Poster #21-39

Monitoring Sediment Oxygen Demand in a Coastal Ecosystem with a Robust, In-situ Oxygen Probe

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BER Program: SBIR
Project: SBIR
Project Website: www.optio2.com

An important parameter in modeling the biogeochemistry of coastal ecosystems is the ability to monitor in real-time sediment oxygen demand. The need for data over a wide range of time and length scales necessitates a dissolved oxygen (DO) sensor technology that is simultaneously robust and cost/resource effective. We report on the development of a benthic flux chamber equipped with a compact, self-contained DO probe designed to withstand the rigors of the marine environment over extended periods of time. This autonomous oxygen probe is cost effective and labor efficient to enable temporally resolved measurements of sediment oxygen demand at multiple locations during weather events or marine cycles of interest. We are working to understand coastal eutrophication and hypoxia events of the Sequim Bay Watershed, WA, USA.

We monitor biological oxygen demand in the sub tidal sediments of the Puget Sound with a benthic flux chamber containing the Opti O2 dissolved oxygen probe and data recording module. DO concentration is determined by measuring the oxygen quenching of the phosphorescence from metal-halide optical indicators. The sensor probe is completely self- contained within a compact water proof body which includes both the optical sensing film and the miniature fluorescence spectrometer. The low power requirements of the spectrometer and data logging module enables a single 9V alkaline battery to power the system for at least 750 hours, collecting one data point every 5 minutes. We will demonstrate that our DO probe can accurately monitor DO in both saline and fresh water with the same instrumentation, i.e. without the need for recalibration under changing water conditions as well as the ability of the probe to withstand the corrosive nature of a tidal coastal environment.

Our technology is well suited for long term studies of carbon cycling at the dynamic interface between coastal and terrestrial environments such as the Olympic peninsula.