Microsoft

AI for Earth Grantee Profile

Africa Flores

Early warning of harmful algal blooms

Summary

Africa Flores, research scientist at the Earth System Science Center in the University of Alabama, and her team are using AI to conduct deep analysis on image datasets from different satellites and weather models to help identify the variables that could predict future algal blooms on Lake Atitlán in the Guatemalan highlands. Knowledge on what those triggers are can turn into precise preventative action, not just in the lake in Flores' home country but also in other freshwater bodies with similar conditions in Central and South America.

Providing early warning of harmful algal blooms

When Africa Flores was growing up on the Pacific coast of Guatemala, she witnessed firsthand the damage caused to the surrounding freshwater bodies by agricultural pollution. In contrast, the waters of Lake Atitlán in the Guatemalan highlands were pristine, a landmark for natural beauty and biodiversity. However, in 2009 the lake experienced the first of several harmful algal blooms (HABs)—out of control colonies of algae that deplete the oxygen in the water and make it potentially toxic to life, including people, fish, shellfish, marine mammals, and birds.

> Harmful algal blooms, or HABs, occur when colonies of algae grow out of control.

Flores describes that first HAB in Lake Atitlán as a "wakeup call" for action to preserve its precious biodiversity. However, unlike in developed countries such as the United States, Guatemala does not have the resources or means to gather continually and in a sustainable way on-the-ground data when algal blooms occur to better understand the causes and help predict and prevent future outbreaks. She decided to apply her and her team's experience with satellite remote sensing and machine learning to the problem in the hopes of finding a solution.

Flores works as a research scientist at the Earth System Science Center in the University of Alabama in Huntsville. Through this grant, she and her team will focus on developing a prototype early warning system for

HABs in Lake Atitlán. Specifically, they will be using the machine learning tools in Azure to conduct deep learning analyses on datasets from different satellites covering variables such as rainfall, temperature, cloud cover, land cover change, runoff, and solar radiation. Machine learning will enable them to run multiple analyses in the hopes of identifying the variables that have the capacity to predict future algal blooms.

Africa Flores, research scientist at the Earth System Science Center in the University of Alabama. [Photo courtesy of Africa Flores.]

Flores hopes this project will provide actionable information to water authorities in Lake Atitlán to take early, preventive measures. For example, it could provide the basis for regulations around agricultural practices for better soil conservation and minimizing runoff from fertilizers. In the longer term, she sees potential to adapt the resulting algorithm to apply to other freshwater bodies with similar conditions in Central and South America.

About Africa Flores

Africa Flores was born in Guatemala and has over 12 years of experience in remote sensing for environmental management. She earned her Bachelors in Agronomy Engineering from Universidad de San Carlos in Guatemala and her Master of Science in Earth System Science from the University of Alabama in Huntsville. She has worked in government, non-government, and academic sectors in Guatemala, Panama, and the United States.

She is currently a research scientist at the Earth System Science Center in the University of Alabama in Huntsville. There she serves the joint NASA and USAID program SERVIR. Her research focuses on water quality, particularly by studying Lake Atitlan, Guatemala. Through this she collaborates with lake authorities and universities in novel uses of hyperspectral and multispectral satellite data. With SERVIR, she has coordinated applied science activities to support environmental and development decision making in Central America, Eastern and Southern Africa, and most recently Amazonia. She is also leading the creation of a handbook for practical applications of synthetic aperture radar data for forestry and biomass estimation applications.

Resources

Press

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