NASA MUREP/SMD Ocean Biology and Biogeochemistry Awards (OCEAN)

Title: Integrating Systems Models and Remote Sensing to Explore Aquatic Ecosystem Vulnerability to Global Change in Lake Huron

Organization: **Northwest Indian College Foundation**

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Summary: Harmful algal blooms (HABs) are expanding in frequency and magnitude, and the US West Coast is directly impacted by the toxigenic phytoplankton, *Pseudo-nitzschia*. The intensification of HABs is linked to warming waters and climate change in the California Current System and can have consequences for coastal communities that are closely tied to marine resources. On the US West Coast there are tools to provide early warning of HABs including forecast models that integrate with federal and state public health entities. Coastal California makes use of the California Harmful Algae Risk Mapping (C-HARM) domoic acid model that is successfully being used to produce nowcasts and 72-hour forecasts of *Pseudo-nitzschia* and domoic acid probabilities off the coast of California. The expansion of the C-HARM model to the Pacific Northwest will link predictive capacity for the entire US West Coast, as domoic acid and Amnesic Shellfish Poisoning events in humans is now considered the leading HAB and conservation issues of the US West Coast.

This project will extend the existing California Harmful Algae Risk Mapping (C-HARM) Model, an operational *Pseudo-nitzschia* and domoic acid (DA) forecasting system used in the southern and central California Current System (CCS), to include the northern sector of the CCS (OR and WA coasts). The project proposes to demonstrate that the C-HARM model can produce predictions of harmful algal conditions for the Pacific Northwest *Pseudo-nitzschia* and DA events, and this model uses a combination of ocean physics circulation models, satellite remote sensing ocean color, and statistical models to predict bloom and toxin likelihood. The project will bring together satellite remote sensing and in situ data sets with Pacific Northwest (PNW) ROMS models to adapt C-HARM to this part of the CCS. Given the strong demonstrated connection between DA production and marine heatwaves, they will also add a sea surface temperature (SST) envelope to improve model performance. The PIs will compare the original C-HARM and the PNW-adapted C-HARM in overlapping sections of the CCS. Preliminary links of SST-enhanced C-HARM with climate model SST outputs for CCS demonstrate promise for using climate models to predict HABs. The project will engage undergraduate interns from NWIC to take part in all aspects of the research, including model development and local outreach.