OPTICAL PHYTOPLANKTON DISCRIMINATOR (OPD) DEVELOPED FOR A GLIDER

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Abstract.
The Optical Phytoplankton Discriminator (OPD) is an instrument that measures for the presence of algal organisms from their optical absorbance characteristics. This instrument is composed by an electronic system and chemical reagents, accomplished by pumping a water sample through a Liquid Waveguide Capillary Cell (LWCC), illuminating it with a light source, and measuring the resulting light absorption spectra. This system has been designed for being coupled to a Slocum Glider. A validation and calibration have been done, results from OPD sensor has been compared with reference material and known samples.

This sensor, the Optical Phytoplankton Discriminator (also called BreveBuster) has been used for the detection of Karenia Brevis, a toxic dinoflagellate which produce red tides [1].
Red tides are produced by harmful algal blooms, and they cause important losses in fisheries and economy if an early detection is not properly done.
It is probed that this sensor lets the detection of Karenia Brevis, and OPD generally detects the toxic bloom before any other detection system (satellite, in situ sampling…)
This automated optical method for the detection of phytoplankton communities has been developed by Mote Marine Laboratory. It has proven successful at discriminating the toxic dinoflagellate Karenia brevis in natural mixed phytoplankton populations in the Gulf of Mexico.
Optical Phytoplankton Discriminators (OPD) analyze particulate absorbance spectra for similarity to phytoplankton community under study through the Similarity Index, which provides a means to quantify the spectral variability in the absorption spectra and is independent of biomass as it is derived from mean-normalized absorption spectra [2].

A multiple regression analysis has been added to the optical discrimination procedure to separate taxonomic classes of phytoplankton using a library of absorbance spectra from laboratory cultures.
Recent modes of deployment include shipboard, moorings, channel markers, piers and autonomous underwater vehicles.
Results from this array of instruments are received at the Sarasota Operations of the Coalition of Ocean Observing Laboratories (SO COOL) for analyses, visualization and dissemination. Deployment and operation of these resources over the past five years has demonstrated the utility of a HAB observatory on the central west coast of Florida. Generally OPD has been installed in different fixed platforms like buoys and moorings (low pressure model, until 30 meters). But in a newer model, it has been developed a high pressure unit (until 100 meters depth) designed for AUV, mainly used in slocum gliders [3].
OPD has been also used for the detection of other kind of phytoplankton as well as toxic dinoflagellates. For the adaptation of the sensor to the determination of different communities it is only necessary having the spectra of different cultures, which lets use them as reference signal for the system.
Having sensors which detect the kind and concentration of phytoplankton communities present in an area is an important advantage in time and resources in the study of the ecological state of a region.

REFERENCES

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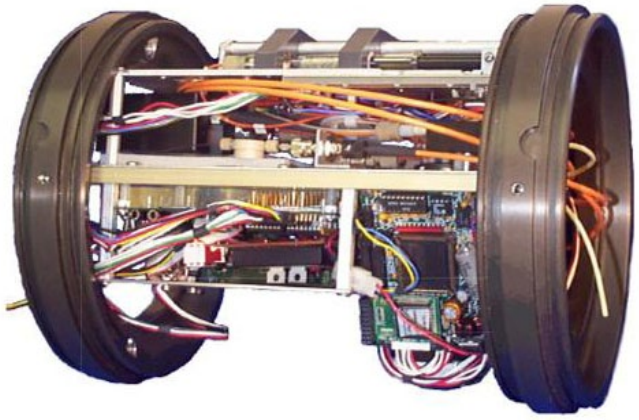

Fig. 1. The Optical Phytoplankton Discriminator (without it's watertight housing).

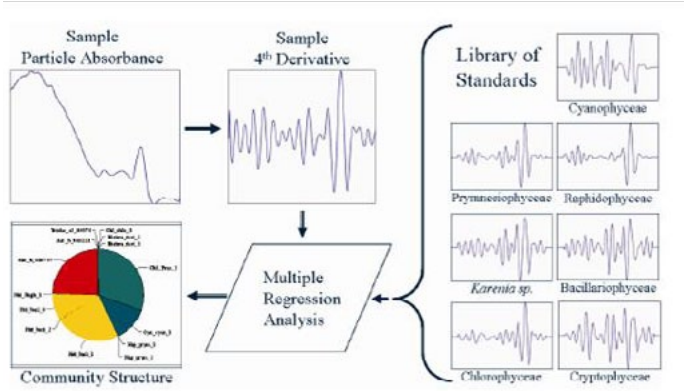

Fig 2. The multiple regression scheme for estimating phytoplankton community structure from particle absorbance spectra.