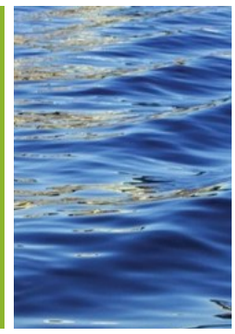
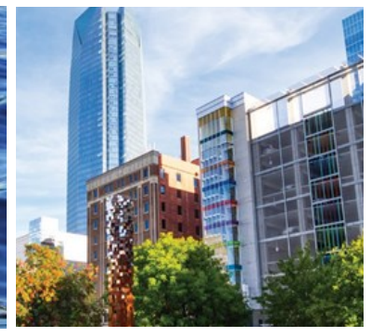
OKLAHOMA EPSCoR UPDATE

Promoting Innovative Research





OK NSF Established Program to Stimulate Competitive Research | December 2023

Iyonsi Gained Summer Intense Lab Experience and Mentorship

Eddy Iyonsi, a junior and major in Geology with a minor in Geospatial Information Science at Oklahoma State University (OSU), was one of the four undergraduate students awarded with an Intense Laboratory Experience and Mentorship (ILEM) grant through the Oklahoma NSF EPSCoR program Track-1 project "Socially Sustainable Solutions for Water, Carbon, and Infrastructure Resilience in Oklahoma (S^3OK)" this past summer. The award provided a research opportunity for Mr. Iyonsi to work in the lab of Dr. Yuting Zhou, who is an assistant professor in the Department of Geography at OSU and is a researcher of the current S^3OK project.

Iyonsi together with his research mentor, Dr. Zhou, investigated to understand people's awareness of drought in the U.S. using the Google Trends data and the U.S. Drought Monitor (USDM) data. Researchers determined a) how severe/long the drought must be before people start paying attention to it?, b) when will people stop paying attention to drought and why?, and c) what are the spatial variations of people's attention to drought and the driving factors?

"We downloaded Daily Google Trends data using the Pytrends API and aggravated the daily to weekly scale in R to reduce noises to match the temporal resolution of USDM data. We used the distributed lag non-linear models (DLNMs) to analyze the relationships between drought awareness as reflected by Google Trends data and the physical impacts of drought as reflected by areas and population affected by droughts," Zhou said.

"We found that population other than areas affected by droughts is playing a more significant role in correlating with drought awareness. There is a one-month lag in people's attention to extreme droughts and their awareness surged once the population affected by severe drought exceeded 3%," Iyonsi said.

"We also found that there are clear spatial variations in people's perceptions of drought such as in CA and TX. We plan to do more statistical analysis to explain these variations," Zhou added.

"Initially, we designed the project to focus on large areas. Several factors could affect the relationships between drought awareness and the physical impacts of drought. So, we started thinking about surveying people's perception about drought in different regions in Oklahoma. We have designed a questionnaire using Survey123 and are waiting for the IRB approval for the survey. A more localized and detailed analysis will help us better understand the drivers for people's perception about drought," Zhou said.

"The summer research internship was an invaluable opportunity for me to do hands-on research. I gained proficiency in data analysis using R, learned how to conduct literature review, and learned to develop a survey using Survey123. My research experience did not only expand my appreciation of research, but also motivated me to pursue research opportunities in this field," Iyonsi said.

Funding for the ILEM project was provided by the National Science Foundation under Grant No. OIA-1946093 through OK NSF EPSCoR.

OK NSF EPSCoR Awards Two Seed Grants through the S^3OK Project

The Oklahoma NSF EPSCoR program through the NSF EPSCoR Research Infrastructure Improvement Track -1 project "Socially Sustainable Solutions for Water, Carbon, and Infrastructure Resilience in Oklahoma (S^3OK)" awards two seed grants up to $75,000 per award that aimed at developing and testing science-based solutions for complex "wicked" problems at the intersection of land use, water availability, and infrastructure in OK.

The Seed Grant recipients are:

Drs. Hantao Cui (Oklahoma State University, OSU) and Abdulmunim Guwaeder (Langston University, LU)

Integrated Microgrid and Water Systems: Advanced Modeling for Climate-Resilient Communities

This project aims to explore deeper into the relationship between water and energy to gain insights from a multidisciplinary perspective. The overall goal of the project is to develop models and testbeds to ensure efficient energy usage for water processes, even during energy shortages, considering specific needs of rural communities in Oklahoma. Specifically, this project will a) develop unified models of community microgrids and water supply systems for OK communities, and b) generate climate-driven scenario analysis for energy-water nexus systems, and c) formulate adaptive control strategies for climatic adversities. Researchers anticipate that this project will elevate the understanding of the intertwined dynamics of energy and water by introducing a pioneering platform dedicated to the in-depth study of the relationship between microgrids and water supply systems, especially considering Oklahoma's unique environmental and energy landscape.

Drs. Kiranmayi Mangalgiri (Oklahoma State University, OSU) and Timothy Hubin (Southwestern Oklahoma State University, SWOSU)

Application of macrocyclic oxidation-based catalytic treatment for energy efficient water reuse

The long-term goal of the project is to develop cost-efficient and sustainable water treatment strategies that will enable safe water reuse for potable purposes in municipal contexts. The project aims to establish tetraazamacrocyclic "Earth-abundant" transition metal catalysts as a low-energy alternative to conventional advanced oxidation processes in potable water reuse systems. Researcher will evaluate the degradation of a suite of contaminants of emerging concern (CEC) that are used as performance-based indicators to determine the treatment efficiency of water reuse systems using four manganese and iron-based tetra azamacrocyclic catalysts. This project will specifically a) evaluate the reactive species generation profile of four tetraazamacrocyclic catalysts using H_2O_2, Cl_2, and chloramine-based oxidation systems, b) establish treatment efficiency of tetraazamacrocyclic catalysts using performance-based indicators in real wastewater samples, and c) determine the reusability of tetraazamacrocyclic in water reuse scenarios. Researchers anticipate disseminating project results addressing the catalytic degradation of CECs and the comparison of catalytic treatment with conventional oxidation methods through peer reviewed journal publication and presentations at national and regional meetings.