Lake Cyanobacterial Harmful Algal Bloom Mapping and Analysis Platform (CHAB-MAP)

https://neurodegenerationresearch.eu/survey/lake-cyanobacterial-harmful-algal-bloom-mapping-and-analysis-platform-chab-map/

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Lake Cyanobacterial Harmful Algal Bloom Mapping and Analysis Platform (CHAB-MAP)

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Research Abstract

? DESCRIPTION (provided by applicant): Concern over toxins and public health threats resulting from Cyanobacterial Harmful Algal Blooms (CHABs) have gained attention as reoccurring and seasonal blooms persist in many waters. It has also been suggested that climate change is increasing the frequency, intensity, and duration of CHABs. Broadly, cyanotoxins can be described as having negative health impacts and can be grouped into

neurotoxic, lipopolysaccharides, or hepatotoxic such as microcystins which tend to be the most frequently reported. The neurotoxin ?-N-methylamino-L-alanine (BMAA) can be produced by cyanobacteria and have been associated with CHABs and Amyotrophic lateral sclerosis (ALS) clusters across northern New England (Caller et al 2009, Torbick et al 2014, Banack 2015). The magnitude and complexity of CHABs in our freshwater lakes requires innovative technologies and multiscale analysis for detection, understanding, forecasting, and mitigating public health threats. Specifically, during this SBIR we partner with Cleveland Clinic and the ALS Research Center to evaluate linkages between Lake Erie CHABs and ALS cases). ALS is a progressive, fatal neurodegenerative disease with a lifetime risk of 1 in 400. The pathologic hallmark of ALS is the selective death of motor neurons in the brain and spinal cord, producing debilitating symptoms of progressive weakness, muscle wasting and spasticity. Mutations in genes underlying familial ALS (fALS) have been discovered in only 5-10% of the total population of ALS patients. Approximately 90% of ALS cases have no known genetic cause; this group is commonly called sporadic ALS (sALS). There is a broad scientific consensus that ALS is caused by gene-environment interactions. Evidence has shown potential linkages between water quality, cyanobacteria, and high ALS incidence. Decision Support Tools (DSTs) that integrate satellite remote sensing, web and cloud services, and mobile devices (e.g., phones, tablets) offer the capability to monitor CHABs at spatial and temporal scales not achievable by discrete point observations or traditional techniques. For CHAB detection, bio-optical algorithms use color remote sensing data to convert observed spectral light information into geophysical products, such as chlorophyll-a and phycocyanin concentration maps. Remote sensing can detail attributes over space, time and characterize location, duration, intensity, and frequency. The amount of historical satellite imagery is now thousands of terabytes, presenting data handling challenges for all but the most technically capable end users. Real time image processing flows, integration of mobile devices and crowd sourcing, and public health warning and forecasting tools are unobtainable for most applications due to technical challenges. Proposed Innovation: We propose to design, build, and operate a ‘Cloud-based Lake Cyanobacterial Harmful Algal Bloom Mapping and Analysis Platform (CHAB-MAP) for supporting public health risk assessment’. The tool will automate the mapping and analysis of relevant satellite remote sensing data and real time imagery updates for mapping and analyzing CHAB metrics derived from MODIS, MERIS/Sentiel-3, and Landsat. Mobile apps and crowd sourcing tools will be designed in partnership with NOAA GLERL and EPA to improve access to information, decision making, and data gathering. In this SBIR we work closely with Cleveland Clinic to address the role of cyanotoxins and ALS in Ohio. Specific Aim #1: Design and apply BigData approaches and generate historical and real time MODIS (2001 – present), MERIS (2002-2012), and Landsat (1984 – present) Lake Erie CHABs metrics including chl-a, phycocyanin, and water temperature working with NOAA GLERL, NASA, and EPA partners Specific Aim #2: Design, test, and identify optimal web and cloud framework for managing, visualization, plotting tools, managing tabular data, and accessing products using web and mobile packages Specific Aim #3: Work in partnership with Cleveland Clinic (and Dr. Erik Pioro; Barry Winovich Chair for ALS Research in the Lerner Research Institute and director of the section of ALS in the Dept of Neurology) to assess the role of CHABs and cyanotoxins in ALS in northern and central Ohio. Grow other applications investigating neurodegenerative diseases and disorders potentially linked to CHABs

Further information available at:

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