STAMPING OUT HABS: MATERIALS AND METHODS FOR TRAINING AN AI CLASSIFIER FOR HAB DETECTION

Robert Currier, Barbara Kirkpatrick
   Texas A&M University Department of Oceanography/GCOOS-RA

Blooms of the toxic microalga *Karenia brevis* occur seasonally in Florida, Texas and other portions of the Gulf of Mexico. Brevetoxins produced during *Karenia* blooms can cause neurotoxic shellfish poisoning in humans, massive fish kills, and the death of marine mammals and birds. Brevetoxin-containing aerosols are a problem, having a severe impact on beachgoers, triggering coughing, eye and throat irritation in healthy individuals, and more serious respiratory distress in those with asthma or other breathing disorders. The blooms and associated aerosol impacts are patchy in nature, often affecting one beach but having no impact on an adjacent beach. To provide timely information to visitors about which beaches are low-risk, we developed HABscope; a low cost (~$400) microscope system that can be used in the field by citizen scientists with cell phones to enumerate *K. brevis* cell concentrations in the water along each beach. The HABscope system operates by capturing short videos of collected water samples and uploading them to a central server for rapid enumeration of *K. brevis* cells using calibrated AI recognition software. When deployed by volunteer citizen scientists, the HABscope consistently distinguished low, medium, and high concentrations of cells in the water. A primary impediment to developing classification models for new taxa is the lack of available imagery. We have created a toolkit that allows us to rapidly generate thousands of tagged images for the training and validation datasets. We use the images to build models based on our STAMP methodology. Rather than attempt to classify all detected objects we build single taxa models and iterate over them. This methodology allows us to easily develop new models that are optimized for a given taxa and that provide robust performance in the cloud and on the HABscopes. We currently have models for *Karenia brevis*, *Alexandrium monilatum* and *Pyrodinium bahamense*.

PRESENTER BIO: Robert Currier's affiliation is as a Research Specialist, Department of Oceanography, Texas A&M University. His primary area of expertise is ocean observation data management and visualization. Currier is the developer of HABscope (https://habforecast.gcoos.org), an automated phytoplankton classification tool that uses AI to detect and count Karenia brevis cells.