NOAA Experiential Research and Training Opportunities

2016-2019 Synopsis

NOAA Center for Earth System Sciences and Remote Sensing Technologies

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ADEDOJA ADEYEYE
Cohort 1, M.S.

PROFILE
Adeyeye received his undergraduate degree in Environmental Engineering from Stony Brook University. He interned at the New York State Department of Environmental Conservation. His goal is to develop a science and engineering based understanding of weather prediction and natural disaster prevention.

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EDUCATION
The City University of New York - The City College of New York
01/21/2017 – 06/01/2018
Major: Civil Engineering
Advisors: Dr. Reza Khanbilvardi and Dr. Tarendra Lakhankar

RESEARCH PROJECT: DEVELOPMENT OF URBAN HYDRO-METEOROLOGICAL TESTBED (NY-UHMT) NETWORK FOR NEW YORK CITY

The proposed New York urban Hydro-meteorological Testbed (NY-uHMT) is a one-of-a-kind, dense hydro meteorological network anywhere in the world. The NY-uHMT network consists of 20 autonomous weather stations that will monitor both meteorological and hydrological state around the densely populated NYC area.

The primary goal of the project is to understand the complex land-atmosphere interactions over urban areas. The project will also result in applications that will improve weather/climate forecasting and prediction, aid emergency response and critical decision making. Under this project, the student (Masters) will work on Site selection, Installation, calibration and data processing of urban Hydro-meteorological Testbed (NY-uHMT) sensors to make available to researchers and communities. Students will work on interpolation of meteorological parameters obtained from weather stations to produce gridded maps of temperature and precipitation.

Learn more at: https://www.noaacrest.org/uHMT/
Adedoja Adeyeye

**NERTO PROJECT: INTER-COMPARISON AND VALIDATION OF REMOTE SENSING SATELLITE BASED SOIL MOISTURE PRODUCT**

Location: NOAA/NESDIS/STAR, College Park, MD  
Start and End Date: 06/04/2018 – 08/24/2018  
NOAA Mentor: Dr. Xiwu Zhan

**Synopsis:**  
Significant advances have been achieved in generating soil moisture (SM) products from satellite remote sensing and/or land surface modeling with reasonably good accuracy in recent years. However, the discrepancies among the different SM data products can be considerably large, which hampers their usage in various applications. Nevertheless, understanding the characteristics of each of these SM data products is required for many applications including flood assessment and drought monitoring. Therefore, most accurate soil moisture data products availability resulting in potentially great economic, environmental, and social benefits.

The objective of 12 weeks NERTO research was to estimate bias, accuracy, and reliability of these products, which can be used for validation and improvement for NOAA soil moisture product. This study inter-compares soil moisture products from different remote sensing sensors (Microwave, and Thermal Infrared) and Land surface models with each other, and evaluates them against in situ SM measurements. The intern is expected to join our team for the effort and will understand the soil moisture data processing, statistical comparison, and applications in hydrology and water resources management.

**NERTO OUTCOMES**

Adedeye gained new programming skills in Python, Linux, and Fortran90. He also presented the final results to his project team.

**VALUE OF NERTO TO THE LINE OFFICE**

The objective to the NERTO research was to estimate bias, accuracy, and reliability among soil moisture measurements from different remote sensing sensors. The results are useful to NESDIS for validating and improving NOAA’s soil moisture products.

**SKILLS**

Python, Matlab, R Studio, Linux, Fortran90, Leadership, Mentoring
PROFILE

Banon received her undergraduate degree in Industrial Engineering from UNMSM – Greater National University San Marcos in Lima, Peru. Past internships include time as an Assistant Production Manager at Texfina S.A., a fabric development company also in Lima, Peru. Her research interests include applying remote sensing to study coral reef bleaching in the Caribbean.

linkedin.com/in/ysabelbanon/

EDUCATION

The City University of New York - The City College of New York
02/01/2018 – 12/01/2019 (Expected)
Major: Earth System Science and Environmental Engineering
Advisor: Dr. Kyle McDonald

RESEARCH PROJECT: THERMAL STRESS AND BLEACHING IN CORAL REEF COMMUNITIES DURING THE 2014-2016 CARIBBEAN BLEACHING EVENT

The goal of this research is to analyze the extent to which satellite-based measurement of heat stress conditions in coral systems relate to in-situ coral bleaching observations. It employs data sets produced from NOAA Coral Reef Watch CRW Degree Heat Week (DHW) and compares them with in-situ bleaching observations in the Caribbean coral reefs for the so-called Third Global Bleaching event for 2014, 2015 and 2016. The DHW is derived from the remote sensing data of sea surface temperature (SST), and provides an indicator of the thermal stress for the coral reefs.

Two analyses are necessary. The first analysis involves developing regional groupings of DHW observations by the Virtual Stations. The second analysis consists of a pixel-based assessment of grouped observations each by 0.05-degree pixel (5Km by 5Km). Significant coral bleaching is expected to occur one to three weeks after reefs begin to experience DHW values over 4°C weeks. Mass bleaching and mortality are expected after 8°C weeks. Multi-year datasets are analyzed in more detail for the Florida Keys, where the most complete coral bleaching observations are available, to see how thermal stress varies with bleaching observations for each year across multiple years. This time series analysis includes linear regression and K-means cluster analyses. Preliminary analyses for the K-means showed the distribution of the DHW was noticeable around 5 °Celsius and 67% bleaching. For observations where DHW values > 4°C-weeks, bleaching was expected and confirmed by in-situ bleaching observations.
Ysabel Banon

NERTO PROJECT: THERMAL STRESS AND BLEACHING IN CORAL REEF COMMUNITIES DURING RECENT CARIBBEAN BLEACHING EVENTS

Location: NOAA/NESDIS/STAR, College Park, MD
Start and End Date: 06/10/2019 – 08/30/2019
NOAA Mentor: Dr. Mark Eakin

Synopsis:
The objectives of the project are to:
1. "Advance research with the NOAA Coral Reef Watch 5km daily Degree Heating Week (DHW) data, updating and extending prior results for the Caribbean from 2014-2016.
2. Analyze multi-year datasets in more detail for the Florida Keys region, where the most complete coral bleaching observations are available from among Caribbean locations that provided in-water observations, to see how heat stress varies with bleaching observations for each year and across multiple years. This time series analysis will include linear regression and K-means cluster analyses.
3. Develop an understanding of how heat stress relates to repeated coral bleaching events across multiple years. (Preliminary analyses for the K-means have shown the distribution of the DHW was noticeable around 5° Celsius and 67% bleaching. For observations where DHW values >4° C-weeks, coral bleaching was expected and confirmed by in-situ bleaching observations.)

NERTO OUTCOMES
Banon gained skills with computer modeling and data analysis.

VALUE OF NERTO TO THE LINE OFFICE
Work performed by Banon through the NERTO program contributed directly to improvement of Coral Reef Watch’s (CRW) products by comparing them against in-situ observations of coral across the Caribbean basin. This will enable CRW to better understand how well the current generation of products performed and identify where they need improvement.

SKILLS
ArcGIS, Matlab, ENVI, AUTOCAD, Visual Basic, 40 Hour OSHA HAZWOPER, 10 Hour OSHA Safety Training, Leadership, Customer Service
PROFILE

Buckner graduated from University of Maryland – Baltimore County in 2014 with a B.S in Physics with a minor in Mathematics. His involvement at the Center began in the summer of 2013, when he took part in the Undergraduate Research Opportunity at Hampton University. His summer project, which involved him working with Hampton's Lidar system, enabled him to continue doing his research. He hopes to work on atmospheric ozone at NOAA or a similar organization upon graduation.

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EDUCATION

Hampton University
01/01/2018 – 12/31/20 (Expected)
Major: Atmospheric Science
Advisor: Dr. Patrick McCormick

RESEARCH PROJECT: DEVELOPING AND TESTING NEW A-PRIORI INPUTS FOR NUCAPS OZONE PROFILES USING OMPS LIMB PROFILER OZONE DATA

The NOAA Unique Combined Atmosphere Processing System (NUCAPS) creates high resolution profile products of different atmospheric constituents and properties. The NUCAPS ozone product is made using a combination of Cross-track Infrared Sounder (CrIS) data for the lower atmosphere along with an a-priori of a tropopause-based climatology derived from ozone sondes for the upper atmosphere. It is thought that incorporating data from the Ozone Mapping and Profiler Suite Limb Profiler (OMPS-LP) instrument, which is on the Suomi NPP satellite along with CrIS, as a stratospheric a-priori could help to improve the ozone product. An improved ozone product could be used by the National Weather Service in their forecasting efforts. This project focuses on creating the new a-priori and validating the results against other ozone measuring instruments and techniques, including data from SAGE III-ISS and MLS.
Steven Buckner

**NERTO PROJECT: DEVELOPING AND TESTING NEW A-PRIORI INPUTS FOR NUCAPS OZONE PROFILES USING OMPS-LP OZONE PROFILE RETRIEVALS**

Location: NOAA/NWS/WAKEFIELD WFO, VIRGINIA  
Start and End Date: 09/23/2019 – 12/13/2019  
NOAA Mentor: Michael Dutter

**Synopsis:**
The Ozone Mapping and Profiler Suite (OMPS) Limb Profiler makes measurements of limb-scattered solar radiances over Ultraviolet and Visible wavelengths. These measurements are used in retrieval algorithms to create high vertical resolution ozone profiles to help to monitor the evolution of the atmospheric ozone layer. The NOAA Unique Combined Atmosphere Processing System (NUCAPS) is the new generational processing system for NOAA and creates high vertical resolution profiles of atmospheric parameters; the NUCAPS ozone product is made using a combination of Cross-Track Infrared Sounder (CrIS) data and a tropopause-based climatology derived from ozone sondes. It is hypothesized that incorporating OMPS-LP data as a stratospheric a-priori first guess could improve the product and, subsequently, numerical weather prediction forecasts that use the data. The main objective of this project is to incorporate the NOAA Total Assimilation of Stratosphere and Troposphere (TOAST) product, which uses OMPS-LP data, into the NUCAPS algorithm as a stratospheric a-priori. Estimates of the accuracy and precision will be generated by comparing both the inputs and the resulting product with similar products, such as measurements from the Stratospheric Aerosol and Gas Experiment III on the International Space Station (SAGE III-ISS). The work will also examine the impact of the new ozone information on the NUCAMS temperature retrievals.

**SKILLS**

Lidar analysis, LaTeX, Mentoring
STEPHEN ESCARZAGA
Cohort 1, Ph.D.

PROFILE

Escarzaga received his undergraduate degree in Environmental Science from The University of Texas at El Paso. He received the 2017 VADM Lautenbacher Public Service Graduate Scholarship which supports students studying Earth Systems Science, Engineering, Data Science, Geosciences, and Remote Sensing Technologies. In October 2018, he spent two weeks aboard the E/V Nautilus as a Seafloor Mapping Intern with the Ocean Exploration Trust.

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EDUCATION

The University of Texas at El Paso
05/01/2018 – 05/01/21 (Expected)
Major: Environmental Science & Engineering
Advisors: Dr. Craig Tweedie and Dr. Miguel Velez-Reyes


The goal of this study is to improve the characterization of dynamic Arctic coastlines and near shore areas using a number of novel remote sensing approaches. This study will touch on four areas of current remote sensing technologies and their applications of different coastal zone aspects:

1) Determine how landscape micro topographic changes are coupled to ecosystem changes utilizing a multi-year time series of Terrestrial Laser Scanning data along a section of Chukchi coastal bluff;
2) Optimize a method of automated coastline retrieval and classification for the highly varied coastlines in the Arctic using Barrow, Alaska as a test in order to expedite estimates of coastal erosion;
3) Assess a range of different approaches for satellite derived near shore bathymetry production given the unique challenges highly turbid Arctic waters present;
4) Characterize the optical properties of coastal waters near Barrow to determine the long term changes of terrestrial inputs of carbon to near shore waters using moderate-resolution, historic datasets from Landsat platforms.
Stephen Escarzaga

NERTO PROJECT: DSM PRODUCTION FROM NOAA RSD COASTAL IMAGERY IN ALASKA

Location: NOAA/NOS/NGS, Anchorage, AK
Start and End Date: 05/23/2019 – 08/14/2019
NOAA Mentor: Dr. Nicole Kinsman

Synopsis:
The NOAA Remote Sensing Division has performed extensive aerial collection of semi-oblique and nadir (traditional) georeferenced imagery of Alaska’s coastline in the summers of 2016 and 2017 to serve as a baseline in assessing navigation impacts of future coastal events and informing coastal-zone management. Additional collection is planned for 2018. The 2017 collection, available at: https://geodesy.noaa.gov/storm_archive/alaska/index.html covers more than 50% of the northern Alaska coastline from Kotzebue to the Canadian border. The approximate ground sample distance (GSD) for each pixel of the nadir imagery is 50 cm and forward/aft overlap imagery in the collection creates new opportunities for these data to be processed into Digital Surface Model (DSM) using Structure from Motion (SfM) photogrammetric techniques.

DSM generation with the 2017 imagery can be used to inform new standards for the collection of NOAA airborne digital imagery and the resultant products will be of substantial value to updating shoreline positions, calculating erosion rates, and making volumetric estimates of geomorphic change on Alaska’s North Slope.

SKILLS
PROFILE

Fenner received her undergraduate degree in Biology from California State University San Marcos. Her previous research experience includes biochemical analyses to determine the structure of thin aggregative fimbiae (Tafi) observed in Salmonella. Tafi is thought to play a role in the long-term survival of respective organisms. Following her doctoral studies, her career interests are to further investigate carbon flux in semi-arid shrublands as a research scientist and to become a college professor.

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EDUCATION

San Diego State University
08/28/2017 – 05/30/2021 (Expected)
Major: Ecology
Advisors: Dr. Walter Oechel and Dr. Aram Kalhori

RESEARCH PROJECT: EFFECTS OF STAND AGE AND CLIMATE VARIABILITY ON CO2 AND WATER VAPOR FLUX AND WATER BALANCE IN THE CHAPARRAL OF SOUTHERN CALIFORNIA

As global atmospheric carbon dioxide (CO2) increases due to human activity, it is vital that we create measures to reduce levels of CO2 in the atmosphere. Carbon flux in semi-arid shrublands has rarely been studied using eddy covariance techniques. Semi-arid shrublands, especially old-growth shrub ecosystems, could mitigate the rising levels of CO2 in the atmosphere.

Under normal weather conditions, such ecosystems can become carbon sinks ultimately absorbing the excess levels of carbon in the atmosphere. However, as global temperatures change due to human activity precipitation patterns are likely to change resulting in an increase in drought events. As the prevalence of drought events increase in semi-arid shrubland ecosystems, gaining a better understanding of how these ecosystems act under non-normal weather conditions is key.

In this study, eddy covariance measurements of the net ecosystem exchange (NEE) of CO2 over a 14 to 20-year period were analyzed for three Mediterranean-type chamise (Adenostoma fasciculatum)-dominated chaparral ecosystems in Southern California. Findings from this study may suggest a shift in the carbon source-sink dynamics of these semi-arid chaparral ecosystems.
Andrea Fenner

**NERTO PROJECT: THE EFFECT OF CORAL REEF HEALTH ON THE NEAR SHORE AIR-SEA EXCHANGE OF CO2 IN AMERICAN SAMOA**

Location: NOAA/NOS/NGS, American Samoa Island  
Start and End Date: 06/04/2018 – 08/27/2018  
NOAA Co-Mentors: LTJG Lauren Jarlenski and Dr. Mareike Sudek

**Synopsis:**
National Marine Sanctuary of American Samoa (NMSAS) is composed of six protected areas covering 13,581 miles of nearshore coral reef and offshore ocean waters across the Samoan Archipelago. The sanctuary supports a variety of corals, invertebrates, fish, turtles, marine mammals, and marine plants, as well as hydrothermal vent and deep-water habitats. The Sanctuary Program provides protection of these natural resources through research and education, which foster public understanding and stewardship of this nationally significant marine area.

The objective of this internship is to engage graduate studies in coral reef ecology and ecosystem studies in support of NOAA and NMSAS missions. This project provides the student opportunities to develop field work skills; conduct data collection analyses; enrich themselves in a unique Pacific Island culture; correlate data with current and former studies conducted in American Samoa; and foster a connection with NOAA’s Marine Sanctuary System.

**NERTO OUTCOMES**
Fenner gained new skills in analyzing data using RStudio and learned how to collect water quality samples properly.

**VALUE OF NERTO TO THE LINE OFFICE**
This NERTO contributed supplementary information and research that will support future presentations and program objectives. Additionally, these contributions will facilitate the research and scientific inquiries of other agencies within American Samoa. This collaborative effort enables all parties to elevate their understanding of the marine ecosystems on this small island.

**SKILLS**
Data analysis using R Studio; Water Quality Sample Collection
PROFILE
Fernandez has always been interested in science and engineering. He holds a Bachelor of Science in Physics. He hopes to keep working on analysis wind patterns and develop models for better wind forecasting. He also hopes to keep working on Doppler LIDAR/RADAR development and applications.

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EDUCATION
The City University of New York - The City College of New York
06/01/2017 – 05/01/2018
Major: Electrical Engineering
Advisors: Dr. Fred Moshary and Dr. Mark Arend

RESEARCH PROJECT: WIND LIDAR TECHNOLOGY AND APPLICATION TO ATMOSPHERIC DYNAMICS, WEATHER, WIND ENERGY, AND AIR QUALITY MODELING AND FORECASTING
The project focused on wind Lidar technology and its application to atmospheric dynamics, weather, wind energy, and air quality modeling and forecasting.

NERTO PROJECT: DOPPLER LIDAR PROFILING OF TROPOSPHERIC WINDS AND AEROSOLS WITH APPLICATIONS TO ATMOSPHERIC DYNAMICS, WEATHER, AND AIR QUALITY
Location: NOAA/OAR/ESRL/CSD, Boulder CO
Start and End Date: 06/05/2018 – 08/27/2018
NOAA Mentors: Dr. Alan Brewer and Co-Mentor: Dr. Paul Schroeder

Synopsis:
Advances in Doppler Lidar technologies to study complex land/atmosphere interactions is crucial for applications that require understanding the dynamics of boundary layer phenomena. Doppler Lidar observations made from mobile platforms and the expansion of land-based observational networks can improve the representativeness of the measurements and be used to study spatially variable atmospheric flows. Applications to numerical weather forecasting, wind energy, urban planning, wildfire behaviors, air quality, and urban energy cycles are a few examples where advancements in Doppler wind Lidar technologies can provide added value.

The student is to carry out research to evaluate the performance of an airborne Doppler Lidar using data collected from a NOAA Twin Otter during winter and spring of 2018. His work will include evaluation of internal navigation/guidance data, Doppler Lidar performance and sensitivity, evaluation of different scan scenarios to retrieve horizontal wind profiles.
Aris Fernandez

NERTO OUTCOMES

Fernandez learned/improved his LabVIEW skills. He also learned to handle optical fibers and other optical equipment. He presented the final results to his project team.

VALUE OF NERTO TO THE LINE OFFICE

The NERTO research evaluated the performance of an airborne Doppler lidar using NOAA data. With a better understanding of the complex land/atmosphere interactions that the observations provide, OAR can apply the results to improve numerical weather forecasting.

SKILLS

LabView, Python, Matlab, Java, SQL, Pandas, Lidar, Tutoring, Teamwork
ROBERTO GARCIA
Cohort 3, M.S.

PROFILE

Garcia completed his undergraduate degree as a CESSRST fellow and currently pursuing an MS degree. His interests include using signal processing to extract meaningful information from images that can later be correlated to external data. He hopes to work in academia and use his skills in projects related to remote sensing, signal processing, and computer vision.

https://www.linkedin.com/in/roberto-garcia-bb9317160

EDUCATION

University of Texas – El Paso, TX
01/01/2019 – 12/01/2020
Major: Electrical Engineering
Advisor: Dr. Miguel Velez-Reyes

RESEARCH PROJECT: GOES-16 LEVEL 2 LAND SURFACE TEMPERATURE - FILLING FOR CLOUD MASKED DATA

The GOES-16 -level 2 Land Surface Temperature (LST) product aims to provide hourly remote measurement of the Earth’s surface temperature. The product however, does not calculate values for regions obstructed by clouds, as determined by a cloud mask intermediate product. An analysis will be conducted to fill in the masked pixels by using environmental variables such as elevation and land cover types as well as past temperature behavior over the study areas of southern New Mexico, far west Texas, and northern Chihuahua, Mexico for 2019 spring season.

NERO PROJECT: GOES-R SCIENCE PRODUCT INTERNSHIP

Location: NOAA/NESDIS/OSPO, Suitland, MD
Start and End Date: 06/13/2019 – 09/09/2019
NOAA Mentor: Mathew Seybold

Synopsis:

The project focuses on data or software associated with GOES-R instruments. The intern will experience the science, technology, and culture behind a space mission of major national importance such as GOES-R.

The above tasks allowed Roberto Garcia to develop the skills and experience needed to access, manage and use GOES-R science products and the process to bring these products to the operations theater. He also learned about data analysis and software tools associated with GOES-R instruments. This new in-depth knowledge will contribute to his own research project at NOAA CESSRT, University of Texas at El Paso. In addition, Garcia made professional connections with NOAA-NESDIS and NASA-GSFC and created a foundation for potential employment/internships in NOAA mission enterprise.
Roberto Garcia

**NERTO OUTCOMES**

Garcia had the opportunity to learn about various software and data associated with GOES-R Instruments such as Earth-pointed instruments (ABI imager, GLM lightning), Solar-pointed instruments (SUVI imager, EXIS sensor) and in-situ space environment (SEISS and Magnetometer).

**VALUE OF NERTO TO THE LINE OFFICE**

NESDIS gained insight on how to improve data and software associated with GOES-R instruments.

**SKILLS**

Awareness on various software tools associated with GOES-R Instruments, data analysis.
Equishasha Glenn
Cohort 2, Ph.D.

Profile

Glenn holds a Bachelor’s in Biology, a Bachelor’s in Earth Systems Science and Environmental Engineering, a Master’s in Sustainability in Urban Environments, and a Master’s in Environmental Engineering and Earth System Science all from The City College of New York. Her interests and ongoing research involve the study of climate trends on water resources in the coastal, urban regions, which includes the Caribbean and surrounding region.

[link to LinkedIn profile]

Education

The City University of New York - The City College of New York
09/01/2017 – 06/01/2020 (Expected)
Major: Civil Engineering
Advisor: Dr. Jorge Gonzalez

Research Project: Caribbean Climate Impacts on Water Resources in Surrounding Regions

Caribbean climate has impacts that extend to surrounding regions, especially the U.S. One such impact includes availability of moisture. Moisture availability has many implications for environmental hazards which include, but are not limited to, hurricanes, floods and droughts. These hazards are linked to water security. This research aims to model these events in order to create water management strategies as the region faces these extreme climate changes in the near future.

NERTO Project: Meso-America Hydrology Project: Sea-Surface Temperatures and Land-Atmospheric Influences on Precipitation

Location: NOAA/NESDIS/STAR, College Park, MD
Start and End Date: 08/27/2018 – 12/12/2018
NOAA Mentor: Dr. Tom Smith

Synopsis:

This project analyzed how sea surface temperatures, meteorological, and land surface variations influence precipitation in the Meso-American region, which includes the Caribbean, Gulf region, and surrounding continental areas. The goal is to understand processes well enough to aid prediction of precipitation variations associated with local and large-scale climate variations such as El Niño.

NERTO Outcomes

Glenn learned the fundamentals of atmospheric modeling and data assimilation, multi-variable analysis, and additional analysis tools in Matlab and R. She presented her results at an ESSIC/CICS/NOAA seminar.
Equisha Glenn

VALUE OF NERTO TO THE LINE OFFICE

NESDIS gained a clearer understanding of processes responsible for seasonal to interannual precipitation variations in the inter-American region, including surrounding continental regions. This included an understanding of associations between the Gulf/Caribbean region and the southern U.S. precipitation variations.

SKILLS

Matlab, R Studio, Teaching, Mentoring, Project Management, Public Speaking
ANDREA GOMEZ
Cohort 1, Ph.D.

PROFILE
Gomez received her undergraduate degree in Marine Biology from the University of California, Santa Cruz and a Master’s degree in Biology from the City College of New York. She interned with NOAA in Charleston, SC where she studied corals’ fluorescence and reflectance signatures.

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EDUCATION
The City University of New York - The Graduate Center
09/01/2016 – 05/01/2020 (Expected)
Major: Earth and Environmental Sciences
Advisor: Dr. Kyle McDonald

RESEARCH PROJECT: EVALUATING CORAL RESILIENCY IN PUERTO RICO BY COMPARING IN SITU AND SATELLITE-BASED OCEAN TEMPERATURES AND CORAL-ALGAE ASSOCIATION DYNAMICS

While covering less than one percent of the sea floor, coral reefs are among the most biologically diverse ecosystems on Earth. Tragically, because of climate change-driven rising sea temperatures, most of the world’s reefs are threatened and in decline. For the coral reefs of Puerto Rico, the 2017 hurricane season was particularly devastating. We know that reefs can recover from stress, but recovery is often non-uniform and depends on the duration of the stress. It has been hypothesized that coral-algae symbiont community dynamics and/or environmental variables may relate to spatial irregularities in stress recovery but data are insufficient to quantify and understand these factors.

This dissertation research investigates the relationship between NOAA Coral Reef Watch’s (CRW) 5km satellite-based sea surface temperatures (SST) product and in situ temperature loggers we deployed at Cayo Enrique and Cayo Mario, in La Parguera, Puerto Rico, and seeks to characterize the seasonal changes of the algae symbionts’ identity and density.

Outcomes of this project include novel time-series sea-water temperature measurements collected in situ at varying depths in coral reef communities that help fill the in situ environmental data gap, and statistical analysis of these in situ measurements against NOAA CRW’s 5km satellite-based SST. This research will also further scientists’ understanding of seasonal symbiont shuffling, by conducting qPCR analysis on two Caribbean coral species to identify and compare the symbiont clade and density dynamics seasonally.
Andrea Gomez

**NERTO PROJECT: SATELLITE MEASURED SEA TEMPERATURES AND COMPARISON WITH VERTICAL TEMPERATURE PROFILES NEAR A CORAL REEF ECOSYSTEM IN SOUTH FLORIDA**

Location: NOAA/OAR/AOML, Miami, FL  
Start and End Date: 06/31/2018 – 08/31/2018  
NOAA Mentor: Dr. James Hendee (OAR), Dr. Karsten Shein (NESDIS), & Dr. Mark Eakin (NESDIS)

**Synopsis:**  
Satellite measured sea surface temperatures are different from temperatures measured near the coral reef, but an algorithmic relation can probably be derived if they are different.

**NERTO OUTCOMES**  
Gomez gained field experience deploying temperature loggers, and learned DNA extractions/qPCR analysis for corals.

**VALUE OF NERTO TO THE LINE OFFICE**  
This NERTO project advanced OAR’s knowledge of the role that sea temperatures play in coral growth and bleaching in south Florida. Specifically, the project compared differences between satellite measurements with in situ temperature readings.

**SKILLS**  
MatLab, DNA extractions/qPCR, Mentoring, Leadership
Herrera received his undergraduate and Master’s degrees in Environmental Engineering in from The City College of New York.

EDUCATION
The City University of New York - The City College of New York
02/01/2017 – 05/01/2018
Major: Environmental Engineering
Advisor: Dr. Alex Gilerson

RESEARCH PROJECT: EVALUATIONS OF UNCERTAINTIES OF SATELLITE RETRIEVALS USING AERONET-OCEAN COLOR AND HYPERSPECTRAL IMAGING

The proper interpretation of atmospheric aerosols is critical in the process of the derivation of the water leaving radiances from the Ocean Color (OC) imagery for ocean monitoring. For the current sensors like the Moderate Resolution Imaging Spectro radiometer (MODIS), and the Visible Infrared Imaging Radiometer Suite (VIIRS) atmospheric correction procedures include assumptions about the characteristics of atmospheric aerosol. The discrepancies between satellite and AERONET data are usually significant in coastal areas which are primarily due to the more complex vertical changing atmospheres near the coast than in the open ocean, therefore associated with less accurate atmospheric correction. In-situ data from the AERONET-OC radiometers, at 8 stations around the Northern Hemisphere, are compared to data from the VIIRS, and MODIS sensors. The impact of the wind speed and solar geometry are evaluated on the accuracies in retrieval AOD and Rrs.

NERC PROJECT: MULTI-AND HYPERSPECTRAL ABOVE SURFACE RADIOMETRIC OBSERVATIONS OF THE OCEAN IN VARIOUS ATMOSPHERIC AND OCEAN ENVIRONMENTS

Location: NOAA/NESDIS/STAR, College Park, MD
Start and End Date: 05/01/2018 – 07/21/2018
NOAA Mentor: Dr. Michel Ondrusek

Synopsis:
Accurate retrieval of the water leaving radiance from above water radiometric measurements is a challenging task. The correction for the sky reflection depends on the wind speed, illumination and viewing conditions and atmospheric parameters. Advanced algorithms which take into account aerosol load will be tested and compared with the radiative transfer simulations. The approaches will be further used in the validation of the satellite Ocean Color sensors.
Eder Herrera

NERTO OUTCOMES

Herrera gained new basic coding in languages such as Python, C++, Fortran.

VALUE OF NERTO TO THE LINE OFFICE

NESDIS gained more information on algorithms for calculating water leaving radiance that take into account aerosol loads. Results are useful for validating satellite ocean color sensors.

SKILLS

ArcGIS, AutoCAD, HEC-HMS, Matlab, R Studio
MATTHEW HILDING  
Cohort 2, M.S.

 PROFILE  
Hilding holds a Bachelor’s in Physics from The University of Texas at El Paso. He has prior experience as a geospatial intelligence analyst in the U.S. Army and attended the Measurements and Signals Intelligence (MASINT) course with Intelligence and Security Command (INSCOM) in Washington D.C.

[linkedin.com/in/matthew-hilding-25917140/]

 EDUCATION  
The University of Texas at El Paso  
09/01/2017 – 12/01/2018  
Major: Engineering  
Advisor: Dr. Miguel Velez-Reyes

 RESEARCH PROJECT: TEMPERATURE ESTIMATION FROM LAND SURFACE TEMPERATURE TO ASSESS HEAT ISLAND EFFECTS IN RICHMOND, VA  
Comparison of in-situ air temperature data with satellite derived land surface temperature (LST). Regression model performed to estimate the air temperature from LST.

 NERTO PROJECT: GOES-16 LST DERIVED PRODUCTS FOR URBAN AREAS MULTI-AND HYPERSPECTRAL ABOVE SURFACE RADIOMETRIC OBSERVATIONS OF THE OCEAN IN VARIOUS ATMOSPHERIC AND OCEAN ENVIRONMENTS  
Location: NOAA/OAR/CPO, Silver Spring, MD  
Start and End Date: 06/2018 – 08/2018  
NOAA Co-Mentors: Paul Hirschberg and Hunter Jones

 Synopsis:  
The goal of this research is to improve and further develop and enable the use of remote sensing products from NOAA and NASA for urban-scale health applications, primarily extreme heat and the urban heat island (UHI) effect monitoring.

 NERTO OUTCOMES  
Hilding increased his research on regression algorithm to convert land surface temperature to UHI. In addition, he learned how to write scientific articles for broader audiences.
Matthew Hilding

**VALUE OF NERTO TO THE LINE OFFICE**

This research helped OAR improve and further develop the use of remote sensing products for urban-scale health applications, primarily extreme heat and urban heat island effect monitoring.

**SKILLS**

Operational Planning, FMV, SIGINT, Geospatial analysis for military applications, Intelligence Analysis
PROFILE

Hrisko received undergraduate degrees in Physics and Spanish from University of Delaware and a Master’s degree in Acoustics from Penn State University. His is interested in satellite calibration and validation, general product development, and other areas associated with big data analysis.

linkedin.com/in/joshua-hrisko-1323b759

EDUCATION

The City University of New York - The City College of New York
09/01/2016 – 08/01/2020 (Expected)
Major: Mechanical Engineering
Advisor: Dr. Prathap Ramamurty

RESEARCH PROJECT: QUANTIFYING HEAT STORAGE IN URBAN AREAS

Using GOES-16 satellite remote sensing tools to improve understanding of heat in urban areas and the general surface energy balance in cities.

NERTO PROJECT: GOES-16 LST DERIVED PRODUCTS FOR URBAN AREAS

Location: NOAA/NESDIS/STAR, College Park, MD
Start and End Date: 05/29/2018 – 07/17/2018
NOAA Co-Mentors: Dr. Yunyue Yu and Dr. Peng Yu

Synopsis:
The primary goal of this research is to improve and further develop the NOAA GOES-16 satellite products for land surface temperatures for urban areas, and eventually increase the accuracy of weather prediction models for metropolitan areas.

NERTO OUTCOMES

Hrisko became more proficient in programming using Python. He presented his work in a weekly meeting to a group of researchers in my NOAA research area. He also presented his results at the International Congress on Urban Climate during a satellite training session for the GOES-R satellite.

VALUE OF NERTO TO THE LINE OFFICE

Results from this NERTO help NEDSIS improve and further develop the NOAA GOES-16 satellite products for land surface temperatures for urban areas, and eventually increase the accuracy of weather prediction models for metropolitan areas.

SKILLS

MatLab, ArcGIS, ANSYS, Swift, R Studio, Python, C++, Teaching, Mentoring, Public Speaking
DAMIEN HUDSON
Cohort 2, M.S.

PROFILE
Hudson received his undergraduate and Master’s degrees in Economics and a Bachelor’s in Civil Engineering from The City College of New York. With his background in economics, he plans to use various statistical and/or analytical tools to explain and predict changes in the Earth’s environment and to make an impact on the allocation of resources on Earth.

linkedin.com/in/damien-hudson-ab14a5a7/

EDUCATION
The City University of New York - The City College of New York
06/01/2018 – 05/29/2019
Major: Economics
Advisors: Dr. Nir Krakauer and Dr. Tarendra Lakhankar

RESEARCH PROJECT: AN ANALYSIS OF THE STANDARDIZED PRECIPITATION EVAPOTRANSPIRATION INDEX (SPEI) ON DROUGHT BASED ON ECONOMIC IMPACTS IN THE NORTHEAST (US)

To examine causes of economic and/or environmental distress, it is important to understand drought. Drought is a byproduct of long periods without precipitation, but it is extremely difficult to quantify. The Standardized Precipitation Index (SPEI) has been used in previous studies to analyze droughts which consist of months to years of below normal precipitation. This type of drought is known as meteorological drought. Absence of rainfall could be used as a tool to measure drought, but it does not consider evaporation; hotter and drier air can extract water from soil and plants. Thus, additional models can incorporate groundwater details or particular characteristics of plants.

In the Northeast (United States), studies suggest that there are signs of drought occurrences. This study sought to understand how “good” of a predictor the SPEI is by looking at the northeast to find trends between dryness indication of the SPEI and drought economic impacts. First, the SPEI was formatted to look at trends in drought-intensity-duration-frequency. Second, economic impact data is looked at to find out where there are trends in low production in both crops and business output.
Damien Hudson

NERTO PROJECT: UNDERSTANDING PRECIPITATION AND ECONOMIC ACTIVITY IN THE MISSISSIPPI RIVER CORRIDOR

Location: NOAA/OCFO/PRSS, Silver Spring, MD
Start and End Date: 02/25/2019 – 05/17/2019
NOAA Co-Mentors: Dr. Ayeisha Brinson and Dr. Christopher Lauer

Synopsis:
This project focuses on understanding community vulnerability and resilience to drought; the project is also part of a broader effort to understand drought impacts for communities along the Mississippi River corridor. The student will work with the NOAA Chief Economist team and other project stakeholders in determining scope, formulating research questions, reviewing literature and methods, collecting and analyzing data, and reporting results. The results of this work will help the National Integrated Drought Information System (NIDIS) in their collaboration with the Mississippi River Cities and Towns Initiative (MRCTI).

NERTO OUTCOMES

Hudson applied his literature review skills to the project. He presented his findings to the NOAA group with whom he worked.

VALUE OF NERTO TO THE LINE OFFICE

The results of this research help NOAA understand how drought affects vulnerability and resilience among communities along the Mississippi River.

SKILLS

Python, SQL, R Studio, ArcGIS, MatLab, Public Speaking, Leadership, Customer Service
PROFILE

Iturrino received his undergraduate degree in Instrumentation and Automatic Control from University of Puerto Rico, Mayagüez. He plans to continue his education by pursuing Ph.D.

linkedin.com/in/carlos-iturrino-930480a9/

EDUCATION

**University of Puerto Rico, Mayagüez**

09/01/2017 – 05/29/2019

Major: Electrical Engineering

Advisors: Dr. Heidy Sierra and Dr. Rafael Rodríguez-Solís

RESEARCH PROJECT: ACQUIRING MULTISPECTRAL IMAGES USING A COMMERCIAL CAMERA FOR OCEAN COLOR PRODUCTS

This project focuses on the development of a lens system to capture the spatial as well as the spectral information of an image plane. Reconstruction algorithms are tested for the creation of a multispectral data cube and compared with spectral instruments.

NERTO PROJECT: IDENTIFICATION OF NEW TSUNAMI DETECTION SYSTEM

Location: NOAA/NWS/CTWP, Mayaguez, PR

Start and End Date: 05/15/2019 – 08/01/2019

NOAA Mentor: Ms. Christa von Hillebrandt-Andrade

Synopsis:

The main objective of this project is to study the potential of enhancing CESON capabilities with the use of Optical Remote Sensing (multispectral imaging) in unmanned aerial vehicles (UAV). Optical multispectral imaging is a useful tool for many applications such as soil analysis, crop health monitoring, earth and ocean topography, or even food processing. It is an efficient, noninvasive way of acquiring information with a high area coverage.

However, many of the techniques used today, as whisk broom and push broom, sacrifice efficiency for quality scanning an entire plane to acquire a single multispectral 3D data cube. This process makes it difficult and tedious to acquire dynamic scenes. Additionally, current spectral imaging instruments are expensive and thus restrictive for certain applications and settings.
CARLOS ITURRINO

Synopsis Continued...
In this project we will work on the design, implementation and testing of a compact lightweight multispectral image acquisition system based on compressive sampling principles for UAV deployment using a high definition commercial camera for ocean and earth topographic analysis. The data collected in such instrument can help extend CESON capabilities by integrating it to current efforts to improve effective surface parameterization for improved high resolution satellite aerosol optical depth (AOD) over land for VIIRS, MODIS and GOES-R as well as validating new AOD approaches using LANDSAT data. We will develop multisensor data fusion mechanisms to effectively integrate the data and evaluate the quality of the obtained results against traditional AOD products. We will use historical satellite and UPRM ceilometer data to test the fusion mechanisms, while the Lidar Lab returns to operation.

NERTO OUTCOMES

Iturrino applied his literature review skills to the project. He presented his research in the OneNOAA Seminar Series. He improved his networking and teamwork skills.

VALUE OF NERTO TO THE LINE OFFICE

Results from this NERTO will help improve NWS tsunami alerts by improving existing data collection and interpretation from existing instrumentation.

SKILLS

C, LabVIEW, R Studio, LaTeX, Simulink, Teamwork, Teaching, Public Speaking
Maxfield holds a Bachelor’s degree from Rutgers University in Geography with a minor in Political Science. He also holds a Master’s degree in International Affairs from Universidad Externado de Colombia. His experience includes working as a GIS analyst and as a University Administrator of an Academic Exchange Program.

linkedin.com/in/nicolas-maxfield-a75a748a/

**EDUCATION**

**The City University of New York - The City College of New York**
11/21/2017 – 05/29/2019
Major: Sustainability in the Urban Environment
Advisor: Dr. Indrani Pal

**RESEARCH PROJECT: ASSESSING THE RELATIONSHIP BETWEEN THE STANDARDIZED PRECIPITATION EVAPOTRANSPIRATION INDEX, WATERSHED CHARACTERISTICS, AND HYDROLOGICAL DROUGHT CONDITIONS IN NORTHERN CALIFORNIA**

Drought indices are often based on atmospheric observations, rather than on other hydrologic conditions that more directly affect economic activity and ecosystem function, such as streamflow. We investigate associations between popular meteorological drought indices (e.g. standardized precipitation evapotranspiration index or SPEI) and streamflow in the Pacific Northwest and California hydrologic regions of the United States. This project examines the differences in linear correlation patterns between meteorological drought indices (SPEI) and dry-season streamflow with particular focus on differences between watersheds characterized by different types and magnitudes of human influences, such as agricultural versus urban land uses and dammed versus undammed rivers. In addition, we model flow as a function of SPEI, watershed attributes, including vegetation (using the NDVI), to better understand how the effect of meteorological conditions on local streamflow is mediated by watershed characteristics. This study gives an advanced understanding of how well meteorologically-based indices can identify local drought conditions when used for drought monitoring and early warning efforts and how the impacts of meteorological drought can vary across watershed conditions.
Nicolas Maxfield

NERTO PROJECT: LINKING CLIMATE FORECASTS TO STREAMFLOW AND ECOSYSTEM SERVICES: SOCIAL AND ECONOMIC USES OF SEASONAL PRECIPITATION FORECASTS

Location: NOAA/NMFS/SWFSC, Santa Cruz, CA
Start and End Date: 06/10/2019 – 08/10/2019
NOAA Mentor: Dr. Cameron Speir

Synopsis: The project will develop approaches to model how climate variability and non-stationarities affect streamflow and aquatic habitat conditions in the western United States. Further, this project will analyze how improved climate forecasts can contribute to ecosystem management and human use of water. These approaches will then be used to develop assess policy options to reduce the risk of water shortages (for human and ecosystem uses) and investigate the monetary value of better climate and precipitation prediction ability. The project will be structures as a case study of one or more watershed sin the western United States that contain Endangered Species Act (ESA)-listed populations of Pacific salmonid species. The project will inform management of protected fish populations covered by the NOAA Fisheries’ responsibilities under the ESA.

NERTO OUTCOMES

Maxfield became proficient with programming with R, using statistical analysis tools and mapping. He presented my work to the Economics team at the National Marine Fisheries Service in Santa Cruz.

VALUE OF NERTO TO THE LINE OFFICE

This project helped NMFS develop approaches to modelling how climate variability and non-stationarities affect stream flow and aquatic habitats in the western United States.

SKILLS

R Studio, SPSS, ArcGIS, Public Speaking, Mentoring, Leadership
DAVID MELECIO-VÁZQUEZ  
Cohort 1, Ph.D.

**PROFILE**

Melecio-Vázquez earned dual Bachelor's degrees in Aerospace Engineering and Mechanical Engineering from Rensselaer Polytechnic Institute. He now applies his knowledge in fluid flows studying the boundary-layer in urban canopies.

[linkedin.com/in/dmvaeropbl](https://www.linkedin.com/in/dmvaeropbl)

**EDUCATION**

The City University of New York - The City College of New York  
09/01/2019 – 12/23/2019 (Expected)  
Major: Mechanical Engineering  
Advisor: Dr. Jorge Gonzalez

**RESEARCH PROJECT: HIGH RESOLUTION WEATHER FORECAST MODELING FOR URBAN AREAS**

This project utilizes observations from remote sensing instruments to evaluate forecasts generated from using high resolution (1 km) model output. As computers become faster and more powerful we are able to push the limits of our models to never before seen scales. The goal of the research is thus to provide a quantified assessment of the results of these models to highlight problems and illuminate paths for improvements.

**NERTO PROJECT: IMPROVING THE REPRESENTATION OF URBAN PROCESSES IN THE HRRR MODEL**

Location: NOAA/OAR/ESRL/GMD, Boulder CO  
Start and End Date: 03/04/2019 – 05/17/2019  
NOAA Mentor: Dr. Georg Grell

**Synopsis:**

The project is to assist in the testing and development of the WRF-ARW urban parameterization (BEP-BEM) making it compatible with the RAP/HRRR suite of physical parameterizations. Case studies will be performed to characterize the impact of the urban parameterization on forecast performance. Additionally, the project will seek to improve the computational efficiency of the WRF Urban parameterization, such that parameterization may be considered for operational implementation as a component of future RAP/HRRR upgrades at NCEP.

**NERTO OUTCOMES**

Melecio-Vázquez gained new skills in high performance computing, web programming, and in Microwave Radiometer Retrieval Algorithms. He presented a poster at the 2019 WRF (Weather Research and Forecasting Model) Workshop at the National Center for Atmospheric Research (NCAR).
David Melecio-Vázquez

**VALUE OF NERTO TO THE LINE OFFICE**

The results from the WRF urban parameterization will be integrated into the Rapid Refresh/ High-Resolution Rapid Refresh/HRRR physics suite and its impact on forecast performance tested and documented in case studies.

**SKILLS**

Audio Engineering, Matlab, Python, R Studio, Public Speaking, Mentoring
JESSICA MONTES
Cohort 2, M.S.

PROFILE
Montes earned a Bachelor’s in Biology from San Diego State University. She is motivated to work in climate change research. She is also committed to supporting students from diverse backgrounds and encourage them to get involved with science and technology.

linkedin.com/in/jessica-amaris-montes

EDUCATION
San Diego State University
08/27/2018 – 12/01/2020 (Expected)
Major: Ecology
Advisors: Dr. Walter Oechel and Dr. Aram Kalhori

RESEARCH PROJECT: ASSESSING SOIL CO2 EFFLUXES IN SEMIARID CHAPARRAL SHRUBLANDS
Soil respiration (Rsoil) is the second largest carbon dioxide (CO2) flux in terrestrial ecosystems and it is important in estimating future effects of climate change. Considering semiarid shrublands are significant sinks of CO2, we will study the effects of vegetation microsites, soil temperature, and rainfall events on Rsoil in a chaparral ecosystem in Southern California.

NERTO PROJECT: ASSESSING CARBON DIOXIDE (CO2) FLUXES IN SOUTHERN CALIFORNIA NATURAL SYSTEMS
Location: NOAA/NWS/WFO, San Diego, CA
Start and End Date: 06/24/2019 – 09/13/2019
NOAA Mentor: Dr. Alexander Tardy

Synopsis:
Terrestrial ecosystems play an important role in climate change mitigation. In Southern California there is a high diversity of natural systems, including chaparral, coastal sage scrub, coastal salt marshes, grasslands, and woodlands. It is crucial to clarify if these ecosystems act as CO2 sources or sinks, and how CO2 fluxes have changed throughout time in Southern California for adequate future management. The objective of this internship is to engage graduate studies in CO2 flux data in Southern California natural landscapes in support of NOAA missions.

NERTO OUTCOMES
The results from the WRF urban parameterization will be integrated into the Rapid Refresh/ High-Resolution Rapid Refresh/HRRR physics suite and its impact on forecast performance tested and documented in case studies.
Jessica Montes

VALUE OF NERTO TO THE LINE OFFICE

The NWS in San Diego is now aware of the research done at SDSU’s Sky Oaks Field Station, which opens the opportunity for collaboration, conference presentations, and outreach events.

SKILLS

Python, R Studio, Customer Service, Public Speaking, Leadership
CORRIE MONTEVERDE
Cohort 2, M.S.

EDUCATION
San Diego State University
06/01/2017 – 05/18/2019
Major: Geography
Advisors: Dr. Trent Biggs and Dr. Fernando De Sales

RESEARCH PROJECT: CLIMATE CHANGE IMPACTS ON WINEGROWING REGIONS IN SOUTHERN CALIFORNIA: FROM THE PERSPECTIVE OF A REGIONAL CLIMATE MODEL

This project will use high-resolution regional climate modeling and observational data analysis to estimate winegrape crop suitability changes for Southern California in the near future and the potential effects of global warming on crop yield. Winegrape represents an economically valuable perennial crop and is very sensitive to changes in temperature. Therefore, determining how climate change can impact crop suitability and potential yield is key.

NERTO PROJECT: ANALYSIS OF REGIONAL CHANGES IN EVAPOTRANSPIRATION ON SUB-SEASONAL TO MULTI-YEAR FORECASTING IN SOUTHERN CALIFORNIA WITH SOCIETAL BENEFIT ANALYSIS OF IMPACTS ON HIGH VALUE CROPS (GRAPEVINES)

Location: NOAA/NWS/WFO, San Diego, CA
Start and End Date: 06/01/2018 – 08/31/2018
NOAA Mentor: Dr. Alex Tardy

Synopsis:
This project will use high-resolution regional climate modeling and observational data analysis to estimate winegrape crop suitability changes for Southern California in the near future and the potential effects of global warming on crop yield. Winegrape represents an economically valuable perennial crop and is very sensitive to changes in temperature. Therefore, determining how climate change can impact crop suitability and potential yield is key.
Corrie Monteverde

Synopsis Continued...
Results from the Weather Research and Forecasting (WRF) model coupled with the Simplified Simple Biosphere (SSiB) land surface model will be used to determine past and future suitability, based on climatic indices relevant to winegrape crop. Model simulations will be completed for two periods: 1983-2012 and 2021-2070. The later period will represent a future with increased greenhouse gas (GHG) concentrations of carbon dioxide, methane, and nitrous oxide based on the Representative Concentration Pathway 8.5 (RCP8.5). Global warming impacts on crop yield will be determined through regression analysis of winegrape yield and long-term changes in temperature and precipitation.

This project will provide high-resolution climate data for Southern California and provide future regional suitability analysis for an economically valuable crop. Additionally, information from climate analyses can be used in vulnerability assessments that can inform decision-making to guarantee local resilience to climate change impacts.

NERTO OUTCOMES
Monteverde became familiar with remotely-sensed and observational tower data. She improved her skills working in a Linux-based operating system. She tested MODIS satellite data performance against Eddy Flux Tower data, simulated a historical climate normal with an advanced climate model, and conducted preliminary analysis of geoviticulture indices for a climate-sensitive crop.

VALUE OF NERTO TO THE LINE OFFICE
NWS gained verification of changes in evapotranspiration over the past 30 years in Southern California, which will be used as a benchmark for predicting sub-seasonal to multi-year forecasts.

SKILLS
HDF-EOS data manipulation, RStudio, Regional Climate Modeling
PROFILE

Morales received her Bachelor's degree from UCLA in Geography. She was interested in earth and environmental sciences early on by an AP Environmental Science in high school. She hopes to take advantage of the interdisciplinary nature of geography by combining remote sensing, GIS, and hydrological analysis with social science theory and methods.

linkedin.com/in/gabriela-morales

EDUCATION

San Diego State University
09/01/2018 – 05/22/2020 (Expected)
Major: Geography
Advisor: Dr. Trent Biggs

RESEARCH PROJECT: IMPACT OF THE QUANTIFICATION SETTLEMENT AGREEMENT ON IMPERIAL VALLEY AGRICULTURE

The Imperial Valley in southern California is a highly productive agricultural region that serves as a large source of winter crops on both national and international levels. Situated south of the Salton Sea near the US-Mexico border, the region receives little annual rainfall; high crop productivity is enabled by irrigation with water from the Colorado River. In addition, the Imperial Valley is both the basis for the economy of Imperial County as well as a source of job security and farmer’s livelihood. The enactment of the Quantification Settlement Agreement of 2003 (QSA), however, reduced the volume of water being transported to the Imperial Valley from the Colorado River, which not only may have impacted crop production, but also livelihoods that depend on a now further-limited water supply. This project examines the impact of the QSA.

NERTO PROJECT: EVAPOTRANSPIRATION FORCINGS WITHIN THE COLORADO BASIN RIVER FORECAST CENTER HYDROLOGIC MODEL

Location: NOAA/NWS/Colorado River Basin Forecast Office, Salt Lake City, UT
Start and End Date: 05/28/2019 – 08/20/2019
NOAA Mentor: Ms. Michelle Stokes

Synopsis:
The Imperial Valley in southern California, a highly productive agricultural region serves as a large source of winter crops on both national and international levels. The region receives little annual rainfall; and high crop productivity is enabled by irrigation with water from the Colorado River. The enactment of the Quantification Settlement Agreement of 2003, however, reduced the volume of water being transported to the Imperial Valley from the Colorado River, which not only may have impacted crop production, but also farmer livelihoods that depend on a now further-limited water supply.
Gabriela Morales

VALUE OF NERTO TO THE LINE OFFICE

NWS gained insight into how the National Water Model models evapotranspiration in the Colorado River Basin.

SKILLS

ArcGIS, QGIS, ENVI, Tableau Public, Adobe Photoshop, Video Editing
YO RIBALDIS OLIVO
Cohort 1, M.S.

EDUCATION

The City University of New York - The City College of New York
1/31/2017 – 09/01/2018
Major: Mechanical Engineering
Advisors: Dr. Prathap Ramamurty and Dr. Jorge Gonzalez

RESEARCH PROJECT: ESTIMATING HEAT INDEX FROM GOES-R SATELLITE

With the limited spatial and temporal resolution in satellites approximating relative humidity and heat index is a challenging task. The Geostationary Operational Environmental Satellite-R Series (GOES-R) upgraded imaging and faster coverage provides the capacity to study environmental phenomena and parameters at near-real time scale. The aim of this project is to utilize the GOES-R improved system and advance technology to estimate heat index at a local scale in urban environments. The project will consist on developing algorithms to determine the heat index and validate the results utilizing ground stations ultimately creating a products useful to forecast heat index at an increased spatial and temporal resolution.

NERTO PROJECT: GOES-16 LST DERIVED PRODUCTS FOR URBAN AREAS

Location: NOAA/NESDIS/STAR, College Park, MD
Start and End Date: 05/29/2018 – 08/06/2018
NOAA Mentor: Dr. Yunyue Yu

Synopsis:
The primary goal of this research is to improve and further develop the NOAA GOES-16 satellite products for land surface temperatures for urban areas, and eventually increase the accuracy of weather prediction models for metropolitan areas.

NERTO OUTCOMES

Olivo developed a statistical model for estimating heat index in New York City for which he intends to write a research paper and publish the results. He presented a poster of his work at the 10th International Conference on Urban Climate.
Yoribaldis Olivo

VALUE OF NERTO TO THE LINE OFFICE

Results from this NERTO help NEDSIS improve and further develop the NOAA GOES-16 satellite products for land surface temperatures for urban areas, and eventually increase the accuracy of weather prediction models for metropolitan areas.

SKILLS

C++, RStudio, Python, Minitab, Teaching, leadership, Community Outreach
GUADALUPE ORTEGA
Cohort 3, M.S.

PROFILE

Ortega’s career interest in NOAA is not only to expand her knowledge, including programming and image processing, she also wants to look for a way to help others with research and to look for opportunities to make her career advance professionally.

https://www.linkedin.com/in/Guadalupe-Ortega

EDUCATION

University of Texas, El Paso
1/1/2019 – 12/31/2020
Major: Electrical and Computer Engineering
Advisor: Dr. Miguel Velez-Reyes

RESEARCH PROJECT: GOES-16 LEVEL 2 LAND SURFACE TEMPERATURES - FILLING FOR CLOUD MASKED DATA

The GOES-16 -level 2 Land Surface Temperature (LST) product aims to provide hourly remote measurement of the Earth’s surface temperature. The product however, does not calculate values for regions obstructed by clouds, as determined by a cloud mask intermediate product. An analysis will be conducted to fill in the masked pixels by using environmental variables such as elevation and land cover types as well as past temperature behavior over the study areas of southern New Mexico, far west Texas, and northern Chihuahua, Mexico for 2019 spring season.

NERDO PROJECT: GOES-R SCIENCE PRODUCT INTERNSHIP

Location: NOAA/NESDIS/OSPO, Suitland, MD
Start and End Date: 06/13/2019 – 09/09/2019
NOAA Mentor: Mathew Seybold

Synopsis:

The project focuses on data or software associated with GOES-R instruments. The intern will experience the science, technology, and culture behind a space mission of major national importance such as GOES-R.

The above tasks allowed Ortega to develop the skills and experience needed to access, manage and use GOES-R science products and the process to bring these products to the operations theater. She also learned about data analysis and software tools associated with GOES-R instruments. This new in-depth knowledge will contribute to her own research project at NOAA CESSRT, University of Texas at El Paso. In addition, Ortega made professional connections with NOAA-NESDIS and NASA-GSFC and created a foundation for her potential employment/internships in NOAA mission enterprise.
Guadalupe Ortega

**NERTO OUTCOMES**

Ortega had the opportunity to learn about various software and data associated with GOES-R Instruments such as Earth-pointed instruments (ABI imager, GLM lightning), Solar-pointed instruments (SUVI imager, EXIS sensor) and in-situ space environment (SEISS and Magnetometer).

**VALUE OF NERTO TO THE LINE OFFICE**

NESDIS gained information on how to improve data and software associated with the GOES-R Instruments.

**SKILLS**

Awareness on various software tools associated with GOES-R Instruments, data analysis.
Paredes-Mesa earned a Bachelor’s in Earth System Science and Environmental Engineering from The City College of New York. Her research experience includes studying air pollution monitoring and oil spill remediation. She was an intern at the NYC Department of Environmental Protection as an Environmental Engineer as part of the Water for the Future program in the Bureau of Engineering, Design and Construction.

linkedin.com/in/Stephany-ParedesMesa

**EDUCATION**

**The City University of New York - The City College of New York**

01/27/2017 – 09/01/2018

Major: Civil Engineering

Advisors: Dr. Tarendra Lakhanka and Dr. Peter Romanov

**RESEARCH PROJECT: INTER-COMPARISON AND VALIDATION OF MIRS, MSPPS AND IMS SNOW COVER PRODUCTS**

Snow coverage and snow water equivalent are important to determine water availability in areas where snow melting is the only water source for some communities. Therefore, having a more accurate product that determines those snow parameters is essential for water management decision making.

**NERTO PROJECT: INTERCALIBRATED SATELLITED MICROWAVE WATER VAPOR MEASUREMENTS**

Location: NOAA/NESDIS/STAR, College Park, MD

Start and End Date: 06/04/2018 – 08/24/2018

NOAA Mentor: Mr. Ralph Ferraro

**Synopsis:**

NOAA/NESDIS generates snow cover products from a variety of satellite platforms and missions. Depending on the attributes of the sensor and also the retrieval algorithm, the results can vary, especially over “challenging” surface types such as densely forested and high-altitude regions, to name a few.

In this project, various satellite products on daily time scales will be compared with various reference sources, including in situ and an interactive snow cover product known as IMS - Interactive Multi-sensor snow and ice mapping systems.

**NERTO OUTCOMES**

Paredes-Mesa finished the comparison of MIRS and MSPPS microwave snow cover products and determined the percentage of error that terrain has on their reading. This experience strengthened her MATLAB skills. She also learned the fundamentals of other programming languages.
Stephany Paredes-Mesa

VALUE OF NERTO TO THE LINE OFFICE

Results of this research helped NESDIS improve snow cover products from a variety of satellite platforms and missions.

SKILLS

C++, Matlab, Data Analysis, Customer Service, Public Speaking, Teaching
OWEN PARKER
Cohort 1, M.S.

PROFILE
Parker’s long-term career goal is to work at the Federal level, to better understand and either provide research support, or consultation, on how best to protect the North Atlantic Corridor from degradation of air and water resources. He earned a Bachelor’s degree in Biology from Goucher College.

EDUCATION
The City University of New York - The City College of New York
02/01/2017 – present
Major: Geology
Advisor: Dr. Maria Tzortziou

RESEARCH PROJECT: ASSESSING SPATIOTEMPORAL VARIABILITY IN AIR POLLUTION IN URBAN COASTAL REGIONS
The project is focused on variability in anthropogenic trace gases above urban coastal environments. Specifically, NO₂ and O₃ above the southern Korean peninsula, and above the Baltimore/DC area of the Chesapeake Bay. The work can identify where and when anomalous events occur.

RESEARCH PROJECT: SURFACE AND TOTAL COLUMN NO₂ DYNAMICS IN URBAN COASTAL REGIONS
Location: NOAA/OAR/ARL College Park, MD
Start and End Date: 02/05/2018 – 04/27/2018
NOAA Mentor: Dr. Winston Luke

Synopsis:
This project will focus on measurements of atmospheric variability in coastal areas, using various in-situ and remote sensing sensors. Specifically, one of the objectives is to deploy sensors at fixed locations across coastal regions, as well as onboard research vessels and moving platforms, to assess spatial and temporal (diurnal and seasonal) dynamics in atmospheric traces gases (NO₂ and O₃) over estuarine and coastal waters, as well as across the land-ocean interface. Measurements will be performed in coastal regions characterized by different levels of atmospheric pollution, including the Chesapeake Bay estuary. Results will be compared with measurements of atmospheric nitrogen pollution performed as part of NOAA ARL (Air Resources Laboratory) field activities.

NERTO OUTCOMES
Parker can now use advanced computer modelling system to monitor air-packet trajectories. He can provide maintenance and near-real-time informatics support for field-deployed assets.
Owen Parker

VALUE OF NERTO TO THE LINE OFFICE

Results from this research helped OAR assess spatial and temporal (diurnal and seasonal) dynamics in atmospheric traces gases (NO₂ and O₃) over estuarine and coastal waters, as well as across the land-ocean interface.

SKILLS

RStudio, Air quality data collection, Public Speaking
ADRIAN PEÑA
Cohort 3, M.S.

EDUCATION

The City University of New York - The City College of New York
09/01/2018 – 06/01/2020 (Expected)
Major: Earth Systems and Environmental Engineering
Advisors: Dr. Reza Khanbilvardi and Dr. Tarendra Lakhankar

RESEARCH PROJECT: DEVELOPMENT OF HIGH RESOLUTION PRECIPITATION AND TEMPERATURE PRODUCT FOR NEW YORK CITY

The proposed project involves developing a precipitation and temperature product to be used in urban flash flood guidance and hazard warnings (uFFG) system. The precipitation product will have 2 km spatial resolution through merging in-situ NY-uHMT (New York Urban Hydrometeorology Test Bed) rainfall data with NWS-RADAR precipitation to create for NY City. Similarly, high resolution gridded temperature product by merging in-situ NY-uHMT temperature data along with NYC MetNet stations.

The developed product will be used accelerate the development and fusion of new observing data, modeling methods, and recent scientific research for developing effort on key hydrological and meteorological forecast issues. This will help identify and isolate areas where land development has altered the runoff characteristics of the New York City Area. Results from these activities will not only be useful in planning for storm emergencies but will also allow for improved designs of infrastructure. Together this forms a key step towards improving regional resiliency against the wide range of impacts incurred by extreme storm event related flooding.
Adrian Peña

NERTO PROJECT: REGIONAL EVALUATION OF HRRR FORECAST PRECIPITATION USING NEW YORK CITY IN-SITU STATION DATA

Location: NOAA/OAR/ESRL/PSD, Boulder CO
Start and End Date: 06/03/2019 – 08/23/2019
NOAA Mentor: Dr. Kelly Mahoney

Synopsis:
The uncertainties associated with rainfall estimates comprise various measurement scales: from local-scale rain gauges and ground-based radars to larger-scale satellite rainfall retrievals, many other challenges exist within precipitation forecast uncertainties, particularly at small scales. A new network (NY-uHMT) of 20 autonomous weather stations offers measurements of air temperature, relative humidity, precipitation, and soil moisture at 15-minute intervals. These high-resolution (in space and time) observations at the urban-scale can serve as new evaluation points for high-resolution numerical weather prediction models, the most operationally-relevant of which being NOAA’s High-Resolution Rapid Refresh (HRRR) model.

Skills
RStudio, MatLab, Public Speaking, Mentoring, Leadership, Project Management
NIA RENE
Cohort 1, M.S.

PROFILE
Rene completed a Bachelor's degree in Chemistry. She worked as a Research Coordinator for The City University of New York Louis Stokes Alliance. While there, she managed and participated in research programs at international universities such as the University of Cartegena in Colombia and Beijing University of Chemical Technology in China. Rene's goals are to enhance weather readiness and water resource management in the United States.

linkedin.com/in/nia-rene-816763a5/

EDUCATION
The City University of New York – Brooklyn College
09/01/2017 – 08/31/2019 (Expected)
Major: Earth and Environmental Science
Advisor: Dr. Jennifer Cherrier

RESEARCH PROJECT: THE MITIGATION OF SEPTIC EFFLUENT NITROGEN USING A HYBRID GREEN INFRASTRUCTURE APPROACH TO REDUCE THE GROWTH OF HARMFUL ALGAL BLOOMS

Green infrastructure (i.e. bioswales, bioretention systems, and rain gardens) has been gaining recognition as an effective low-impact best management approach for mitigating stormwater related nutrient loading into waterways and may have the potential to address septic leaching as well. However, the design of these systems is passive and as a result their water interception and nutrient removal capacity has been shown to be highly variable and inconsistent. The overall goal of this research is to evaluate the potential of an activated hybrid green infrastructure system (ecoWEIR™, patented) for reducing nutrient loading from septic systems and thus offset HAB growth in coastal waters.

NERE PROJECT: MITIGATION OF SEPTIC EFFLUENT NITROGEN USING HYBRID GREEN INFRASTRUCTURE FOR THE MANAGEMENT OF HARMFUL ALGAL BLOOM PRODUCTION IN LONG ISLAND COASTAL WATERS

Location: NOAA/NOS/NCOOS, Charleston, SC
Start and End Date: 06/01/2019 – 08/24/2019
NOAA Mentor: Dr. Steve Morton

Synopsis:
Non-point source nutrient loading into our waterways is one of the leading causes of coastal eutrophication and subsequent harmful algal bloom (HAB) events. In Suffolk County, N.Y, septic systems treat 70% of the domestic waste and have been identified as a leading cause for degraded coastal water quality in Long Island coastal waters and an important factor contributing to massive outbreaks of HABs in the Great South Bay, Peconic Bay and Long Island Sound. The HAB Cochlodinium polykrikoides (C. poly) causes toxic algal blooms in Suffolk County as well as coastal waters worldwide, and has been found to be lethal to multiple species and life stages of fish and shellfish.
Nia Rene

Synopsis continued...
Green infrastructure (i.e. bioswales, bioretention systems, and rain gardens) has been gaining recognition as an effective low-impact best management approach for mitigating stormwater related nutrient loading into waterways and may have the potential to address septic leaching as well. However, the design of these systems is passive and as a result their water interception and nutrient removal capacity has been shown to be highly variable and inconsistent.

The project objectives are to (1) conduct controlled ecoWEIR mesocosm studies to evaluate nutrient removal efficiency from septic effluent and (2) carry out time-series incubations with the C. poly with mesocosm inflows and outflows to determine how ecoWEIR treatment offsets growth of this HAB species. This study will inform residents and coastal ecosystem managers of a cost-effective solution to groundwater contamination from onsite wastewater treatment via engineered drain fields.

NERTO OUTCOMES
Rene developed a deep interest in toxin analysis via identification and quantification processes. She also developed skills with the scanning electron microscope which is a powerful tool that she would like to use to analyze samples from urban ecosystems.

VALUE OF NERTO TO THE LINE OFFICE
The National Ocean Service (NOS) provides data, tools, and services that support coastal economies and their contribution to the national economy. Their mission is to provide science-based solutions through collaborative partnerships to address evolving economic, environmental, and social pressures on our ocean and coasts. The annual occurrence of harmful algal blooms (HABs) in coastal waters are of interest to NOS and the National Center for Coastal Ocean Sciences (NCCOS) because of its negative impact on the economy, environment and our society. This research provides insight on the stressors that contribute to HABs and investigates the use of improved septic systems to mitigate HABs in coastal waters. This work also contributes vital information about the components in water that facilitate toxin production by HABs. NOS/NCCOS provides information to protect human health and coastal economies with early warnings of HABs and other health threats. The results of this work will assist NOS in working with coastal communities to develop prevention strategies that can mitigate HABs.

SKILLS
Toxin quantification in water and animal tissue, Scanning using an electron microscope, Event Planning, Strategic Planning, Customer service
CHRISTIANA SASSER
Cohort 2, M.S.

PROFILE
Sasser completed her Undergraduate degree as a CESSRST fellow and is now pursuing her Master’s degree and continuing her training in NOAA mission enterprise. Sasser is interested in renewable and sustainable energy sources to help protect the earth’s environment. Her current research on wind lidar aligns with her interests and future professional goals.

www.researchgate.net/profile/Christiana_Sasser

EDUCATION

University of Maryland, Baltimore County, MD
8/28/2018 – 05/24/2020 (Expected)
Major: Mechanical Engineering
Advisor: Dr. Ruben Delgado

RESEARCH PROJECT: ASSESSMENT OF ATMOSPHERIC STABILITY FROM LIDAR AND MICROWAVE RADIOMETER RETRIEVALS

This research involves use of Doppler lidar measurements and interpreting lidar data and images and understanding the role of atmospheric conditions and stability regimes on BLH dynamics. These studies are important to help understand and improve weather forecasting and wind resource assessment.

NERTO PROJECT: ANALYSIS OF BOUNDARY LAYER HEIGHT (BLH) USING DOPPLER LIDAR MEASUREMENTS

Location: NOAA/OAR/ESRL/CSD, Boulder CO
Start and End Date: 06/10/2019 – 08/30/2019
NOAA Mentor: Alan Brewer

Synopsis:
The project helped Sasser gain further knowledge on the basics of Doppler Lidar measurements, technical parameters, type of scans, and scanning patterns, while also furthering her knowledge of how to interpret lidar data and images. This opportunity also helped advance her knowledge of the role of atmospheric conditions and stability regimes of BLH dynamics.

NERTO OUTCOMES
Sasser gained experience in several aspects of research related to lidar measurements and technical aspect of the science behind lidar instruments.
Christiana Sasser

**VALUE OF NERTO TO THE LINE OFFICE**

The understanding of boundary layer height for a variety of atmospheric conditions is important for many studies including land-atmosphere interactions, air quality monitoring, wind energy research, and evaluation of numerical weather prediction forecasts and modeling.

**SKILLS**

Data Analysis, Visualization, interpretation of Lidar images, Read data and compare measurements from different instruments.
MICHAEL TRUNKHILL
Cohort 1, M.S.

PROFILE
Trunkhill fell in love with the ocean growing up on the state of Washington. He was an intern at the Environmental Protection Agency where he collected data on possible toxic waste sites along the Columbia River. He plans to pursue a Ph.D. and to continue researching problems and solutions in ecology.

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EDUCATION
San Diego State University
06/01/2017 – 08/31/2020 (Expected)
Major: Ecology
Advisor: Dr. Donatella Zona

RESEARCH PROJECT: CO2 LEVELS ABOVE REEF FLATS IN AMERICAN SAMOA

The project consists of taking several water chemistry measurements and benthic surveys of nine reef flats from around the island of American Samoa. With help of his NOAA mentor, Mareike Sudek, nine flats of various stages of recovery and decline will be selected to discern if there are differences in water chemistry levels between them.

NERTO PROJECT: THE EFFECT OF CORAL REEF HEALTH ON THE NEAR SHORE AIR-SEA EXCHANGE OF CO2 IN AMERICAN SAMOA

Location: NOAA/NOS/NMSAS, American Samoa
Start and End Date: 06/01/2018 – 08/31/2018
NOAA Mentor: LTJG Lauren Jarlenski and Dr. Mareike Sudek

Synopsis:
The project involved conducting air-sea CO2 measurements in pre-selected bays on the island of Tutuila, American Samoa. Using a NOAA research vessel and a headspace equilibrator the student took CO2 samples from water columns in and around coral reef ecosystems and the air above these systems to calculate flux measurements. Using a YSI sonde the student took pH, salinity, and dissolved oxygen measurements. The student also assisted NOAA biologist Mareike Sudek in estimating coral reef health in these same bays.

NERTO OUTCOMES
Trunkhill gained experience in several aspects of research but more than anything, invaluable research experience in performing benthic survey's.
Michael Trunkhill

**VALUE OF NERTO TO THE LINE OFFICE**

The National Marine Sanctuary of American Samoa (NMSAS) supports a variety of corals, invertebrates, fish, turtles, marine mammals, and marine plants, as well as hydrothermal vent and deep-water habitat. This project provided the National Ocean Service and NMSAS with a health assessment of the coral reef habitat.

**SKILLS**

Biological and chemical water data collection, Teaching, Public Speaking
TYLER TUCKER
Cohort 1, M.S.

PROFILE
Tucker earned a Bachelor’s in Mechanical Engineering from the University of California, San Diego. He was on the team that developed a data visualization web app that visualizes Argo temperature and salinity profiles (www.argovis.com) as part of his Master’s degree.

linkedin.com/in/tyler-tucker-04200745

EDUCATION
San Diego State University
09/01/2016 – 06/01/2018
Major: Applied Mathematics
Advisor: Dr. Sam Shen

RESEARCH PROJECT: ATMOSPHERIC MEASUREMENTS & INSTRUMENT CALIBRATIONS AT MAUNA LOA OBSERVATORY

Tucker was responsible for the biannual Dobson Spectrophotometer calibration at Mauna Loa, HI, and delivering daily data to the Global Monitoring Division in Boulder, CO. The World Standard Ozone Observations (WSOO) carried depends on this calibration. This will help maintain high-quality measurements in the entire WMO Global Atmospheric Watch Program of ozone observations. Langley method data shall be collected daily as weather permits and transmitted to Boulder Global Monitoring Division (GMD) within 24 hours of collection.

He also assisted the station with weekly ozone and monthly water vapor profile measurements using balloon-borne instruments. Additional duties include atmospheric sampling, maintaining/improving the MLO website, and hosting tours to MLO.

NERTO PROJECT: CALIBRATION OF WORLD OZONE STANDARD AND BALLON SONDE RELEASES FORM HAWAII

Location: NOAA/OAR/GMD, Boulder, CO and Hilo HI
Start and End Date: 06/04/2018 – 08/24/2018
NOAA Mentor: Mr. Russell Schnell

Synopsis:
The purpose of the project was to conduct premier atmospheric measurements and instrument calibrations at Mauna Loa Observatory (MLO) in Hilo, Hawaii. In the process of performing calibrations of the WMO Dobson standard spectrophotometer, the research will directly contribute to the continuation of the World Standard Ozone Observations (WSOO) carried by the NOAA Global Monitoring Division. This will help maintain high quality measurements in the entire WMO Global Atmospheric Watch Program of ozone observations. Langley method data shall be collected daily as weather permits and transmitted to Boulder Global Monitoring Division (GMD) within 24 hours of collection.
Tyler Tucker

**NERTO OUTCOMES**

Tucker gained training on how to make Langley measurements, and to test the Dobson Spectrophotometer, both automated and manual. He learned how to analyze and estimate atmospheric parameters using the data he collected. Chief among them, the extraterrestrial constant.

**VALUE OF NERTO TO THE LINE OFFICE**

This was the first ever opportunity where an intern participated in the measurement and operations of the premier Atmospheric Baseline Observatory on Earth (ABOE) to measure and calibrate ozone measurements at the Mauna Loa Observatory.

**SKILLS**

AutoCAD, SolidWorks, C++, MatLab, Python, RStudio, Pandas, Teamwork
ANNA VACULIK
Cohort 2, M.S.

PROFILE
Vaculik earned her undergraduate degree in Geology and Geography from Mount Holyoke College. Her research interests were in remote sensing, remediation efforts, and STEM outreach.

linkedin.com/in/annafvaculik/

EDUCATION
The City University of New York – The City College of New York
10/24/2017 – 05/29/2019
Major: Geology
Advisor: Dr. Hamidreza Norouzi

RESEARCH PROJECT: DOWNSCALING OF SATELLITE LAND SURFACE TEMPERATURE OVER URBAN ENVIRONMENTS
The purpose of this study was to estimate high temporal and high spatial resolution land surface temperature (LST) over different surface types in urban regions. The goal is to estimate high resolution LST by combining Landsat 8 and the Geostationary Operational Environmental Satellite-R Series (GOES-R) infrared-based LST. Landsat 8 provides higher spatial resolution (30 m) estimates of skin temperature every 16 days. However, GOES-R, which has lower spatial resolution (2 km), has much higher temporal resolution (5 min).

The research project aims to match the dates that both GOES-R and Landsat LSTs to find their spatial relationship to develop the downscaling of GOES-R LST. The downscaling approach will account for systematic biases between Landsat and GOES-R LST products.

NERC PROJECT: ESTIMATING HIGH SPATIO-TEMPORAL RESOLUTION IN LAND SURFACE TEMPERATURE USING SATELLITE AND GROUND OBSERVATIONS OVER URBAN REGIONS
Location: NOAA/NESDIS/STAR, College Park, MD
Start and End Date: 06/04/2018 – 08/20/2018
NOAA Mentor: Dr. Yunyue Yu

Synopsis:
The primary goal of this research is to improve and further develop the NOAA GOES-16 satellite products for land surface temperatures for urban areas, and eventually increase the accuracy of weather prediction models for metropolitan areas.
Anna Vaculik

NERTO OUTCOMES

Vaculik gained more confidence working with Matlab and QGIS. She participated in the weekly meetings of the Land Surface Team. She presented her work at the 10th International Conference on the Urban Climate.

VALUE OF NERTO TO THE LINE OFFICE

NESDIS gained information on how the NOAA GOES-16 Land surface temperature product performs over urban and non-urban areas. Downscaling the land surface temperature measurements to urban areas will improve weather prediction models and the accuracy of urban head island studies in cities.

SKILLS

Matlab, GIS, OSHA 40 Hour HAZWOPER (Expires January 2020), OSHA 10 Hour Construction Management
JEAN PIERRE VALLE
Cohort 2, M.S.

EDUCATION
University of Puerto Rico, Mayagüez
01/01/2018 – 06/14/2019
Major: Environmental Engineering and Water Resources
Advisors: Dr. Jonathan Muñoz Barreto and Dr. Rafael Rodríguez-Solís

RESEARCH PROJECT: FLOOD RISK ASSESSMENT USING IN-SITU AND REMOTE SENSING PRODUCTS: DEVELOPMENT OF FLASH FLOOD FORECASTING SYSTEM FOR PUERTO RICO

Weather-related disasters have increased in their frequency since 1980. For Puerto Rico, a territory of the United States in the Caribbean, the past decades have been plagued with constant floods, whose impact range from limited to catastrophic. This can be attributed to the topographic features and weather patterns of a tropical climate, where constant high temperatures lead to high intensity convective rainfall. Even though any rainfall event can lead to a flood, they are more likely to occur during the hurricane/rain season.

Currently, the method used by the National Weather Service for flash flood analysis in Puerto Rico is the Flash Flood Guidance. For the island, the Flash Flood Guidance divides the territory in multiple regions and provides a single value for each one of them. For Puerto Rico, whose topography and weather patterns experience drastic changes in short distances, this guidance value may not be an accurate representation for all the area contained within each of the subdivisions.
Jean Pierre Valle

**NERTO PROJECT: EVALUATION OF WRF-HYDRO AT WESTERN PUERTO RICO**

Location: NOAA/OAR/ESRL/PSD, Boulder, CO  
Start and End Date: 04/03/2019 – 05/24/2019  
NOAA Mentor: Dr. Kelly Mahoney

**Synopsis:**  
The objective of this work is to enhance flood forecasting using WRF-Hydro for the Puerto Rico Island. To reduce the expected errors from modeled/forecasted forcing due the effects of the complex terrain, our goal is to test different forcing datasets and assimilate satellite data including (1) subsurface soil moisture and (2) precipitation (Satellite and Radar) into WRF-Hydro. The assimilation will be assessed in terms of streamflow simulations over complex terrain. The model will be validated using the runoff output of WRF-Hydro for the selected watersheds using USGS Data. This work will help in the future implementation and optimization of the National Water Model (NWM) for Puerto Rico.

**VALUE OF NERTO TO THE LINE OFFICE**

OAR gained a better understanding of the differences in the precipitation products particularly in the Puerto Rico region that could lead to improvements in hydrologic model forcings used in the National Water Model.

**SKILLS**

AutoCAD, HEC-HMS, HEC-SSP, ArcGIS, SWAT, MODFLOW, QUAL2K, Public Speaking
CARLOS WAH-GONZÁLEZ
Cohort 1, Ph.D.

PROFILE
Wah-González earned Bachelor’s and Master’s degrees in Electrical and Electronics Engineering from the University of Puerto Rico, Mayagüez. He interned at the NOAA Great Lakes Environmental Research Laboratory. He plans to teach electrical engineering upon graduation.

linkedin.com/in/carloswahgonzalez

EDUCATION
University of Puerto Rico, Mayagüez
08/15/2016 – 05/22/2020 (Expected)
Major: Electrical and Electronics Engineering
Advisor: Dr. Rafael Rodríguez-Solís

RESEARCH PROJECT: DEVELOPMENT OF A MULTI BAND RADIOMETER FOR UAS-SATELLITE PRODUCT PRIORITIZATION STUDY

The use of unmanned systems provides opportunities for more localized and higher resolution observations. These systems can then be used to complement satellite observations, and for calibration/validation of satellite sensors in combination with ancillary sensors. Our goal is to develop microwave sensors (passive and active) for soil moisture, atmospheric moisture and temperature, and precipitation, to work together in particular with the ATMS sensor in JPSS. UAS-based sensors can provide inputs to develop high-resolution products in combination with coarse-resolution satellite sensor information. The mobility and simple deployment of such platforms can allow targeted studies in areas of interest during and after flash floods, or other extreme events. Specifically, we propose the development of compact microwave sensors for surface (skin) temperature and brightness temperature for small payload UAS, to provide high-resolution implementation of coarse scale MIRS products, and cross calibration/validation for the ATMS sensor in JPSS, in particular for channels 1 and 2.

The overall goal of this project is to define and characterize a new passive microwave sensor that could fulfill this purpose. The project will consist of two specific objectives/elements: 1) Definition of instrument requirements 2) Simulation of the instrument signal resulting from expected environments. The first element entails working from existing and desired NOAA physical mission requirements to derive the corresponding needed instrument characteristics. Required specifications include quantities such as accuracy, stability, and resolution. Within the second element, the goal will be to apply the characteristics of an instrument meeting the specified requirements to directly simulate the observations that would be obtained from sampling of representative scenes of interest. This task is essentially construction of a simplified forward model for the instrumental observations. Availability of this information is critically important for studies to evaluate the potential impact of a new observing system prior to supporting full operational development.
Carlos Wah-González

**NERTO PROJECT: DEFINITION AND CHARACTERIZATION OF AN AIRBORNE SENSOR FOR OCEAN SALINITY AND SOIL MOISTURE SAMPLING**

Location: NOAA/OAR/ESRL/GSD, Boulder CO  
Start and End Date: 05/15/2018 – 08/03/2018  
NOAA Mentor: Dr. Gary Wick

**Synopsis:**  
High accuracy and spatial resolution measurements of the ocean salinity and soil moisture content have important applications to currently unmet NOAA requirements in different mission areas. The use of unmanned aircraft enables new opportunities for broad sampling at low altitudes and speeds that could optimize data collection if a suitable sensor can be constructed and deployed. The overall goal of this project is to define and characterize a new passive microwave sensor that could fulfill this purpose.

**NERTO OUTCOMES**

Wah-González learned new data analysis techniques. He also learned how to understand radiometric data from the point of view of a physicist.

**VALUE OF NERTO TO THE LINE OFFICE**

Through the intern's project and interaction, OAR gained a better understanding of potential future instrumental capabilities for measuring two variables of interest from small unmanned aircraft. The project was in large part distinct from daily ongoing activities.

**SKILLS**

Python, Matlab, ANSYS, Mentoring, Public Speaking