5th Symposium | Accra, Ghana | 24 – 28 October 2022

# Coastal Observations in Under-Resourced Countries


| | | |
|---|---|---|
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**And multiple Co-PIs**

Ocean best practices

Task Team 22-01

# Coastal Observations in Under-Resourced Countries

**Lucie Cocquempot** (IFREMER, France) and **Jethan d'Hotman** (SAEON, South Africa), and multiple co-investigators

***"Affordable and standardised practices that can be broadly used for observations of physical and biogeochemical parameters of the coastal ocean"***

| | | |
|---|---|---|
| ❑ | Team development | Ongoing |
| ❑ | Literature collection and archiving | Ongoing |
| ❑ | **Co-design (surveys, workshops)** | **NOW** |
| ❑ | **Instrument and method packages** | **NOW** |
| ❑ | Standard operating protocols | |
| ❑ | Data QA and management | |
| ❑ | Training | |

# COLaB: "Coastal Observation Lab in a Box"

## Objectives

***Packages of instruments and methods for physical, biological and biogeochemical observations***

- "Old-school" – affordable, low-maintenance, proven
- Modular
- Minimal infrastructure (vessel, laboratory)
- Portable and easily taught
- Diverse applications (wetlands to shelf edge)
- Complementary to moored systems and remote sensing
- Protocols (sampling to data management)
- Modelling and data packages
- Training

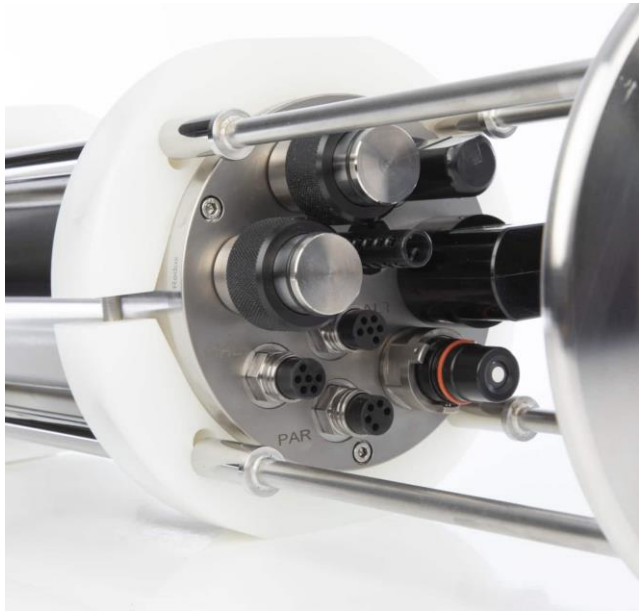
# Vessels

| | |
|---|---|
| Inland waters: | Kayaks<br>Outboards (dive boats/RIBs)<br>Small research vessels |
| Offshore (open shelf): | Fishing boats to full research vessels |

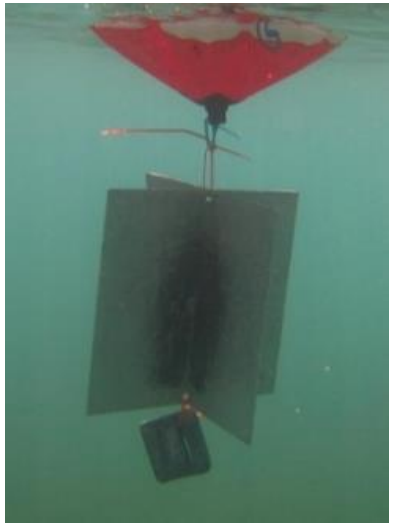


# Basic hydrographic instrumentation

## CTD


## Currents



# Biogeochemical analyses

## Multiparameter sondes


## Some lab-based methods

- Nutrients
- Chlorophyll
- Dissolved oxygen
- Alkalinity
- pH
- SPM
- Sulfide
- CDOM and FDOM

## Simple analytical instrumentation

- UV-vis spectrophotometer
- Fluorometer

## Water sampling and profiling

### Shallow water

Niskin bottle, rope, and messenger

### Deep water

12V line hauler or winch

## Portability

2-4 23-kg crates

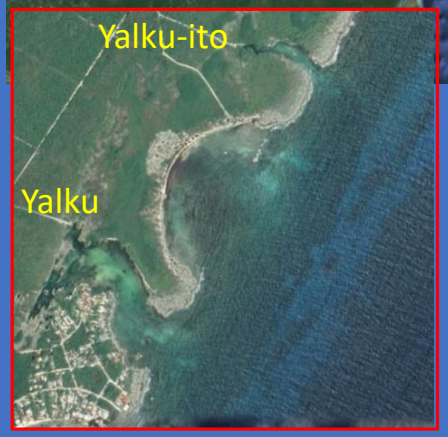
## No formal lab required

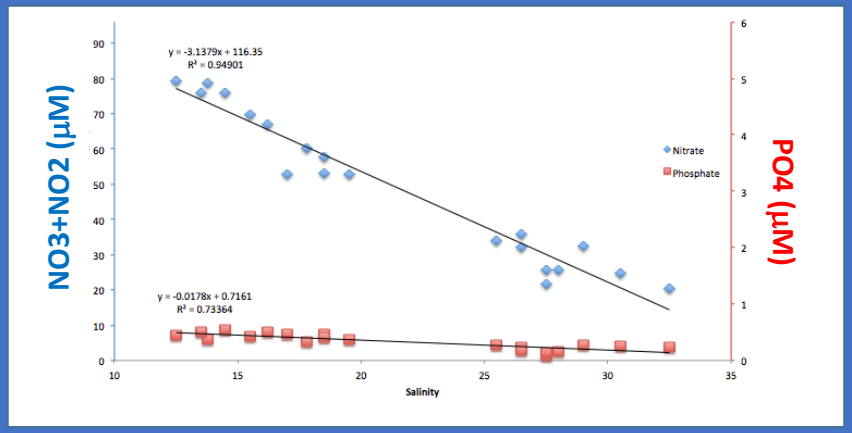
- Sink
- Power
- Bench space

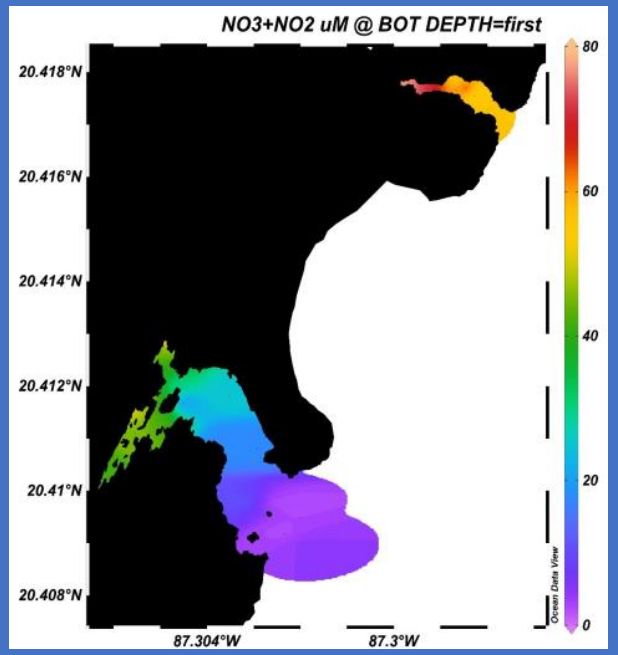
## Throughput

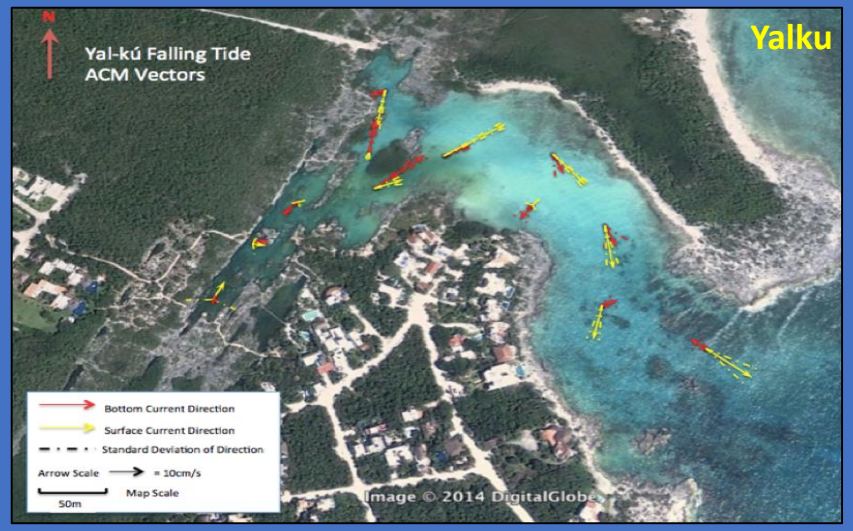
30 - 40 samples/day
(e.g. 1 staff + 3 students)

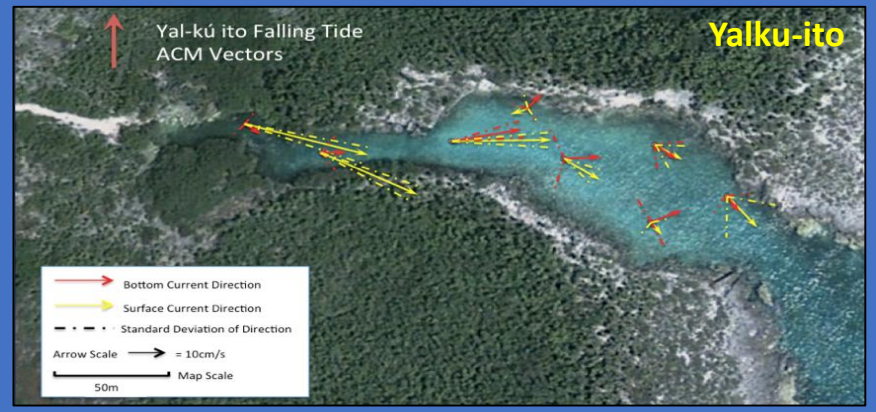
# **Mexico:** Contaminated groundwaters and reef health

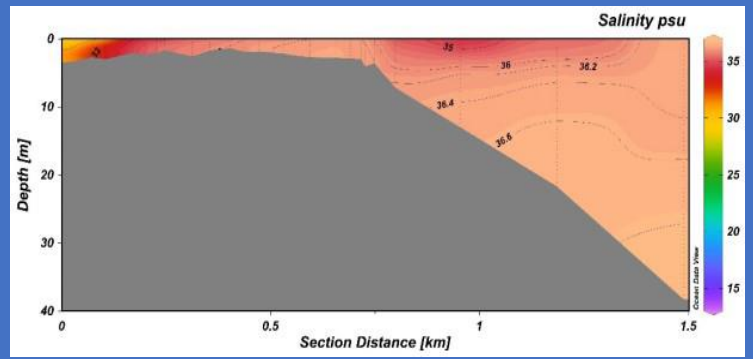



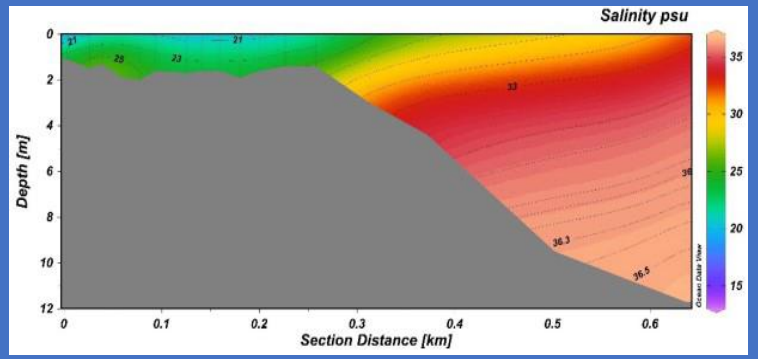



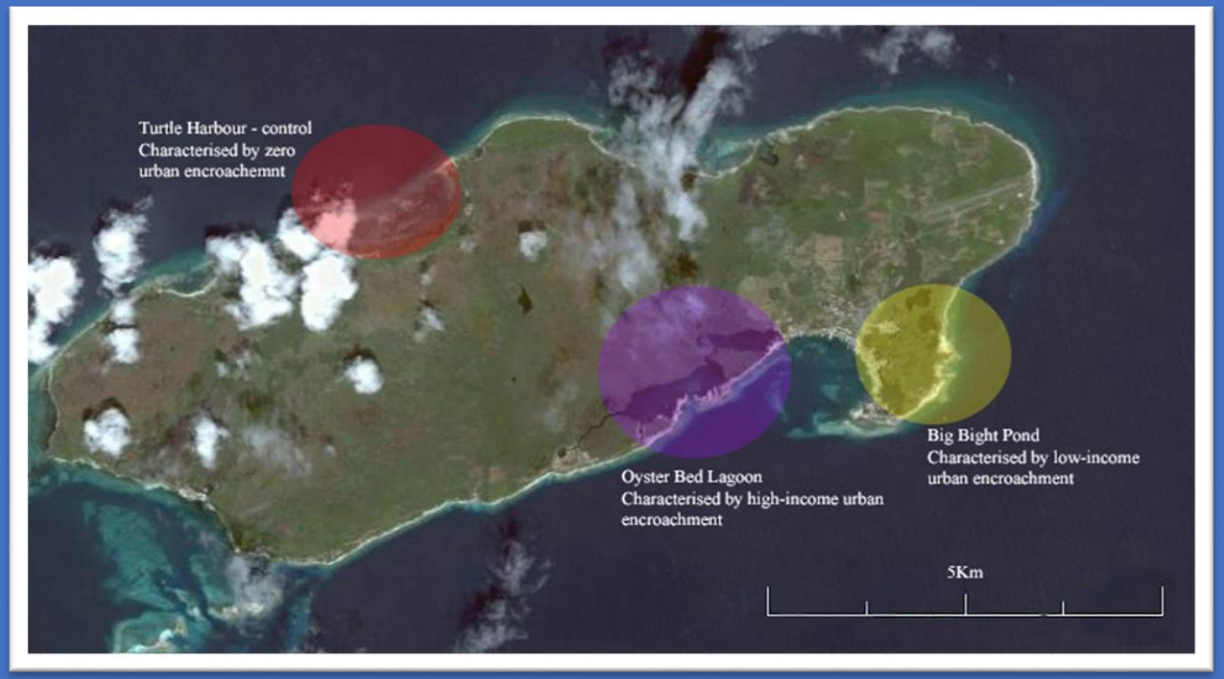





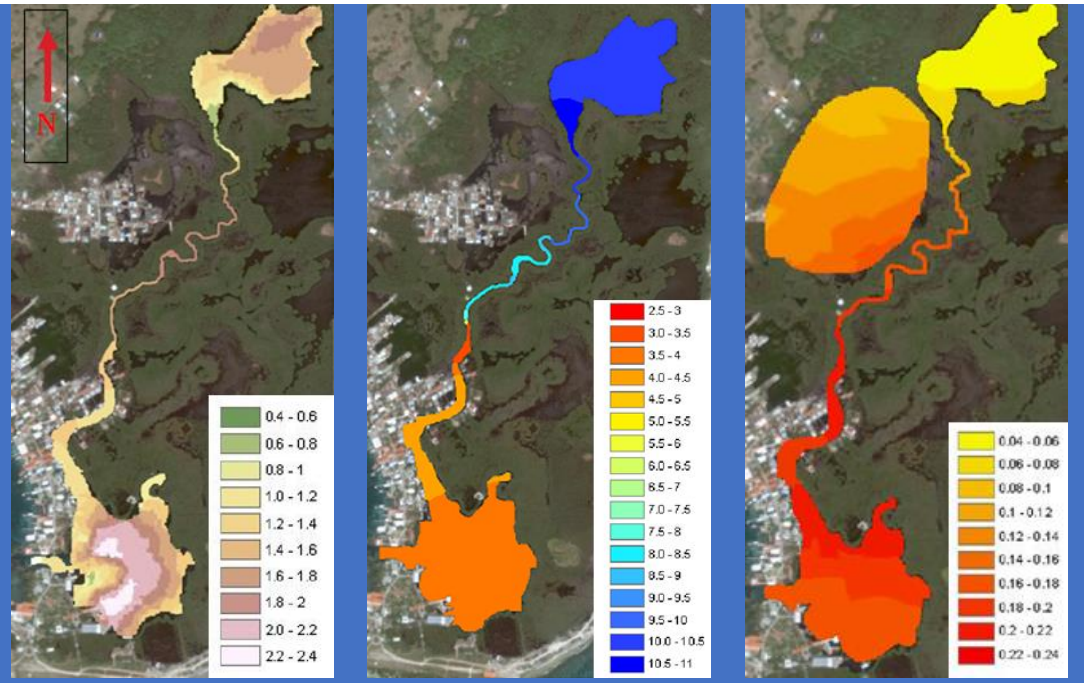


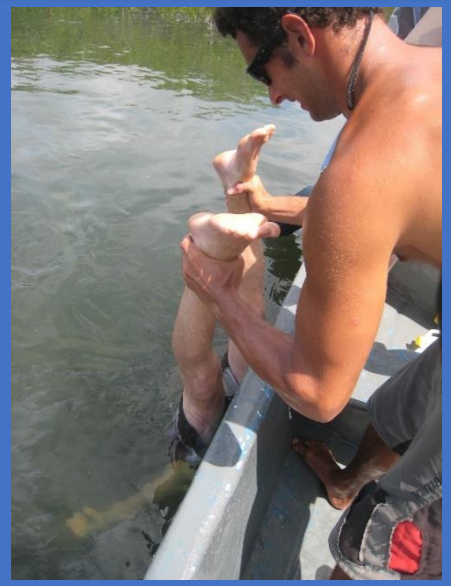



# **Honduras:** Human impacts on mangroves and offshore reef health

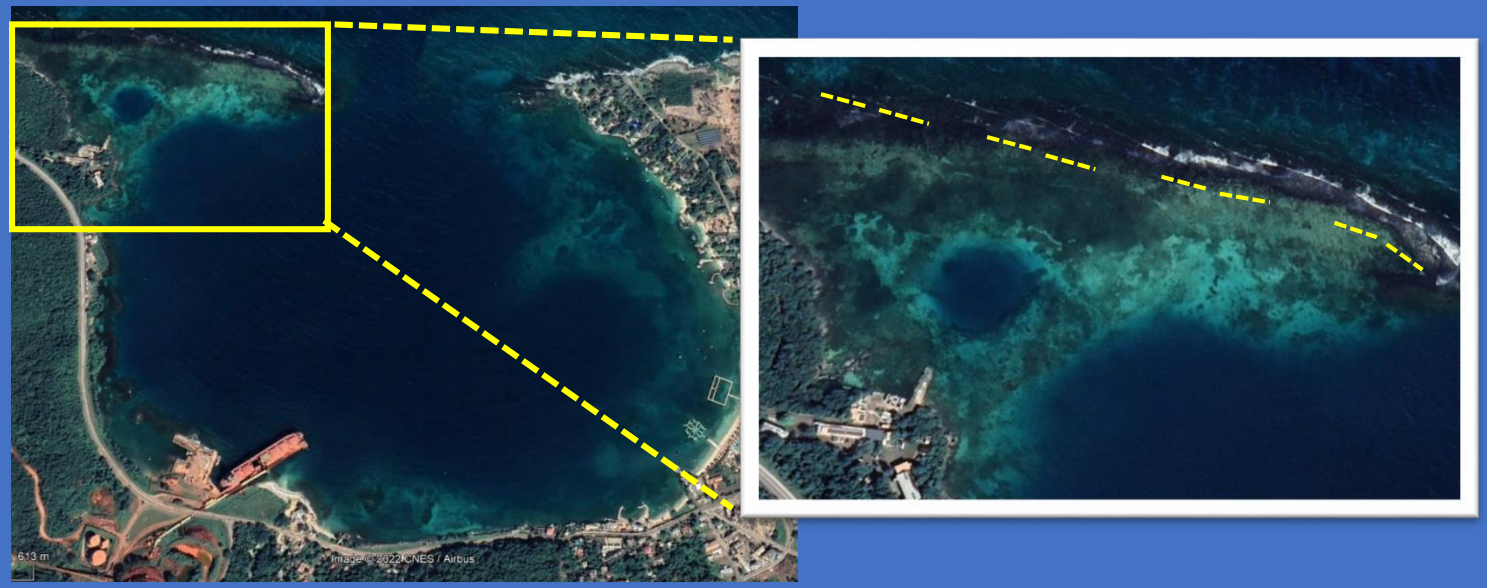


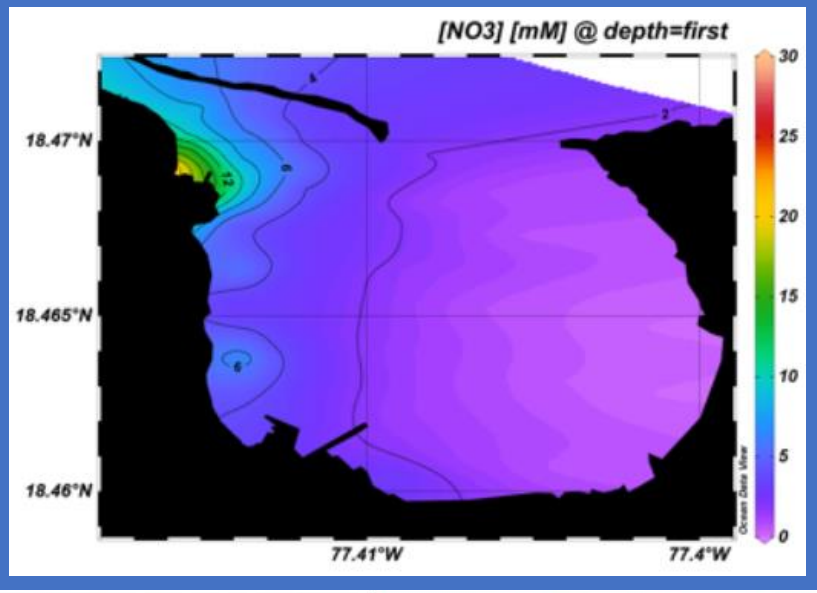

Bathymetry (m) SPM (mg/l) Ammonium (µM)



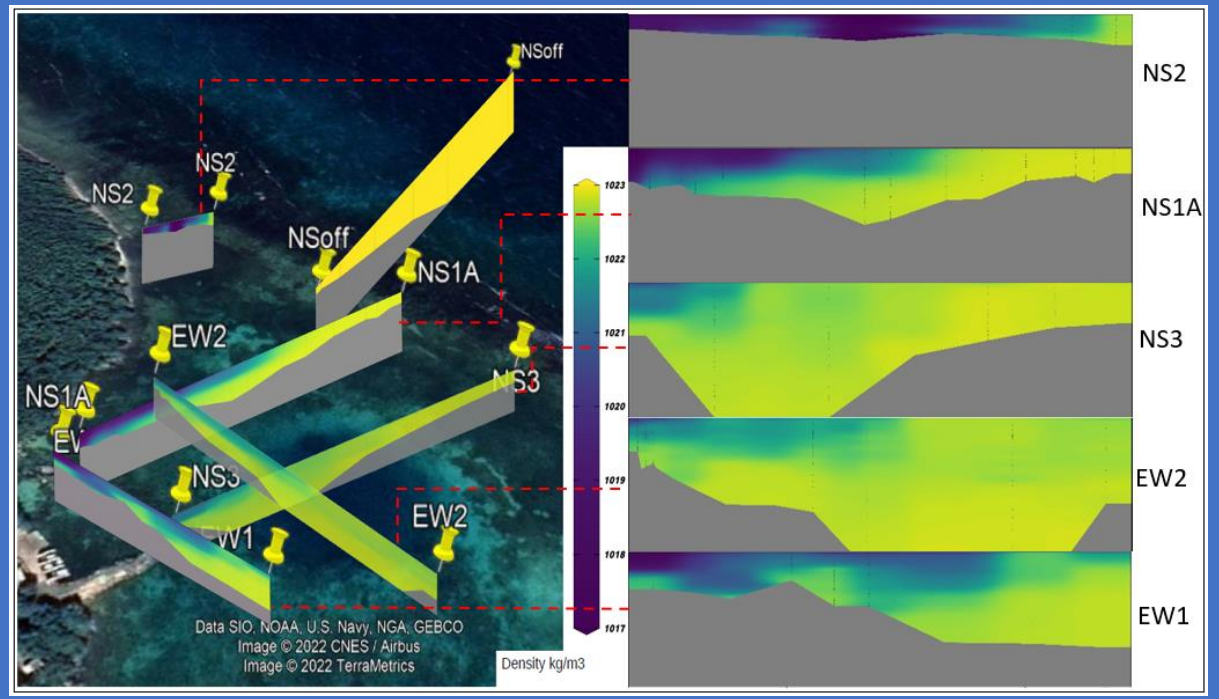



# **Jamaica:** Groundwater nutrient contamination and reef health

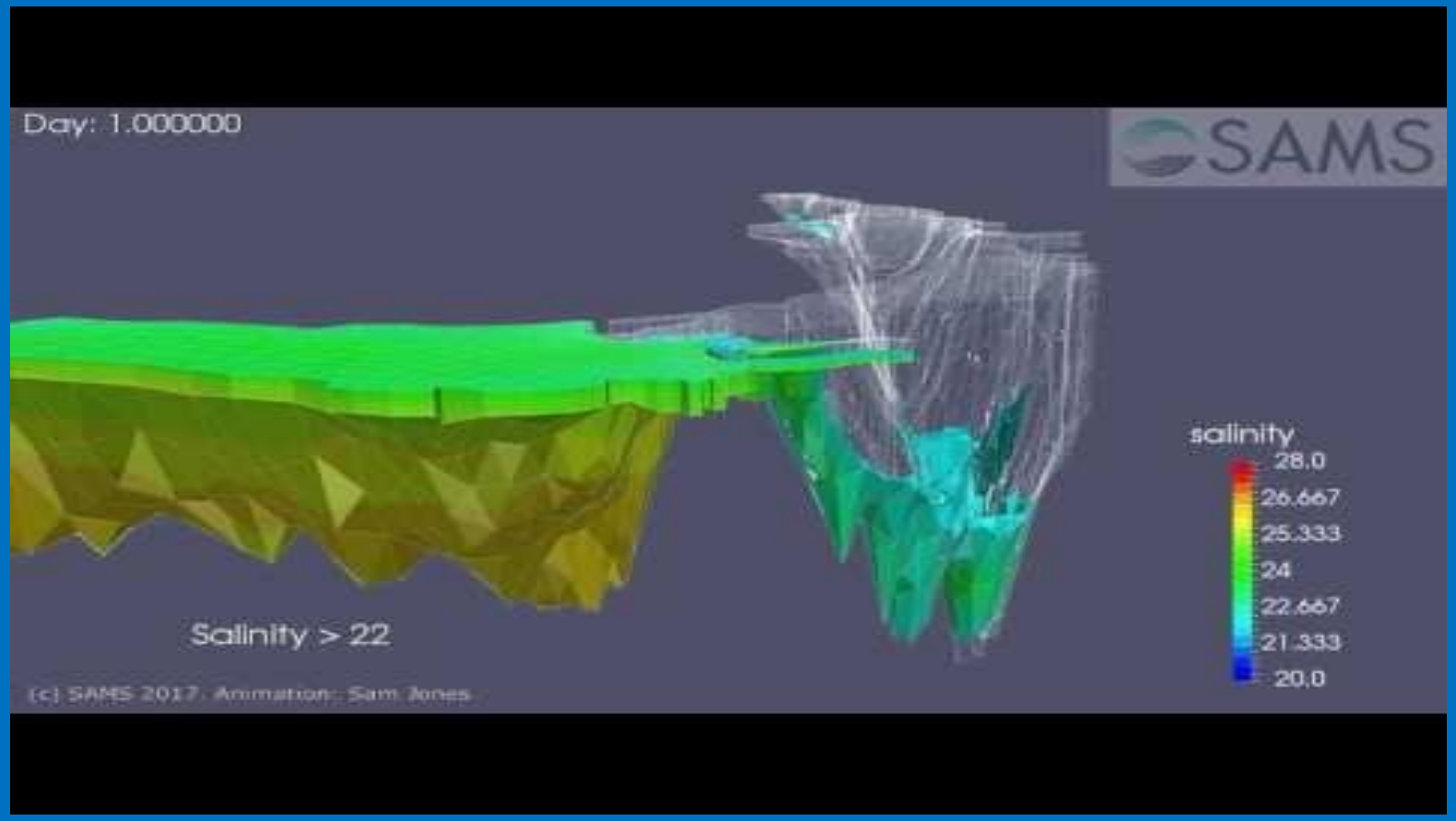


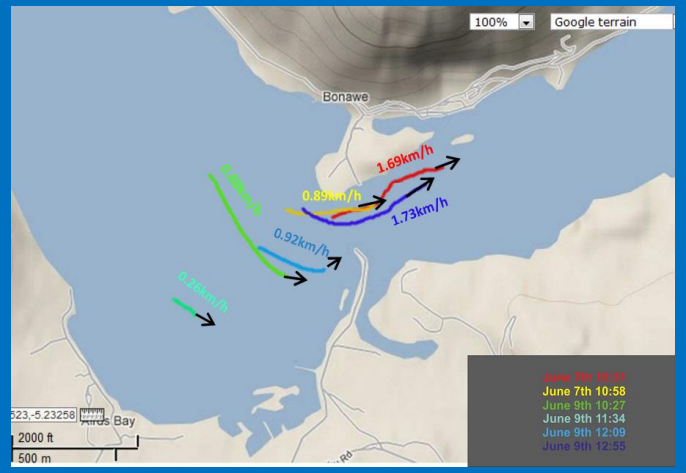



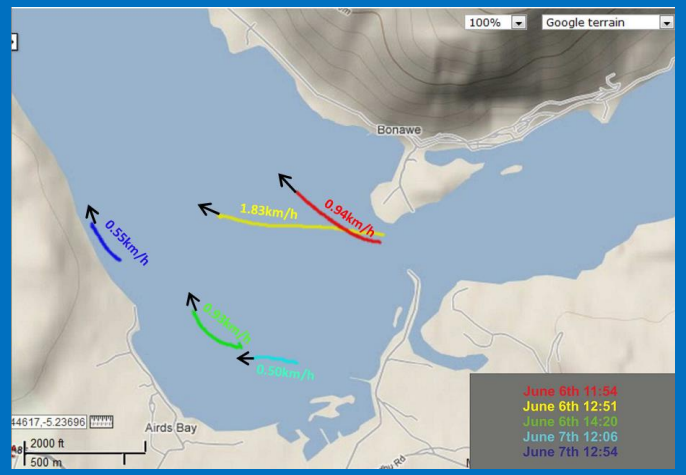


# **Scotland:** Biogeochemical and physical process studies in a temperate fjord

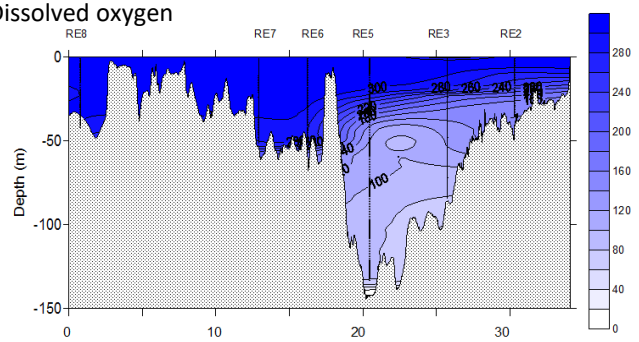


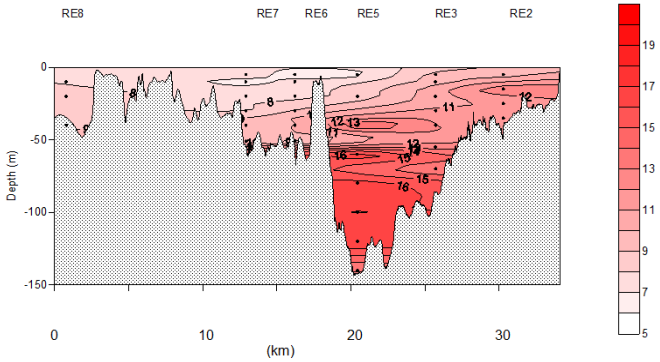




# Loch Etive, March 2012

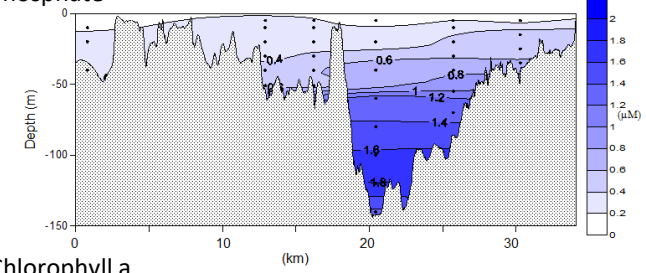
Dissolved oxygen



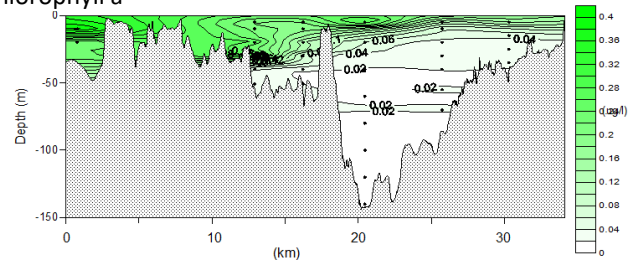

Nitrate



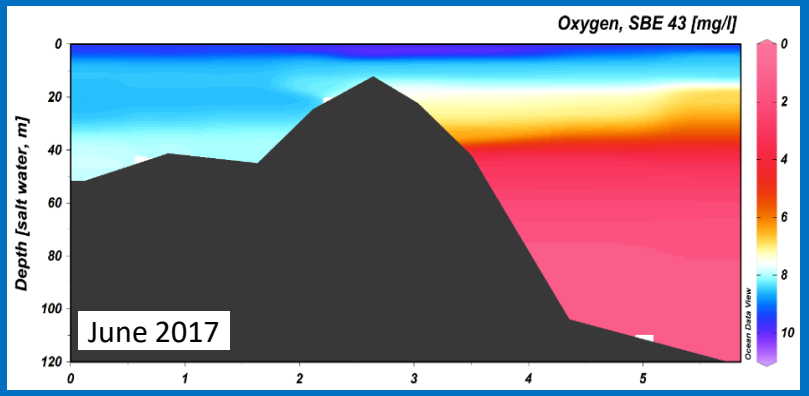

Phosphate

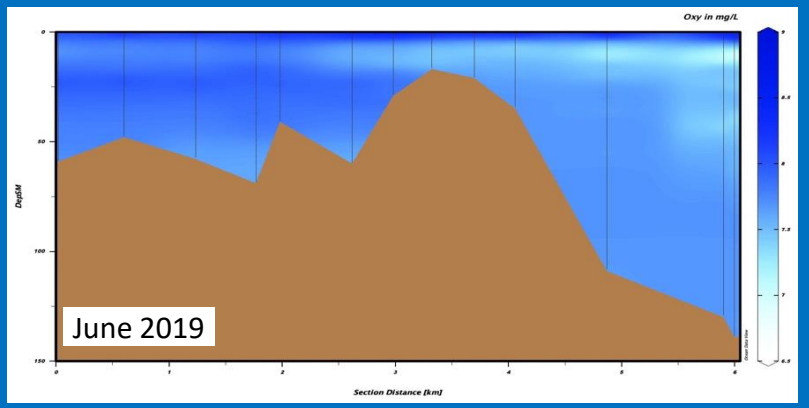



Chlorophyll a

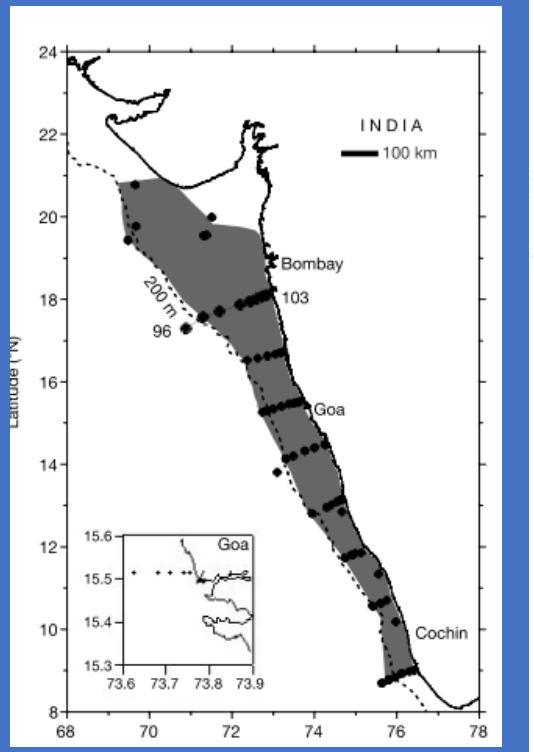


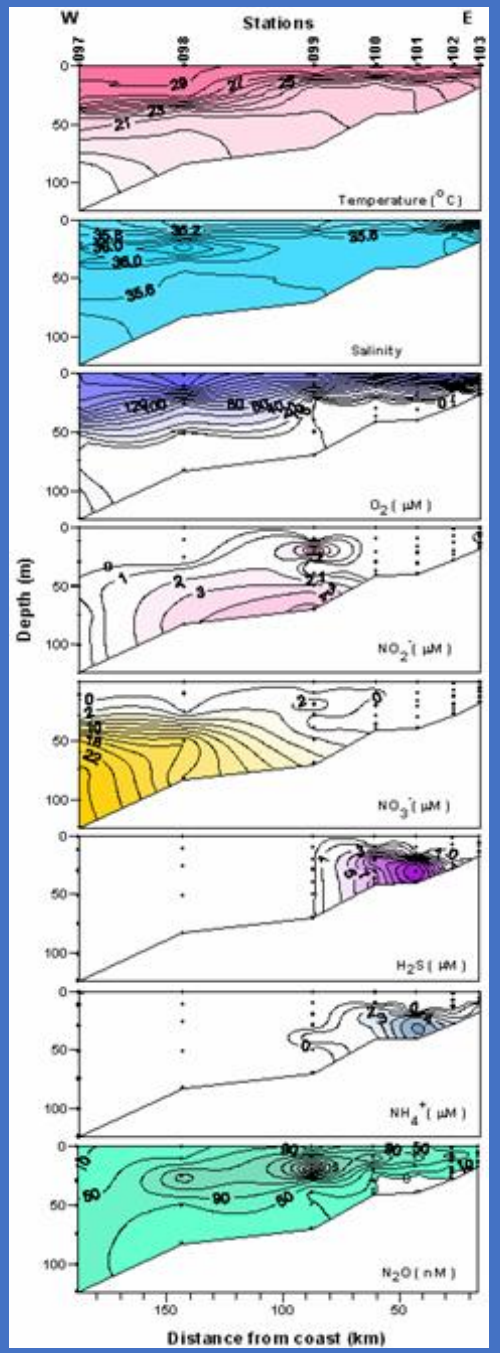

Dissolved oxygen

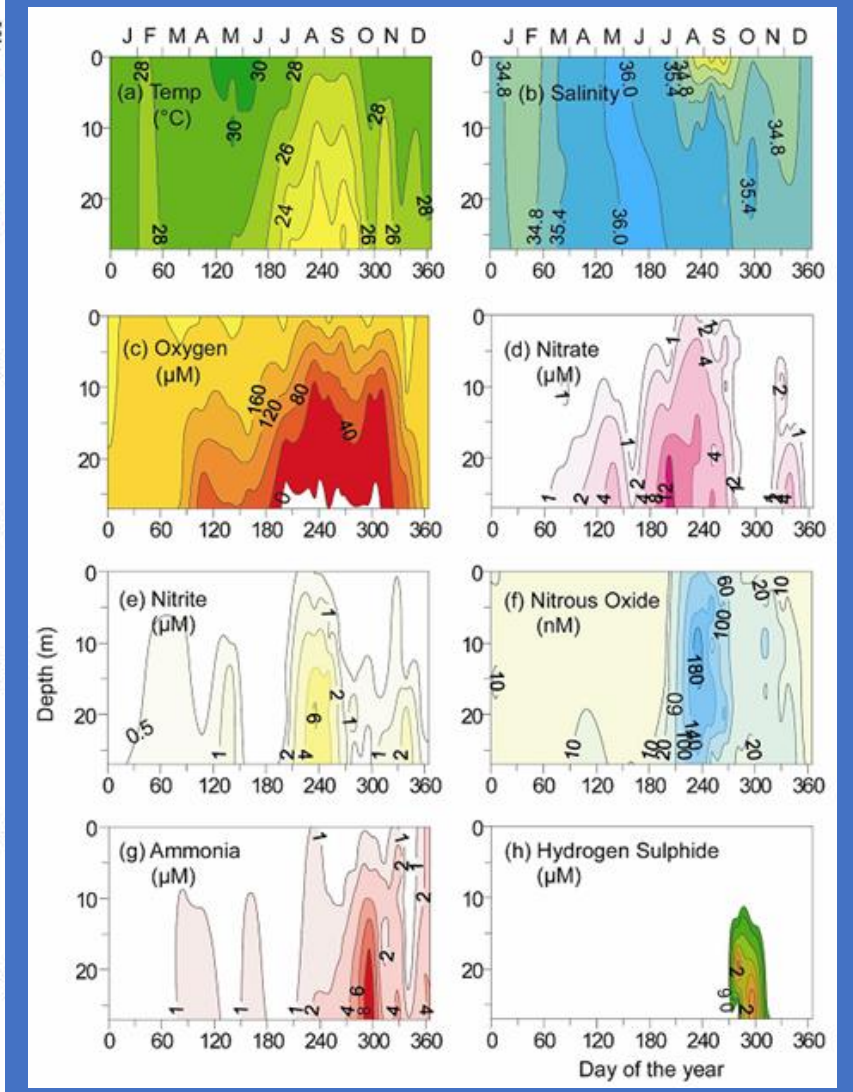


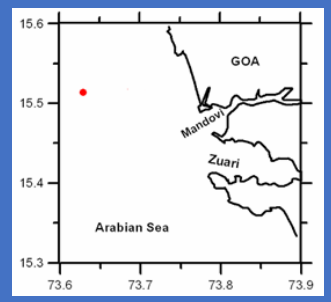



# **Western Indian margin:** Observing system and cross-shelf transects



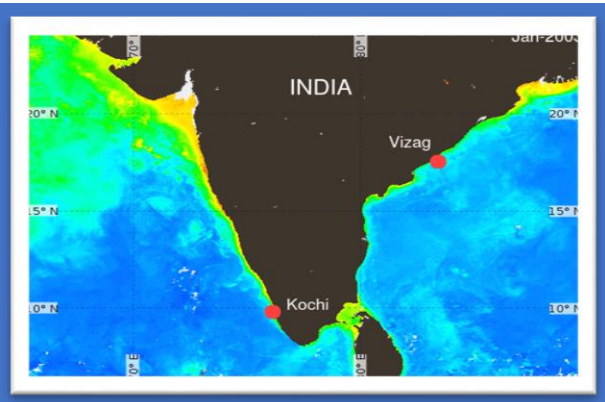




Naqvi et al 2006, 2009

MOSAIC programme (INCOIS)




**CONTACT:** Dr. Aneesh Lotliker
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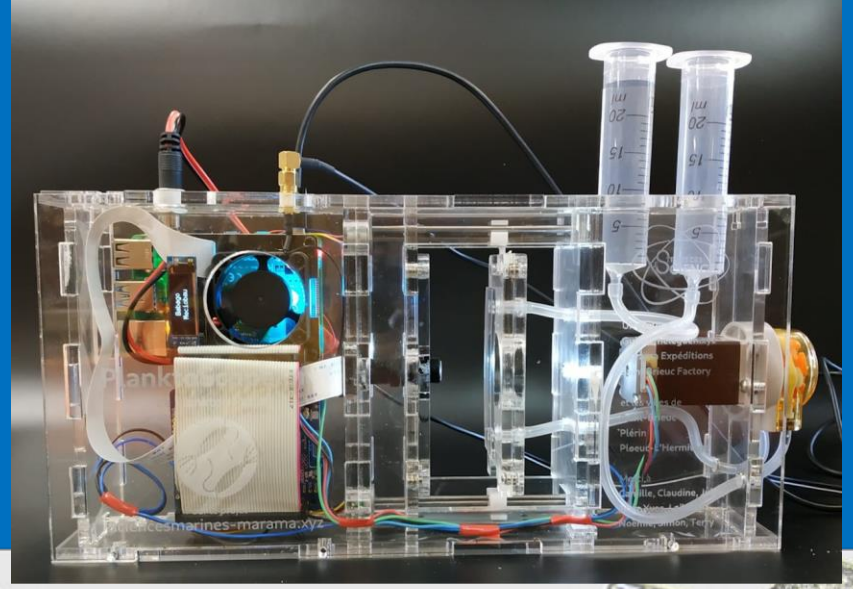
# Open and affordable modular imaging platform for citizen oceanography

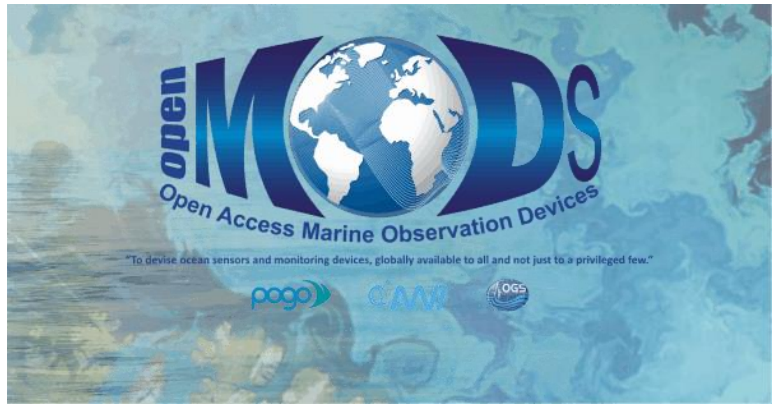


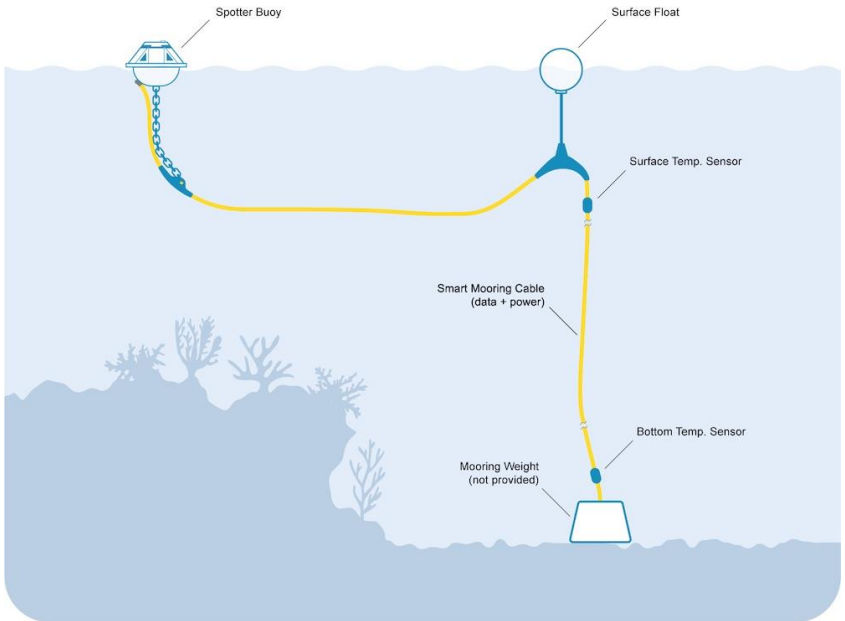

https://www.planktoscope.org

Shoal
Supporting our Oceans

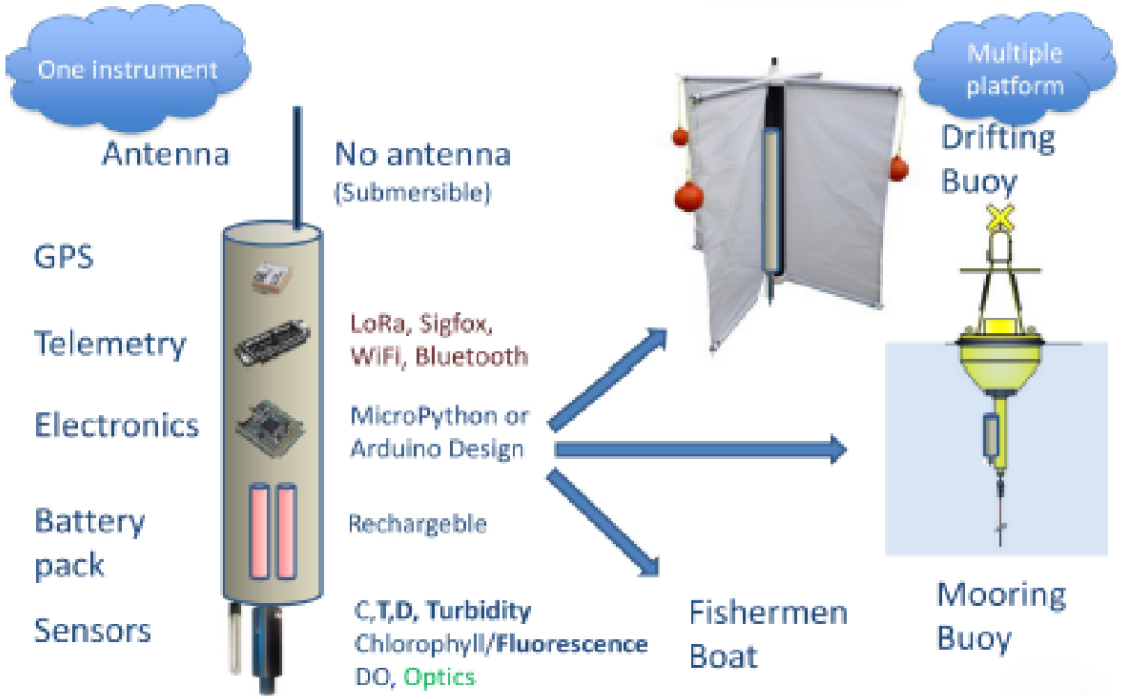
# Low-cost real time moorings

Spotter 3




## Architecture of the multipurpose Low-cost Effective Ocean-observing (LEO) platform



# Global Eutrophication Monitoring (GEM)-in-a-box

## UN SDG 14.1.1- Eutrophication Monitoring

Problem: 900+ areas of the ocean world-wide suffer from eutrophication

- Causes harmful algal blooms, deoxygenation and other water quality issues affecting coastal ecosystems and human populations
- Current monitoring is expensive, labor-intensive, not standardized

Solution: create a cost-efficient kit for world-wide monitoring– GEM-in-a-box

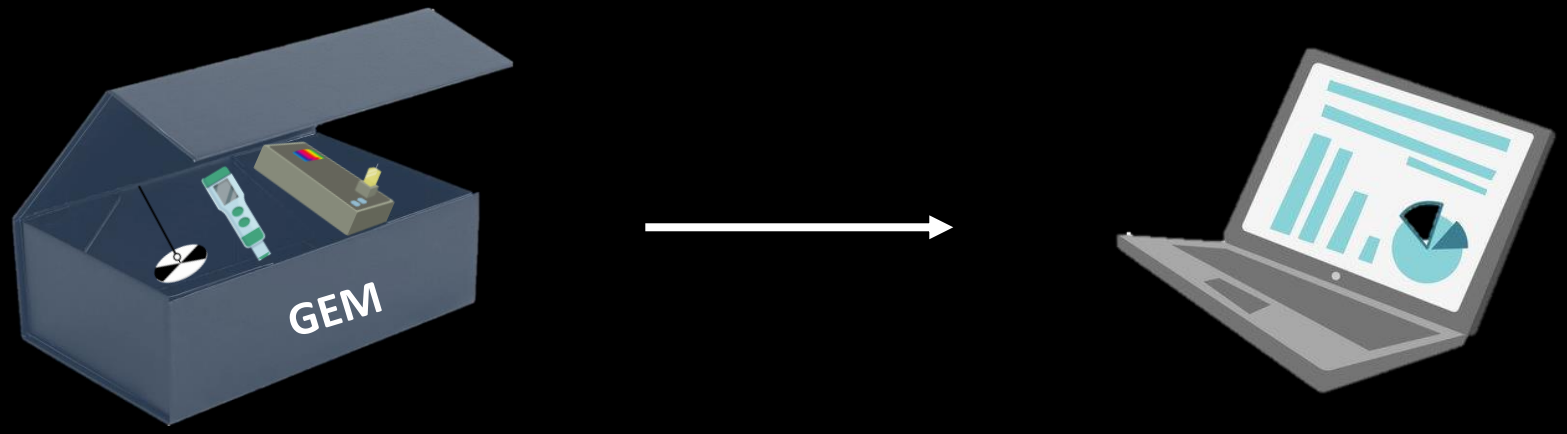
- Contains supplies and equipment needed
- Contains easy-to-use instructions (SOPs)

Goals:

- Reduce the costs and training required for monitoring
- Increase data collection and monitoring in remote, under-resourced and vulnerable areas
- Create standardized global-scale datasets to improve the development of mitigation and prevention strategies to protect our oceans

# Current Progress- Pilot Project

- Designing a prototype for preliminary testing and data management systems for data analysis and interpretation




- Identifying interested partners to test the prototype in their home basins
  - We provide the kit, you provide the water

*For more information, please contact: katherine.shaw@dfo-mpo.gc.ca

# **COLaB Data management:** Integration of ERDDAP Services

**CONTACT:** Dr. Kevin O'Brien
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data payload

**1**. Data payload is extracted from sensor and pushed directly into an ERDDAP service using the HTTP Rest API

ERDDAP service

| Time | Airp |
|---|---|
| UTC | Pa |
| 2022-03-14T16:18:00Z | 1016 |
| 2022-03-15T18:52:00Z | 1021 |
| 2022-03-16T03:54:00Z | 1019 |

ERDDAP also provides extensive capabilities for:

- Data access through interoperable and machine-to-machine services
- Improving metadata and documentation of datasets
- Federation of distributed data services
- Integration into cloud environments
- Potential connection to WMO WIS 2.0 data exchange services

**2**. Data are then available to be accessed immediately and used in one of the many data formats ERDDAP supports

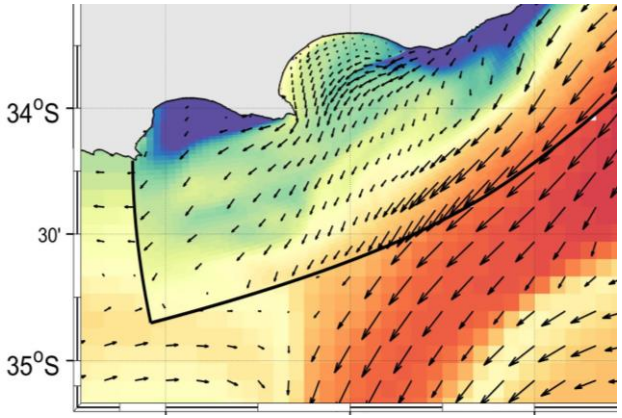
EXAMPLE URL: http://localhost:8080/erddap/data.insert?date="2022-03-16T03:54:00Z"&airp="1019"

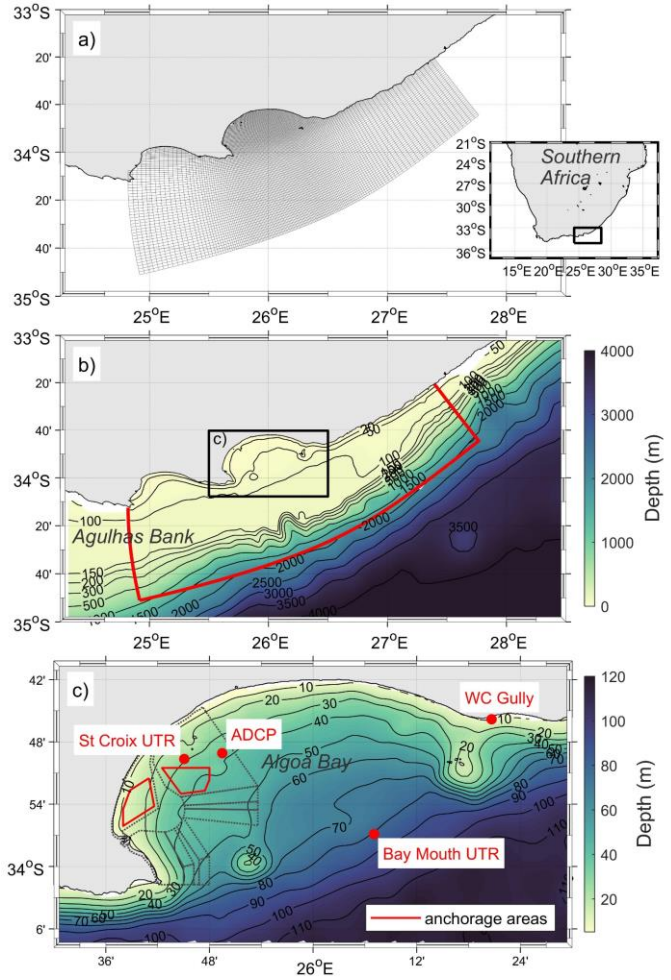
# COLaB: Integration of Ocean Models

## Ocean models optimized for key coastal regions, downscaled from global models

Limited-domain operational ocean forecast system (OOFS):

Example: Algoa Bay, South Africa




**CONTACT:** Dr. Jennifer Veitch
ja.veitch@saeon.nrf.ac.za

"Easy to implement and relocate ocean models, integrated into the COLaB concept will 'fill the gaps' and provide a spatially and temporally cohesive dataset. This will be done by using the in situ observations to constrain (assimilation) and evaluate the models".

science & innovation
Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

NRF National Research Foundation | SAEON South African Environmental Observation Network

# COLaB Training

## Regional training camps

## Online training

IOC Ocean Teacher Programme https://classroom.oceanteacher.org/

Ocean Best Practices System https://www.oceanbestpractices.org/


**Please contact us**!

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Juliet Hermes: juliet@saeon.nrf.ac.za

Tommy Bornman: tg.bornman@saeon.nrf.ac.za

GEO BLUE PLANET

# Thank You.
# Medaase.
# Oyiwaladon.