOAA Collaborative Projects	4		
	Externally Funded Projects:	1		
	Students:	7		