NOAA Educational Partnership Program
WITH Minority Serving Institutions:

9th BIENNIAL EDUCATION AND SCIENCE FORUM

PARTNERING WITH ACADEMIA TO PREPARE HIGHLY SKILLED AND DIVERSE CANDIDATES FOR NOAA'S STEM WORKFORCE

Building Successful Educational and Research Collaborations for an Inclusive NOAA Mission Enterprise

HOSTED BY HOWARD UNIVERSITY & NCAS-M

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HOWARD
UNIVERSITY

OFFICE OF THE PRESIDENT

March 19, 2018

Greetings Attendees:

On behalf of Howard University and the National Oceanic and Atmospheric Administration (NOAA) Center for Atmospheric Sciences and Meteorology (NCAS-M), I extend a warm Bison welcome to each of you on the 9th Annual NOAA Educational Partnership Program/Minority Serving Institutions Education and Science Forum. We are pleased to host this important conference for a second time and bring together key stakeholders from academia, federal and local governments as well as the private sector.

Your theme of "Partnering with Academia to Prepare Highly Skilled and Diverse Candidates for NOAA's STEM Workforce: Building Successful Educational and Research Collaborations for an Inclusive NOAA Mission Enterprise" is a timely one as the need to strengthen the pipeline of diverse and innovative talent is more critical than ever.

I am proud that Howard University's graduate program in atmospheric sciences is the most productive single source of underrepresented minority professionals entering NOAA's workforce over the past decade.

We stand ready to work with you to continue to advance our shared goal of diversifying and increasing the number of highly qualified and well-trained graduates for careers in the atmospheric sciences. Please accept our best wishes for a productive summit and our continued thanks for the incredible efforts extended by the many partners that make this convening possible.

Excellence in Truth and Service,

Wayne A. I. Frederick, M.D., MBA
President

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Concurrent Session III A:
WEATHER READY NATION
(BLACKBURN FORUM)

8:30 AM **John Cortinas,** Director Office of Weather and Air Quality (NOAA/OAR)

9:00 AM **Ricardo Sakai**, NCAS-M Faculty

Relating Planetary Boundary Clouds to Surface Meteorological Parameters over a Complex Landscape

This study shows the results of the presence of Planetary Boundary Layer clouds (PBLc) and the related surface beneath. Even though the Howard University Beltsville Campus (HUBC) has a complex landscape, it can be separated in a more "homogeneous" sectors: commercial/ industrial sector, suburban sprawling, and agricultural fields mixed with a mix of deciduous and conifer forest. Since 2006, this site has been monitoring almost continuously micro-meteorological parameters and a ceilometer (Vaisala, CT25K, and later Vaisala CL51) has been collecting cloud base and profile backscatter. When ceilometer's cloud base (h), and the lift condensation level (LCL) estimated from tower data have a good agreement is considered a PBLc. They correlate well to the surface parameters, such as temperature, humidity, wind direction and speed, and turbulent fluxes, according

to the upwind fetch. Highest values are found when winds come from the industrial sector, and lowest when it winds come from the suburban sector. This sector partition is also followed by turbulent fluxes (friction velocity, sensible heat and latent heat flux), indicating that local effects on the formation a PBLc. However, a spatial analysis is also necessary to determine the importance of larger spatial scale meteorological phenomena to PBLc. Results at HUBV with surrounding National Weather Service – Automated Surface Observatory System (NWS-ASOS) stations that have ceilometer data are also shown.

9:15 AM **Brian J. Carroll,** NCAS-M Graduate Student

Boundary Layer Structure and Low-level Jets

A low-level jet (LLJ) is most simply defined as a strong wind speed maximum in the lower troposphere with a significant decrease in wind speed at higher altitudes. LLJ events over land typically occur at night and are confined to the lowest kilometer of the atmosphere. These events impact meteorology and air quality by transporting atmospheric constituents hundreds of kilometers and by generating significant wind shear mixing near the surface. LLJs are found in many locations on Earth but are most common and strongest in the Great Plains region of the United States during the warm season. This presentation will summarize LLJ-relevant data from the Plains Elevated Convection at Night (PECAN) field campaign which made continuous observations of Great Plains rainfall and precursor events (including the LLJ) from June 3rd to July 15th, 2015. Similarities and differences among the wind profiles of more than 30 nights with LLJs will be shown, along with thermodynamic profiling to reveal linkages with stability. The measurements that will be utilized are primarily from co-located remote sensing Doppler lidars and atmospheric emitted radiance interferometers (AERIs), which allow for novel time series profiling of the bulk Richardson number. These observations clearly show an increasing impact on the nocturnal boundary layer with increasing LLJ wind speed; stronger LLJs tend to erode the commonly expected nocturnal surface layer inversion.

9:30 AM **Mengsteab H. Weldegaber**, Howard University Physics & Astronomy Department Faculty

A High-resolution WRF-ARW Analysis of 29 June 2012 Derecho in Washington-DC Area

A modeling study of the 29 June Derecho over the Washington-DC area is presented. Derecho is a widespread convectively induced straight-line windstorm produced by mesoscale convective system. This Derecho thunderstorm with a sustained wind gust of 60-80 mph was responsible for significant damage in Washington-DC area. The Weather Research and Forecasting (WRF) model with the National Center for Atmospheric Research (NCAR) Advanced Research WRF (ARW) dynamic core is used to analyze the Derecho weather event. This research investigates the dynamics of WRF simulated convective system that led to the destructive thunderstorm outbreak. Moisture pattern, low-level divergence, convective available potential energy, and upper air dynamics will be thoroughly analyzed and discussed.

9:45 AM **David Melecio-Vazquez,** CREST Graduate Student

Boundary-Layer Characteristics over a Coastal Megacity

Boundary-layer characteristics over New York City are analyzed for various local and synoptic conditions over several seasons. An array of vertical profilers, including a Doppler LiDAR, a micro-pulse LiDAR and a microwave radiometer are used to observe the structure and evolution of the boundary-layer. Additionally, an urbanized Weather Research and Forecasting (uWRF) model coupled to a high resolution landcover/land-use database is used to study the spatial variability in boundary layer characteristics. The summer daytime averaged potential temperature profile from the microwave radiometer shows the presence of a thermal internal boundary layer wherein a super adiabatic layer lies underneath a stable layer instead of a mixed layer. Both the winter daytime and nighttime seasonal averages show that the atmosphere remains unstable near the surface and does not reach stable conditions during the nighttime.

The mixing ratio seasonal averages show peaks in humidity near 200-m and 1100-m, above instrument level, which could result from sea breeze and anthropogenic sources. Ceilometer measurements show a high degree of variability in boundary layer height depending on wind direction. Comparison with uWRF results show that the model tends to overestimate convective efficiency for selected summer and winter cases and therefore shows a much deeper thermal boundary layer than the observed profiles. The model estimates a less humid atmosphere than seen in observations.

Concurrent Session III B:
HEALTHY OCEANS
(BLACKBURN AUDITORIUM)

8:30 AM **Ashok Deshpande**, Research Chemist (NOAA/NMFS/NEFSC)

Characterization of microplastics by using a novel method of pyrolysis GC-MS

Plastics are contaminants of emerging concern that are accumulating at increasing rates in the marine and freshwater ecosystems. Some scientists refer to plastics as the next predator of wildlife. Because of sun and wave energy, the plastics tend to break down into smaller particles, called the microplastics of grain size lower than 5 mm. Microplastics also enter the aquatic environments directly from a variety of sources, including cosmetics, clothing, and industrial processes. Microplastics are a cause for concern because their size range overlaps with the preferred particle size ingested by the animals at the base of the aquatic food webs. We seek to characterize microplastics polymer types by using a novel method of pyrolysis gas chromatography-mass spectrometry (GC-MS). In this method, a small piece of microplastic sample, less than 1 milligram in weight, is placed in a narrow quartz tube which is then placed in a platinum coil and heated to 750 degrees C. The intense heat breaks down the large plastic polymer chain into smaller fragments. The pyrolytic

fragmentation patterns are reproducible and unique to a given polymer type. These fragments are then transferred to and separated on a gas chromatographic column and identified using a mass spectrometer. We have created a pyrolysis GC-MS library of some of the most commonly used plastics polymers. The next step in this effort is the characterization of the weathered field samples. Understanding the nature of microplastics is critical to the identification and possibly regulation and mitigation of sources of plastics that can impact the quality of bivalve and fish habitats as well as that of the aquaculture facilities. As different types of plastics exert different toxicities by themselves, and as in addition they adsorb different levels of chemical contaminants, the knowledge of polymer composition is important in the understanding of fisheries risk assessment.

9:00 AM **Christina Mbuya**, Florida Agricultural & Mechanical University
Graduate Student

Biomarkers to evaluate UV-enhanced toxicity of oil sheens to estuarine organisms

One of the lingering questions after the Deep Water Horizon oil spill is the toxicity of thin oil sheens to early life stages of aquatic species, and whether that toxicity may be modified by interaction of hydrocarbon compounds with ultraviolet (UV) light. Previous studies have shown that UV at levels found in natural sunlight interacts with some oil components such as polyaromatic hydrocarbons (PAHs), increasing their reactivity and toxicity. Thus, thin oil sheens remaining on surfaces after oils spills might yield photoactivated products that impact exposed organisms, particularly eggs and juvenile stages of estuarine fish and invertebrates. Understanding the potential interactions between UV light and oil hydrocarbons requires consideration of i) the physical interaction of the organisms with the thin oil sheen on the water surfaces, ii) UV effects on oil at the surface that can photomodify the chemical constituents of oil into more toxic forms and iii) uptake of oil into small, transparent life stages, followed by later UV exposure to photoactivate oil hydrocarbons to more

toxic forms. Laboratory testing will be used to assess interactive effects of UV and oil sheens on selected estuarine species. We will evaluate DNA damage (DNA Fast Micromethod) and oxidative stress responses (superoxide dismutase, glutathione, and lipid peroxidation) to better understand toxicity responses and assess risks of UV phototoxicity after oil spill events.

9:15 AM **Amanda Lawrence,** UMCES-IMET Graduate Student

Insulin-like androgenic gland factor (IAG) found in decapod crustaceans is known to regulate male sexual development. IAG is produced in the male-specific endocrine tissue, androgenic gland (AG); however, its expression has also been observed in other tissues of decapod crustacean species including, *Callinectes sapidus* and *Scylla paramamosain*. We isolated the cDNA sequence of *IAG* from the AG of male red deep-sea crab, *Chaceon quinquedens* using 5' and 3' rapid amplification of cDNA ends (RACE). The full-length *ChqIAG* cDNA sequence (1555 nt) encodes an ORF encoding 151 aa including: 19 aa signal peptide, 32 aa B chain, 56 aa C chain, and 44 aa A chain. The putative ChqIAG amino acid sequence is similar to those found in other crab species, including *C. sapidus* and *S. paramamosain*, which are clustered together phylogenetically. We are currently investigating the role IAG in the onset of sexual maturity and functional maturity of male decapod crustaceans.

9:30 AM **Shadaesha Green,** Living Marine Resources Cooperative Science Center Graduate Student

Elucidating the presence and expression of the crustacean hyperglycemic hormone of the red deep-sea crab, *Chaceon quinquedens*

The crustacean hyperglycemic hormone (CHH) is a well-studied pleiotropic neuropeptide hormone synthesized and stored in the XO-SG complex of decapod crustaceans. Currently, information pertaining CHH in deep-sea cold-water crustacean species is scarce in comparison to that of their shallow-water counterparts in which

various physiological processes including glucose metabolism, osmotic regulation, response to fluctuating environmental conditions have been reported. The overall objective of this study is to delineate the physiological role of CHH in the red deep-sea crab, *Chaceon quinquedens*. First, we examined the presence of CHH in the neurosecretory cells (x-organ) and the sinus gland of eyestalk ganglia using immunohistochemistry. Then, neuropeptides from the sinus glands of adult male and female red crabs were separated using a reverse phased high-performance liquid chromatography (RP-HPLC). Two peaks (1 and 2) representing the minor and major forms of *C. quinquedens* CHH were identified and combined with a dot blot assay with using anti *Carcinus* CHH serum to confirm peak identities. Peaks areas from both adult male and female red crabs were used to quantify CPRP and CHH (1 and 2) peptide concentrations. All peptide levels were similar between males and females, apart from CHH 2 (major isoform) which was significantly higher in females than that in males. Finally, a degenerate PCR and 5' and 3' RACE cloning strategy was employed to obtain the full-length cDNA sequence for CHH (*ChqCHH*). Expression levels of *ChqCHH* was determined in both sexes via qRT-PCR assay. Although not statistically different *ChqCHH* expression was slightly higher in adult females.

9:45 AM **Andrea Gomez,** CREST Graduate Student

Evaluating Coral Health in La Parguera, Puerto Rico, and Southeastern Florida: Comparison of Satellite-Based Sea Surface Temperature to *In Situ* Observations

The third global coral bleaching event, which began in mid-2014 and ended mid-2017, is a major environmental stressor that has been causing significant documented damage to coral reefs in all tropical ocean basins. This worldwide phenomenon is the longest and largest coral heat stress event on record. During this event, some coral colonies proved to be more resilient to increased ocean temperatures while others bleached severely. This research investigates the spatial and temporal variability of bleaching stress on coral reefs in La Parguera, Puerto Rico, and Southeastern Florida to help further understand the role

of temperature and light in coral bleaching. We examine the microclimate within two coral reef systems, using *in situ* collections of temperature and light data from data loggers deployed throughout Cayo Enrique and Cayo Mario in La Parguera, and Lauderdale-By-The-Sea in FLorida. The *in situ* measurements are compared to NOAA's Coral Reef Watch 5-km sea surface temperature data as well as to the associated Light Stress Damage Product. Research outcomes include statistical analyses of *in situ* measurements with satellite datasets supporting enhanced interpretation of satellite-based SST and light products, and ecological niche modeling to assess where corals could potentially survive under future climate conditions. Additional understanding of the microclimate encompassing coral reefs and improved satellite SST and light data will ultimately help coral reef ecosystem managers and policy makers in prioritizing resources toward the monitoring and protection of coral reef ecosystems.

Concurrent Session III C:
RESILIENT COASTAL COMMUNITIES AND ECONOMIES
(BLACKBURN GALLERY LOUNGE)

8:30 AM **Nicole LeBoeuf**, Deputy Assistant Administrator (NOAA/NOS)

9:00 AM **India Oliver,** LMRCSC Undergraduate Student

Seasonal Changes Affect the Accumulation of Starch in *Spartina alterniflora* rhizomes

Starch is the storage form of carbohydrates in plants. Knowing when plants accumulate starch over time informs us when the plant needs more carbohydrates or has too much carbohydrates. The purpose of this study was to determine the seasonal accumulation of starch in *Spartina alterniflora* rhizomes. Samples were collected from a salt marsh site adjacent to Savannah State University, Savannah, Georgia. Cross sections of the rhizomes were taken, and iodine solution was added

as an indicator to view the starch grains. Photographs were taken using a microscope. The total number of cells in each photograph and the number of cells with starch grains were manually counted. Results from this study were compared with previous data. The major finding of this study was that starch grains were more abundant during the colder seasons than in the warmer seasons. In February, the starch grains had an average of 120 present compared to months like June and August which had an average of 75-80. During late fall, plants are preparing for dormancy so they stored carbohydrates as starch in the rhizomes. In early spring, starch is converted to glucose to provide the energy needed for new growth. Marsh dieback is important to understand because salt marshes play a vital role in our ecosystem, mainly to our coasts, by preventing floods and wave action from the ocean and providing food and shelter for many organisms.

9:15 AM **David Yoskowitz,** Texas A&M University-Corpus Christi Faculty

Sea level rise in Galveston Bay and the impact on coastal ecosystem services

Sea level rise worldwide poses threats to not only built infrastructure but more critically the habitats that provide numerous ecosystem services. For example, wetland losses or marked vegetation changes can result from accelerated sea level rise (Craft et al. 2009; Warren and Niering 1993) which in turn can lead to significant changes in the provision of ecosystem services (Barbier et al. 2011; Brauman et al. 2007; Engle 2011). For the Galveston Bay region in Texas we assess the impact of sea level rise on ecosystem services and the value that people place on them. Our study investigates individuals' preferences for these habitats and the services they provide. We use an attribute based–stated choice survey of individuals in the region (stated preference). Stated preference survey design is said to be consequential, or truth revealing, when the respondent views their answers as having a potential effect on their future utility. We find that, on average, households in the region are willing-to-pay $714 to protect coastal freshwater marsh and $134 for undeveloped upland habitat.

9:30 AM **Richard McLaughlin,** CCME Faculty

Findings of a White Paper on Living with Sea-Level Rise on the Upper Texas Coast

The Harte Research Institute at Texas A&M University – Corpus Christi is working on a multi-year project that will provide an assessment of the impacts of sea-level rise (SLR) on the greater Houston area and upper Texas coast with the goal of providing the knowledge to mitigate and adapt to higher sea level during the next 50-100 years. The assessment involves projecting the geographic changes that SLR is likely to cause, surveying economic impacts on the natural and built environments, and analyzing current policies and laws for coastal zone management that may create barriers or opportunities in respect to adapting to SLR. I propose to present findings on the progress to date of the portion of this study addressing how current policies and laws affect potential options available to the State of Texas and local communities in adapting to SLR. These findings are contained in a report entitled, Living with Sea Level Rise on the Upper Texas Coast: Public Policy Concerns and Opportunities with Comparisons to Florida. This report will be one component in a larger multidisciplinary study and integrated into the project website through hot links and section summaries. In my presentation, I will compare and contrast the likely impacts of SLR on private and public property located on Gulf of Mexico-facing coastal areas compared to bay-facing coastal property. Four case studies will highlight different sets of natural and built environments and community priorities along with the mitigation strategies that may be most appropriate. Finally, I will describe the findings of a survey of local government ordinances and comprehensive plans in Texas and Florida to understand more fully how the two states are currently addressing potential SLR challenges. This survey clearly shows that Texas lags far behind Florida in proactive strategies to deal with SLR at the local and state levels.

9:45 AM **Michelle Dovil,** NCAS-M Graduate Student

Rising Waters: A Critical Analysis of the Risk Perceptions and Place Attachments of Coastal Resident's at Risk for Sea-Level Rise in Maryland

It is not particularly surprising that the world we live in has undergone dramatic changes in the past few decades. These continuous changes have been attributed largely in part to both man-made and natural occurrences. For centuries we have witnessed continents shift, temperatures warm globally, wetlands erode, land submerge, and sea level rise just to name a few. Moreover, with there being little to no chance of these occurrences slowing down this puts particularly vulnerable communities severely at risk. In the United States alone there are over thirty-five coastal communities at risk for sea level rising. According to the Union of Concerned Scientist (2013) sea level rise is changing the dynamics at play along our coasts, and with them our coastal communities, economies, and ecosystems. Furthermore, there remains a gap in disaster literature regarding the influence of risk perceptions and place attachment on vulnerable populations, specifically those at risk for sea-level rise due to climatic changes. This project will present preliminary findings from a pilot study on two coastal communities that are currently at-risk for sea-level rise in Maryland. The goal of this research is to employ a quantitative approach using survey questionnaires to help explain the significant connections and dynamic relationship between vulnerable populations and land. Specifically, during a time where some of the toughest questions both the public and governmental officials will have to face, relies on not only understanding these populations, but also effectively determining how to appropriately handle this social phenomenon.

Concurrent Session III D:
CLIMATE ADAPTATION AND MITIGATION
(BLACKBURN 148/150)

8:30 AM **LaToya Myles**, Deputy Director (NOAA/OAR/ATDD)

9:00 AM **Zachary Moon,** NCAS-M Graduate Student

Modeling the disposition of spectral actinic flux in a mixed deciduous forest canopy

Photolysis rates of molecules such as ozone, nitrogen dioxide (NO2), and formaldehyde are wavelength-dependent, and this dependence varies among chemical species. However, past canopy radiative transfer modeling efforts have considered three main broad bands (UV, visible, and near-IR). Therefore, detailed knowledge of the spectral actinic flux disposition within plant canopies, combined with an in-canopy turbulence model, could significantly improve photolysis rate estimates. Wavelength-resolved radiative transfer models can be used to assess the importance of in-canopy photochemistry in modifying/processing biogenic volatile organic carbon emissions into the overlying atmospheric mixed layer. For many plant-emitted gases (such as β-caryophyllene), the canopy air parcel residence time is similar to the chemical lifetime with respect to oxidation by the hydroxyl radical. The objective of this study is to examine these processing effects, as well as aerosol formation, in the context of the NOAA ARL/ATDD (Air Research Laboratory, Atmospheric Turbulence and Diffusion Division) Atmospheric Chemistry and Canopy Exchange Simulation System (ACCESS), a one-dimensional coupled canopy atmosphere model. The in-canopy photolysis scheme of ACCESS will be modified to include roughly 100 bands, and a simple aerosol formation scheme added. Using such high spectral resolution and corresponding wavelength-dependent leaf optical properties, profiles of spectral actinic flux within a forest canopy will be examined. Results from four different radiative transfer schemes of varying complexity are

compared: Beer–Lambert, two-stream, four-stream, and a multiple scattering scheme. Related past studies have found that aerosol formation is sensitive to the nitrogen oxide regime, as well as the chemical mechanism used, and the results will be evaluated in this light.

9:15 AM **Lekealem Hilary Taku,** Howard University Graduate Student

Statistical analyses between sensitive crop yield and ozone and UV-B

Over the past decades, understanding of the relationship between ozone, ultraviolet V-B and their impact on the ecosystem and human environment has been explored extensively. The annual average background surface ozone concentration [O3] and ultraviolet 'B' radiation are two major surface atmospheric factors that have been increasing yearly leading to stresses such as phytotoxicity and phototoxicity in vegetation and human respectively. Due to the fact that both atmospheric factors have quite similar impacts on sensitive vegetations, lots of research studies have focused only focused primarily on individual impact without clearly distinguishing if a pairing impact exist for both factors on sensitive vegetation based on exposure limit. The objective here is to perform statistical analyses to investigate possible correlation between sensitive crop (e.g. Maize) yield and aforementioned atmospheric factors (ozone and UV-B). The data of interest collected for this study covers a 10-year period limited to vegetation growing seasons (2006 – 2015) and both corn vegetative growth and reproductive development stages will play a key role for the data analysis. Though, ozone and UV-B impacts can be classified as secondary, it will be interesting to look at the key role of micrometeorology during growing season and their key role in crop yield. This approach might be useful to provide significant information of the stressors (ozone and UV-B) daily levels and the frequency that could impact corn yield during growing seasons. As a result, the information gathered might be useful for policy making for O3 control in order to minimize the stressor's impacts during corn growing season. Corn sensitivity threshold limit acquired from experiments is used as a baseline for the trend analysis. From experiment, the ozone critical level

of damage corn 10 ppb, and for UV-B 10 kJ/m2/d. Corn is a typical crop grown at the USDA (United State Department of Agriculture), Beltsville, metropolitan, where the UV-B data is collected and ozone data is collected by MDE (Maryland Department of the Environment) at Beltsville, Maryland.

9:30 AM **Keon Gibson,** NCAS Undergraduate Student

Measuring Solar Coronal Magnetism during the Total Solar Eclipse of 2017

The total solar eclipse on August 21, 2017 provided a notable opportunity to measure the solar corona at specific emission wavelengths to gain information about coronal magnetic fields. Solar magnetic fields are intimately related to the generation of space weather and its effects on the earth, and the infrared imaging and polarization information collected on coronal emission lines here will enhance the scientific value of several other ongoing experiments, as well as benefit the astrophysics and upper atmosphere communities. Coronal measurements were collected during the 2 minute and 24 second totality period from Casper Mountain, WY. Computer-controlled telescopes automatically inserted four different narrow band pass filters to capture images in the visible range on a 4D PolCam, and in the infrared range on the FLIR 8501c camera. Each band pass filter selects a specific wavelength range that corresponds to a known coronal emission line possessing magnetic sensitivity. The 4D PolCam incorporated a novel grid of linear polarizers precisely aligned with the micron scale pixels. This allowed for direct measurement of the degree of linear polarization in a very small instrument with no external moving parts as is typically required. The FLIR offers short exposure times to freeze motion and output accurate thermal measurements. This allowed a new observation of the sun's corona using thermo infrared technology.

9:45 AM **Harold Gamarro,** CREST Graduate Student

Urban WRF- Solar Validation and Potential for Power Forecast in New York City

Recent developments in the Weather Research and Forecasting (WRF) Model have made it possible to accurately approximate solar power through the implementation of WRF-Solar. This study couples the WRF-Solar module with a multi-layer urban canopy and building energy model in New York City (NYC) to create a unified WRF forecasting model called uWRF-Solar. Hourly time resolution forecasts are validated against ground station data collected at eight different sites. The validation is carried out independently for two different sky conditions: clear and cloudy. Results indicate that the uWRF-Solar model can forecast solar irradiance considerably well for the global horizontal irradiance (GHI) with an R squared value of 0.93 for clear sky conditions and 0.76 for cloudy sky conditions. Results are further used to directly forecast solar power production in the NYC region, where a power evaluation is done at a city scale. The outputs show a gradient of power generation produced by the potential available solar energy on the entire uWRF-Solar grid. In total, for the month of July 2016, NYC had a city PV potential of 233 kW/day/m2 and 7.25 MWh month/m2.

Concurrent Session IV A:
WEATHER READY NATION
(BLACKBURN FORUM)

10:15 AM **Ariel Stein**, Research Physical Scientist (NOAA/OAR/ARL)

10:45 AM **Terri Adams,** NCAS-M Deputy Director

As we continue to face increases in risks for weather related disasters, it becomes clear that it is important to unravel how and why people respond to severe weather threats. Response to threats whether they are health, technological, or severe weather are influenced by the perceptions of the observer. Consequently, as we continue to

delve deeply into understanding why people choose to or elect not to take protective actions in the face of weather related threats, it is important to note that culture plays a significant role in how people interpret and respond to the environment around them. Thus, different groups in society may evaluate environmental risks differently depending on their cultural influences (Smith and Leiserowitz, 2013). This project examines the impact of cultural worldviews on perceptions of risk to severe weather events.

11:00 AM **Robert Garrett,** NCAS Undergraduate Student

How GLM Functions with Cloud Optical Depth

The Geostationary Operational Environmental Satellite R-series (GOES-R) is the most recent and more technologically advanced satellite in recent years. The satellite features advancements over current GOES capabilities which include a Geostationary Lightning Mapper that will map total lightning activity continuously day and night with a spatial resolution of 8 kilometers with a refresh rate of less than 20 seconds over the Americas and the surrounding ocean regions. The GLM also measures the radiances at cloud top from all types of lighting. This will not only help in forecasting severe storms, but will also aid in convective weather impacts on aviation safety and efficiency. In this study, we are hoping to find a correlation between cloud optical depth and GLM capabilities of finding lightning if the cloud is optically deep. Also, we are examining different scenarios (thunderstorm, mesoconvective storms, hurricanes, and lightning) to test the performance of GLM in each of those situations. It is known that a rapid increase or "jump" in total lightning associated with vigorous updraft intensification serves as a precursor signature for the occurrence of tornadoes and other severe weathers. With this information GLM can predict where lightning will strike next and plots that data. Flash rate per area and cloud optical depth are the main comparisons being looked at in this study.

11:15 AM **Zhifeng Yang,** Department of Physics, University of Maryland, Baltimore County, Graduate Student

Comprehensive Study on the role of the Chesapeake Bay to ozone pollution in Maryland

Inspired by findings of ozone pollution maxima unaccounted by modeling forecast over Maryland, this study investigates the influence of the Chesapeake Bay on the local ozone concentration through the integration of both surface observation and model simulation. The Weather Research and Forecast model coupled with Chemistry (WRF-Chem) was used to simulate the ozone generation and transportation near the Bay. We also utilized the surface ozone measurements from the Environmental Protection Agency (EPA) Airnow to evaluate the model performance. We conducted a case study on June 3, 2015 with two sensitivity experiments that switched the surface type (land/no water or water) over the Bay, and then analyzed the difference between water and no water simulations. Here we critically look the results from both chemistry and dynamics perspectives. Under the northeastern prevailing wind conditions, the ozone was transported to the western coast from the Bay. The ozone concentration over the Bay increased during both daytime and nighttime, a result of sunlight and bay breeze dynamics. During daytime, with sunlight, more NOx was generated under the higher water vapor concentration condition over water. Then bay breeze transported ozone from the Bay to the west coastal areas and increases the ozone concentration over the downwind regions. Ozone increase of up to 20% on daytime and 5% at night was found because of the Bay dynamics effect. In addition, the boundary layer was higher during daytime due to higher surface temperature and active vertical convection, so ozone was mixed and diluted up to 1.2 km, while that depth dropped to 0.4 km at night. Another interesting result stems from the southern Bay connection to the Atlantic Ocean. This large water border led to stronger bay breeze circulation and more water vapor, which resulted in more ozone generated over the southern Bay.

11:30 AM **Kelly Maria Nunez Ocasio,** Pennsylvania State University/NCAS-M Graduate Student

An Automated Tracking Scheme for Mesoscale Convective Systems-African Easterly Waves Couplets over West Africa and Tropical Atlantic

Waves (AEW) as a couplet. Studies have shown that coupled systems are the main Tropical Cyclone (TC) precursor, however, a complete climatological relation between the AEW-MCS coupled systems is ongoing. It is hypothesized that the MCS embedded to an AEW provide the necessary environmental vorticity for TCs to form, not the AEW by itself. To examine this hypothesis, the first step is the development of a tracking and classification scheme for MCSs. The scheme uses a refine area overlapping technique and the physics equations of motion that detects and tracks an MCS through growth and mature phases to decay. It has four system classes based upon their level of organization. An illustrative case study will be presented. Statistical analysis reveals that this system attains maximum vertical growth in the initiation stage, typical of a Convective Cloud Cluster (CCC) as well as obtaining the highest precipitation accumulation at this time. It also experienced a splitting at the time of its maximum areal extent and highest symmetry, a few hours before termination. Having demonstrated the efficacy of this scheme, the next step is to extend it to compile a climatology of MCSs, examining each with respect to AEWs and subsequent TC development

11:45 AM **Keren Rosado**, NCAS-M Post-Doctoral Fellow

Evaluating the Impact of Grell-Freitas Convective Parameterization into Hurricanes Harvey, Irma, and Maria Simulations using FV3GFS

The National Oceanic and Atmospheric Administration (NOAA) has recently announced the selection of the Finite-Volume on a Cubed-Sphere (FV3) atmosphere dynamical core for its Next Generation Global Prediction System and is now engaged in defining the physics suites to be used in upcoming operational implementations of the FV3-based Global Forecast System (FV3GFS). In this investigation, we tested

and evaluated the Grell-Freitas (GF) convective parameterization for the 2017 Atlantic hurricanes: Harvey, Irma, and Maria. Simulations for each hurricane were initiated four times a day, lasting for 120 hours for their entire life cycle. The impact of the GF physics and its interaction with other members of the FV3GFS physics suites will be addressed relative to observations. Preliminary results show that when a tropical cyclone is simulated using FV3GFS with GF convective parameterization, convective precipitation, as well as the total precipitation values are reasonable alongside observed total precipitation satellite derived from NOAA Climate Prediction Center Morphing Technic (CMORPH). These results were also compared alongside with simulations using FV3GFS with the Simplified Arakawa-Schubert (SAS) convective parameterization. Results of the comparison of these two convective parameterizations show that the tropical cyclone simulated using GF convective parameterization has more convective and total precipitation than the simulation using SAS convective parameterization. The analysis of tropical cyclone forecasts in FV3GFS will provide insight and understanding of the mesoscale and synoptic systems that directly impact track and intensity forecasts, therefore advancing the knowledge of mechanisms associated with forecast model errors.

Concurrent Session IV B:
HEALTHY OCEANS
(BLACKBURN AUDITORIUM)

10:15 AM **Doug Lipton,** Senior Scientist for Economics (NOAA/NMFS)

10:45 AM **Cara Schweitzer,** LMRCSC Graduate Student

Evaluating the Effectiveness of Reflex Action Mortality Predictor (RAMP) in Black Sea Bass, *Centropristis striata*, Bycatch Within the Commercial Trap Fishery

To maintain fisheries sustainability, harvest restrictions (e.g. size limitations) are implemented resulting in bycatch. Fish are discarded back into the ocean to help

ensure that juveniles mature to later contribute to the spawning stock. However, discarded fish can succumb to delayed mortality due to accumulated stress from fishing activity. High delayed mortality rates can impede sustainability efforts. Quantifying reflex impairment is quick and cost-effective method to estimate probable mortality in some species. The objective of this research is to determine the effectiveness of reflex action mortality predictors (RAMP) in black sea bass, BSB; Centropristis striata, to determine delayed mortality of bycatch in the trap fishery. Sublegal BSB were fished and placed in 190 L container filled with 150 L of seawater. Fish were tagged and assessed for presence or absence of barotrauma and reflexes before being placed in a seawater filled vat until processing for all fish was complete. Fish were held in sea cages for up to 10 days to determine delayed mortality. A greater RAMP score was significantly correlated with an increase in mortality rate. This is the first RAMP validation study to predict mortality in BSB and could be a useful approach to quickly predict mortality.

11:00 AM **Halie Ofarrell,** LMRCSC Graduate Student

Evaluation of Environmental Conditions as Predictors for Mako Shark CPUE using Generalized Linear Mixed Modeling and Quantile Regression

Environmental conditions were evaluated for their influence on catch per unit effort (CPUE) of shortfin mako sharks (Isurus oxyrinchus). Standardized catch rates of shortfin mako were calculated from the US pelagic longline observer program (1992-2016) using a generalized linear mixed model (GLMM) with a delta-lognormal approach. The GLMM analysis included consideration of the environmental variables sea surface height, sea surface temperature, and bathymetry as predictor variables. The addition of environmental predictor variables resulted in an index that spans 2003-2012. The two portions of the delta-lognormal approach retained different suites of variables with sea surface temperature and bathymetry retained to predict proportion of positive sets while bathymetry was retained to predict the CPUE

of positive catches. Quantile regression was also performed to evaluate whether environmental variables can predict spatial areas with high CPUE. The results of both the GLMM and quantile regression methods were compared and assessed for their ability to contribute to the production of habitat suitability maps. Comparison showed that quantile regression has the potential to be more informative than the traditional GLMM approach for determining mako distribution and spatial densities.

11:15 AM Chryston Best-Otubu

Concentrations of Heavy Metals in Seawater, Sediments, and Crabs in the Maryland Coastal Bay Areas

Heavy metal pollution can be incredibly detrimental to the biological health of an ecosystem. The ability for heavy metals to bioaccumulate through the food web is what makes them environmentally disastrous. To combat this public health issue in the Maryland Coastal Bays (MCB's), we must see if bioaccumulation is present in the MCB ecosystem, as well as how high the heavy metal concentrations are. It is believed that the concentrations of heavy metals are significantly higher in the warmer months in the more developed sites. This idea would mean that the heavy metal concentrations are lower during the colder months in the more pristine areas. Following the idea of bioaccumulation, the heavy metal concentration will be the highest in the crab hepatopancreas when compared to the sediments and water. First, monthly samples of sediments, water, and blue crabs, *Callinectes sapidus*, were collected from sites in the coastal bays as well as dead-end canals. Sediment samples and crab samples were freeze-dried, then digested using a microwave assisted sample treatment. Water samples were filtered. After being diluted, all samples were analyzed using inductively coupled plasma mass spectrometry (ICPMS) to detect the heavy metal concentrations in them. Looking at the concentrations, it was clear that the crab samples had the highest concentration levels of elements overall when compared to sediment and water samples. On average, the dead-end canal sites were more contaminated than the Maryland Coastal Bay sites. Further studies on heavy metal concentrations in the Maryland Coastal Bays are needed to see if these trends are real levels.

11:30 AM **Aiche Toure**, LMRCSC Graduate Student

Assessment of Factors Affecting the Ingress of Ichthyoplankton into the Maryland Coastal Bays.

The abundance and composition of ichthyoplankton are useful in detecting trends in the population of adults. However, there are biotic and abiotic factors that influence the ingress of ichthyoplankton and affect their long-term growth and survival. My study will examine the abundance and composition of ichthyoplankton at different locations over time; compare these data with a similar study conducted a decade ago; and assess the factors that drive fish egg and larval movement from the nearshore oceanic area into the Maryland Coastal Bays (MBCs) system. I plan to collect ichthyoplankton at locations north and south of the Ocean City inlet. Samples will be collected twice a month during the night on a flood tide using 1 mm mesh with a 1 m wide mouth opening. For each sampling period I will deploy two nets for one hour and preserve the collection in formalin for later identification. The MCBs play an important role in supporting the production of fish and shellfish. Many of the fishes found in the system are estuarine dependent; they spawn offshore during the winter and the eggs and larvae drift through Ocean City and Chincoteague inlets into the MCBs. Unfortunately, like many other coastal lagoon systems, the MCBs face threats from nutrient enrichment and climate change. By comparing the data collected from this study to other efforts I hope to provide some insight into whether or not climate change has affected the composition of ichthyoplankton in the MCBs.

11:45 AM **Erin E Easton,** CCME Post-Doctoral Fellow

Assessing Coral Assemblages Inhabiting Relict Coral Banks off the South Texas Coast

Hermatypic corals flourished on reefs in the Gulf of Mexico in the late Pleistocene to early Holocene. Today, many of these relict reefs are at mesophotic depths and have unique coral assemblages that provide critical habitat. Despite their ecological

importance, the reefs of the South Texas Banks have not been quantitatively surveyed unlike their northern counterparts. Therefore, Blackfish Ridge and Aransas, Baker, Dream, Harte Banks were surveyed by ROV. Coral taxa densities (individuals m^{-2}) were estimated from discrete 30 s video segments. Coral communities were respectively 58-70% and 49-76% similar among terraces and slopes; however, significant differences were observed among banks and between slope and terrace communities except at Harte Bank, where terrace communities did not significantly differ from slope communities at any bank. Pairwise testing indicated significant differences between all terrace communities and between only some slope communities. Differences in coral communities among banks were highly correlated to geographic and geomorphic features including bank area, rugosity, longitude, and number of site components. Connectivity within the GOM basin occurs but the extent and pathway of these connections requires further investigation.

Concurrent Session IV C:
RESILIENT COASTAL COMMUNITIES AND ECONOMIES
(BLACKBURN GALLERY LOUNGE)

10:15 AM **Gary Matlock,** Deputy Assistant Administrator (NOAA/OAR)

10:45 AM **Haydar Kurban,** Howard University NCAS-M and Department of Economics Faculty

Estimating the Economic Value of Weather Forecasts

Disruptions due to weather events can have a serious impact on the amount of economic activity. The weather reporting products offered by the National Oceanic and Atmospheric Association (NOAA) are critical to businesses to prepare and mitigate their losses in increasingly more volatile weather situations. The potential economic impacts of severe weather can amount to millions of dollars and can

have lasting impacts on a local economy. Businesses and consumers have relied on weather forecasts to avoid or minimize their economic loses. To accurately account for the costs and benefits of the short-term and long-term weather forecast products, we develop an empirical methodology for assessing the value of NOAA's forecast predictions from an economic perspective, combining forecast accuracy data with economic damage and other relevant local area specific variables such as gross domestic product and frequency of severe weather events. Our study fills an important gap in the existing economic impact literature which ignores the economic impacts of weather forecasts in economic impact estimations. We specifically incorporate both the role of public perceptions and forecast accuracy into our economic impact analysis. Our analysis provide estimates of the value of information provided by NOAA weather forecast products.

11:00 AM **Andrea Orozco,** Graduate Student

Effectiveness of Public Education at Controlling Nonpoint Source Pollution along the Mosquito Lagoon

Surface runoff is caused by rainfall or floods that can transport pollutants from land into nearby waterbodies. The runoff from waterfront homes and ponds within an estuarine watershed adds direct sources of nutrients and pollutants into the estuarine system. The research goal is to assess and enhance the waterfront communities' perception on their roles in contributing to and controlling nonpoint source pollution. Study area is in the northern part of the Mosquito Lagoon, a sub-lagoon of the Indian River Lagoon, Florida. Approach was to conduct public outreach and education to raise awareness of surface runoff effects on aquatic ecosystems using education exhibits, conducting workshops, and using pre and post surveys on people's knowledge about the problem. Surveys and outreach on knowledge of living shorelines and the public's roles in nonpoint source pollution were conducted in order to assess current knowledge and behaviors by the community in their contribution to non-point source pollution and to measure how exposure to public education helps

change their knowledge and willingness to change their behaviors. Survey data were used to evaluate the public's knowledge against the regional environmental aims, particularly those pursued by "Be Floridian Now". Pre- and post-surveys were given out to the following groups of people: (a) lagoon front homeowners whose property was used in a living shoreline project, (b) homeowners whose retention pond property was used in the same project, (c) people who attended outreach workshops, and (d) people who attended the guided living shorelines tour at the Marine Discovery Center in New Smyrna Beach, FL. Pre and post surveys were conducted to assess effectiveness of the public education on their awareness of factors affecting the health of the lagoon, and their willingness to change the behavior in their yard.

11:15 AM Adeljean Ho, CCME Post-Doctoral Fellow

Implementing Living Shorelines as Tools for Runoff Treatment & Public Education

Living shorelines provide a semi-naturalistic way for researchers to not only educate the public on paramount environmental issues, but to also actively engage residents in the scientific process and foster better citizen-science relationships. Bethune-Cookman University is executing two living shoreline projects on the central-east coast of Florida, specifically in the Indian River Lagoon (IRL) & Halifax River systems: The Mosquito Lagoon Project & the Reed Canal Project. The Mosquito Lagoon project (Environmental Protection Agency funded) consists of creating living shorelines on retention ponds and lagoon-front properties — on both private and public properties — in order to directly engage residents in the process and educate the public on the benefits of these natural systems. The shorelines have been installed at 15 sites (10 lagoon & 5 ponds) within the Mosquito Lagoon (a sub-lagoon of the IRL) watershed, and monitoring is ongoing and will continue for two more years. The Reed Canal Project (Indian River Lagoon – National Estuaries Program funded) consist of constructing a treatment wetland in an existing diversion pond with an outfall canal that drains the urban Daytona Beach and South Daytona areas into the Halifax

River. The goal of this restoration project is to improve existing stormwater discharge management programs within the Reed canal, which receives untreated urban runoff totaling 1,252 acres from the drainage area. Pre-construction monitoring is ongoing, and construction is slated for this spring. This project will create a stormwater treatment wetland using native plants with an added dry pond diversion system. Public education programs for both the Mosquito Lagoon & Reed Canal projects will be conducted to gauge awareness knowledge of stormwater pollution, fertilizer ordinance, and how they impact the estuarine systems.

11:30 AM David Padgett

Technical Assistance in Support of Citizen Science and Community-Based Participatory Research (CBPR) at Five Gulf Coast Region Environmental Justice Communities

The Gulf Coast Historically Black College and University (HBCU) Consortium is a multi-state, multi-institution collaboration the main goal of which is to provide technical assistance to predominantly African American environmental justice stakeholder communities. Community-based participatory geographic information systems (GIS) mapping investigations organized by the Consortium enable residents to visually display local assets, as well as threats to their health and quality of life. The Consortium is partnering with community-based organizations (CBOs) in five Gulf Coast states – the Wedgewood Community, near Pensacola, Florida; the Africatown Community, near Mobile, Alabama; the Lower Ninth Ward Community in New Orleans, Louisiana; the Turkey Creek Community, near Gulfport, Mississippi; and the Pleasantville Community, near Houston, Texas. Faculty researchers representing several HBCUs, including – Texas Southern University, Tennessee State University, Florida A&M University, Alabama A&M University, Jackson State University, and Dillard University - are sharing their expertise with CBO leaders to cooperatively develop citizen-science best practices in order to fully engage stakeholders in collecting critical data. This presentation demonstrates how the Consortium is engaging stakeholders

in citizen-science research, specifically via the NASA-funded and NOAA supported, Global Learning and Observations to Benefit the Environment (GLOBE) program. The GLOBE program has as its primary objective improving science education at the kindergarten through 12th grade level at both formal and informal educational institutions. The GLOBE Atmosphere Protocols include detailed investigations of atmosphere phenomena. Young stakeholders and teachers are engaged in hands-on applications of weather and climate science research methods. Lessons learned by educators, students, and perhaps parents, provide sustainable deliverables beyond the five-year life of the project.

The ultimate goal is to leverage HBCU resources and human capital to assist the resilience and preparedness efforts of Gulf Coast communities vulnerable to, and impacted by, extreme weather events associated with global warming and climate change.

11:45 AM Diana Del Angel, CCME Graduate Student

Socio-Economic Impact of Storm Surge under Projected Sea Level Rise: Spatial Assessment of Communities at Risk

Global sea level is projected to increase by 0.3-1m by the year 2100. Locally, sea level rise (SLR) may be higher due to local geology and coastal processes. In addition, the US coastal population has increased by 39% since 1970, and is expected to increase an additional 8% by the year 2020. These statistics combined raise a concern for the economic cost that SLR and flooding will have on coastal communities. This project estimates the socio-economic impacts of 100- and 500-year storm surge in the Northern Gulf of Mexico under four SLR scenarios, low (0.2m), intermediate-low (0.5m), intermediate-high (1.2m) and high (2m). Impacts were assessed using HAZUS software, a GIS-based modeling tool developed by the Federal Emergency Management Agency to estimates physical, economic, and social impacts of natural disasters such as floods, earthquakes and hurricanes. The HAZUS database integrates demographics, General Building Stock, agricultural statistics, vehicle inventory, essential facilities, transportation systems, and utility systems data. User-defined

inundation scenarios were used to identify areas of inundation, building stock and transportation system damage, number of people displaced, and shelter needs. Model results show that under a high SLR scenario, a 100- or 500-year storm surge can result in an increased in the cost of building damage and the number of displaced people by 100-400%, and an increase in damages to transportation system of 50-80%, as compared to present day. Further, spatial analysis identified areas that will be most affected, as well as new areas that would be affected under the various SLR scenarios. This interdisciplinary project seeks to develop spatially explicit products to communicate the role of natural features for storm surge protection, as well as products for policy development and planning.

Concurrent Session IV D:
CLIMATE ADAPTATION AND MITIGATION
(BLACKBURN 148/150)

10:15 AM **Jose Fuentes**, NCAS-M Faculty

On the air chemistry of the floral scents that bees need to locate flowers

The most common floral scents, that bees need to locate flowers, will be summarized to learn which odors can be readily reacted in polluted air masses. Reactivity of floral scents is included in atmospheric models to determine rates of reactions, traveled distances away from sources, and changes in composition and amounts of the scent bouquet. Model outputs are then employed to estimate the changes in foraging times that bees would experience in environments where the original flower odors are modified by different levels of air pollutants. Results from laboratory studies will be presented and discussed to identify the threshold air pollutant levels that impair the ability of insects to locate flowers. Strategies to minimize the effects of air pollutants in decreasing the quantity and modifying the quality of scent signals to bees will be presented and discussed.

10:45 AM **Ariel Avgi,** CREST Undergraduate Student

The Impact of Concurrent Hot and Dry Extreme Conditions on Global Wheat Production and Trade

Seasonal extreme hot and dry spells in major growing regions may have far reaching impacts on global food production. Observed data suggests that there has been a substantial increase in the number of concurrent droughts and heatwaves over the last fifty years—conditions that prove devastating for crop growth. This study assesses the incidence of concurrent extreme droughts and heatwaves on spring and winter wheat croplands across the world between 1950 and 2014. Maps were produced depicting the global distribution of wheat croplands in the years found to have the greatest number of concurrent extremes using gridded daily surface temperature data and monthly SPEI and PDSI data. By assessing the global distribution of wheat producing locations affected by the most extreme incidents of concurrent hot and dry conditions, we may have a better understanding of (1) the relative effect of extreme weather conditions on wheat yields and (2) the associated large-scale climatic conditions surrounding these events. The results of this study suggest that major wheat producers such as Australia, the United States and Kazakhstan observe a reduction in wheat yield fraction in years where wheat croplands are impacted by concurrent droughts and heatwaves.

11:00 AM **Vitaly Kholodovsky,** NCAS-M/University of Maryland, Department of Atmospheric and Oceanic Science Graduate Student

A New Integrated Threshold Selection Methodology for Spatial Forecast Verification of Extreme Events

Extreme weather and climate events such as heavy precipitation, heat waves and strong winds can cause extensive damage to the society in terms of human lives and financial losses. As climate changes, it is important to understand how extreme weather events may change as a result. Climate and statistical models are often

independently used to model those phenomena. To better assess performance of the climate models, a variety of spatial forecast verification methods have been developed. However, spatial verification measures that are widely used in comparing mean states, in most cases, do not have an adequate theoretical justification to benchmark extreme weather events. We proposed a new integrated threshold selection methodology for spatial forecast verification of extreme events that couples existing pattern recognition indices with high threshold choices. This integrated approach has three main steps: 1) dimension reduction; 2) geometric domain mapping; and 3) thresholds clustering.

We apply this approach to an observed precipitation dataset over CONUS. The dataset is stratified by year and season and the threshold selection algorithm is compared to two test cases, conventional and conditional approaches with fixed threshold. The method offers user the flexibility of selecting a high (or low) threshold that is linked to desired geometrical properties.

The proposed threshold selection methodology automates the threshold selection process and, as added bonus, offers user a flexibility of selecting an extreme threshold that is linked to desired geometrical properties. The algorithm could either complement existing spatial verification methods, or be directly applicable in extreme value theory.

11:15 AM **Chris Lunger,** CREST Undergraduate Student

The Role of Aerosols in Modulating Local Convective Storms in Puerto Rico

While precipitation accumulation in Puerto Rico (PR) is seasonally dependent and largely driven by large scale processes, local thermal and mechanical processes have been found to enhance precipitation on the island. The objective of this study was to quantify the role of aerosols in modulating island-scale convective activity on the western side of the island. Daily precipitation totals were determined for

storms occurring on the island between June 1, 2015 and July 31, 2016 via Advanced Hydrologic Prediction Service (AHPS) data. 322 storms total storms were observed during this period, of which 89 were determined to be localized, convective events. Fifty-three of these localized storms occurred during the summer months. The storms were classified by coverage area as small (< 460 sq. km), medium (461-830 sq. km) and large (831-1620 sq. km). Remote sensing and in-situ data (radiosondes, radar, air sampler, and ceilometer) obtained during the Convection, Aerosol and Synoptic-Effects in the Tropics (CAST) experiment (June 22-July 14, 2015, Feb 6 – 22, 2016, April 24 – May 7, 2016, and June 27 – July 12, 2016), and sun photometer data from the Aerosol Robotic Network (AERONET) were used to characterize aerosol distributions and local atmospheric conditions. Aerosol optical thickness (AOT) and the Angstrom exponent were found to exhibit weak to moderately negative correlations with respect to the total area of storms. These results support the conclusion that aerosols play a lesser role in storm modulation than large and local scale dynamics.

11:30 AM Daniel Yeager, NCAS-M/Howard University Graduate Student

While Saharan dust outflows are known to influence global radiative forcing, there is uncertainty in its direct effects on climate due to the inhomogeneity and evolving composition. The compositional complexity of dust aerosols arises from variations in source region and atmospheric aging processes. Relative to this investigation, a dust signature is defined as a set of chemical, optical, and size distributional characteristics that distinguish a dust storm event. We hypothesize that there may be an identifiable signature from dust events based on source region that may have the potential to serve as a proxy for their radiative forcing effect. The signatures of dust storms over the eastern North Atlantic were analyzed during the 2015 Aerosol Ocean Science Expedition (AEROSE) campaign conducted onboard the NOAA Ronald H. Brown. Dust signatures were identified using a combination of chemical and infrared (IR) spectral analysis. Mineralogical components were deduced by multivariate data analysis of metal concentrations using Inductively Coupled Plasma Mass Spectrometry (ICP-MS) on dust filters that collected based on particle size. The ship-based Marine

Atmospheric Emitted Radiance Interferometer (M-AERI) enabled IR analysis of the suspended mineral dust particulate. Iron enrichment and longwave absorption features were pivotal observations when contrasting various dust air masses sampled during the 2015 AEROSE cruise. Through a combination of dust signature characterization techniques, a foundation for evaluating radiative forcing assessments of dust on North Atlantic heat budgets may be established.

11:45 AM **Sorina Seeley,** University of Alaska Fairbanks, International Arctic ResearchCenter Faculty

An Innovative Education and Workforce Model: Addressing Challenges of Diversity in a Changing Arctic

NOAA Fisheries in Alaska and North Pacific faces unique challenges managing resources in a rapidly changing Arctic. Emerging issues require complex solutions across a wide biogeophysical range, and across diverse and fragmented institutions. To understand and create integrative solutions to these complex problems, a diversity of perspectives, backgrounds, and skills, are needed that match the complexity of the issues. Developing a model that is applicable to a broad geographic scope and many different resource management agencies presents a challenge when developing education and workforce models in Alaska and the West Coast. Additionally, the significance of Traditional Ecological Knowledge to education and workforce needs is highlighted in Alaska and the West Coast. Uniquely, our model unites a network of resource agencies, communities, traditional knowledge holders, and universities involved in marine resource management and education in an interdisciplinary academic and workforce experience model. The program consists of two main components: (1) education and (2) practical work experience internships. This program leverages the strengths of existing programs such as the Alaska Native Science and Engineering Program (ANSEP) which successfully engages students in STEM education. This model connects ANSEP students to NOAA and marine related internships, strengthening ANSEP's science internship component, exposing students to policy, and creating stronger and more direct pathways into marine resource management careers.

The educational component will be co-taught by resource managers, scientists, and Indigenous Knowledge holders. The interdisciplinary approach creates a well-rounded and robust understanding of the complex challenges emerging with climate change and prepares students with the knowledge and skills needed to develop integrative responses. The classes will also be open to NOAA staff participation which will promote interdisciplinary learning and provide continued workforce development opportunities.

Concurrent Session V A:
WEATHER READY NATION
(BLACKBURN FORUM)

9:30 AM **Chris Landsea, PhD**, Science and Operations Officer (NOAA/NWS/NHC)

10:00 AM **Ena Keys**, NCAS Undergraduate Student

The Historic Tornadoes of 2011: A Case Study on Weather Preparedness

The 2011 Super Tornado Outbreak was the largest, costliest, and one of the deadliest tornado outbreaks ever recorded, affecting the Southern, Midwestern, and Northeastern United States. There is no exact science to predicting one of nature's most perplexing phenomena. We often struggle to know how strong a tornado will be, what path it will follow, or how long it will last. So what can be done? We try to implement preparedness measures to insure safety, but the remedy is not so simple. Using the Historic Tornadoes of 2011 National Service Assessment as a case study, this presentation will highlight key situations that may have caused problems during the Super Tornado Outbreak event, and also go into depth about why we continue to struggle with community safety and possible solutions to help address these gaps. This project will also focus on the effectiveness of weather education to communities, communication across Weather Forecasting Offices (WFO) as well as proper planning

in the event of extreme weather events, and improving WFO outreach. Finally, this work will utilize the tactics in the NOAA Risk Communication Best Practices Guide to recommend strategies for addressing gaps in communication practices.

10:15 AM M. Patrick McCormick, PhD, CESSRST Faculty

SAGE III Instrument on the International Space Station

A much-improved Stratospheric Aerosol and Gas Experiment (SAGE III) instrument was launched on February 19, 2017 from NASA's Kennedy Space Center aboard the SpaceX CRS-10 Dragon Spacecraft. It subsequently docked with the International Space Station (ISS), completed commissioning on July 1, 2017, and is now in its Mission Operations phase. SAGE III-ISS will combine the experience and capabilities of its successful predecessor satellite instruments SAM II, SAGE, SAGE II, and SAGE III-Meteor-3M to measure aerosol, cloud, O_3, H_2O, and NO_2 profiles from the upper troposphere through the stratosphere. In addition to solar and lunar occultation with vertical resolutions of about 1.0 km, SAGE III-ISS will make limb scattering measurements on the solar side of each orbit greatly expanding the measurement coverage per spacecraft orbit, and tie the very high resolution and precise solar occultation measurements with the limb scattering measurements, especially those of NOAA's OMPS instrument. The programmable readout array detector enhances its measurement capability and should allow for experimental data products like BrO, and IO, and along with a single photodiode detector, the measurement of larger aerosols. The wavelengths covered by SAGE III-ISS range from 280 to 1050 nm with 1 to 2 nm spectral resolution using a grating spectrometer. The single photodiode extends measurements to 1550 nm. This talk will describe the measurement capabilities of SAGE III, and include early data and validation examples, its additional modes and increased geographical coverage, its calibration and characterization, and data archival and validation approach.

10:30 AM **Steven Buckner**, CESSRST Graduate Student

Validation of OMPS-LP Ozone Measurements and Development of a New NUCAPS A-Priori

The Ozone Mapping and Profiler Suite (OMPS) Limb Profiler (LP) instrument onboard the Suomi National Polar-orbiting Partnership (S-NPP) satellite measures limb-scattered radiances over visible and ultraviolet wavelengths. Efforts have been made to validate OMPS-LP ozone measurements by comparing them with data from the Microwave Limb Sounder (MLS) instrument on the Aura Satellite and with the Stratospheric Aerosol and Gas Experiment III instrument on the International Space Station (SAGE III ISS). This validation effort was made to incorporate OMPS-LP data into the NOAA Unique Combined Atmosphere Processing System (NUCAPS) global profile ozone product as a stratospheric a-priori. NUCAPS is NOAA's new generation processing system, and the ozone product is created using a combination of Cross-track Infrared Sounder (CrIS) data and a climatology derived from ozonesondes. The CrIS data is used for the troposphere part of the profile, while the climatology is used as an a-priori for the stratosphere. It is thought that by instead using OMPS-LP data, in the form of Total Ozone from Assimilation of Stratosphere and Troposphere (TOAST) profiles, as the stratospheric a-priori, the NUCAPS ozone product can be improved. TOAST is a 100-layer global gridded profile ozone product, just as NUCAPS is, and can be created using a combination of both CrIS and OMPS-LP data or just simply OMPS-LP data. This paper examines some of the validation comparisons performed using OMPS-LP data, as well as the structure of the new a-priori as it compares to NUCAPS currently. The validation efforts of OMPS-LP have shown that it compares well with other ozone instruments and that it should help in improving the NUCAPS ozone product.

10:45 AM **Mussie Kebede**, NCAS-M Graduate Student

Evaluation of the North American Mesoscale Model's 10 Meter Wind Speed Forecasts During Cool Season Extratropical Cyclone Events Over the Mid-Atlantic United States

Forecasting non-convective wind speed becomes increasingly difficult the lower one descends into the atmosphere, specifically within the Planetary Boundary Layer (PBL), due to friction caused by vegetation, orographic effects and infrastructure. The goal for this project is to determine if model error is significantly influenced by the urban landscape, and to identify regions along the mid-Atlantic coast of the United States where 10 meter winds associated with Extratropical Cyclones (ECs) were most difficult to predict during the 2014-2015 cool season (October-March). The 12 km North American Mesoscale model (NAM) forecasts are verified using Automated Surface Observing System (ASOS) wind observations, which correlate with documented EC events in time and location. Regression analyses were conducted to determine the relationship between model errors and geographic location. The Ocean City station (KOXB) reported the greatest mean absolute error (MAE) and bias compared to all other stations. The results, consistent with the findings of previous studies, indicate that non-urban and coastal stations had a higher frequency of forecast error compared to stations in urban and inland regions.

Concurrent Session V B:
HEALTHY OCEANS
(BLACKBURN FORUM)

9:30 AM **Ammar Hanif**, Graduate Student, LMRCSC

Identification of Bacterial Communities Associated with Laboratory Cultures of Amphidinium carterae by Metabarcoding

Menhaden are a key forage fish species that serve as a trophic link between the

plankton and piscivorous predators in the marine environment. Menhaden feed by filtering the water column based on size. Stomach content identification is difficult because the organisms are small (5 – 100μm) and easily digested, making traditional microscopic identification often inconclusive and biased. Molecular identification techniques, such as metabarcoding, provide an alternative method for assessing diet diversity and community composition. Here we used metabarcoding, the combination of mass-amplification of short DNA sequences (barcodes) and high-throughput sequencing, to characterize the microbial stomach content of Atlantic menhaden. This aims to give a better understanding of menhaden diet and an estimate of marine microbial diversity.

9:45 AM **Brian Galvez**, Graduate Student, LMRCSC

Diet Analysis of Juvenile Weakfish (Cynoscion Regalis) from the Delaware Bay Using Stable Isotope and Stomach Content Analyses

The weakfish (*Cynoscion regalis*) is a commercially and recreationally valuable fish species that inhabits the Atlantic coast of North America from Florida to Nova Scotia. The weakfish fishery is depleted and has not rebounded despite fishing mortality decreases since 2011. The failure of the fishery to recover has been attributed to elevated rates of natural mortality, the current causes of which are unknown. However, previous studies positively correlated pre-emigrating weakfish with empty stomachs to an increase in natural mortality. The Delaware Bay is one of the primary spawning and nursery habitats of weakfish and supports vast quantities of juveniles prior to their fall emigration to offshore overwintering grounds. Juvenile weakfish were separated into three different size classes that represent ontogenetic shifts in diet (small- 0-60, medium- 60-100, large- 100-137 mm SL). We use stomach content and stable isotope analysis of juvenile weakfish throughout their Delaware Bay residency (May-October) to answer questions regarding prey availability, prey preference, and prey origin (benthic/pelagic, marsh derived or not). We found that mysid shrimp (*Neomysis americana*), gammarid amphipods, zooplankton, and a recently introduced invasive isopod dominated the diet of weakfish throughout the

summer. Stable isotope analysis results revealed significant differences between bay locations along the salinity gradient, species, and size classes. These preliminary results suggest that different size class juvenile weakfish feed at similar trophic levels throughout their estuarine residency, signifying that juvenile weakfish are reliant on invertebrate prey during their time spent in Delaware Bay.

10:00 AM **Paul A. Montagna**, Faculty, CCME

Effect of Freshwater Inflow on Biogeochemistry of Estuaries Across a Climatic Gradient

Hydrology controls inorganic and organic loading to estuaries. There is a climatic gradient along the Texas coast where freshwater inflow varies over 1000 fold within a narrow latitudinal band, providing a natural experiment to examine inflow effects. A 3-year study was performed in four Texas estuaries ranging from meso- to hypersaline to determine how hydrologic changes alter the biogeochemistry within and among the estuaries. Spatial and temporal trends in chlorophyll, dissolved inorganic nutrients, dissolved organic matter, and carbonate chemistry indicate that these estuaries had drastically different biogeochemical signatures. Nutrients and chlorophyll patterns illustrated an emerging paradigm where phytoplankton biomass in positive estuaries is supported by “new” nitrogen from riverine input, while high concentrations of reduced nitrogen (organic, ammonium) still allowed for high chlorophyll in the negative estuary. For carbonate chemistry, a positive estuary receiving river input from a limestone-dominated watershed was well-buffered under moderate to high freshwater inflow conditions. When weathering products were diluted during high flow conditions there is carbonate undersaturation (for aragonite) and decreases in pH. However, “acidification” was not observed in the negative estuary because evaporation concentrated the dissolved species and increased buffering capacity. It is concluded that hydrological changes over spatial gradients are analogous to climatic changes over time, meaning each estuary has a unique biogeochemical signature, and effects of future climate change can be predicted by conducting estuarine comparison experiments.

10:15 AM **Angelica Munguia**, Graduate Student, LMRCSC

Making Connections to Habitats: Feeding Ecology of Juvenile Salmonids During Emigration

In the lower Columbia River Estuary (LCRE), salmon recovery efforts have focused on wetland restoration. Although wetland residence by subyearlings has been well documented, it is less clear how important these habitats are for rapidly migrating species such as yearling Chinook salmon populations. Our goal was to determine if stomach fullness, which provides a relative indication of feeding success, and foraging habits changed as salmon moved through the LCRE, which extends from the lowermost mainstem dam (Bonneville) to the mouth of the estuary. As part of a collaborative effort to evaluate ecological benefits of restoration actions for threatened Chinook salmon in the Columbia River basin, we followed a specific stock to determine if their feeding ecology changes during emigration (April-May). Stomach fullness, diet composition, and primary producers supporting salmon were determined by examining diets and stable isotope signatures ($d^{13}C$ & $d^{15}N$) of tissues (fin and muscle) with relatively fast turnover rates (7 –10 d). In 2016 and 2017, juvenile salmon were collected from three riverine sites using a tow net and at the mouth of the estuary using a purse seine. This presentation will focus on summarizing feeding habits of the Snake River Spring stock. Initial results indicate, on average, salmon collected in 2017 had greater stomach fullness (2016 = 0.86 ± 0.43 SD; 2017 = 1.15 ± 0.53 SD, $p < 0.001$) and higher richness of prey taxa (2016 = 4.25 ± 2.48 SD; 2017 = 6.25 ± 3.57 SD, $p < 0.001$) in their diets compared to 2016 salmon. Salmon also consumed more insects in 2017 than in 2016, with dipterans eaten at 100% of the sites in both years. Further analysis of carbon sources of salmon tissues and stomach contents will provide additional insight on potential benefits and food web linkages to wetland habitats.

10:30 AM **Sarah Nash**, University of Texas Rio Grande Valley Graduate Student

Effects of Heat Stress on Gonadal Functions, Heat Shock Protein Expression and Cellular Apoptosis of American Oyster

Global warming due to climate change is likely to intensify the heat/thermal stress in marine and coastal organisms, affecting their development, growth and reproductive performance. American oyster also called Virginia oyster (*Crassostrea virginica*, a native edible and commercially important marine oyster in the Eastern seaboard and Gulf of Mexico) is an excellent model species in response to global climate change. This marine species is a classic example of how global warming affects organism's normal reproductive functions. In this study, we tested gonadal development, heat shock protein expression and cellular apoptosis in gonad, and coelomic fluid (CF, an important body fluid that helps regulate important physiological functions) pH in American oyster under elevated sea water temperature. Oysters were placed in six different 20-gallon aquariums with various temperatures under controlled laboratory conditions for one week. Two of these aquariums were at a controlled temperature (24^{o}C), followed by two at medium temperature (28^{o}C), and the remaining two at high temperature (32^{o}C). Ten oysters from each aquarium were dissected and sampled for normal histological observations of gonadal functions, immunohistochemical analysis of heat shock protein expression, *in situ* Terminal deoxynucleotidyl Transferase (TdT) dUTP Nick-End Labeling (TUNEL) assay for goandal apoptosis, and also biochemical analysis for coelomic fluid. Oysters exposed to higher temperature showed an increase of heat shock protein expression in eggs of ovary and spermatogenic cells of testis, as well as an increase in cellular apoptosis in gonadal tissues. High temperature also significantly increased pH levels of the coelomic fluid in oyster. Collectively, these results suggest that high temperature has a negative impacts of gonad development and reproductive functions in American oyster.

10:45 AM Kathleen M. Gillespie, Post Doctorial Fellow, IMET

Identification of Bacterial Communities Associated with Laboratory Cultures of Amphidinium carterae by Metabarcoding

In the ocean, dinoflagellates are associated with a microbial community that provides some of their essential nutrients. In the laboratory, most dinoflagellates are cultured in seawater supplemented with nutrients, although little effort has been made to maintain them axenically. This can complicate the study of their physiological processes such as protein synthesis and its modulation. In bacterized cultures of Amphidinium carterae Hulbert, up to 80 % of protein synthetic activity appears to be bacterial based on their responses to inhibitors of protein synthesis. The bacterial community associated with a nonaxenic culture of A. carterae was examined by combining mass-amplification of short DNA sequences encoding 16S rRNA (barcodes) with high-throughput sequencing. The Illumina MiSeq high-throughput sequencing platform was used to sequence 600-1500 bp16S amplicons of the microbial community using universal primers for 16 rRNA genes. The dominant 16S sequences at the phylum level were assigned to Alphaproteobacteria, Rhodobacteraceae, Hyphomonadaceae and Gammaproteobacteria. Axenic cultures, maintained in antibiotic mixtures of kanamycin (50 µg/mL), carbenicillin (100 µg/mL), and streptomycin sulfate (50 µg/mL) (KCS) grew as well as the nonaxenic and to slightly higher cell densities. They showed little evidence of bacterial protein synthesis based on responses to inhibitors of protein synthesis and a dramatically lower bacterial presence. However, over time in culture Proteobacteria, Cyanobacteria, and Actinobacteria gradually emerged, probably reflecting less than adequate sterile technique and less than optimal antibiotics.

Concurrent Session V C:
RESILIENT COASTAL COMMUNITIES AND ECONOMIES
(BLACKBURN GALLERY LOUNGE)

9:30 AM **Jonathan Pennock, PhD**, National Sea Grant Director (NOAA/OAR)

10:00 AM **Owen Thomas Parker**, Graduate Student, CESSRST

Spatial and Temporal Dynamics of Total Column O3 and NO2 in Urban Coastal Regions

Economic development in East Asia has led to a dramatic heightening of industrial activity, population density and energy expenditure in the region. Accurate remote sensing capabilities are crucial for effective ecological management, public health planning and coastal resiliency.

We examined the temporal and spatial dynamics of total column nitrogen dioxide ($TCNO_2$) and total column ozone (TCO_3) over coastal megacities in the Republic of Korea, using OMI-Aura and Pandora spectrometer data from the May 2016 KORUS-AQ campaign. Deployed in both urban centers, rural locations and using boat-mounted sensors, the Pandora network supplied high-resolution data on various air-quality and meteorological metrics, including $TCNO_2$ and TCO_3. Nitrogen dioxide variability in the study site was complex, with high temporal and spatial variability, with nearly all station reporting an hourly coefficient of variance above 30%. Concentration was consistent with near-surface emission from urban areas, and dependent on proximity to population centers, with significant diurnal and weekly patterning. More sparsely-populated areas had lower TCNO2 concentrations, with daily peaks indicating consistent transportation or meteorological influences. Correspondence of Pandora observations with OMI retrievals was low ($R^2 < 0.6$), in-line with ground-level emission of NO_2. Additionally, for 5/8 stations, hourly mean $TCNO_2$ at time of overpass

(~13:30) had a z-score of >0.2, against the daily average, indicating a limitation in OMI's capacity to monitor this ecologically and epidemiologically-important pollutant. TCO_3 variability was much lower than $TCNO_2$ variability, with no stations reporting a coefficient of variance above 10%. Both OMI and Pandora instruments indicated much lower spatial variation, with the highest values observed not in the major population centers of Seoul and Busan, but in rural Amyeon-do, on the western coast of the Korean peninsula, along the Yellow Sea. Correspondence between OMI and Pandora was high ($R^2 > 0.9$), attributable to stratospheric congregation of O_3.

10:15 AM **Mallory Brooks**, Graduate Student, CCME

Evaluating the Effectiveness of Living Shorelines in Mitigating Non-Point Source Pollution and Increasing Soil Carbon Storage in the Mosquito Lagoon Watershed

Increasing populations around the world poses many environmental problems, including increased pollution, natural habitat loss, and increased carbon dioxide entering the atmosphere. Non-point source pollution through runoff and increased atmospheric carbon dioxide are growing problems caused by human activities leading to nutrient pollution, algal blooms, fish kills, hypoxic zones sea level rise, habitat loss and long term climate shifts. Restored salt marshes and living shorelines are constructed to reduce nutrients entering Florida's estuarine waterbodies from non-point sources while storing atmospheric carbon in their sediments and plant tissues. The research goal is to scientifically test living shorelines and restored wetlands designed to employ native Florida vegetation for their efficiency in filtering nutrients from runoff and in carbon storage in their soils. Restored salt marshes and living shorelines are evaluated through in-situ measurements in contrast with dominant turf grass shorelines and undisturbed natural salt marshes. Water quality, vegetation and soil measurements are taken annually at 30 waterfront residential sites. 15 of these sites are living shorelines with native vegetation species, while the other 15 are control sites with turf grass lawns. Vegetation and soil measurements are also obtained to from four restored and undisturbed salt marshes to determine restored shorelines'

role in sequestering carbon in the coastal habitat. Ten stratified samples obtained along the restored salt marsh edges and 20 throughout the entirety of the restored salt marshes. The amount of carbon sequestered by the restored shoreline and entire restored salt marsh will be used to understand future performance of living shorelines.

10:30 AM **Glorimar Torres-Pagan**, Graduate Student, UPRM

Coastal Erosion Assessment using Unmanned Aerial Vehicles (UAVs)

Puerto Rico has been exposed to the impacts of atmospheric events that increase the vulnerability of the coastal zones. Coastal erosion, for example, has been one of the biggest concerns since it can negatively impact coastal communities' ecosystems and our economy. This phenomenon is a natural process that may occur in response to short- and long-term events, such as natural disasters, wave actions, climate changes, tides, and tectonic activities. Since many Puerto Rico's beaches are eroding, it is significantly important to monitor the coastal zones; this is fundamental to understand the morphological changes in coastal environments due to natural and anthropogenic factors. To efficiently monitor the coastal regions, frequent surveys is required to detect and quantify the morphological changes. Using UAVs for coastal monitoring provides great advantages that include relatively low hardware costs, rapid-response deployment, low operating cost, high precision positioning, high level of automation, and high resolution imagery. For this reason the present study focuses on monitoring coastal erosion in four areas distributed along the western region of Puerto Rico coast line using small UAVs based systems. Shoreline changes were monitored and assessed using small UAV high resolution images from 2016. These images served to establish a baseline aerial analysis useful to compare the rate of erosion with historical aerial photographs from 1930 to 2010. Additionally, the Digital Shoreline Analysis System (DSAS) was used to quantify beach erosion by computing the rate-of-change statistics of the coastal zones from multiple historic shoreline positions. The results obtained from the statistical calculations showed an accretion rate of 0.38 m/year for Crash Boat beach and erosion rates of -0.07, -0.45,

and -0.26 m/year for Jobos, Cofresí, and Playuela beaches respectively. These results demonstrate the effectiveness of low cost small UAV surveys as a tool for monitoring the coastal zones.

10:45 AM **Cristin Mayes**, Graduate Student, LMRCSC

Ecosystem Based Approaches to Modeling Fish Species Distributions in Chesapeake Bay

Assessing the viability of commercial fishery stocks benefit from ecosystem-based approaches. Understanding the impacts of harvest on species sustainability require accurate characterizations of species interactions and seasonal fluctuations in environmental conditions. Unfortunately, recent variations in climate have caused reductions in fishery stocks; therefore, additional mechanisms must be considered in population models used for such assessments. This project aims to provide a quantitative analysis of the impacts of increasing sea temperatures on fish species distributions and abundance in the Chesapeake Bay ecosystem. To test our modeling strategies, we initially focus on the black sea bass (Centropristis striata), a protogynous hermaphrodite found in coastal waters of the Atlantic United States. In addition to having the ability to transition from male to female, this species has expanded in distribution during the last decade, thus making it a species of interest. Sea surface temperature will serve as a starting point for simple modeling techniques that, by extension, will serve as a foundation for more complex methods aimed at defining ecosystem-level patterns of fish species distributions within the Chesapeake Bay.

Concurrent Session V D:
CLIMATE ADAPTATION AND MITIGATION
(BLACKBURN ROOM 148/150)

9:30 AM **Roger Pulwarty PhD**, Senior Scientist, Physical Sciences Division, and Co-Chair National Integrated Drought Information System Executive Council NOAA/OAR/ESRL)

10:00 AM **Shadya Sanders**, Graduate Student, NCAS-M

When the Rubber Meets the Road: An Examination of Contextual Factors that Impact the Decisions Made by Emergency Managers During Severe Weather Events

10:15 AM Kafayat Olayinka, Graduate Student, NCAS-M

Cirrus Cloud Climatology in the Polar, Mid-latitude, and Tropical Region

Cirrus cloud play an important role in the atmospheric energy balance and hence in the earth's climate system. The properties of optically thin clouds can be determined from measurements of transmission of the direct solar beam. The accuracy of cloud optical properties determined in this way is compromised by contamination of the direct transmission by light that is scattered into the sensors field of view. With the forward scattering correction method developed by Min et al., (2004), the accuracy of thin cloud retrievals from MFRSR has been improved. Our result shows over 30% of cirrus cloud present in the atmosphere are within optical depth between (1-2). In this study, we do statistics studies on cirrus clouds properties based on multi-years cirrus cloud measurements from MFRSR at ARM site from the South Great Plain (SGP) site due to its relatively easy accessibility, wide variability of climate cloud types and surface flux properties, large seasonal variation in temperature and specific humidity. Through the statistic studies, temporal and spatial variations of cirrus clouds are investigated. Since the presence of cirrus cloud increases the effect of greenhouse

gases, we will retrieve the aerosol optical depth in all the cirrus cloud regions using a radiative transfer model for atmospheric correction. Calculate thin clouds optical depth (COD), and aerosol optical depth (AOD) using a radiative transfer model algorithm, e.g.: MODTRAN (MODerate resolution atmospheric TRANsmission)

10:30 AM **Yoribaldis Olivo**, Graduate Student, CESSRST

Estimating Heat Index in Urban Areas from GOES16 Satellite

The primary objective of this study is to estimate the heat index (HI) in urban areas using remotely sensed satellite measurements. HI is increasingly used to quantify the impact of extreme heat events and is used as early warning indicator. Currently HI is calculated from weather forecast and in-situ measurements, both of which have several inconsistencies. Weather forecasting models employed by National Weather Service do not have any urban parameterizations and their estimates of urban thermal conditions is inaccurate. The in-situ measurements are incapable of representing the spatial variability in temperature and humidity over urban areas. Herein we will use the Geostationary Operational Environmental Satellite16 Series (GOES16) from NOAA to estimate the heat index over urban areas. GOES16 is fitted with an advanced imaging sensor and has faster coverage that provides the capacity to study environmental phenomena and parameters at near-real time scale. The heat index will be estimated by computing relative humidity and temperature. The relative humidity will be obtained using the total precipitable water, air temperature and pressure from GOES-R satellite. These parameters will be compared to currently available remote sensing products from MODIS to verify the validity and accuracy of our results. Additionally, the cities morphological characteristics and NASA's LANDSAT higher spatial resolution thermal imagery will be used to further downscale the GOES16 product. The heat index approximation at high temporal and spatial resolution will be further validated with ground station measurements. We will use New York City as a test case.

10:45 AM **Jennifer Kennedy**, Graduate Student, NCAS-M

Applying Land Surface Data Assimilation to Simulate Days Suitable for Fieldwork

Agricultural production is sensitive to weather variability, including extreme events and climate anomalies that directly damage crops and or hinder field activities. Many farmers rely on past regional conditions to make decisions regarding acreage, crop type, equipment, and resource application. However, such historical estimates neglect local climate variability, as well as the improving capabilities of extended-range and seasonal forecasts. Decision-support tools translating these forecasts into agriculturally-applicable metrics may increase their usability. Here, we develop a method linking meteorological variables from the North American Land Data Assimilation System to historical records of the number of days suitable for fieldwork, to develop statistical criteria of the weather conditions in which agricultural fieldwork can be conducted. We define seasonal state-level workability thresholds across the continental United States, which may in the future be linked to fine-resolution climate model to provide multi-scale forecasts of workable days.

Concurrent Session VI A:
WEATHER READY NATION
(BLACKBURN FORUM)

11:15 AM **Vijay Tallapragada, PhD**, Chief, Modeling and Data Assimilation Branch (NOAA/NWS/EMC/MDAB)

11:45 AM **Cesar Hincapie**, Undergraduate Student, CESSRST

Creating a Hybrid Statistical- Physical Flood Estimation Model for Metropolitan New York City

The increased likelihood of the New York City metropolitan area to flooding is a pressing matter. A comprehensive flood estimation model that can inform regions

at risk of floods (current and future) is constructed and presented. The hybrid model (statistical and physical) incorporates rainfall intensity and duration along with land-use characters. We did this using a combination of radar rainfall data (NEXRAD Stage IV) together with three weather stations (Central Park, JFK, and LGA). The radar data is used as a reference point from which inference is made on the homogeneity of the precipitation throughout the city. The rainfall events are also used to model the surface runoff flow and distribution in to the sewer conveyance system. A comprehensive sewer network is design which takes in to account the topography of the metropolitan area which plays an important role on the way that runoff behaves; ultimately affecting the way water is channeled and transported by the sewer system. The sewer network is created in ArcGIS using publically available data to map out the main interceptors, the catch basins and other infrastructure that will likely influence the flood volume. In addition, a conveyance capacity is giving to the sewer network depending on the characteristics (such as diameter) and other parameters affecting the amount of flow. The study also accounts for the water treatment plants' capacity and the effects of environmental factors such as high tides and explores its relation to increase flooding. The model includes links to drainage areas, peak flows and directions of flow together with the sewer interceptors and its capacity to identify areas of potential flooding.

12:00 PM **Meredith Sperling**, Graduate Student, CESSRST

Remote Sensing Measurements and Characterization Methods to Reduce Wind Power Prediction Uncertainty

Accurate and precise wind turbine energy yield predictions are necessary both for preconstruction justification of wind farm viability and real-time cost-effective power grid balancing. However, a lack of measurements in the offshore turbine rotor layer (40m-250m) and a lack of methods to characterize atmospheric conditions that deviate from expected conditions introduce significant uncertainty into wind power predictions. Available power assessment, wind resource characterization, and turbine

efficiency determination are three individual yet interconnected causes of this wind turbine power prediction uncertainty and the resulting wind farm underperformance bias. During the VERTical Enhanced miXing (VERTEX) campaign, scanning Doppler Wind Lidar was used to collect wind speed and direction data at varying heights in front of an operational coastal turbine. In this work, a systematic method is introduced to evaluate the site-specific power prediction uncertainty associated with a particular power predictor during a given set of atmospheric conditions. Overall, results demonstrate the value of using remote sensing technology to obtain measurements throughout the rotor layer to reduce available power uncertainty as using a Rotor Equivalent Wind Speed (REWS) instead of hub-height wind speed alone reduces power prediction uncertainty. Results also exhibit the importance of a wind profile classification algorithm to reduce wind resource characterization uncertainty as the magnitude of the aforementioned improvement increases as classified wind profiles deviate from expected, near power-law, shapes with low shear. This work elucidates that turbine power is not a function of hub-height wind speed alone; rather, additional atmospheric conditions notably impact wind energy production.

12:15 PM **Adrian Flores**, Research Scientist, Howard University Beltsville

On Saharan Air Layer Stability and Suppression of Convection over the Northern Tropical Atlantic: Case Study Analysis of a 2007 Dust Outflow Event

This study presents an observational case study of a prominent Saharan air layer (SAL) and its propagation over the mid-Atlantic in 2007. Data used in the observational analysis were obtained from the 2007 Aerosols and Ocean Science Expedition (AEROSE), which encountered a major dust outflow event on 13 and 14 May of 2007. Data from this campaign were collected before, during, and after the dust plume, with measurements from onboard instrumentation and radiosondes capturing the dust-front impact on local meteorological parameters. Backscatter distance of the aerosols were confined in the marine boundary layer, with strong backscatter layers within the

3 km height. Aerosol optical depth increased one order of magnitude during the dust front, from 0.1 to 1. Downward solar radiation were also attenuated by 200 W/m^2 and 100 W/m^2 for 13 and 14 of May, respectively. Potential temperature profiles show that during the SAL event there is a weaker gradient at about 500 m and above, indicating a less defined marine boundary layer (MBL). Ambient air temperature of 26^{0}C and 28^{0}C are measured above 500 m the 14 and 15 of May, respectively, reinforcing the temperature inversion and static stability of SAL. Following the passage of the dust front, clear days were observed with a small fraction of shallow capped marine boundary layer clouds dominating the weather pattern. Convective Inhibition (CIN) profile values show the suppression of deep convection development. From 5/14 till 5/18 there is a CIN layer starting to develop at the top of the MLB, and a negative buoyant forcing for the entire free troposphere from 5/17 till 5/22.

12:30 PM **Maurice Roots**, Undergraduate Student, CESSRST

Lidar Signal Simulation and Study

The lidar equation has been simulated and studied for use in retrieving aerosol information from a lidar signal. In this equation, and are the backscatter and extinction of the sample dependent on altitude, *R*, and incident wavelength, . The subscripts of *mol* and *aer* refer to molecules and aerosols. C is the lidar constant and is relative to each instrument. Completing this task of simulation requires computing the lidar equation for different types of aerosols (maritime, clean continental, and urban environments) and wavelengths (355 nm, 532 nm, and 1064 nm). Molecular and aerosol optical properties are both dependent on incident wavelengths. However, molecular optical properties are mostly invariant and can be obtained from atmospheric model. In the tasking of this project, many aerosol and molecular optical properties are simulated; including Mie scattering, aerosol size-distribution with altitude, Mie scattering with altitude, aerosol lidar signal, molecular lidar signal, aerosol lidar signal, and total lidar signal with the complete lidar equation. This work focuses on tropospheric aerosol measurements using the Hampton University lidar

systems to collect air quality and planetary boundary layer observations in support of the CREST Earth System Observing Network. We present the procedures used in developing this simulation and a case study comparing PBL heights measured with the lidar and a radiosonde. This process has been a useful tool in studying the relationships between a lidar signal and Mie scattering, especially for an undergraduate laboratory.

Concurrent Session VI B:
HEALTHY OCEANS
(BLACKBURN AUDITORIUM)

11:15 AM **Dwight Gledhill, PhD**, Deputy Director NOAA's Ocean Acidification Program (NOAA/OAR)

11:30 AM **Patricia Cockett**, Graduate Student, CCME

Every Population Matters: Hotspots of Genome-Wide Genetic Diversity in Hawaiian 'Opihi (Cellana exarata)

Populations with low genetic diversity can be particularly vulnerable to environmental and anthropogenic stressors due to the loss of advantageous mutations. Population genetic theory predicts that genetic diversity will scale with population size. In this study, we use genome-wide surveys of genetic variation in 'opihi (*Cellana exarata*) from the Hawaiian Islands to test for a relationship between genetic diversity and population size. 'Opihi is subject to varying levels of harvesting pressure on different islands, ranging from no harvest on the uninhabited island of Nihoa in the Papahānaumokuākea Marine National Monument (PMNM), to reductions in population size on Maui and Kaua'i, to near extirpation on O'ahu, the most populous of the Hawaiian Islands. Historical 'opihi population sizes (pre-human colonization) are predicted to have ranged from ~1 x 10^6 to 1 x 10^8 and have been reduced by up to four orders of magnitude by harvesting. Contrary to expectations, nucleotide

diversity exhibited a strong negative relationship with historical census population size but was unaffected by harvesting. These results indicate that ‘opihi populations within the main Hawaiian Islands (MHI) are not in equilibrium and have experienced a major bottleneck in pre-human times, followed by a net population expansion. Two alternative explanations are (1) either ‘opihi was extirpated from the MHI and they were recolonized from populations in PMNM or (2) demographic history, migration, and mutation rates have led to a predictable non-equilibrium relationship between diversity and population size. Overall, these results suggest that the ‘opihi in PMNM harbor a stockpile of genomic diversity, despite relatively small population sizes. Depending on the locus, however, every island harbors a genetic diversity hotspot, and management plans should focus on maintaining genetic diversity range-wide.

11:45 PM **Mario Marquez**, Graduate Student, ECSC

Ecosystem Services of Oyster (Crassostrea Virginica) Aquaculture as a Method of Nitrogen Bio-Extraction in Oyster Bay, Florida

Oyster aquaculture is growing to meet consumer demand given the decline of harvestable wild populations. In addition to oysters for consumption, aquaculture operations can contribute to improved water quality, as filter-feeding oysters remove organic matter that can cause low dissolved oxygen conditions, and assist in mitigating nutrient loading from terrestrial runoff. Given their potential utility in removing nutrients that contribute to eutrophication, valuation of aquaculture operations must consider the ecosystem services provided as well as value of shellfish harvested. Oyster aquaculture has been investigated as a best management practice to improve water quality in the northeastern and mid Atlantic regions, but no such data exists for the Gulf of Mexico. Small-scale oyster aquaculture began in Wakulla County, FL in 2014; partnering with recently started aquaculture operations and an aquaculture training program, we assessed water quality and nitrogen bio-extraction over time associated with developing oyster farming businesses in this area. Waters in the area are somewhat eutrophic (total N in summer 0.7-3.0 mg/L) and support

very high oyster growth rates (in 3 months after placement in cages, diploid oysters grew at 12 mm/mo and triploids at 15 mm/mo), suggesting high potential for nutrient sequestration. Oyster rates show significant differences among diploids (0.157 g/day) and triploids (0.234 g/day). Nitrogen extraction by the oysters is being measured by tissue analysis and will be used to parameterize an existing model (Farm Aquaculture Resource Model) and to calculate economic benefits associated with the nutrient removal services.

12:00 PM **Detbra Rosales**, Graduate Student, LMRCSC

Harmful Algae Succession and Vibrio Association in the Delaware Inland Bays

The Delaware Inland Bays (DIBS) are a collection of salt marshes, saltwater creeks, and shallow open waters. Over the years, the ecological health of certain areas in the DIBs has deteriorated because of poor water quality. Historically, oyster reefs were evenly distributed in the DIBS, but oyster disease caused the population to collapse in the 1950s. In 2013, the Delaware State Legislature instructed the Delaware Department of Natural Resources and Environmental Control to create an oyster aquaculture industry. Recent studies have suggested an association between the abundance of phytoplankton and the pathogenic bacterium *Vibrio parahaemolyticus* in the DIBs. The presence of *V. parahaemolyticus, V.vulnificus,* and several harmful algal bloom (HAB) species causes concerns for the proposed aquaculture sites due to environmental and human health risks associated with these organisms. We are examining the areas near proposed aquaculture sites to determine the impacts of water quality and proliferation of pathogenic bacteria on oyster aquaculture. Using a combination of microscopy and MPN-QPCR-based methodologies, we are comparing the HAB community and *Vibrio* spp. in the water column and in *Crassostrea virginica.* In 2017 we were able to identify the presence of many bloom forming algal species such as *Karlodinium veneficum, Dinophysis spp.*, *Heterosigma akashiwo* and *Chattonella subsalsa* in the DIBs. *V. parahaemolyticus* and *V. vulnificus* were also detected in both

environmental samples and *C. virginica*. However, *Vibrio* spp. abundance varied between sites and was positively correlated with temperature. On average nutrient levels were relatively higher at Torquay canal in comparison to other areas in the DIBs. Data on HAB and pathogenic bacteria from both water and oyster samples will be presented, in the context of human health risks at the proposed DIB oyster aquaculture sites.

12:15 PM **Adrianne Wilson**, Graduate Student, LMRCSC

Larval Fish Assemblages in the Gulf of Mexico during the Deepwater Horizon Oil Spill

The Gulf of Mexico is of great economic and ecological importance and contains spawning grounds for a number of commercially and recreationally important fish species. The monitoring of larval fish communities in this area is vital for the effective evaluation of fish stocks. The Deepwater Horizon oil spill in 2010 discharged millions of barrels of crude oil into the Gulf of Mexico and impacted local ecosystems and wildlife. At the time of the spill, knowledge about larval fish species composition and distribution was insufficient. In this study, samples were collected in July 2010 immediately following the spill. Here we describe the composition and spatial structure of larval fish assemblages to provide more information on the ecology of the area at this time. Multivariate analyses were used to examine larval communities and commercially valuable fish populations and to relate these findings to oceanographic patterns (i.e., water types, mesoscale features). The results show low separation among water types and high abundances of Scombridae and Clupeidae families. The Eddy Franklin Core Water (EFCW) was isolated from the Loop Current (LC), causing lower temperatures and higher salinities. Unlike other water types, EFCW contained high abundances of the Gonostomatidae family. Analysis of commercially valuable families showed a high abundance of the Scombridae family, which contains a number of coastal and shelf species.

12:30 PM **Laura Almodóvar-Acevedo**, Graduate Student, LMRCSC

Effect of Temperature on Respiration Rates of Black Sea Bass and Applications in Modeling

Black sea bass (*Centropristis striata*) support important commercial and recreational fisheries and have a wide habitat range that covers a variety of temperatures. This controlling factor is essential in determining the metabolism and general bioenergetics of the fish. A common way to study the physiological state of fish is through their respiration rates, yet black sea bass specific studies have not been published. We measured the temperature effect on black sea bass respiration rates through intermittent-flow respirometry. Standard metabolic rate and active metabolic rate was estimated at three different temperatures: 15°C, 20°C and 25°C, at a constant salinity of 25 ppt. The information obtained from this experiment will be incorporated in growth rate potential model inside a habitat suitability model of the Chesapeake Bay for black sea bass juveniles. This model has previously been used to estimate habitat availability in the bay and had been parameterized with general fish respiration rates. Model will be run again with black sea bass specific respiration rates and results compared. Understanding factors affect the physiology of the fish will also help us understand better their distribution and abundance and how climate change will affect it.

Concurrent Session VI C:
RESILIENT COASTAL COMMUNITIES AND ECONOMIES
(BLACKBURN GALLERY LOUNGE)

11:15 AM Chris Kelble, PhD, Oceanographer (NOAA/OAR/AOML)

11:45 PM Harrison Watson, Undergraduate Student, CCME

Examining Polydora websteri (Annelida: Polychaeta: Spionidae: "Mud Blister Worms") Infestation on Crassostrea virginica to Improve Oyster Farming Methods

Larvae of the mud blister worm *Polydora websteri* (Annelida: Polychaeta: Spionidae: "Mud Blister Worms") usually settle onto mud, rocks, and mollusk shells, but also the shells of the common eastern oyster (*Crassostrea virginica).* As these worms develop, they form burrows within the shell causing damage to the oyster shell, forcing the oyster to expend energy on shell repair and, as a result, infestation often impedes tissue and gonad growth. Furthermore, reduced shell quality often makes it more difficult for oyster famers to sell the oysters on the open market or forces sales well-below market value. Although the relationship between infestations of *Polydora* and reduced oyster quality has been known for decades, few studies explored the variables that impact infestation rates. For this study we examined the relationship between ploidy of oysters (*triploid* oysters, fast growing and lower reproduction rates vs. *diploid* oysters, slow growing and higher reproduction rates) and tidal height (subtidal vs. intertidal) to determine how these factors impact rates of infestation, oyster growth, and oyster recovery following infestation. We tested two hypotheses: 1) triploid oysters will recover faster from infestation than diploid oysters, and 2) oysters in the intertidal height will have a reduced rate of re-infestation than subtidal

oysters. Six hundred adult oysters were deployed, with even distribution between ploidy and tidal height, at Point Aux Pins Oyster Farm May 18th, 2017. Beginning June 13th, 20 oysters were sampled each week over a seven-week period to determine: the number of *Polydora* specimens present per oyster, oyster shell dimensions and total mass, worm burrow density, and shell quality. Due to the persistent rainy weather cycles, salinity levels were consistently lower than average and water levels were consistently higher. Despite these conditions, tidal height was found to significantly impact worm count with intertidal oysters demonstrating a lower worm count than subtidal oysters. While the cause is uncertain, we postulate that this may be a mechanism of intertidal oysters being exposed to the larval worms with less regularity than their subtidal counterparts. This data suggests that oysters kept at intertidal heights may have some protection from infestation and thus, may result in a higher oyster quality. In addition, the utilization of a pre-brine dip was successful in reducing worms counts to <1 worm/oyster and suggests a correlation between salinity and worm infestation densities. While our data support a correlation between infestation rates and salinity, the duration of the study, along with the confounding affects of the below average salinities, require additional studies over longer durations.

12:00 PM **James Gibeaut, PhD**, Faculty, CCME

Effect of Relative Sea Level Rise and Land Cover Change on Future Storm Surge Impacts in the Galveston Bay, Texas Region

Relative sea level rise (RSLR) is a major driver of environmental change along the flat and low-lying Texas coastal plain. Approximately 0.6 m of RSLR has occurred since 1910 in the Galveston Bay region. Hazardous flooding from storm surges and rain events is likely to increase as RSLR and development continues; this study provides an assessment of the effects of future landscapes on storm surge. Hurricane Ike (2008) is used as a representative storm making landfall in 2100. Using the Sea Level Affecting Marshes Model (SLAMM), the possible effects of RSLR on coastal geoenvironment transition under the IPCC's RCP8.5 mean scenario (0.74 m by 2100) was modeled.

The 2100 topographic surface and land cover predicted by SLAMM is used as representative of future elevations and land cover type for input to the coupled Advanced CIRculation (ADCIRC) and Simulating Waves in the Nearshore (SWAN) models used to simulate Hurricane Ike. The coupled ADCIRC + SWAN model is run on the TX2008_R35H computational mesh that extends to the western North Atlantic Ocean, Caribbean Sea and Gulf of Mexico and has element sizes varying from 20 km in the deep ocean to 30 m in the channels and rivers within the Galveston Bay study area. The sea level in 2100 is applied by increasing the initial water level offset from the geoid in the ADCIRC + SWAN model. The storm surge inundation grid obtained from the output of the ADCIRC + SWAN model was input to HAZUS-MH to estimate potential building and infrastructure losses due to Hurricane Ike storm surge in 2100. Initial results indicate that RSLR would cause Hurricane Ike in 2100 to inundate 450 square miles more area and cause 72% more property damage (2010 dollars and development level) than the original 2008 landfall.

12:15 PM **Kirby Bartlett**, Undergraduate Student, EPP USP Cal State Monterrey Bay

Quantifying Long-Term Population Dynamics in Relation to Habitat Reconnection

Pacific salmon (*Oncorhynchus spp.*), commercially, recreationally, and culturally important taxa, have been threatened by habitat fragmentation due to dam construction. The Landsburg Dam, built in the Cedar River, WA fragmented the habitat which salmon use to spawn and rear. In 2003, a fish ladder was added to the dam effectively reconnecting salmon with the upper reaches of the Cedar River for the first time in over 100 years. While salmon are adept at recolonizing suitable habitats, few studies have shown the effects reintroduced salmon populations have on resident fish. This study investigates the effects recolonizing coho salmon (*Oncorhynchus kisutch*) have on resident trout species (*Oncorhynchus mykiss, Oncorhynchus clarki*) in the Cedar River through a 17 year time series analysis. Species populations densities were determined by fish counts collected through snorkel surveys per area snorkeled;

densities were calculated for each reach and for each year sampled to observe spatial and temporal trends. Preliminary evidence suggests coho had a slightly negative impact on resident trout densities. These results could have implications for other fish passage or barrier removal projects.

12:30 PM **Meghan Martinez**, Graduate Student, CCME

Influence of Oyster Reef Restoration on Benthic Infauna and Reef-associated Macrofauna

The Eastern oyster, *Crassostrea virginica*, is an important resource in estuaries along the U.S. Atlantic and Gulf coasts. Oysters perform numerous important ecological functions, including provision of complex three-dimensional habitat for nekton, enhancement of water quality, and protection of shorelines. Anthropogenic activities (pollution via high nutrient input, coastal development, and changes in climate) have contributed to rapid degradation of oyster reefs however, restoration has shown success in ameliorating effects of habitat loss. In summer of 2017, approximately 600 meters of oyster reef were restored using recycled oyster shells in St. Charles Bay, TX. Ecological monitoring is being conducted to quantify the effects of restoration on water quality, oyster recruitment and health, and faunal community metrics for nekton and infauna. Benthic cores and sampling trays are being used to evaluate species abundance, biomass, and diversity compared to reference areas**.** Mantle tissue is being extracted from sub-market and market-sized oysters to assess the presence and prevalence of Dermo disease (*Perkinsus marinus*). We hypothesize that the restored oyster reef will support higher densities of nekton and infauna as compared to unstructured habitat, and that the density and size of oysters on the restored reef will become more similar to reference reefs over time. Results will help us better understand the ecological influence of restored oyster reefs on reef-associated macrofauna and soft-sediment benthic communities.

12:45 PM **Lily Walker**, Graduate Student, CCME

The Effects of Hurricane Harvey on South Texas Coastal Water Quality

On August 25th, 2017, Hurricane Harvey made landfall on the middle Texas coast as a Category 4 hurricane. Intense flooding and storm surge damaged shorelines and coastal infrastructure, making it one of the costliest storms in United States history. High frequency water quality data collected before, during, and after the hurricane were analyzed to determine the effect of Harvey on water quality in two South Texas bays: San Antonio and Baffin Bay. More severe impacts were observed in San Antonio Bay which experienced greater intensity of weather effects. Winds from the storm broke down stratification in San Antonio Bay and briefly reoxygenated coastal waters. Thereafter, stratification and hypoxia developed, with hypoxia lasting for one week and low salinity conditions lasting for over one month. The benthic organisms in this system experienced multi-stressor effects of both wide salinity swings and low oxygen. In contrast to San Antonio Bay, there was little evidence of storm impacts on Baffin Bay other than wind-induced mixing. These findings improve our understanding of the factors influencing hurricane impacts, improving the ability of managers to optimize the resilience of coastal ecosystems to future stressors.

Concurrent Session VI D:
CLIMATE ADAPTATION AND MITIGATION
(BLACKBURN FORUM)

11:15 AM **Ben DeAngelo, PhD**, Deputy Director, NOAA Climate Program Office (NOAA/ OAR)

11:45 AM **Esther Otu**, Undergraduate Student, Howard University

Understanding Bioaerosols in the Atmosphere and Its Effect on Human Health

Particulate matter found in the atmosphere is known to transport living microorganisms that range in size from less than a micrometer to more than one hundred micrometers. At the low end of the size spectrum, some of these microorganisms are small enough to deposit in the bronchi, bronchioles and the alveoli of the human lungs if they are respired and may cause or exacerbate respiratory diseases. In this study, air filters were used to collect ambient particulate matter at the University of Gondar hospital, located in northern Ethiopia in the intensive care unit (ICU) and tuberculosis (TB) wards. More than one hundred size-resolved air filter samples were collected during June and July of 2015 and 2016. This span of two months covers the transition dry season to wet season in northern Ethiopia. The biological materials present on each of the filter were extracted to obtain the DNA concentrations and to identify the specie of microorganism on each filter paper and a function of size and time during the seasonal transition. A portion of each filter paper was also cultured in selective culture media (trypticase soy broth and agar) in order to isolate viable pure colonies of microorganisms. This was done to better understand the distribution and transmission of these microorganisms at the

University of Gondar hospital.

12:00 PM **Katherine Fitzenreiter**, Graduate Student, NSF CREST/LMRCSC

Investigating the relationship between wind forcing and drifter velocities in Maryland's coastal waters

Wind is a major forcing agent that drives circulation and current flow in coastal estuaries. However, little is known about the conditions that enable wind-forcing dominance of circulation dynamics, and thus, gaining a deeper understanding would enhance marine forecasts. The objective of this study was to better understand the role of wind on circulation dynamics in the Maryland Coastal Bays system (MCBs) and the adjacent coastal ocean during different seasons. The ultimate goal was to determine pathways of passive particles within an estuary and the coastal ocean as they drift with prevailing surface currents under the influence of wind forcing. Lagrangian surface drifters were used in this study to represent passive particles such as nutrients, sediments, planktonic larvae, and marine debris, all of which drift passively along with mean surface current flows. Exchange dynamics between the MCBs and the neighboring ocean were studied through the use of these drifters, which were tracked remotely via satellite telemetry. From late March of 2017 through October 2017, sets of drifters were released at the interfaces between the MCBs and coastal ocean and tracked remotely over time. Local wind data was collected in conjunction with drifter location data and analyzed to assess the relationship between wind forcing and drifter velocity. Thus far, a positive linear relationship has been observed between wind speed and drifter speed. Currently, prevailing wind direction and drifter bearing are being compared to assess relationships between those components. By deploying and tracking surface drifters over different seasons, seasonal variability of passive particle pathways is represented. The results of this study can aid future oceanographic studies in understanding seasonal estuarine and oceanic processes, including larval transport and advection of other passive particles such as pollutants and debris in and near the MCBs and other coastal lagoon systems around the world.

12:15 PM **Shan Guruvadoo**, Graduate Student, CCME

Investigating Causes of Changing Tidal Range and Timing in U.S. Harbors

The Center for Operational Oceanographic Products and Services (CO-OPS) collects and disseminates water level, current, and meteorological data from over 200 real time stations along the US coastline. CO-OPS then studies the collected information to make data driven tools that advance a user's understanding of coastal variability and facilitate local preparedness, risk reduction, and response. In an effort to provide the coastal communities and mariners with the most impactful information and products, CO-OPS aims to better understand how changes to an estuary such as dredging, shoreline hardening, geomorphology, and long term sea level rise impact tidal harmonics. The data sets show a gradual change in the timing and amplitude of tide over decades. The goal of this project is to analyze the data at long term stations to determine: (1) how much are each of the five largest constituents (M2, S2, O1, K1, and M4) are changing over time; (2) if these changes correlate with the rise of sea level at each station; and (3) if significant changes in constituent amplitude and phase correlate with dredging events. Hourly water level data at 92 tidal stations were analyzed using harmonic analysis with Matlab package t-tide to examine changes in tidal constituents over observed time. Monthly Mean Sea Level (MSL) and Mean Higher High Water (MHHW) datums were calculated in a running month scheme using the CO-OPS Tidal Analysis and Datums Calculator, then cross-correlated with constituent amplitude at zero lag to examine correlation without temporal variability. Regional patterns of constituent amplitude changes were identified using GIS. Dredging events were correlated with significant amplitude changes using historic coastal survey charts and dredging reports. Long-term trend analysis of tidal constituents will support increased accuracy of sea level rise scenarios, as well as revisions to standard operating procedures of tidal prediction at CO-OPS.

12:30 PM **Kaja Brix**, PhD, NOAA NMFS

Innovative Teaching Model: 'Applied Arctic Climate Problems: From Science to Actionable Policy

The authors developed a class on Arctic Science and Policy that emerged from conversations exploring how educators can better prepare science students (graduate as well as undergraduate) to think about the entire process of transitioning climate research from theory to applications. This course was offered for the first time in Spring 2017 at the University of Alaska Fairbanks and was co-taught by an academic climate expert (Bhatt) from UAF, and a NOAA policy expert (Brix). The learning activities in the class were designed to prepare the students for conducting a team project on applying climate information either to a) Alaska fire weather or b) Marine mammal management in Alaska waters. Our goal was to teach both the scientific and policy theory by uniting the academic and workforce teaching expertise and knowledge spheres. Along with practical activities, we used climate science data to address real world management problems with policy recommendations. With these tools, the students would be able to outline the steps needed to solve a real world practical problem using environmental information.

This class consisted of 10 students (3 undergraduate and 7 graduate) with backgrounds from various science disciplines (atmospheric sciences-3, environmental science-2, geography-1, biology-1, physics-2, science communication-1). The course encouraged questions, discussion, and sharing of knowledge. There were regular quizzes, a midterm and a final project. Classes alternated between climate science and policy, including guest lectures from experts relevant for the project (i.e., stakeholders). This presentation will report on the lessons learned in teaching this course; we hope also to encourage discussion on how students can be better trained for the types of future problems they will encounter in the workplace.

12:45 PM **Ricardo Sakai, PhD**, Senior Scientist, NCAS-M

Upper-air measurements at Howard University, Beltsville Campus

This study will report the upper air research activities at the Howard University Beltsville Campus (HUBC). HUBC has been assembled to probe the upper air meteorological quantities. The research facilities at the HUBC site include instrumentation for launching radiosondes (Vaisala RS92 and RS41, Intermet), ozonesondes, Cryogenic Frostpoint Hygrometer, microwave radiometer, instrumented 30-m flux tower, MFRSR, whole sky camera, ceilometers, backscatter and Raman lidar offering measurements of aerosols, ozone, clouds, and water vapor. Recently, HUBC has been certified as a WMO GCOS Reference Upper Air Network (GRUAN) site, in which careful QC/QA are being performed to assure high accuracy measurements and well characterized uncertainties of pressure, temperature and relative humidity for climate studies. Also, cryogenic frost-point hygrometers and ozonesondes were launched throughout the year. For some of the daytime soundings, a radiosonde was launched at about the same time at NOAA's Sterling facility to understand the spatial variability. Most of these soundings are synchronized with satellite overpasses (NPP and COSMIC) at HUBC site. Comparisons among radiosondes, satellite, and in-situ remote sensing instrumentation will be shown.

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