Optical Phytoplankton Discriminator (OPD) developed for a glider

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b) Plataforma Oceánica de Canarias, Gran Canaria, Spain
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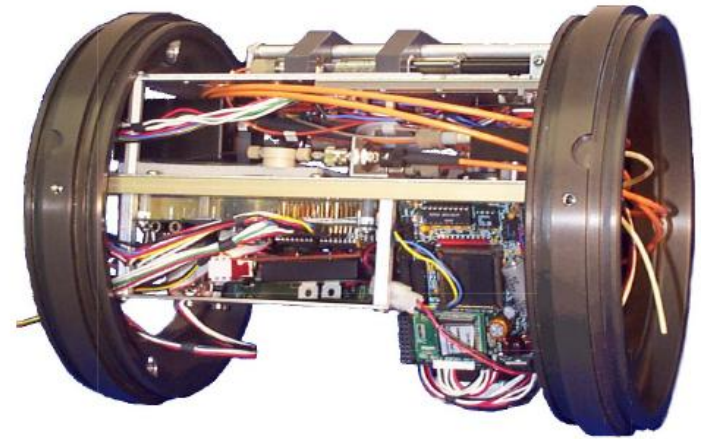*d) Mote Marine Laboratory, Sarasota, Florida, USA*

16 de Marzo de 2011

RUTGERS UNIVERSITY
COASTAL OCEAN OBSERVATION LAB
OPERATIONS CENTER

MOTE MARINE LABORATORY

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PLATAFORMA OCEÁNICA DE CANARIAS

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Originally called **Brevebuster**
Developed for the monitoring of
Karenia Brevis (2003)

Hails et al. Mote Marine Lab

BreveBusters optically detect Karenia brevis blooms by comparing light absorption by particles in ambient water to the light absorption fingerprint that is characteristic of K. brevis.

That comparison yields a Similarity Index (SI) which is related to the fraction of phytoplankton community biomass contributed by K. brevis. Values of SI below 0.5 indicate less than 10% K. brevis, values over 0.8 indicate greater than 90% K. brevis.

Harmful algal bloom –
Red Ties

In the Eastern Gulf of Mexico are most often composed of toxic dinoflagellates from the genus Karenia.

An early detection is important to minimize economic and health problems.

Bloom of the toxic alga Karenia brevis is visible along the west coast of Florida. (Image from Jacques Descloitres, NASA)

In Spain:
Red ties are frequently in Galicia and in Mediterraneo coast. Sometimes it appears in Canary Islands.

Peridinium
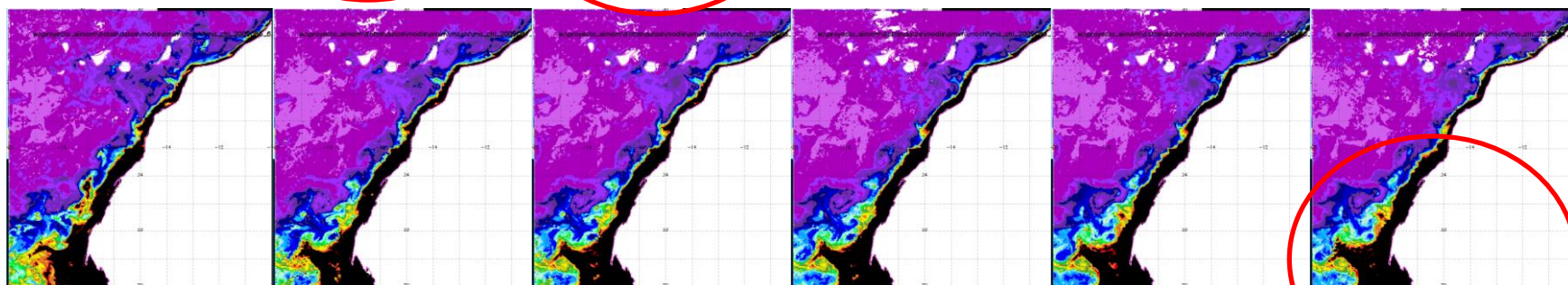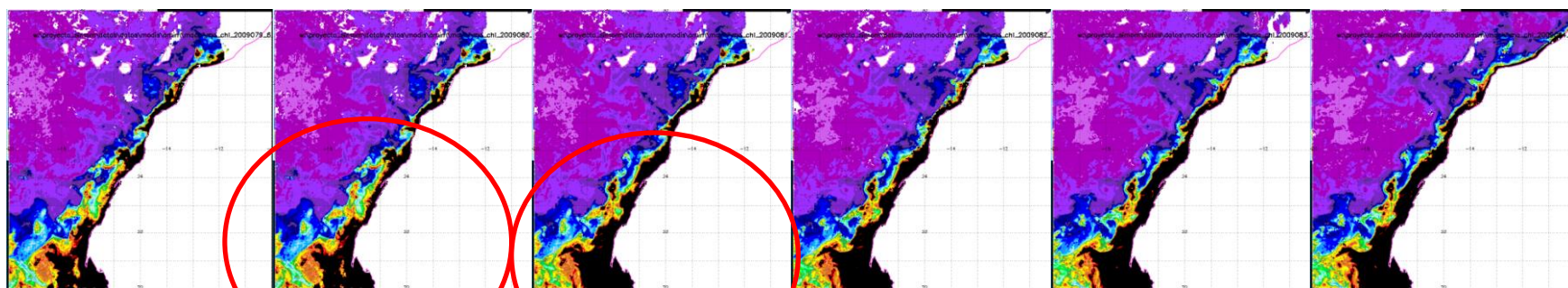*Gymnodinium*
Prorocentrum
Pseudonitzschia
Karenia

Very fast cycles

Little is known about transitions in phytoplankton community structure during the very early and late stages of the blooms. Sometimes phytoplankton cycles are very fast.
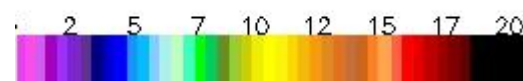
Monthly sampling couldn´t be enough for an early detection.

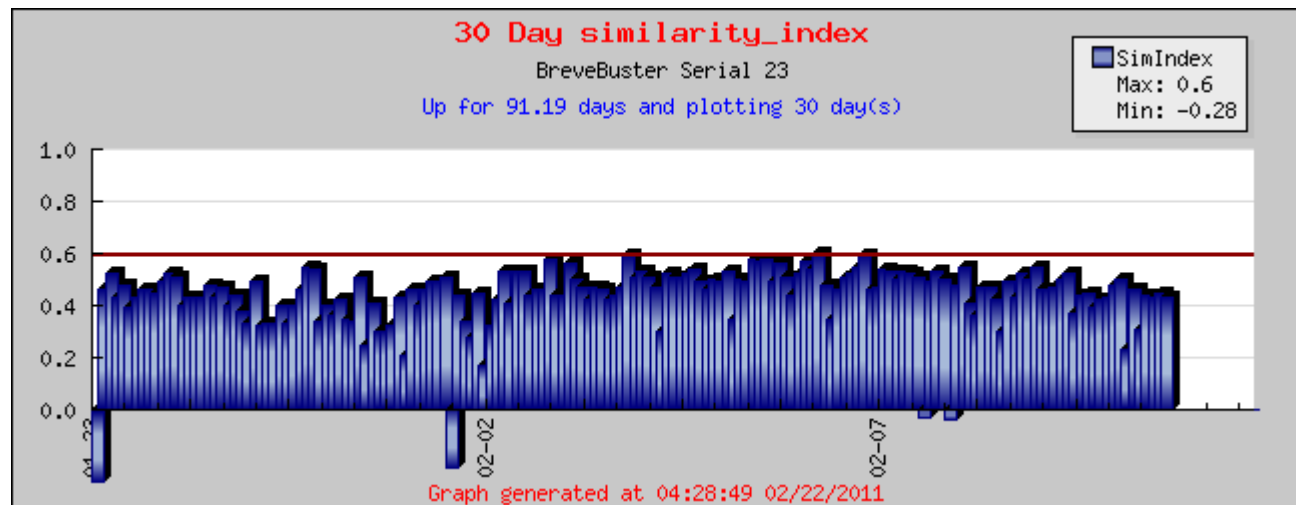Study of daily variability of phytoplankton growth:

20.03.09   21.03.09   22.03.09   23.03.09   24.03.09   25.03.09

27.03.09   28.03.09   29.03.09   30.03.09   31.03.09   01.04.09

02.04.09   03.04.09   04.04.09   05.04.09   06.04.09   07.04.09
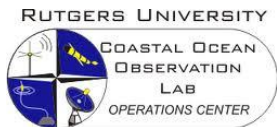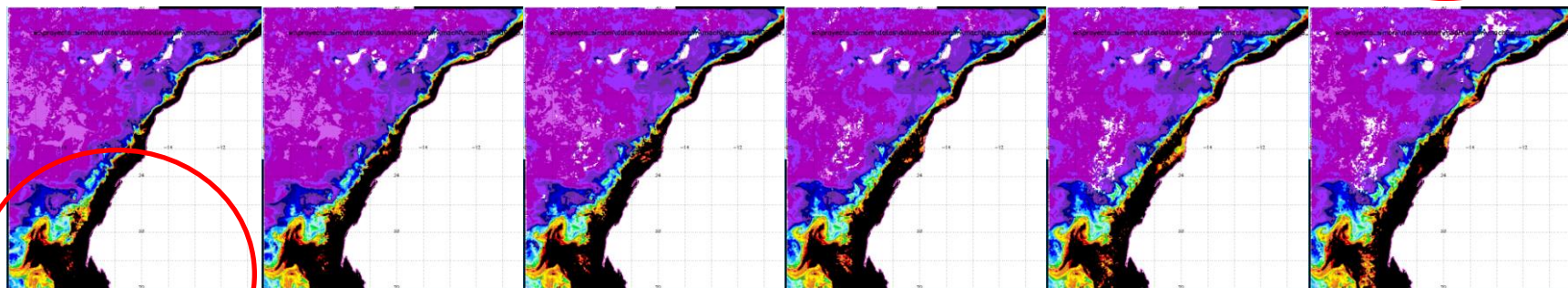
Chlorophyll a concentration
(mg·m⁻³)

2   5   7   10   12   15   17   20

Karenia Brevis is monitored every 2 hours in Florida coast

Operator	Site	Serial	Status	Deployed	Days Wet	Voltage	SimIndex	Bypass	S	a(440)	Last Xmit
FWRI/Mote	MB3 -- ANNA MARIA	23	ACTIVE	2010-11-23	91.18	12.677	0	0.181	0.014	0.18	2011-02-12 12:02:46

30 Day similarity_index
BreveBuster Serial 23
Up for 91.19 days and plotting 30 day(s)

SimIndex
Max: 0.6
Min: -0.28

Graph generated at 04:28:49 02/22/2011

Most sensors for the detection of phytoplankton are based in fluorometer detection, but this sensor is an spectrofotometer.

It measures tramitance at different wavelenght, but it is obtained → **Absorbance**

It lets determine different kind of pigments, not only chlorophylls and with the **different spectra** → obtained **phytoplankton communities**
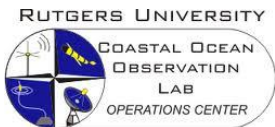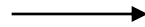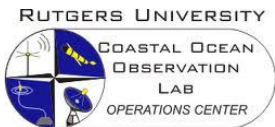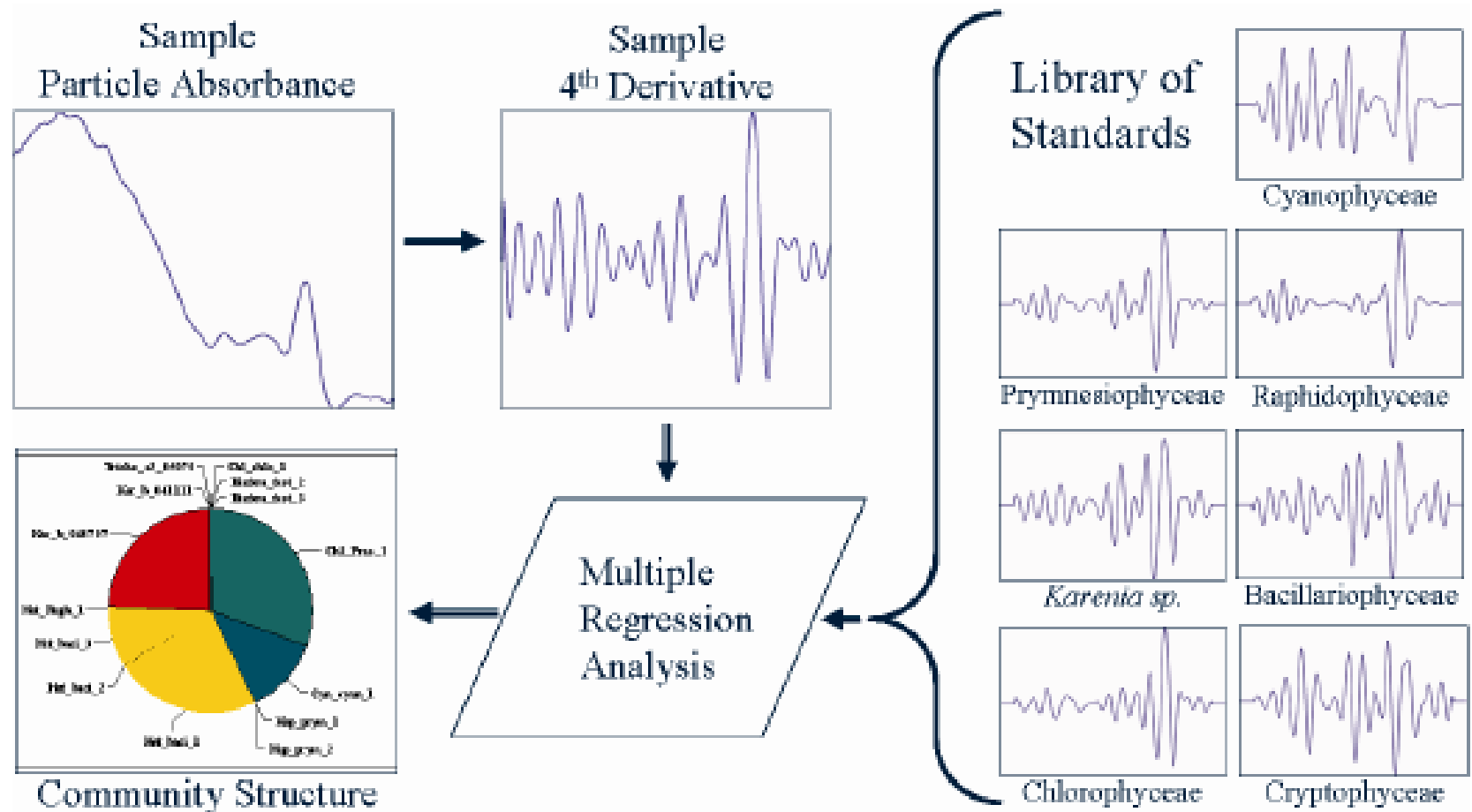
Brevebuster ⟶ **OPD**

With the appropiate identification of **spectra** of the different populations it is possible to determine the presence and concentration of **different kind of phytoplankton communities** at real time with this kind of systems
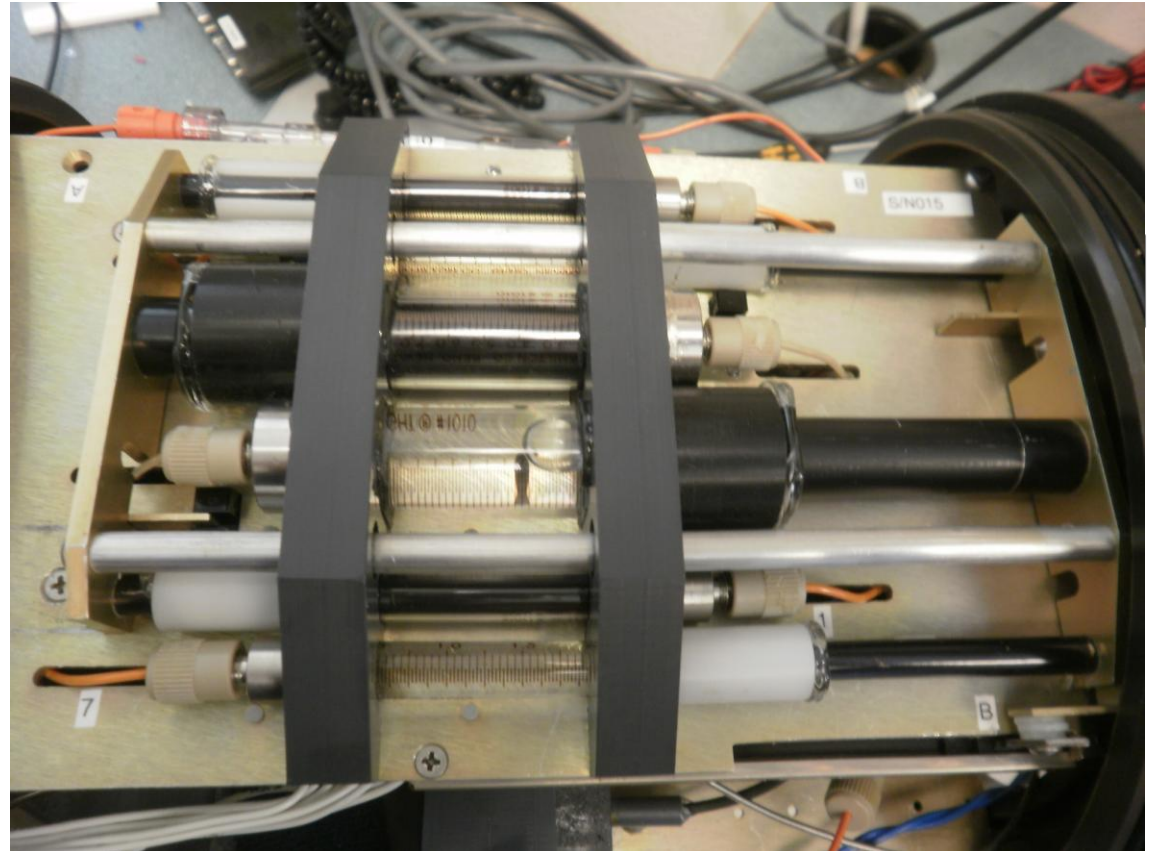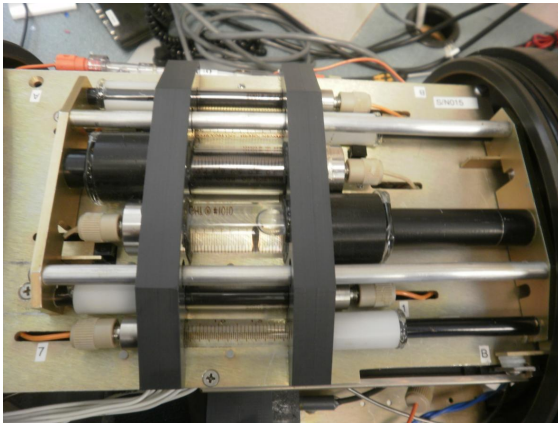
Kirkpatrick et al. (2008)

This kind of sensor can be installed in fixed platforms and in AUV as gliders.

OPD instrument can be adapted to a Slocum glider. It is limited to 70 meters
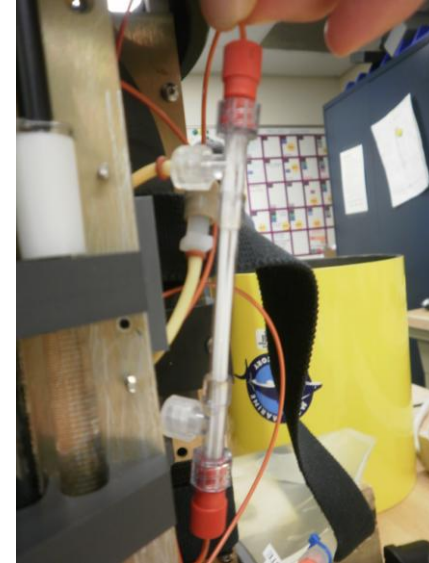
The difference is the sample pump. It is adapter for higher pressures.
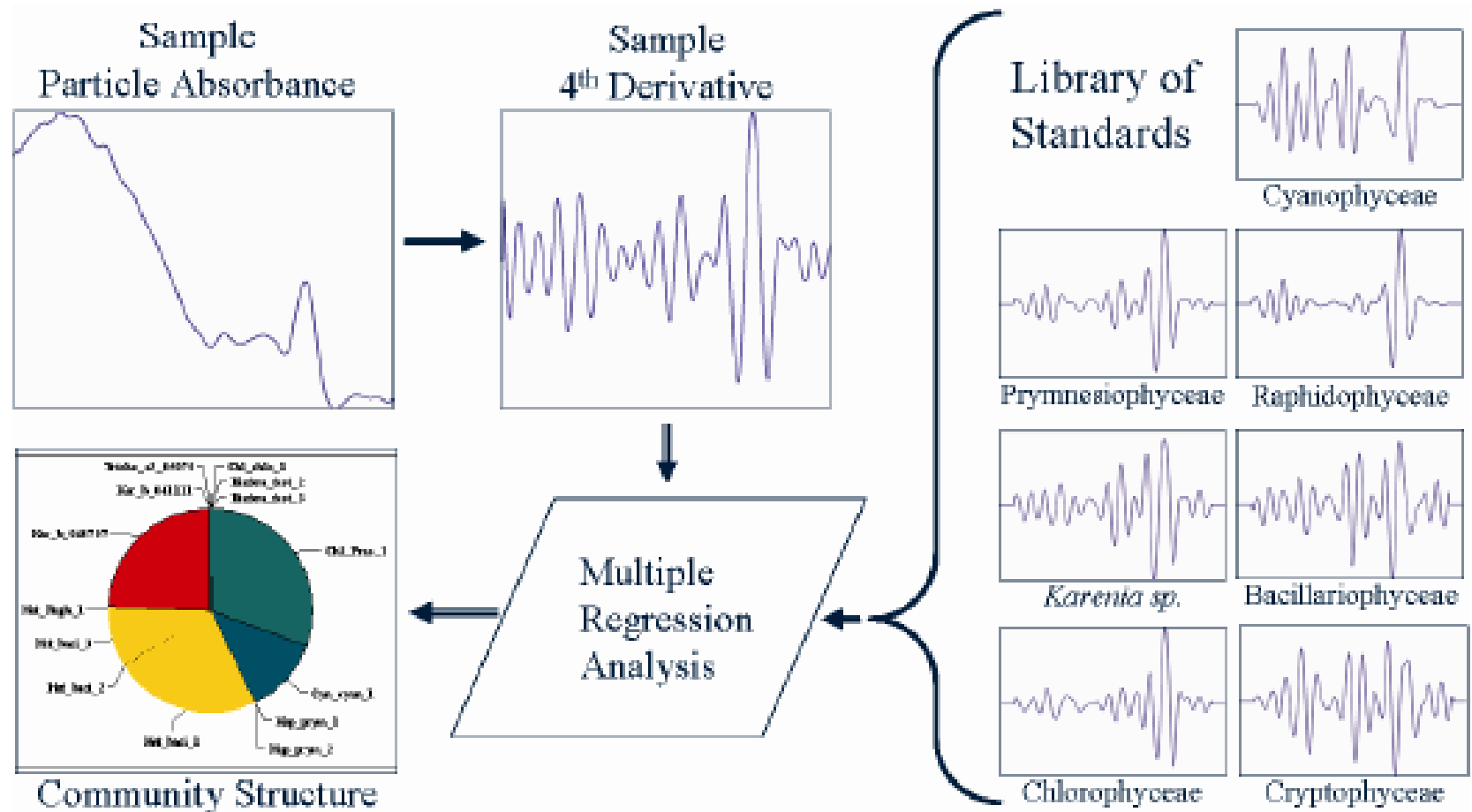
According to the phytoplankton concentration in open oceans, it is necessary to preconcentrate the sample in a filter.

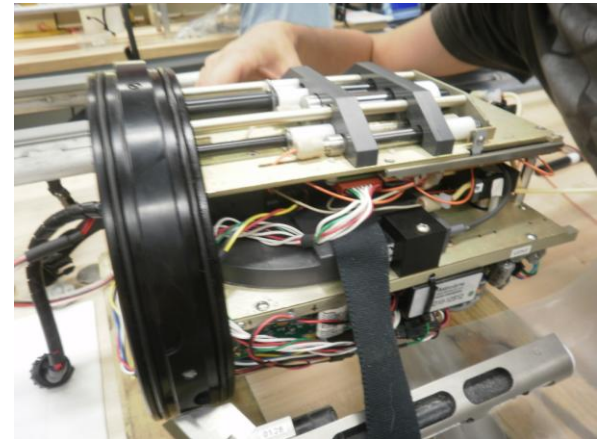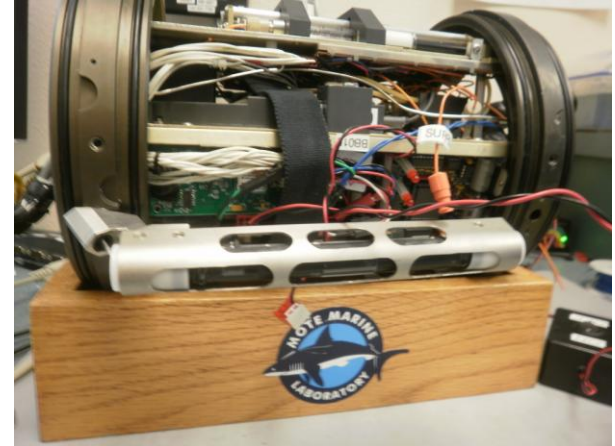This is more crucial in low concentration regions.

Kirkpatrick et al. (2008)

Spectral absorbance data for taxonomic class discrimination analysis:

We are working nowadays increasing the database of standards with phytoplankton cultures, for a better comparation on the algorithm.
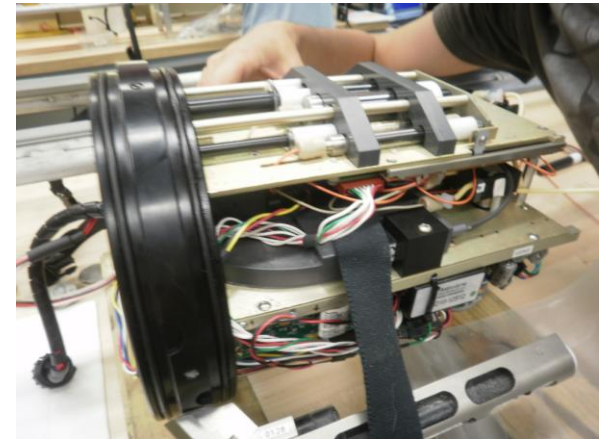
Also it is necessary to do more system test at different regions, with different biogeochemical properties

The new cultures in study:

Thalassiosira weissflogii
Porphyridium cruentum
Phaeodactylum tricornutum
Isochrysis galbana
Emiliania Huxleyi
Dunaliella tertiolecta
Amphidinium carterae

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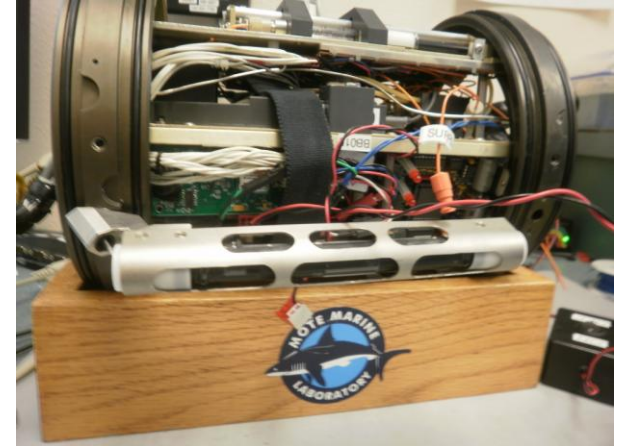
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