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DEVELOP applied Earth science program discusses latest project

MOBILE, Alabama — Since 2003, the Mobile County Health Department (MCHD) has served as a host for the National Aeronautics and Space Administration's (NASA) DEVELOP National Program. The program fosters an interdisciplinary research environment for participants to work on applied science research projects under the guidance of NASA and partner science advisors.

The foundation for the DEVELOP Program began in the summer of 1998 when three student interns at the Langley Research Center in Virginia co-authored a research paper titled "The Practical Applications of Remote Sensing." This set the stage for the creation of a new internship program within NASA, and in 1999 the DEVELOP Program was officially formed.

Dr. Bernard H. Eichold II, Health Officer for Mobile County, was attending a policy conference soon after that where the DEVELOP Program was being discussed. He was intrigued and spoke to Mike Ruiz of NASA about hosting one of the teams. MCHD became the second county government location to explore the use of NASA Earth observations applied to public health

The Mobile County DEVELOP office conducted three projects (Spring, Summer, Fall) with approximately 16 participants each year, with one project and roughly four or five participants each term. Since being founded, the node has expanded from a single-room office to a nearly an entire floor of a building located on health department property in downtown Mobile.

The node has partnered with MCHD on several projects addressing public health concerns within the community including air quality, extreme heat and disease transmission.

During the Summer 2019 term, the team's project was titled "Mobile Urban Development." The participants evaluated urban heat islands (UHI) and flooding to enhance green infrastructure initiatives in coastal communities near Mobile.

Danielle Quick, Impact Analysis Senior Fellow based at the Langley Research Center in Hampton, Virginia, introduced the team members who discussed their findings. They included Lydia Stanley (Project Lead), a resident of Baldwin County and a graduate student in Geology at the University of Alabama; Arman Bajracharya, who is entering his senior year at Saint Cloud State University in Minnesota while pursuing a degree in Ecology and Field Biology; Kelly Dunn, a graduate student at the University of West Florida who has a bachelor's degree in Environmental Management; and Filoteo Gomez-Martinez, who is pursuing a master's degree in Geology at the University of Oklahoma.

Each took turns to discuss the project, which utilized satellite Earth observations to assess locations in Mobile County that are vulnerable to the UHI effect and flood impacts. The team partnered with Groundwork Mobile County (GWMC) and other local entities that need information on UHIs and flooding risk to develop mitigation strategies for reducing such threats.

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To locate communities with UHI impacts between 2005 and 2019, the team used Landsat 5 Thematic Mapper (TM), Landsat 8 Thermal Infrared Sensor and Terra Moderate Resolution Imaging Spectroradiometer to evaluate land surface temperature. Low elevation areas susceptible to flooding were distinguished using Shuttle Radar Topography Mission data.

The team assessed flash flood vulnerability with Sentinel-1 C-band Synthetic Aperture Radar and LiDAR elevation data. Lastly, the team processed data from Landsat 5 TM and Landsat 8 Operational Land Imager to compute the Normalized Difference Vegetation Index and compared that with Sentinel-2 Multispectral Instrument data to evaluate impervious surface area and thus, the increase in urban development over time.

A Social Vulnerability Index was produced for Mobile County based on a 5-point scale, comparing demographic characteristics with UHIs and flood potential. To compute social vulnerability maps, the team retrieved data from the Agency of Toxic Substances and Disease Registry dataset. Of the 114 census tracts, 11 tracts showed high risk for both flooding and extreme urban heat. The project provided GWMC with end products that help in planning mitigation strategies for reducing flood risks and UHI effects.

Joseph Spruce, the DEVELOP Lead Science Adviser to the Mobile node, was present at the event along with NASA's Jamie Favors, who once was a DEVELOP participant in Mobile. Other groups attending the presentation with GWMC were Mobile Bay National Estuary Program, Keep Mobile Beautiful, Dauphin Island Sea Lab and City of Mobile's Architectural Engineering Department and Environmental Services.

The early success of DEVELOP was due to the alignment of projects with the issues facing local and regional communities. DEVELOP gradually expanded from one office at Langley Research Center into a nationwide program that averages 350 participants each year at 12 nodes.

More than 4,600 participants have participated in the DEVELOP program completing 915 projects since 1998. To learn more about the program, please visit <https://develop.larc.nasa.gov/>

The presentation took place at the Mobile County Health Department on August 7. Unfortunately, this was the final DEVELOP term in Mobile. Dr. Eichold said that NASA is restructuring the program, and future students will be hosted at the Marshall Space Flight Center.

"The DEVELOP program teaches participants to combine science, knowledge and common sense to make decisions," Dr. Eichold said. "There have been countless participants who came through the process. They have gone on to make such a difference in so many lives."

Following the report, Dr. Eichold recognized NASA, previous Mobile DEVELOP interns and Ruiz with a plaque for their involvement with Mobile's DEVELOP program for 16 years. Ruiz and Favors presented Dr. Eichold with a certificate and NASA images of Mobile for serving as a host and advisor to the students.