Joint Environmental Data Integration System: JEDI System

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Supported by JST

PICES2014 October 17, 2014 Korea

JST Crest Project

Novel technologies to evaluate multi-scale variations of pelagic marine communities and biodiversity under the influence of the Kuroshio and internal waves in coastal habitats

Principal Investigator Hidekatsu Yamazaki

Goal:

1) To develop a scheme to evaluate the dynamics of biodiversity of phytoplankton/zooplankton in Kuroshio-affected habitats.

2) To develop a new planktonic ecosystem model using a closure approach

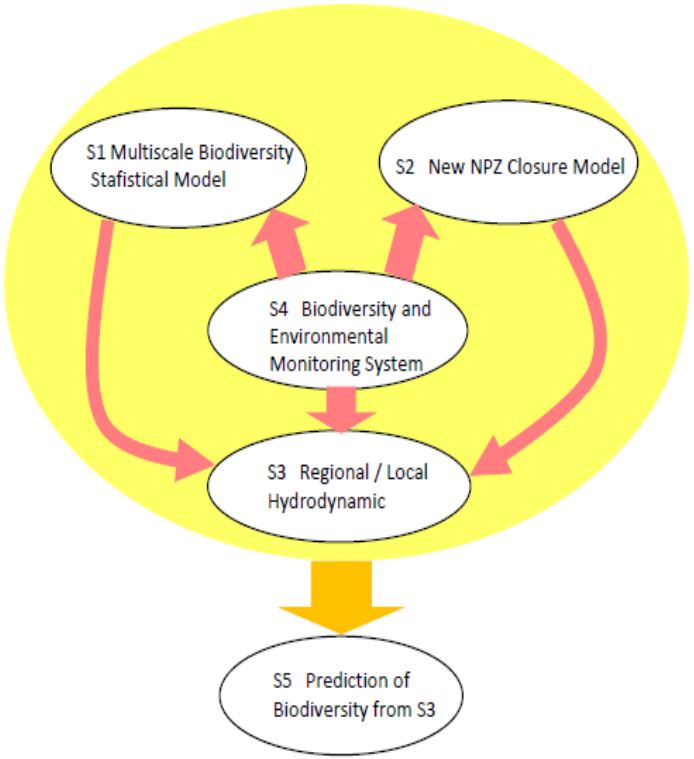
Specific Objectives:

To characterize biodiversity dynamics in Kuroshio-affected habitats using a novel approach that combines numerical models with field observations obtained with advanced sensing technologies.

Core sub-programs:

- ▲ S1 Multi-scale Biodiversity Statistical Model
- ※ S2 New *NPZ* Closure Model
- ※ S3 Regional / Local Hydrodynamic Model
- ※ S4 Biodiversity and Environmental Monitoring System

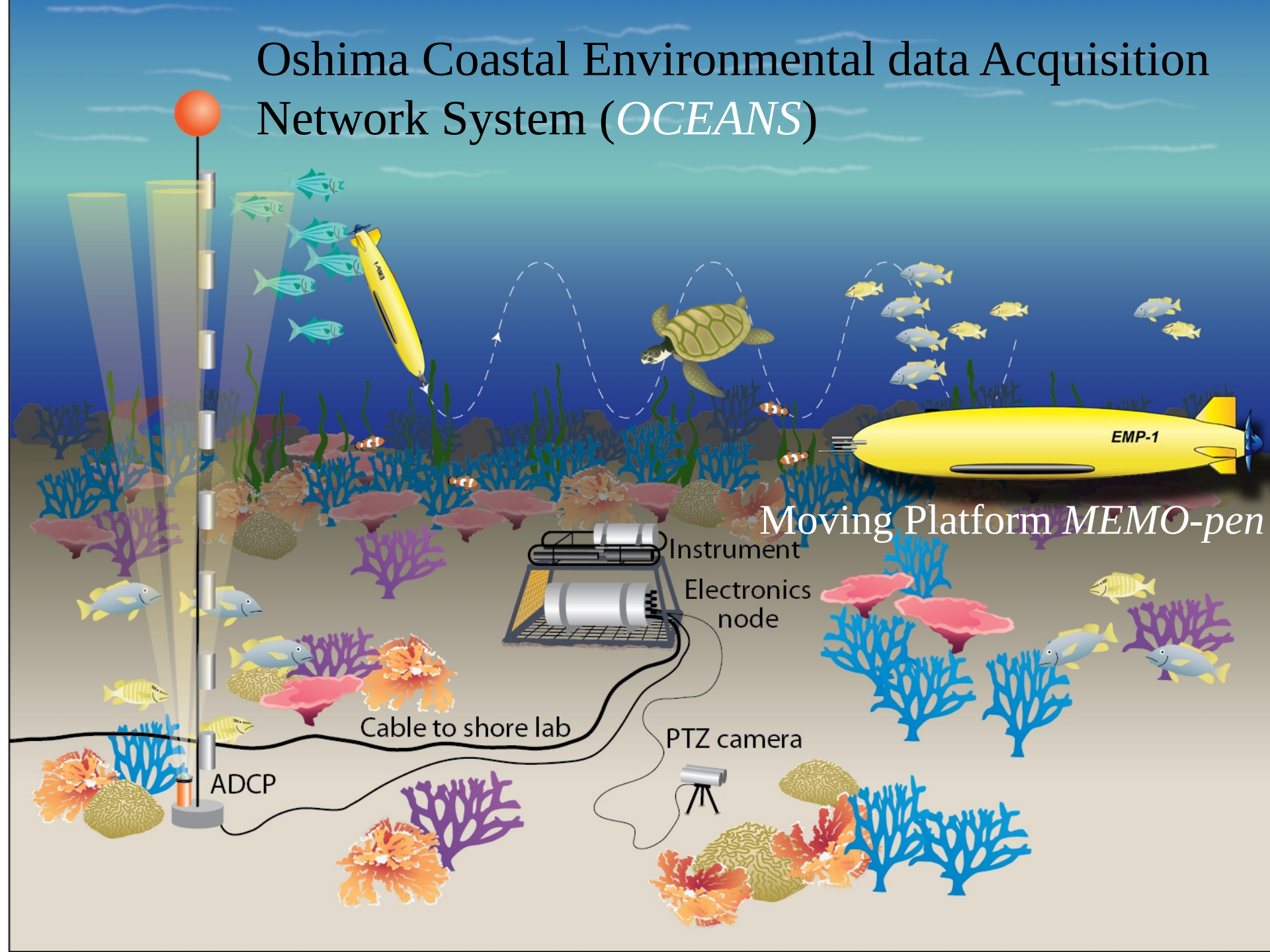
S5 Prediction of Biodiversity from S3



Joint Environmental Data Integration System: JEDI System

JEDI System HOMEPAGE http://www2.kaiyodai.ac.jp/~hide/JEDI/index.html

Oshima Coastal Environmental data Acquisition Network System (*OCEANS*)



Physical

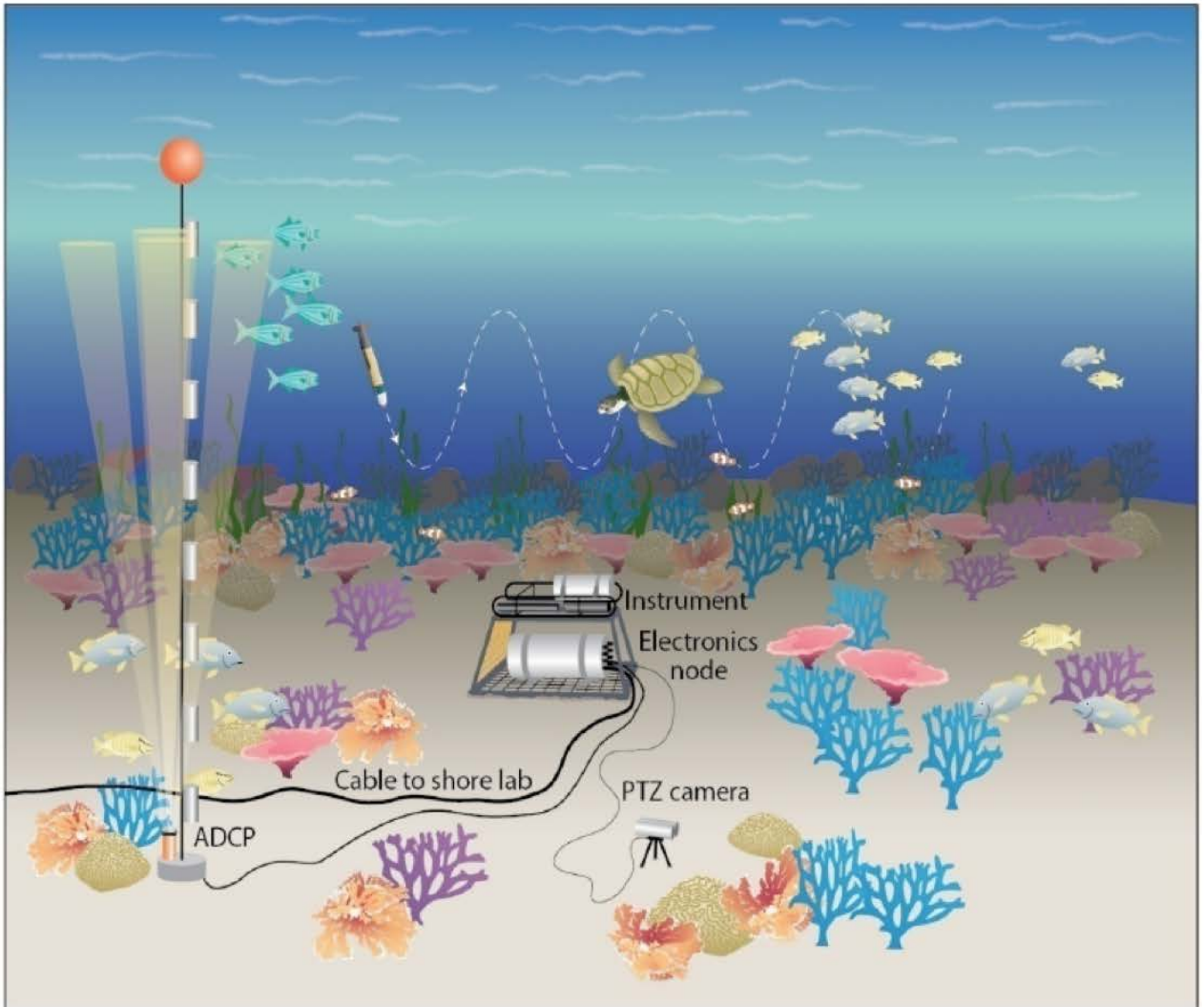
- Temperature- JFE Infinity CTW
- PME T-string
- Salinity- JFE Infinity CTW
- Water currents- Nortek ADCP
- Turbulence- Nortek ADV
- Optical Properties:
    - PAR- JFE Compact ALW,
    - Turbidity- JFE Infinity CLW
- Pressure- JFE Infinity AWH

Chemical

- Nitrate- Satlantic SUNA
- O_2- JFE RINCO W

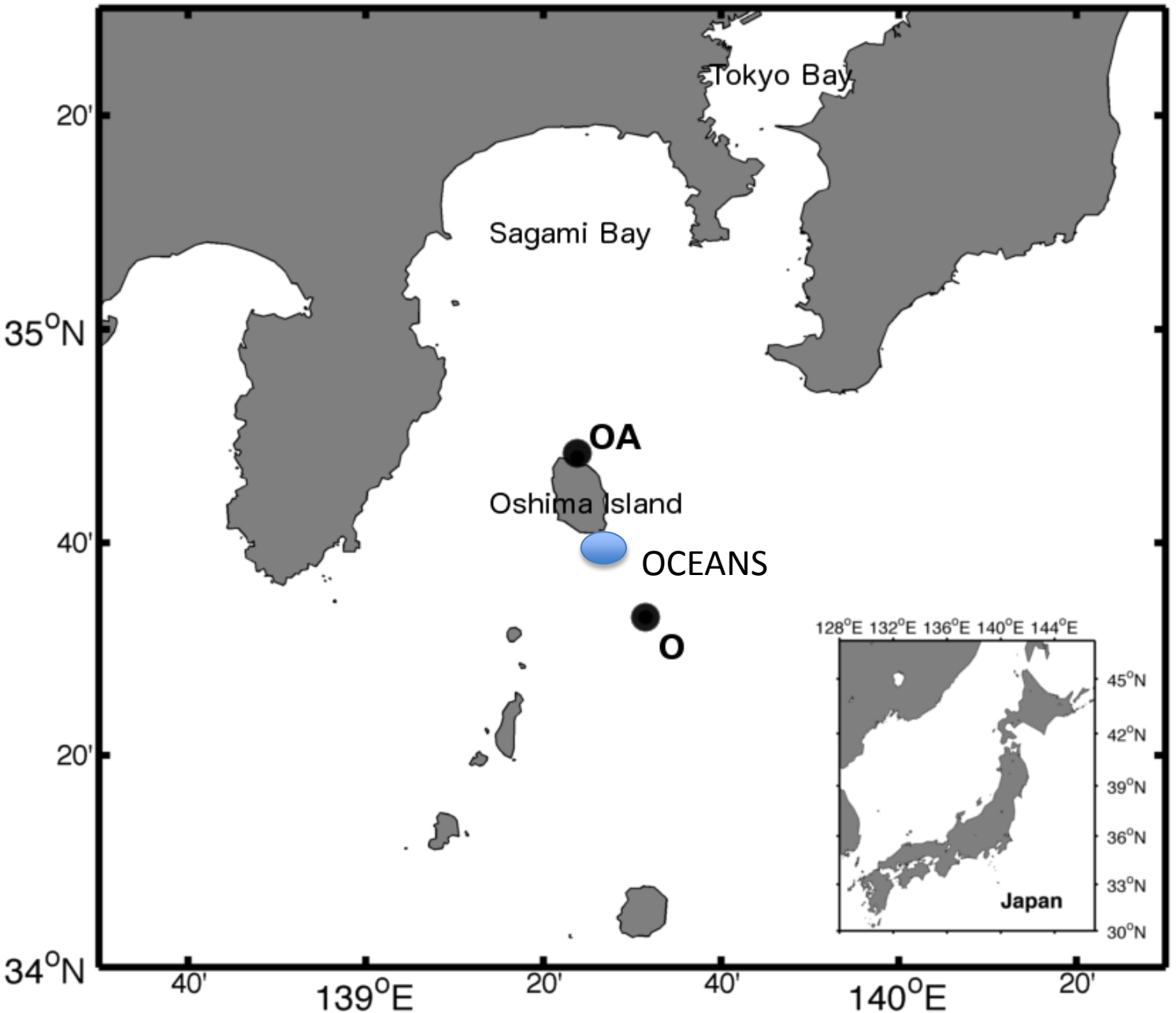
Biological

- Phytoplankton- WHOI µCPICS (5 µm to 1 mm)
  chlorophyll- JFE Infinity CLW
- Zooplankton- WHOI CPICS (200 µm to 2 cm)
- Fish- PTZ and WHOI stereo camera
- Marine mammals- sonar, hydrophone



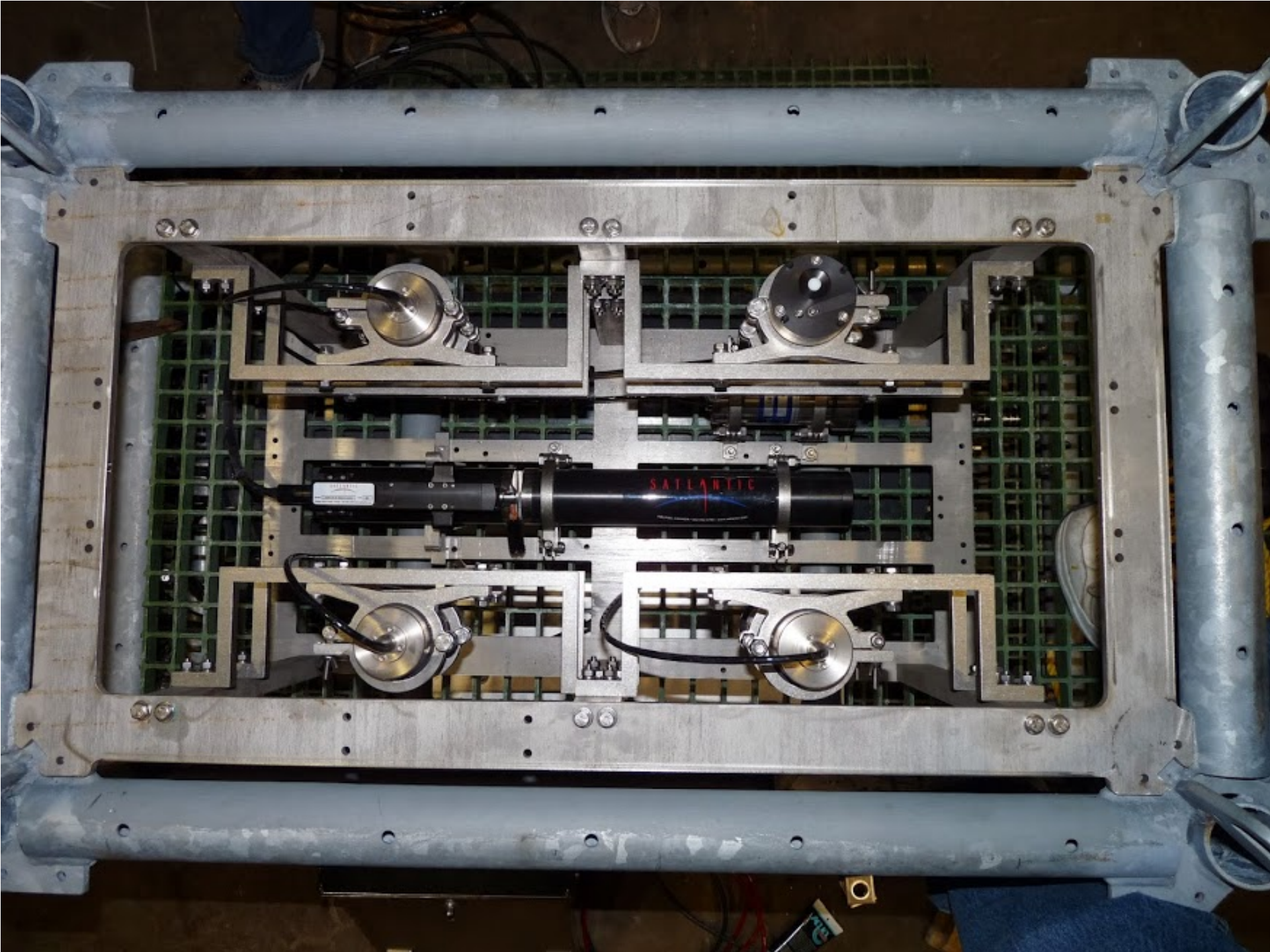

Woods Hole Oceanographic Insti
PORT

The location of OCEANS

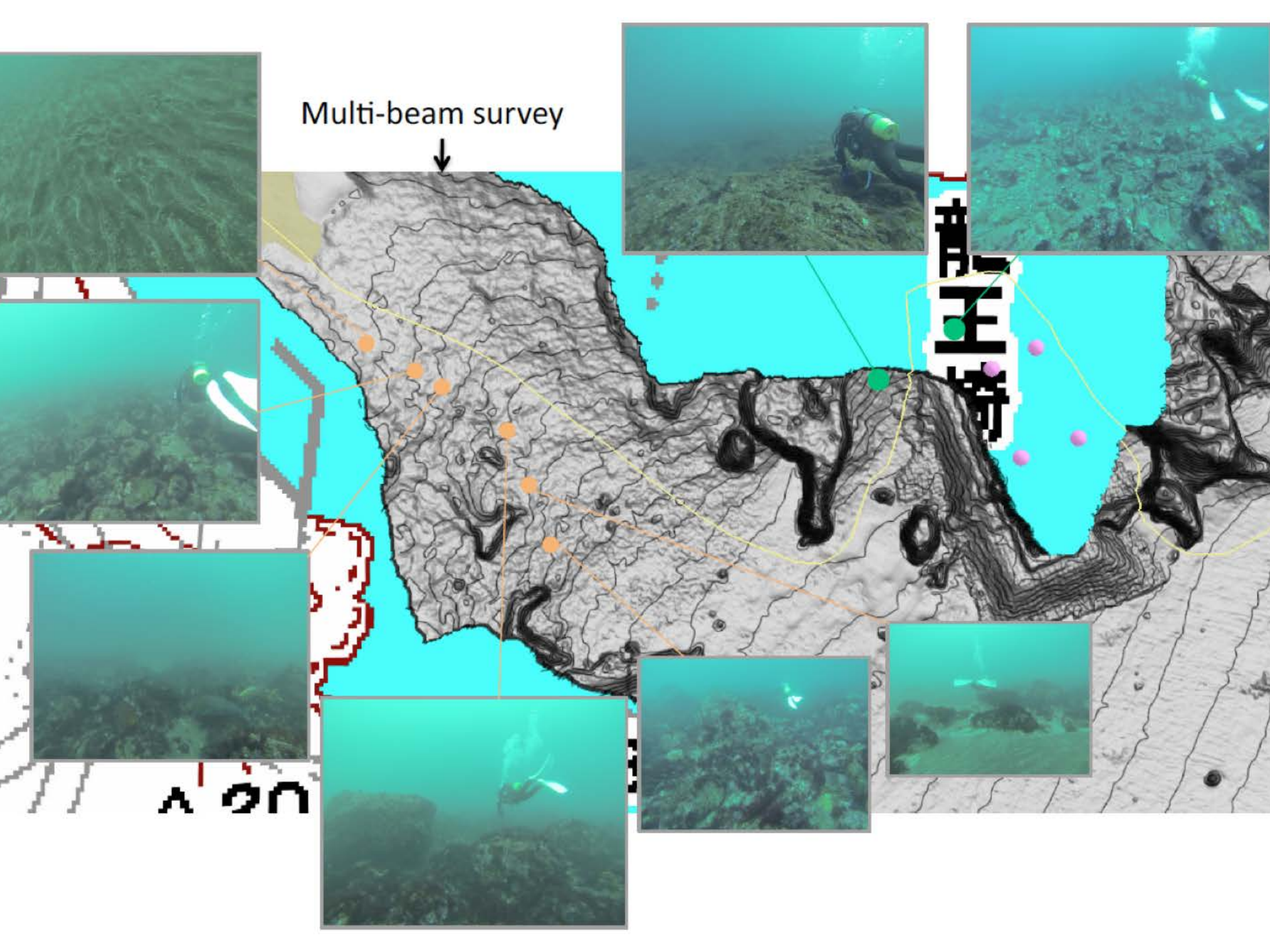


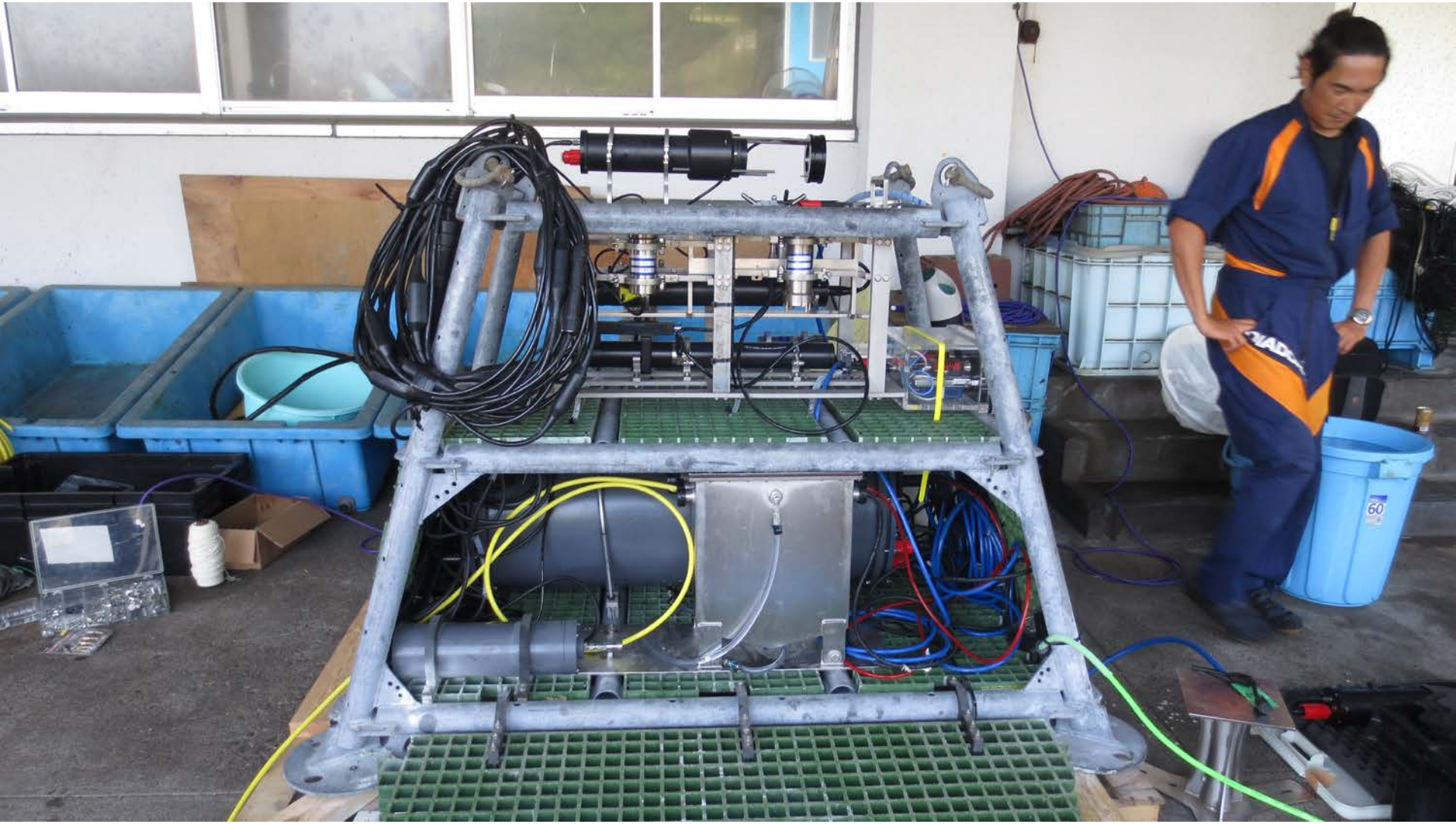

Arrived at Oshima on March 15, 2014

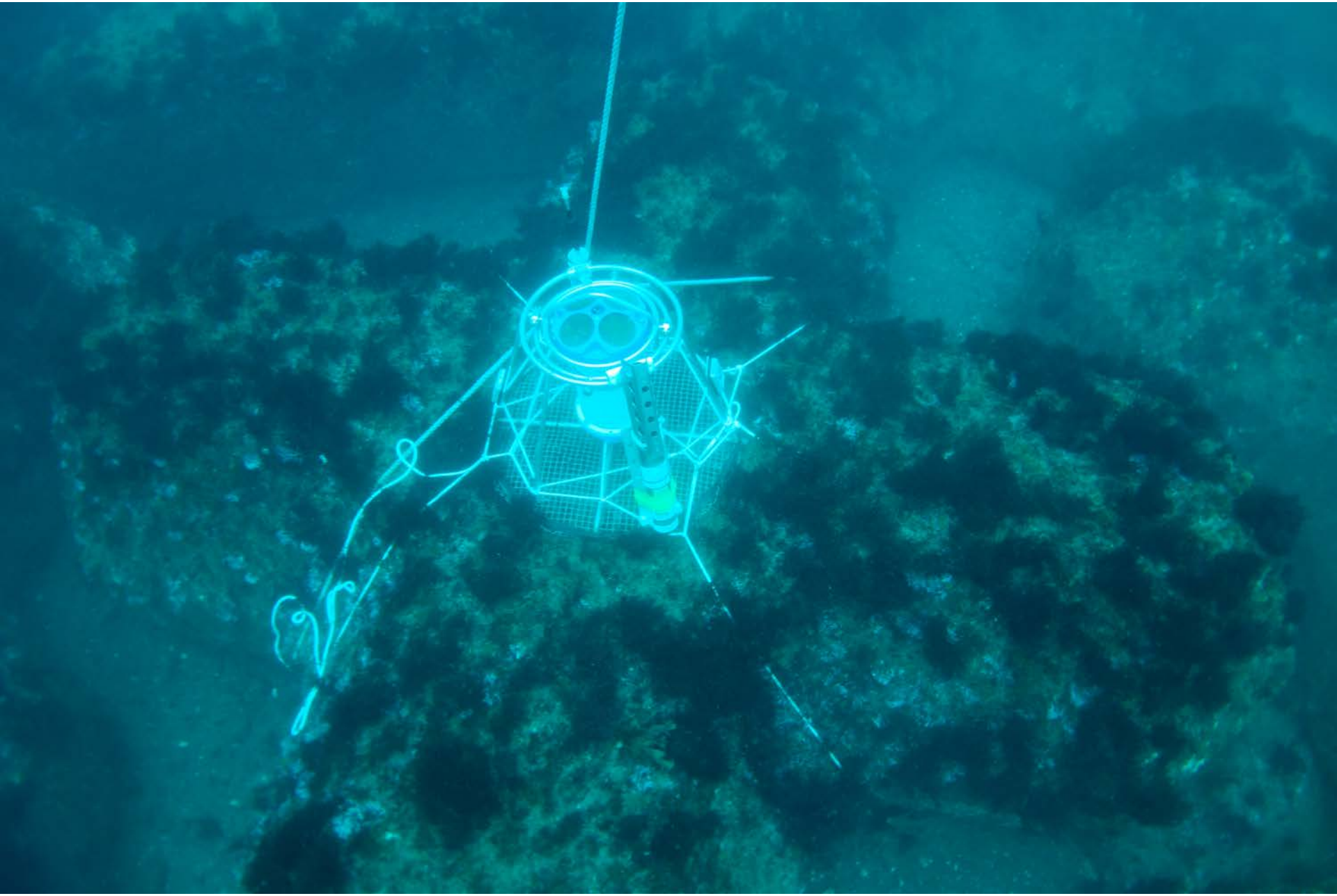

ULINE H-1815
800-295-5510


SATLANTIC

CPICS for Node


Multi-beam survey



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TRIATHLON 2014

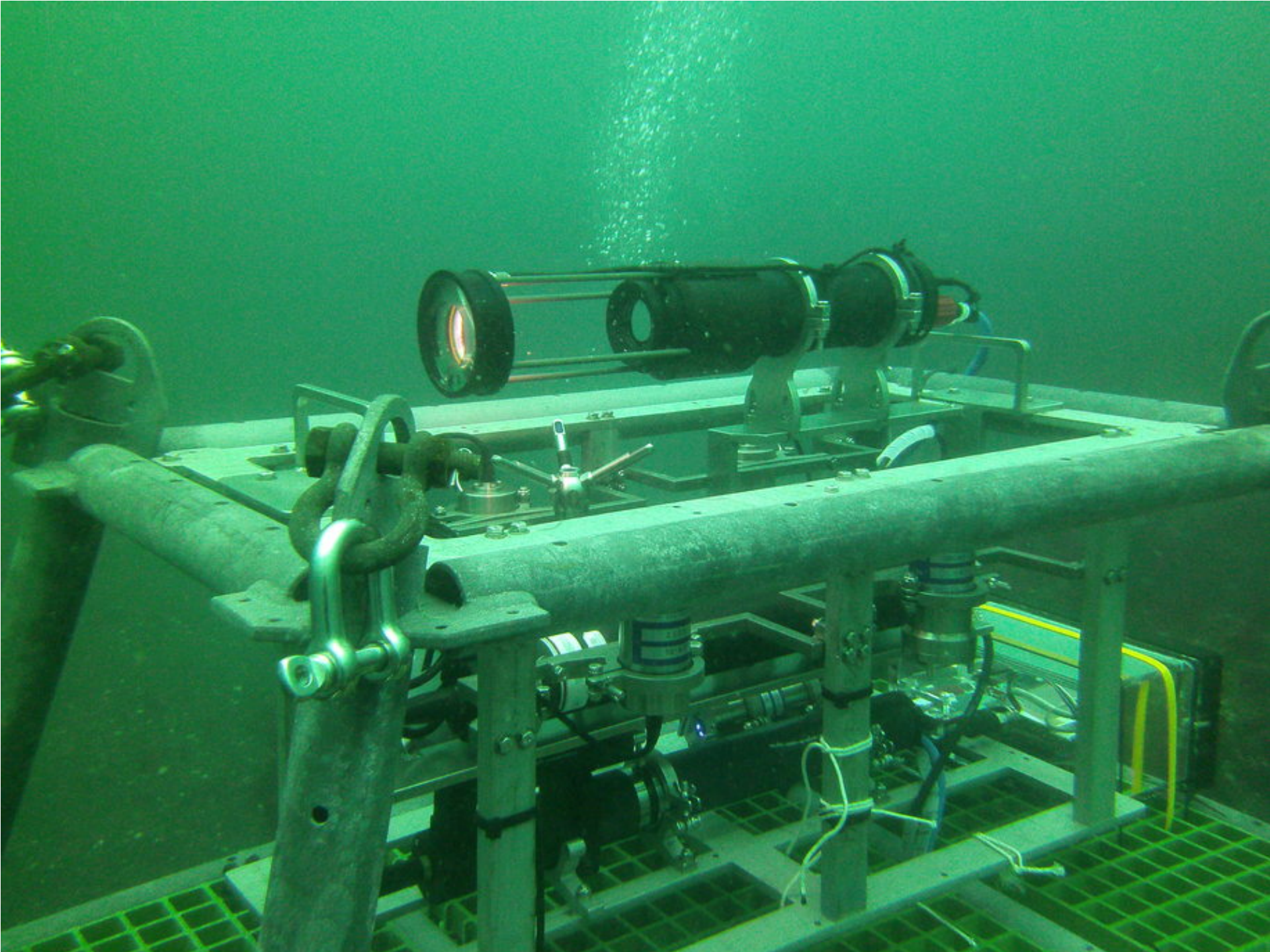

UNIC
大島町
第八潮丸
波浮港

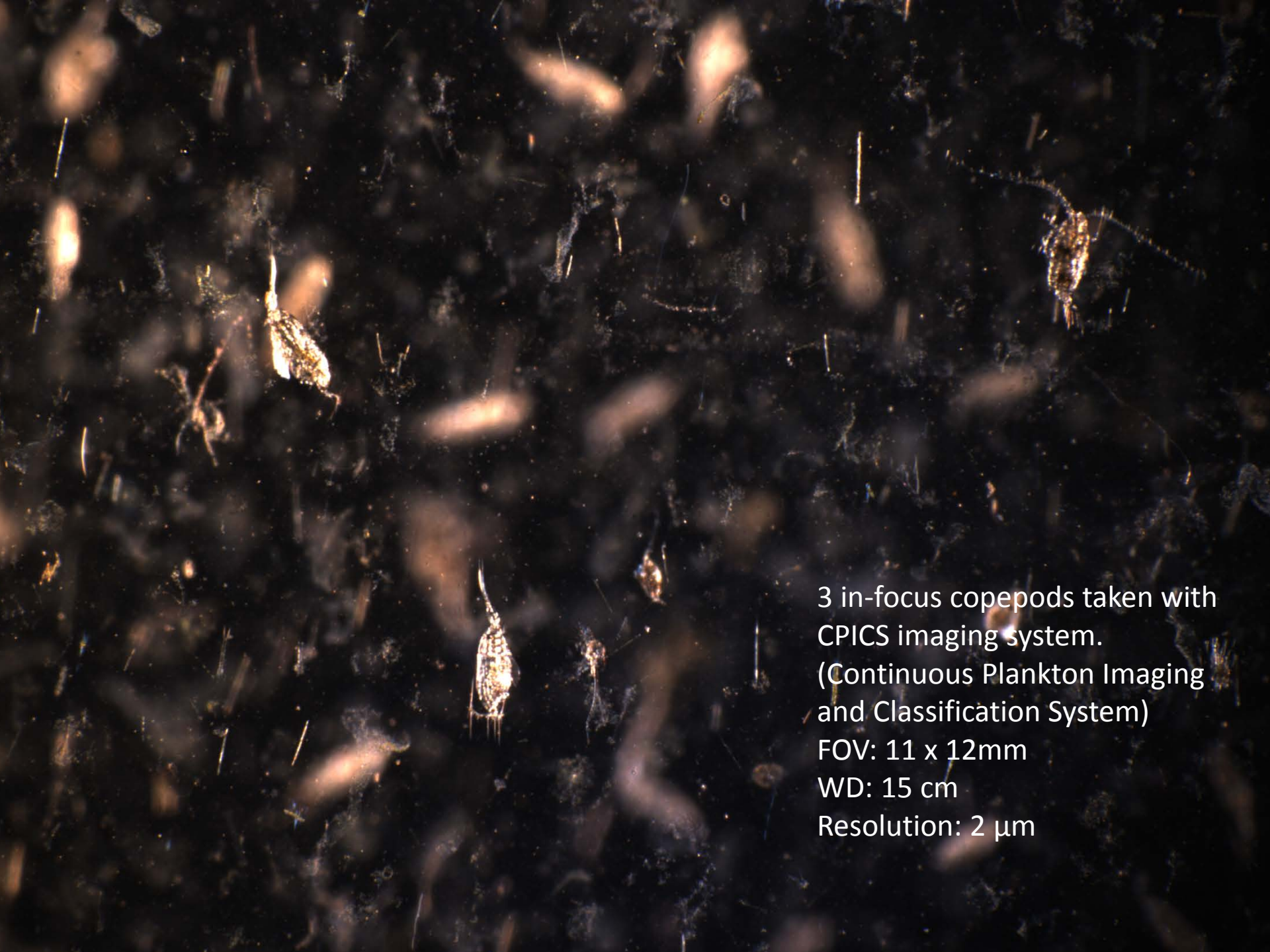

UNIC


第八潮丸


2014/8/12
2014/8/12
2014/8/12
N34° 41'9.6"
E139° 26'19.68"
E139° 26'45.6"
OCEANS
OCEANS
OCEANS
166 m
© 2014 ZENRIN
Image © 2014 DigitalGlobe
Google earth

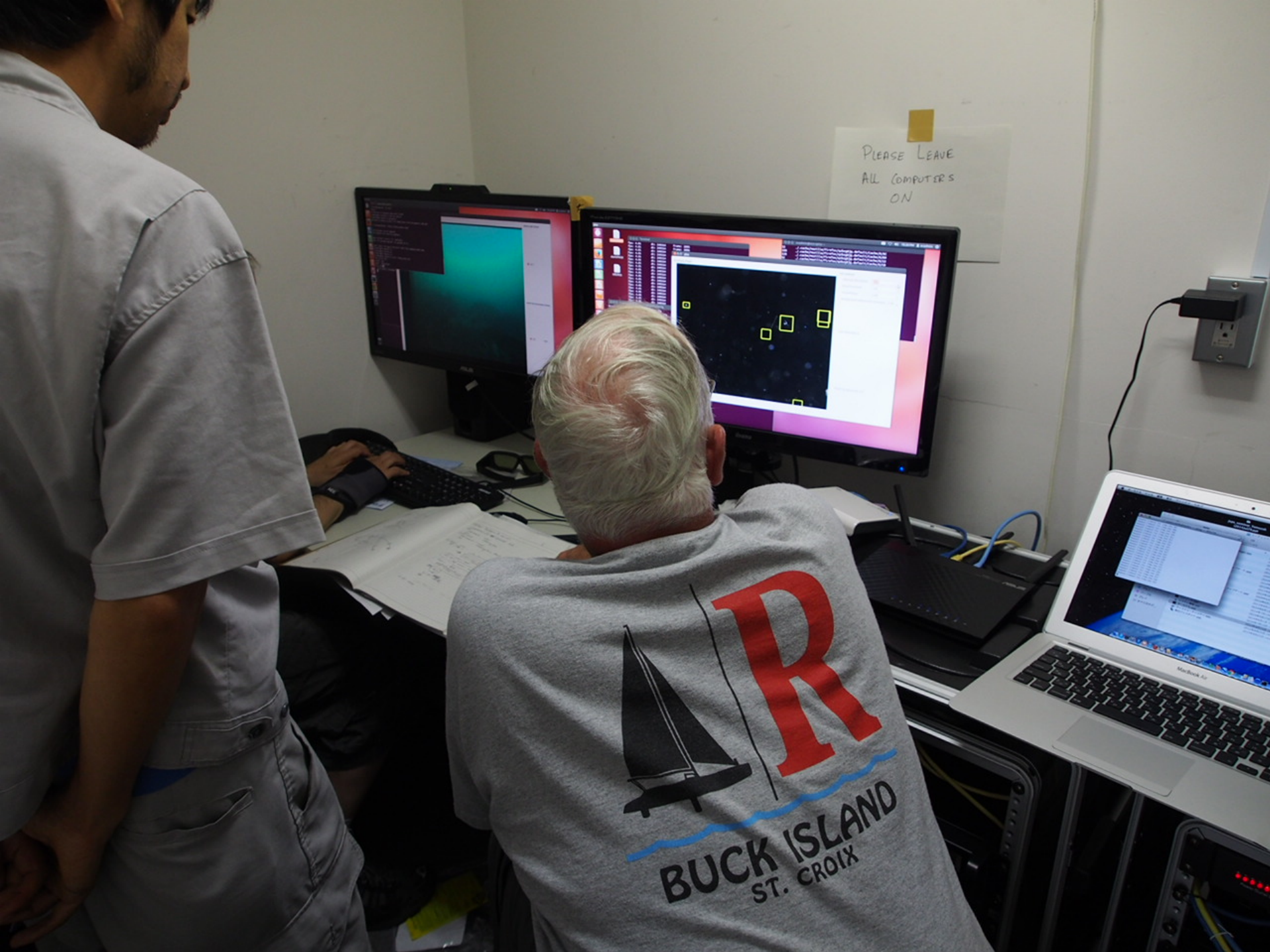

Overview
Live Data
Data Status
Data Plots
Pwr Monitor
CPU Monitor
Instruments
Photos
Doc
About...
Select Instrument: All ADCP1 ADV CPICS1 ChlorTurbid CondTemp DO Env Board IBTHX PAR
Pan-Tilt Camera SUNA Stereo Cam1 TString1 WaveHeight
OCEANS Ocean Cube Observatory
2014/09/04 05:31:08 UTC
1
Tstring1
Min: 24.641 °C
Max: 26.841 °C
Depth: 17.645 m
Hydrophone
Web Pan/Tilt Cam
CPICS LoMag
ACTW Temp: 24.831 degC
Cond: 51.808 S/m
Salin: 34.192
AWH Pressure: 0.18167 MPa
ACLW Chlorophyll: 0.999 ug/l
Turbidity: 0.601 FTU
Temp: 24.844 degC
ALW PAR: 120.8638 umol/sec/m^2
AROW2 DO: 94.571 percent
Temp: 24.818 degC
ADV Vel_E: 0.094 m/s
Vel_N: -0.135 m/s
Vel_U: 0.195 m/s
SUNA Nitrate: 5.20 uMol/L
1
ADCP1
Vel Bin 01: -0.171 0.207 -0.133 m/s
Vel Bin 20: -0.520 0.248 -0.128 m/s
Stereo Cam1
Cable Pwr: ON Current: 5.93 ma
Shore GFD: 50 MΩ Node GFD: 50 MΩ
Node: Temp: 39.8 degC Humid: 24.7 % Press: 1085 mbar
Shore: Temp: 28.2 degC Humid: 47.8 % Press: 1012.7 mbar

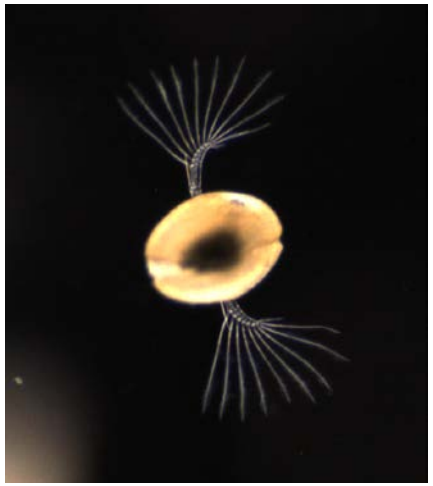


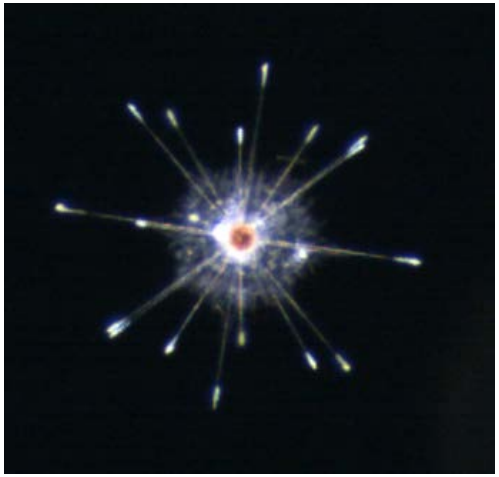


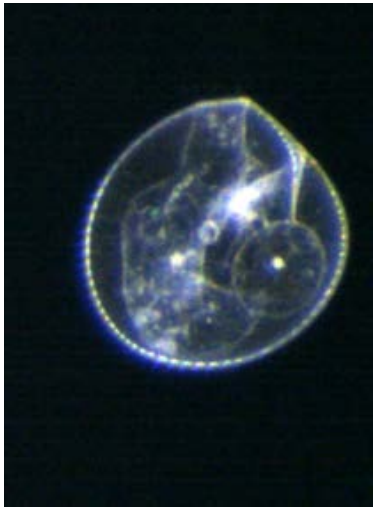
3 in-focus copepods taken with CPICS imaging system. (Continuous Plankton Imaging and Classification System)
FOV: 11 x 12mm
WD: 15 cm
Resolution: 2 µm


Three copepods with yellow
Region of Interest (ROI) pixels
extracted in real-time by FPGA
(frame programmable gate array)

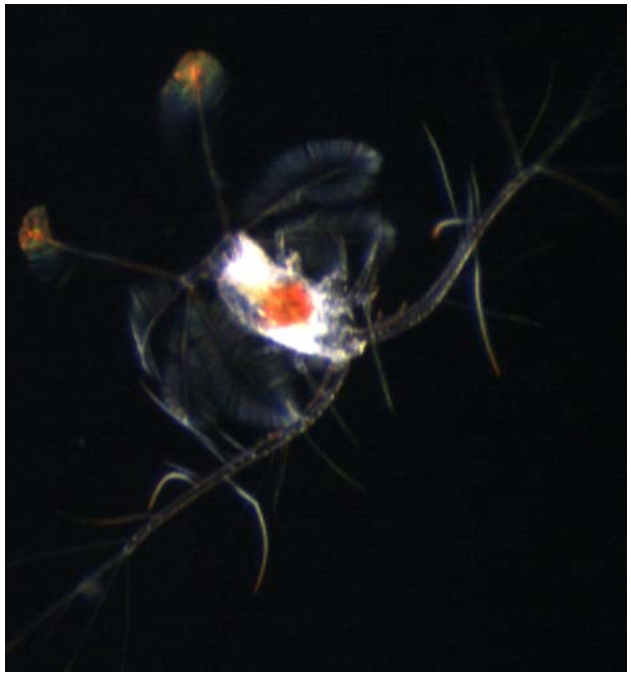
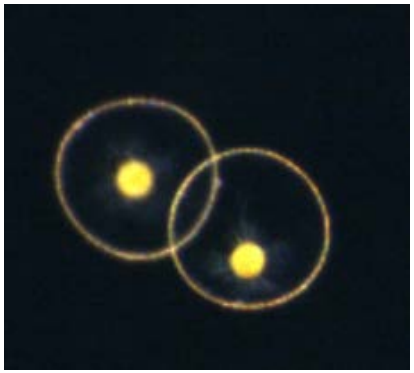
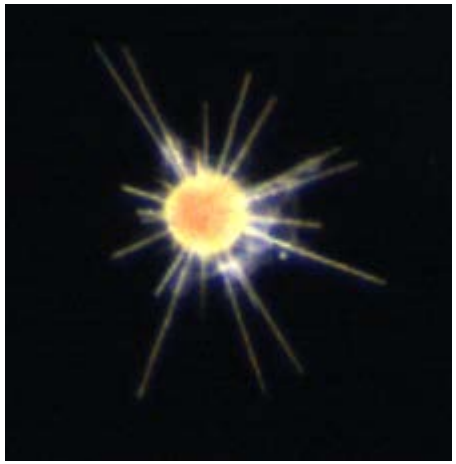
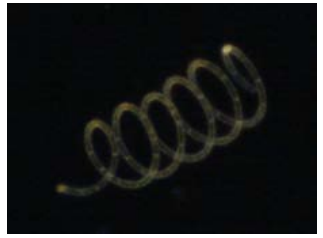

PLEASE LEAVE
ALL COMPUTERS
ON
R
BUCK ISLAND
ST. CROIX

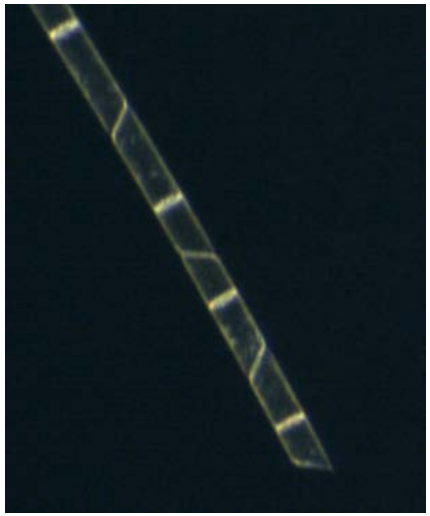
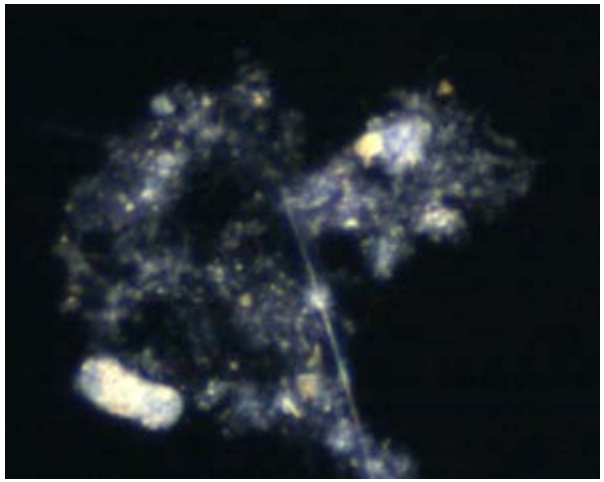


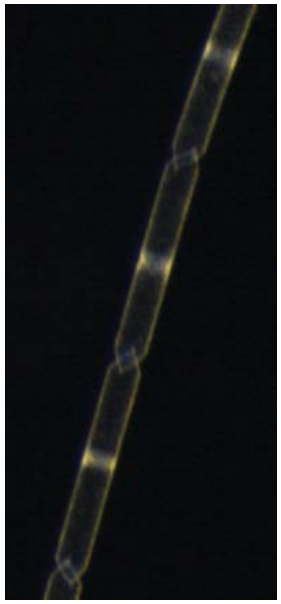


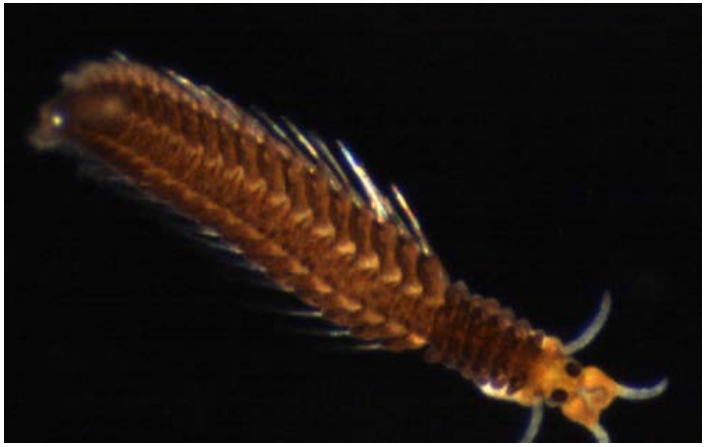


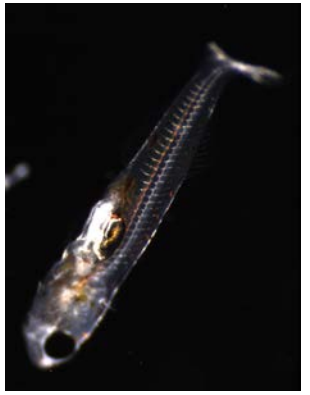


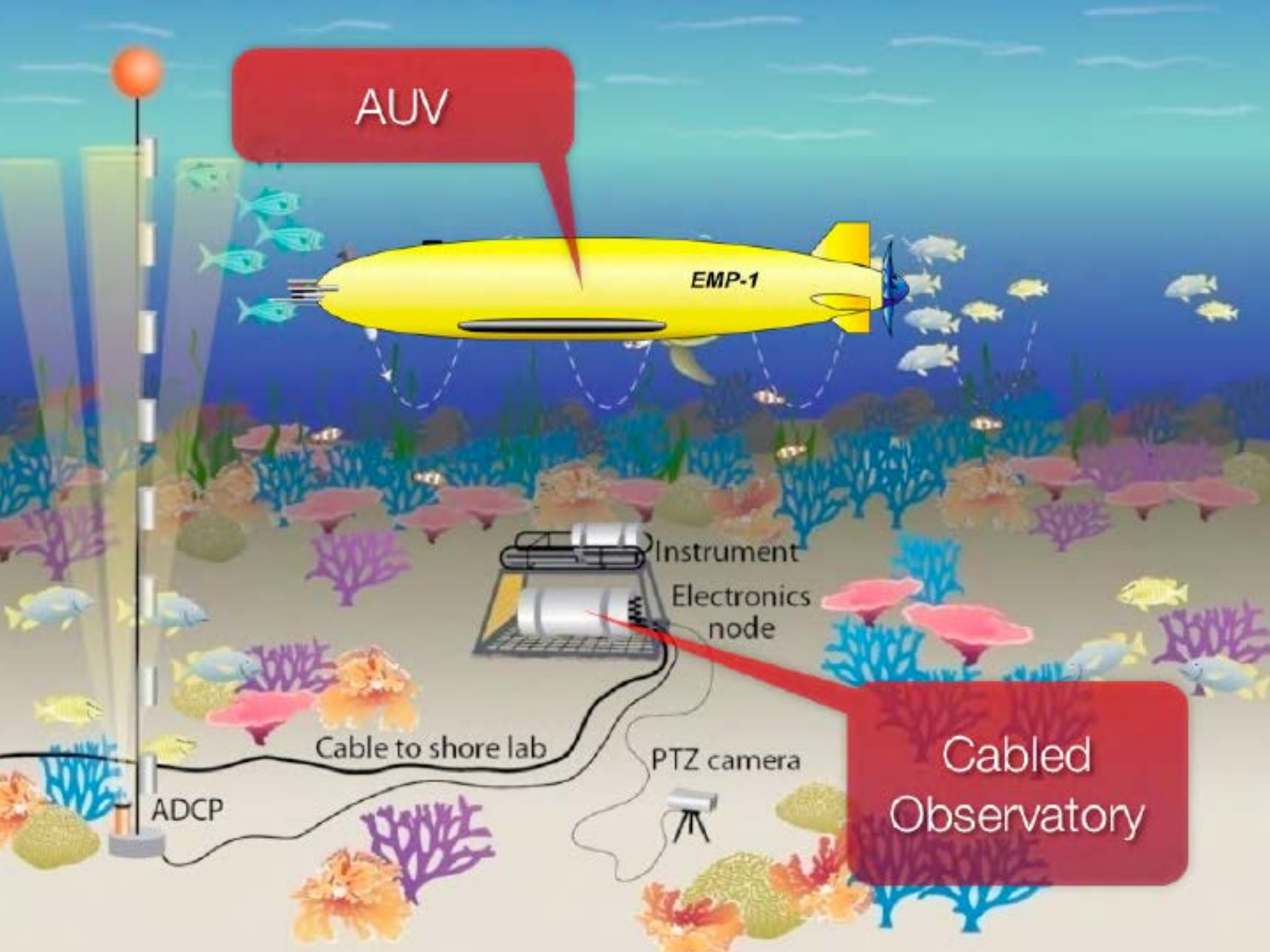












AUV
EMP-1
Instrument
Electronics
node
Cable to shore lab
PTZ camera
ADCP
Cabled
Observatory

Cabled Observatory

- Monitor time series of multiple variables of biodiversity in marine ecosystem
- But NOT spatial

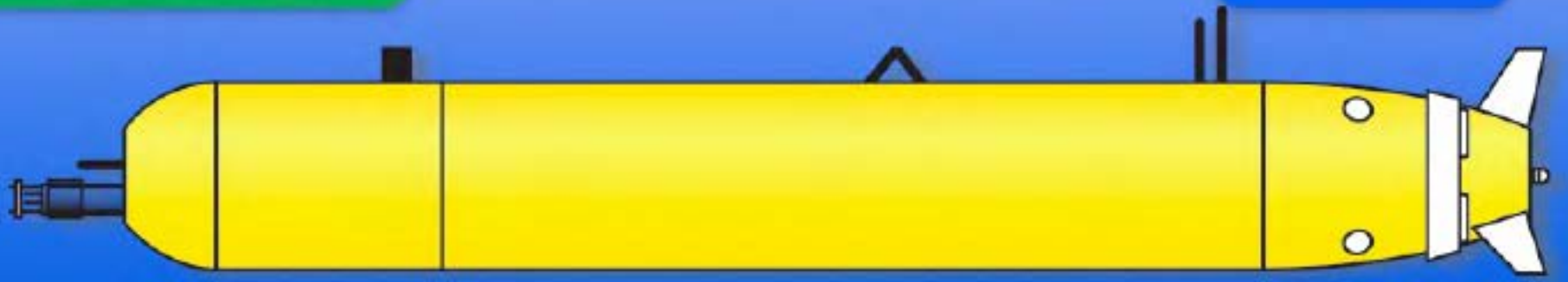
Design Concept of the AUV

Cruising-Style

Slow Cruising Speed

Plankton Microscope Camera

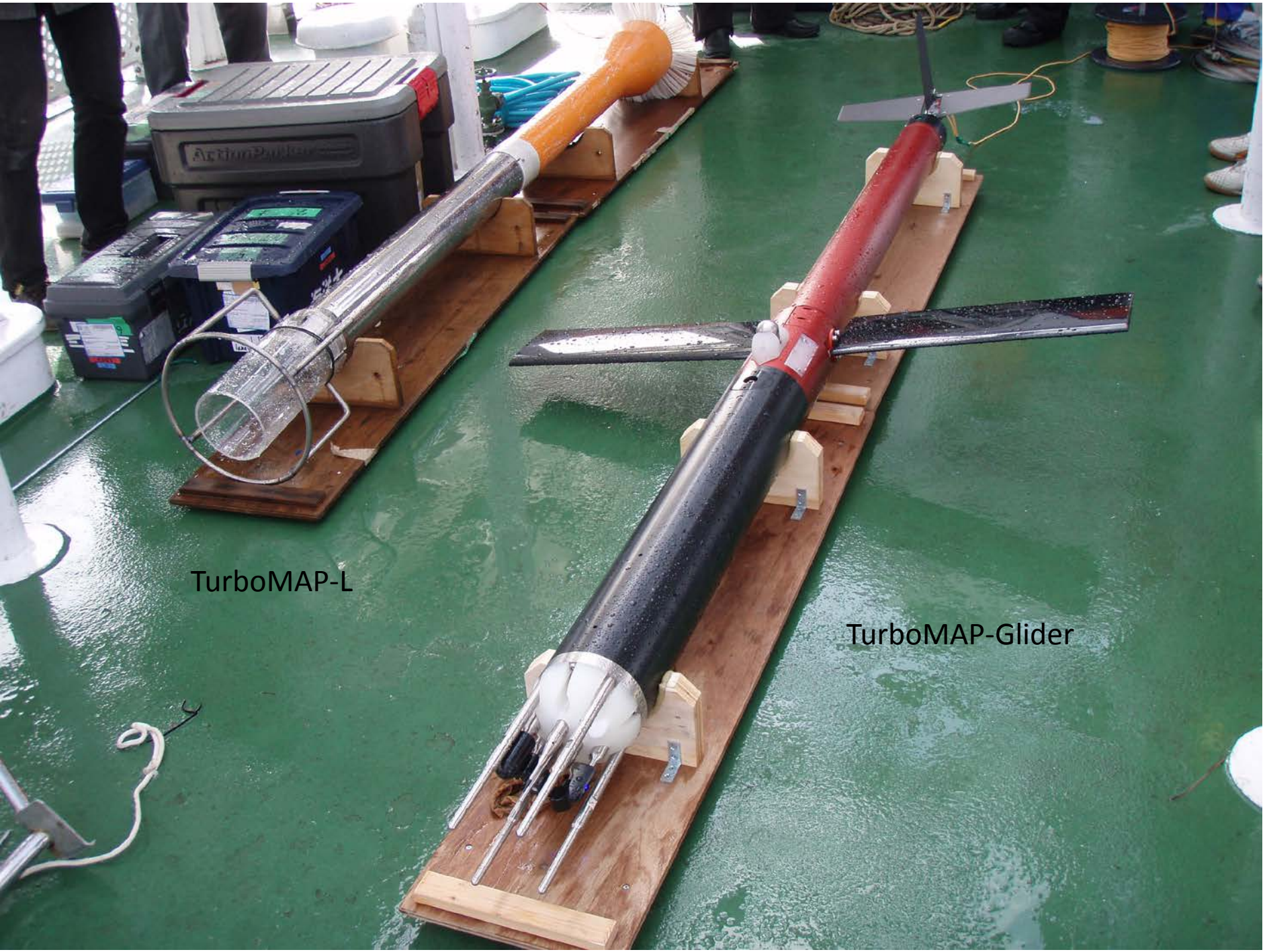
Operation with CO



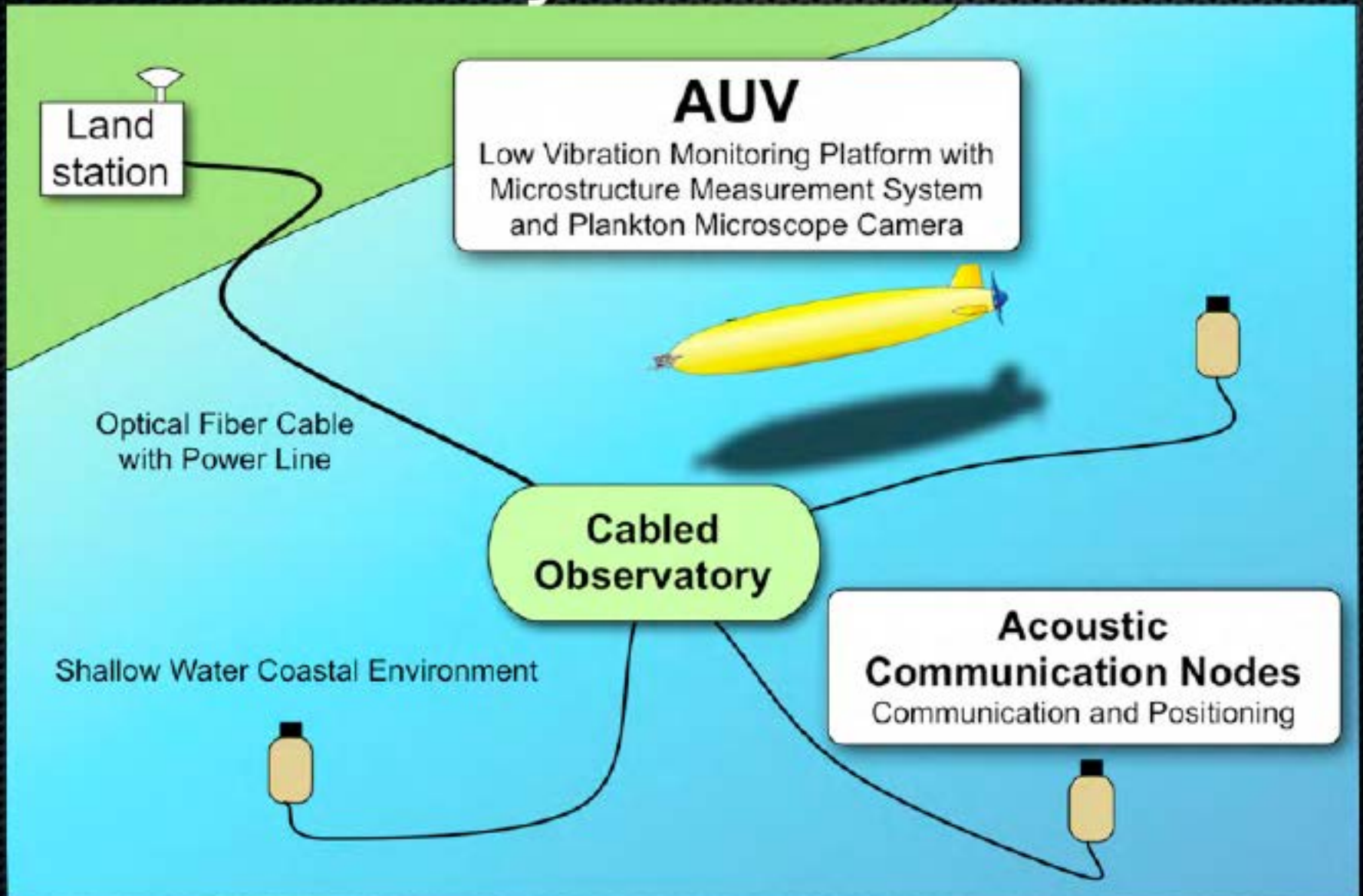
Microstructure Measurement System

Low-Vibration

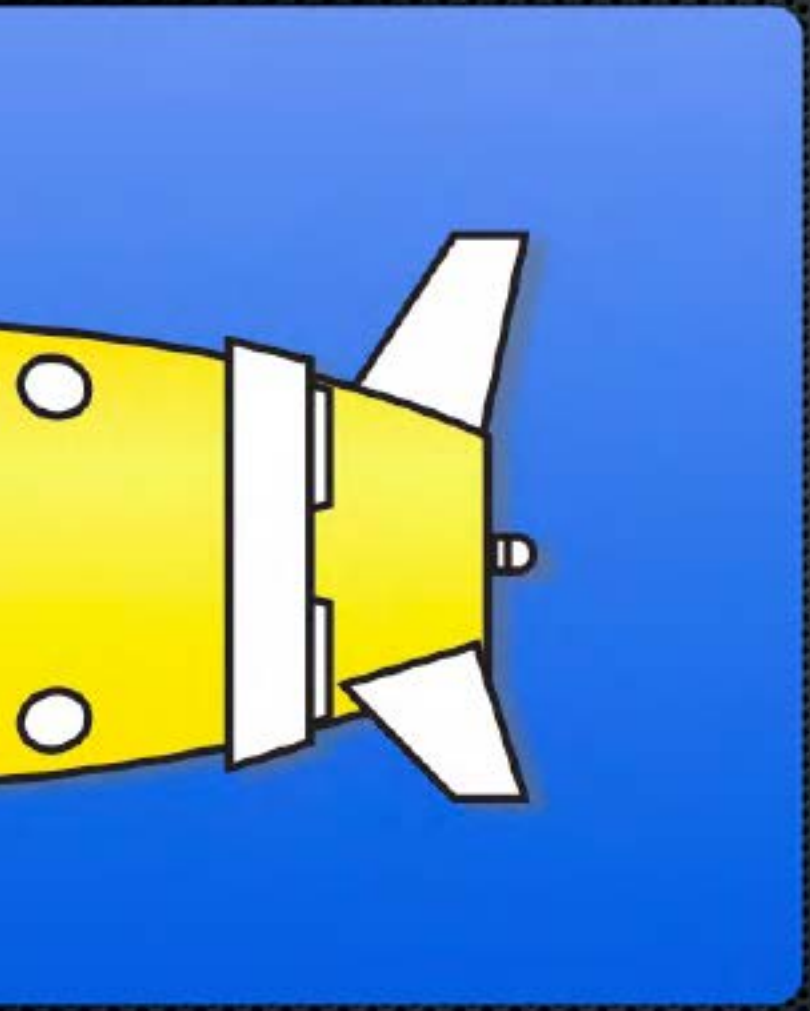
Low-Vibration Propulsion System


TurboMAP-L
TurboMAP-Glider

Operation with Cabled Observatory

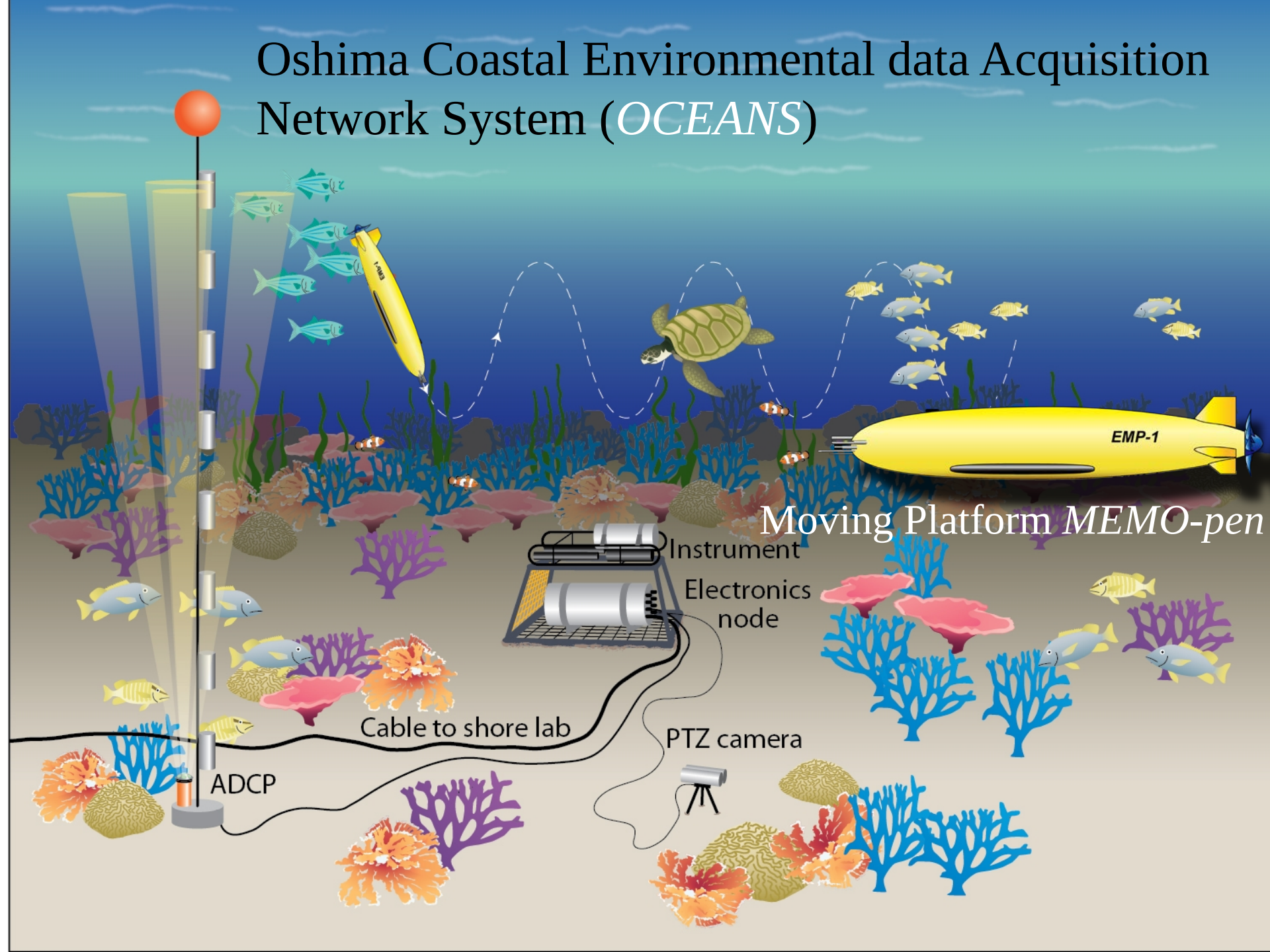


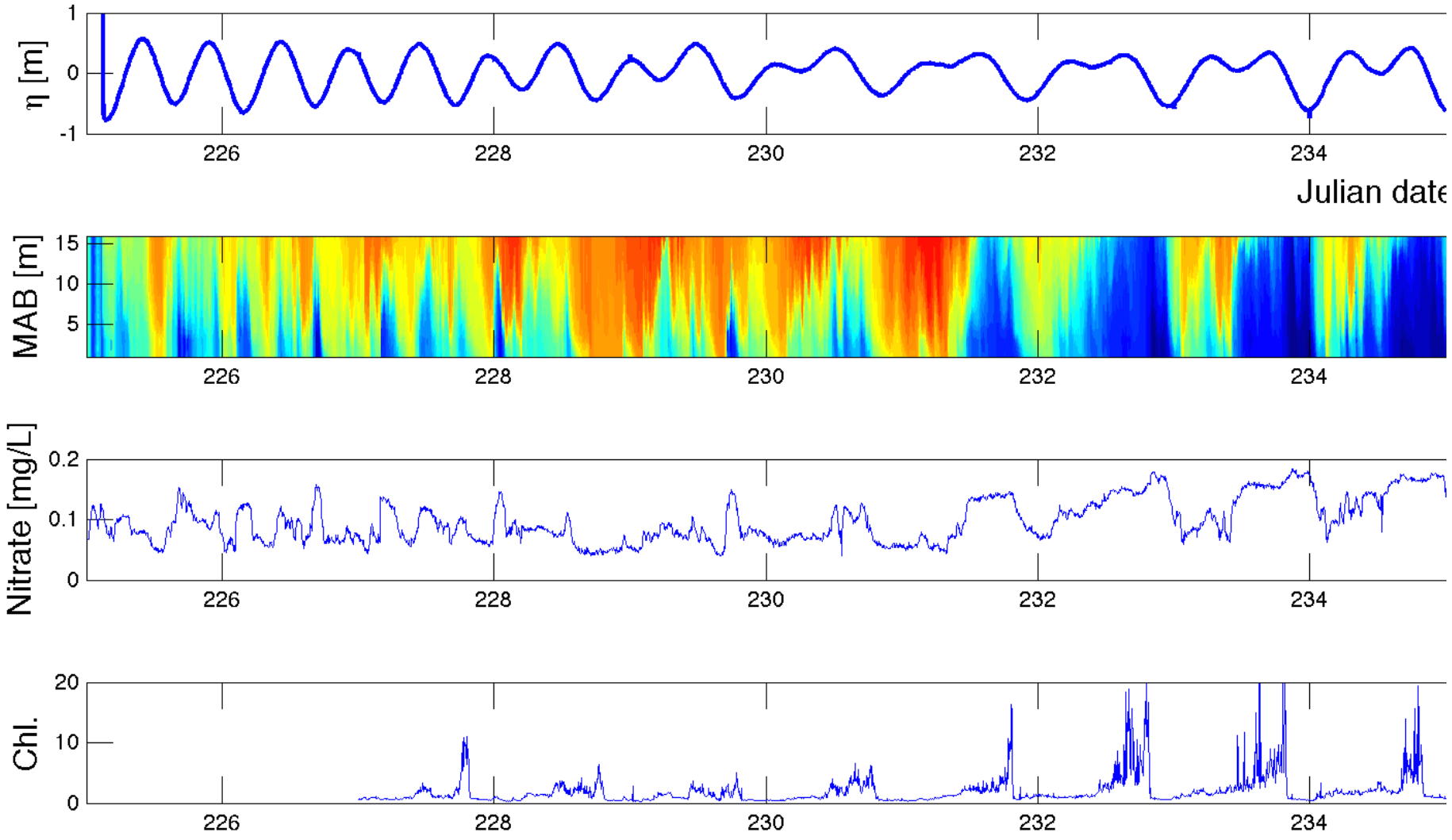
Low-Vibration Propulsion System



- Pump Jet System
- High Rotation Rate Small Motor
- Avoid Low Frequency Vibration from a Rotating Propeller and a Motor
- Eliminate the Spiral Stream by a Rotating Propeller
- Drawing Surrounded Water to Increase the Thrust Efficiency
- Introduce Direction Control Surface (DCS)

Oshima Coastal Environmental data Acquisition Network System (*OCEANS*)

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230
232
234
Julian date
MAB [m]
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Nitrate [mg/L]
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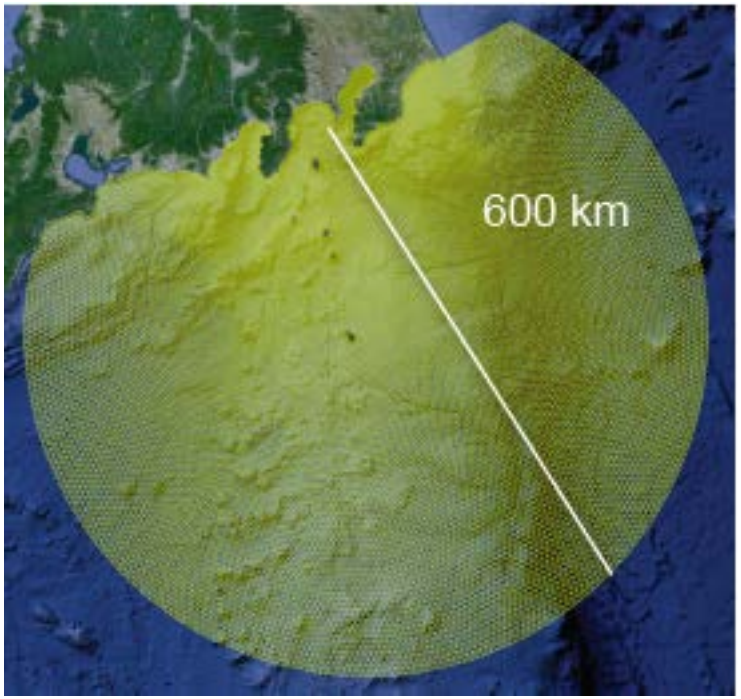
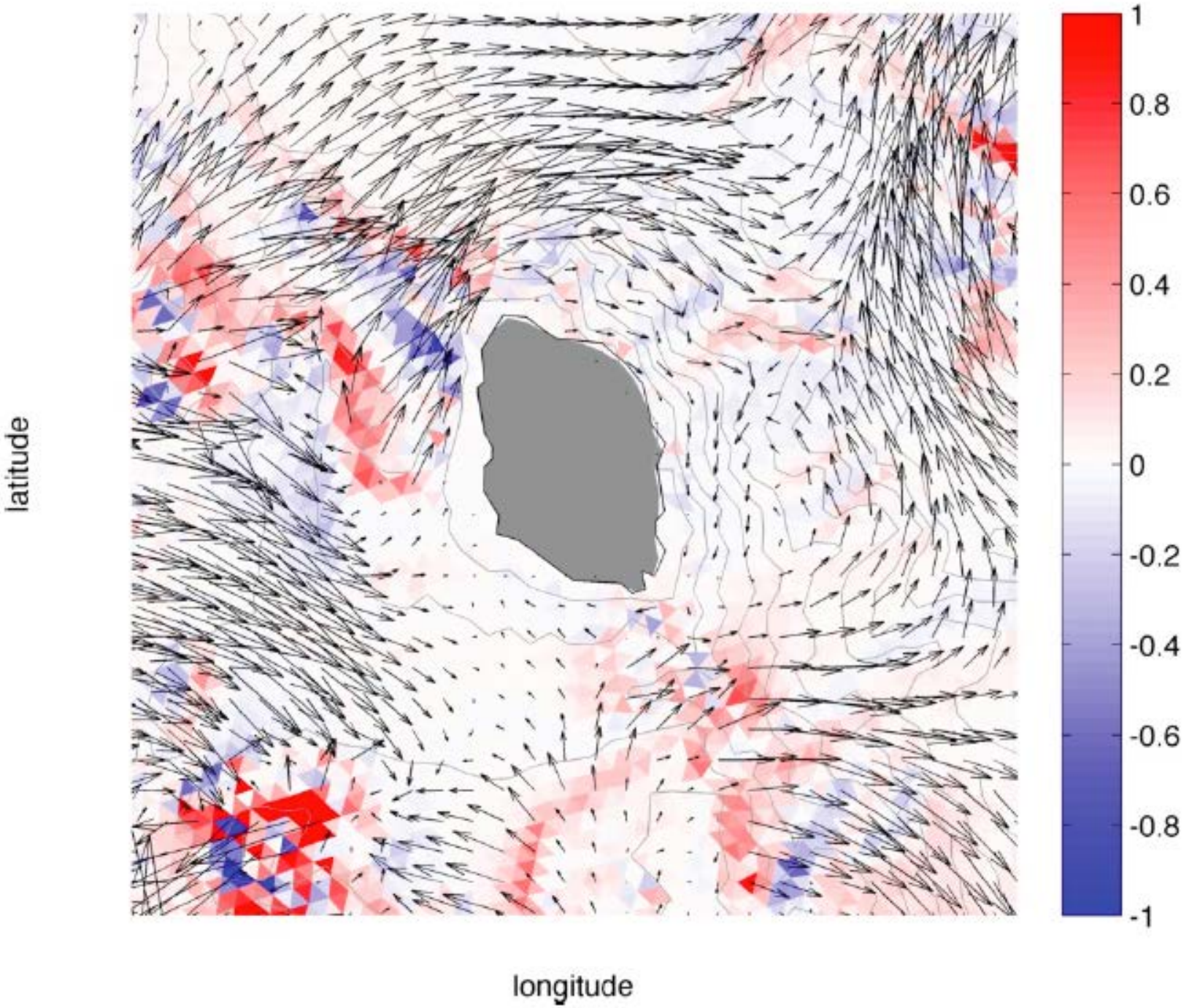
SUNTANS




latitude
longitude
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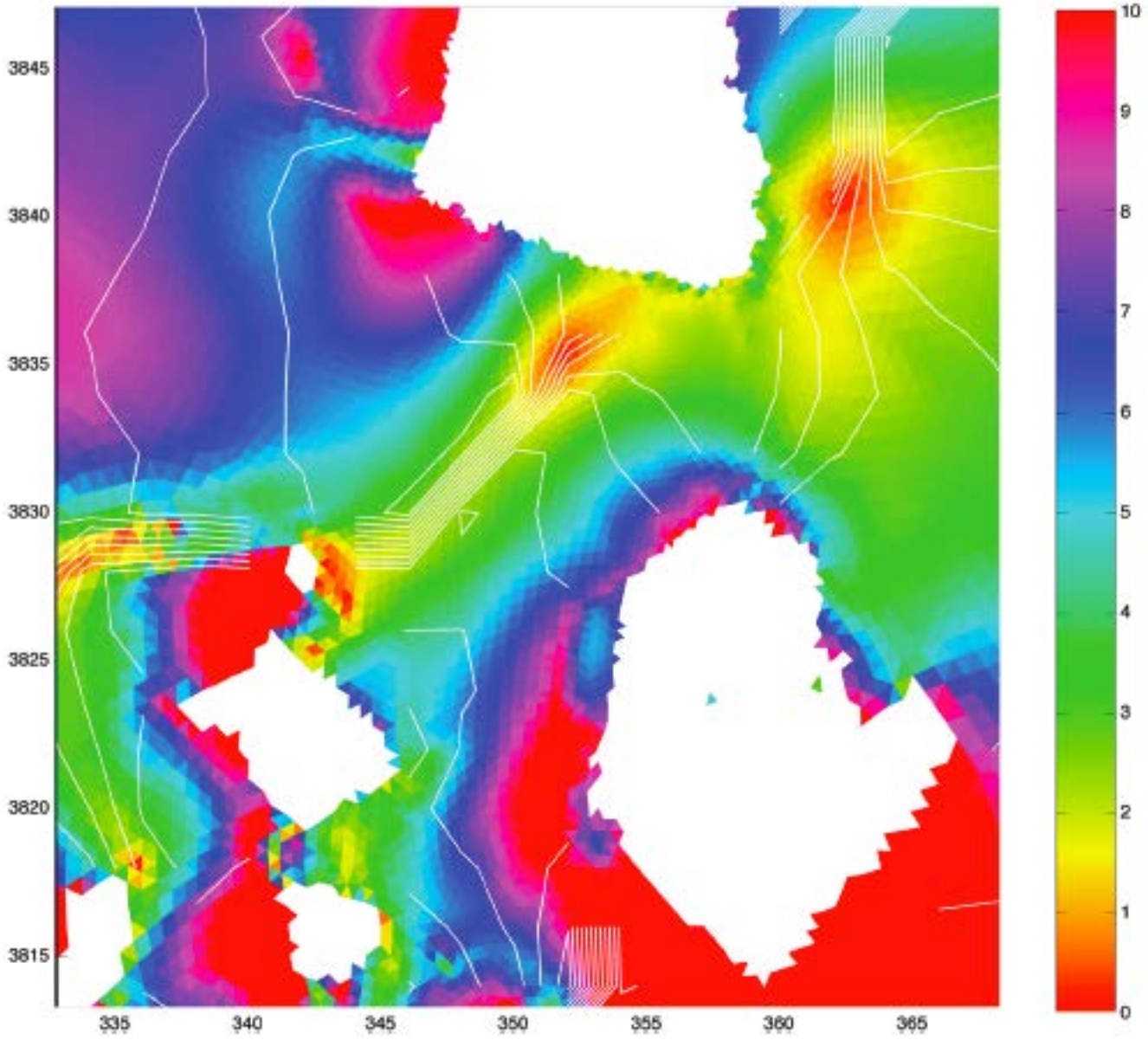
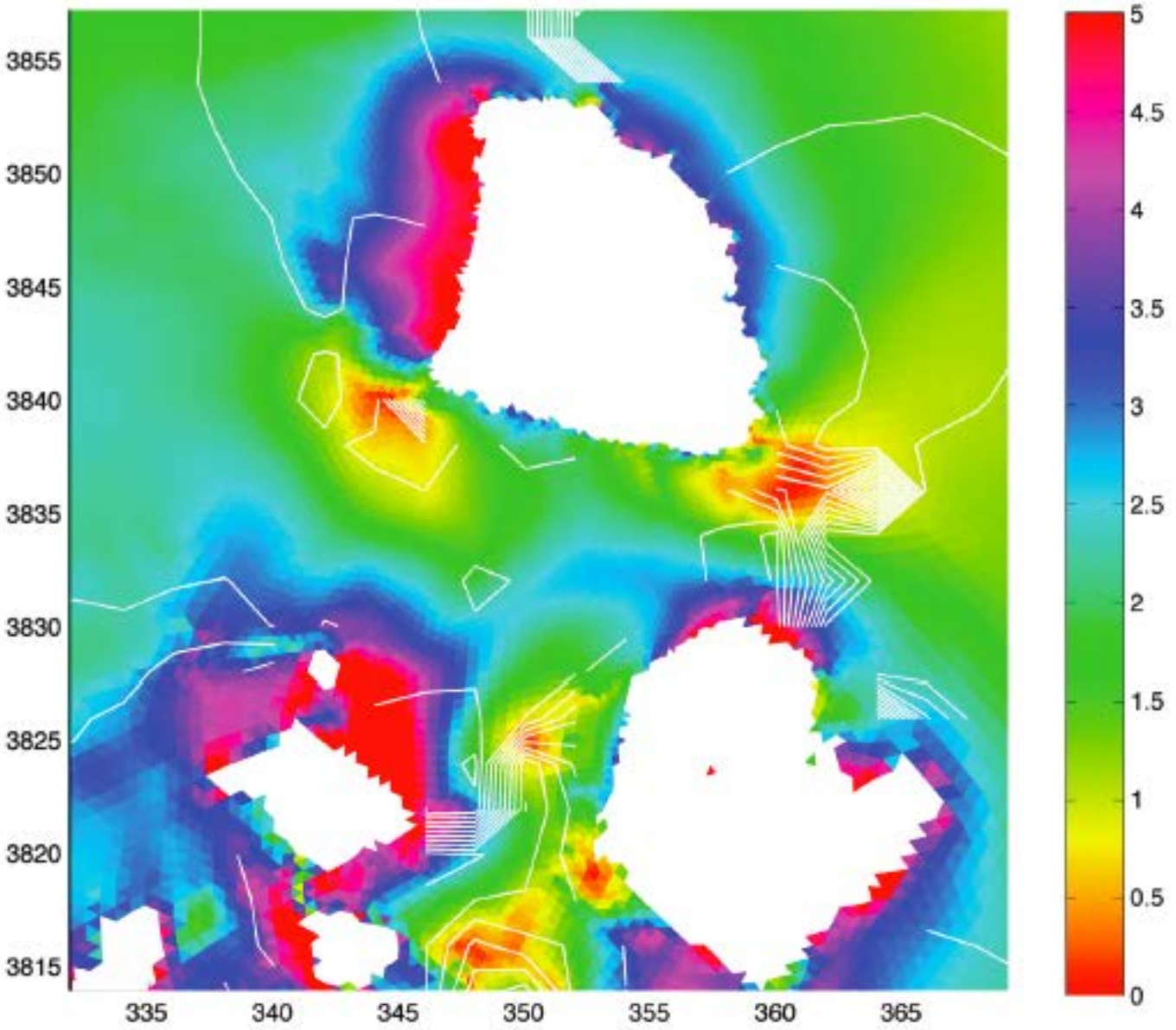


Plot of co-amplitude and co-phase contour line of isothermal elevation at 15 C at M2 frequency around Oshima Island.



Plot of co-amplitude and co-phase contour line of isothermal elevation at 15 C at K1 frequency around Oshima Island.