NOAA Center for Earth System Sciences and Remote Sensing Technologies

2019 Summer Program Research Projects

Title	Project Description	Faculty/Staff Mentor	Other Mentor(s)
Understanding the Link Between Tropical and Extratropical Cyclone Paths and the Hazards They Create	Tropical Cyclones, which are Hurricanes in the Atlantic Ocean, and Extratropical Cyclones, which include Nor'Easters, can generate wind and rain damage, and storm surge. These storms all have a central low-pressure minimum, which serves as a guide for the position of the storms. The propagation speed and direction of the storm centers can be linked to the hazards generated by the storms, but this has not been fully developed. Therefore, this project will focus on: (1) teaching students the physics of cyclones, (2) training students to plot and interpret cyclone tracks, and, (3) associating the cyclone tracks with precipitation hazards.	Jimmy Booth	Jiehao Huang Luo
US Tornado Frequency, Losses and Trend Analysis	The research includes US tornado analysis during 1990-2017 period. The data set is obtained from NOAA storm prediction center which records daily occurrence of US tornadoes since 1950 with information of their intensity and touch-down location. The research will investigate: 1. Changes in Tornado frequency in each State during different time period. 2. Tornado occurrence in each State by categories 3. Tornado seasonality analysis at different climate regions to see if tornado season varies in different regions 4. Average annual loss caused by Tornado in each state for each five categories The students will learn R programming to do the data analysis and Arc-GIS to represent their results on maps.	Reza Khanbilvardi	Niloufar Nouri
Evaluating Coral Reefs in Southwest Puerto Rico by Combing Remote Sensing and Biology	Increased seawater temperatures due to climate change are causing stress to corals worldwide. Students engaged in this research project will learn the importance of coral reefs, and what major threats are endangering them, how we can monitor coral reefs using remote sensing, and become familiar with NOAA's Coral Reef Watch Program, and learn how to extract DNA from two Caribbean coral species, and run qPCR assays.	Kyle McDonald	Andrea Gomez

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Climate, Rivers, and Fish	Goal: Understand the relationship between coastal streamflow and the population of stream-dependent fish in Northeastern United States • Learn about important fisheries and their importance to society • Learn about habitat conditions that are important for fisheries • Learn about the role of climate and human-made factors on habitat conditions	Indrani Pal and Valerie Were	Nico Maxfield
Satellite Analysis & Validation	As we will to collect and processes GOES, ABI satellite images. This will include gridding and registering the three platforms (GOES-16, 17, and Himowari) to each other. We will identify times when the problem is acute, moderate, and not serious and develop a collection of images to do analysis on. The analysis will include develop correlation plots between the ABI to see how the instruments agree, and learn what normalization can per preformed to bring them in as close alignment with each other. We will investigate grid cell based models and if there is time, windows based models to regress. We will also consider whether it is possible to build a statistical model for the image degradation to potentially use as better training for restoring the images.	Michael Grossberg	Ronald Adomako
Big Data MOS Forecasts	Most weather forecasts do not come directly from weather models, but are based on Model Output Statistics (MOS). The goal of this project is to create a data scientist-friendly programmable interface to a version of the MOS guidance product geared towards big data analytics and machine learning applications. This project builds on previous work processing this dataset and will utilize modern technologies like scalable analytics and distributed computing libraries, and cloud based web services. If time allows, this project will also have a computational component unpacking patterns in how the forecast is off in different regions. The work will primarily be done using the Python programming language.	Michael Grossberg	Hannah Aizenman
Assessment of Lake Water Quality and Quantity Using Satellite Remote Sensing	This research relies upon analysis of the inherent optical properties of chlorophyll and sedimentation present within the bodies of water in question, achieved through analysis of the reflectance values of the red and blue bands from Landsat satellite images of five bodies of water. The analysis, will be performed using Geographic Information System (GIS), allows for determination of the values that attest to changes in surface area, turbidity, and eutrophication. "	Tarendra Lakhankar	Noel Cercizi Jiali Chen

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The Socioeconomic Analysis of Hurricane Events in New York City	The focus of this research project will be an analysis of the frequency, location, and socioeconomic effect of street floods in NYC boroughs before and after a major hurricane event. First, an understanding of the topic and its current state in academia need to be developed through thorough research. This means reading scholarly articles and research papers on the effects hurricanes have on drainage systems, how long flooding remains within the streets after hurricanes/major storms, and how hurricanes affect people living in flood affected areas. Through research, an APA formatted page or two should be written on what has been covered in the topic so far, how this relates to NYC, and how we will be going about building upon this knowledge in our research. Then, data pertaining to this topic will be filtered and collected from the 311 Service Requests Database surrounding the years of either Hurricane Katrina or Hurricane Sandy (whichever was chosen in the beginning). Using the most comfortable programming language, the data will then need to be read, filtered, and organized in a way that is easy to perform future statistical analyses. Using learned programming skills, patterns of the frequency of catch basin clogs and street floods need to be analyzed. This includes comparing and contrasting this information as well as understanding the significance of the locations in which they remain the most frequent. In the end, a conclusion about which boroughs experience the most street floods and catch basin clogs will be finalized as well as whether or not there was an increase in catch basin clogs or not after a hurricane event. Creating ArcGIS maps will be essential in visually representing such results.	Tarendra Lakhankar	Erin Wengerter
An Analysis of Economic Impact of Extreme Weather Events on New York City's Transit System	Climate change impacts will increase the total costs to the nation's transportation systems and their users, but these impacts can be reduced through rerouting, mode change, and a wide range of adaptive actions. After Hurricane Sandy MTA proposed a $5B budget for repairs. This project explores the weather impacts on NYC tolls & bridges, and the Subway.	Tarendra Lakhankar	Murshedur Shahy
National Water Model (NWM) and WRF-Hydro	The model is designed to link multi-scale process of atmospheric and terrestrial hydrology. It is applied to improve hydrometeorological forecasts (flash flood prediction, regional hydroclimate impacts assessments, seasonal forecasting of water resources, land-atmosphere coupling studies). In this project, students will learn about working with this model.	Tarendra Lakhankar	Tarendra / Arik / Engela

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The Impact Of Climate On Food Security	In this project the impact of some important climatic variables such as precipitation, temperature, ENSO and drought on crop yields of some major crop producer countries around the world will be investigated.	Reza Khanbilvardi	Ehsan Najafi
Data Visualization – It's More Than Pretty Pictures	The NOAA Center for Earth System Sciences and Remote Sensing Technologies receives data from various sources including instruments in the field and satellites. The data include temperature, precipitation, and soil moisture. The goal of this project is to explore visualizations of those data. Students will learn how to display data using various techniques. They can learn how to sketch or find the best visualization first , then try some simple visualization tools such as Vega lite to explore them.	Ronak Etemadpour and Valerie Were	Oleksandr Kozlenko
Monitoring Water Quality in the Long Island Sound from Shipboard and Space-Based Platforms	Like many similar highly populated estuaries in the world, the Long Island Sound suffers from water quality problems, including hypoxia, anoxia, eutrophication, and recurrent harmful algal blooms (HABs). These environmental hazards can be exacerbated by a number of human and environmental pressures, including changing wind patterns and precipitation, increasing temperatures, coastal habitat degradation and urban development. This is an opportunity for a student to participate in a highly interdisciplinary project that examines how human activities, episodic events, and seasonal processes impact the water quality and ecology of the Long Island Sound ecosystem. The student will participate in fieldwork in the Long Island Sound and will receive a highly interdisciplinary training in the fields of wetland ecology, biogeochemistry, biology, oceanography, and remote sensing of ocean color, and will build skills in a wide variety of field and laboratory techniques, data analysis and the use of analytical instruments.	Maria Tzortziou	Alana Menendez

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Satellite Based Heat Index for Cities	This projects aims to develop a satellite based heat index for cities using GOES-R downscaled data. Heat index is a combination of air temperature and relative humidity. An algorithm for relative humidity based on geostationary satellites was recently released by Nazario et al. 2019 (Int. J. of Remote Sensing). Our goal here is to build from this algorithm and expanded to include air temperatures as a single product. This will require Cal/Val. The focus area will be NYC. The student should have background on GIS and basic remote sensing to participate in this project. Students pursuing degrees in environmental engineering, civil, mechanical, or electrical are welcome as well as students in environmental sciences.	Jorge Gonzalez	Rabindra Pokhrel Equisha Glenn
Studies for Resilient Electric Power Infrastructure	Motivated by the catastrophic Hurricane Maria, under the sponsorship of the US National Science Foundation, and the US Department of Education, a team of researchers from City College of New York, and other academic institutions launched the project: Integrated Socio-Technical Modeling Framework to Evaluate and Enhance Resiliency in Islanded Communities (ERIC) [https://www.eric21.org/]. The project's main aim is to use Hurricane Maria as lesson to research the impacted critical infrastructure to make it more resilient for future extreme events. This component of the project consists of quantifying failure modes of power lines. The approach will consist of: scale sections of power transmission lines (3 or more poles) so that they may fit in wind tunnel experiments; build multiple prototypes such that they representative of the variety of power lines (i.e. size parameters such as the height, and material type); test these samples under simulated extreme weather conditions; and compare with Computational Fluid Mechanics (CFD) simulations. These prototypes would be tested in a wind tunnel to explore their failure behavior under different wind speeds and soil conditions (saturation levels, and slope) in order to define critical wind speeds before failure. This will be the speed at which the transmission line starts to show damage and ultimately, the speed at which the line completely fails. Finally, critical wind speeds would be scaled up to the original transmission line size.	Jorge Gonzalez	Rabindra Pokhrel Equisha Glenn
VIIRS Satellite Data Processing	This project will look at generating various quick look images from VIIRS SDR and EDR with a focus on some extreme events.	Paul Alabi	Shawn Telesford
A Test bed for Satellite Data Publishing using CKAN	An experimental data publishing platform using CKAN	Paul Alabi	Shawn Telesford

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Error Analysis of In Situ Sea Surface Temperature Data	Sea Surface temperature (SST) is a critical variable for analyses of climate variability and trends and a crucial parameter for understanding the impact of climate and environmental conditions on marine life, such as fish stock and movement and the health of coral reefs. We can monitor the SST from satellites but even with high quality remote sensing observations, it is important to validate observations with in situ temperature measurements taken directly in the water. There are various types of observational platforms providing in situ SST measurements. One type of platforms is represented by commercial, research, and government-operated ships. Another type is drifting buoys (DB), also called floats or drifters, which are moved freely by currents throughout the ocean. There are also moored buoys, which cannot move, fixed in place at a set of locations in the ocean. Taking a close look at the measurements made from an individual platform (a particular ship or a DB) and provided with the matched OSTIA SST values and their error estimates, students will compare the two, characterize the statistical distribution of their difference (the "error"). Students will also identify and discuss the outliers (some of which are due to clear cases of a recording error or typo) and look for a possible influence of various factors, like a season or a time of the day, or platform history and its metadata (Kent et al., 2007), on the bias and magnitude of the error, as well as on the temporal persistence of the error.	Michel Grossberg	Candice Baptiste-Sexton
Thermal Response of Cities	The student will understand the distinct impact different urban surfaces have on the City. He/She will use a high-resolution thermal camera to study the thermal footprint of various built materials in the city. They will use the data to validate and calibrate satellite measurements.	Prathap Ramamurthy	Rafael Barinas