University of Hawaii DeSSC Report

- HURL
- ACO
- ROV *Lu'ukai*
- Green cable systems

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University of Hawai'i at Manoa

DESSC Meeting
San Francisco
14 December 2014

Hawaii Undersea Research Laboratory - HURL

Pisces IV & Pisces V

Completed a highly successful 20 dive program in November 2014

Future dive programs will be dependent on contract funding

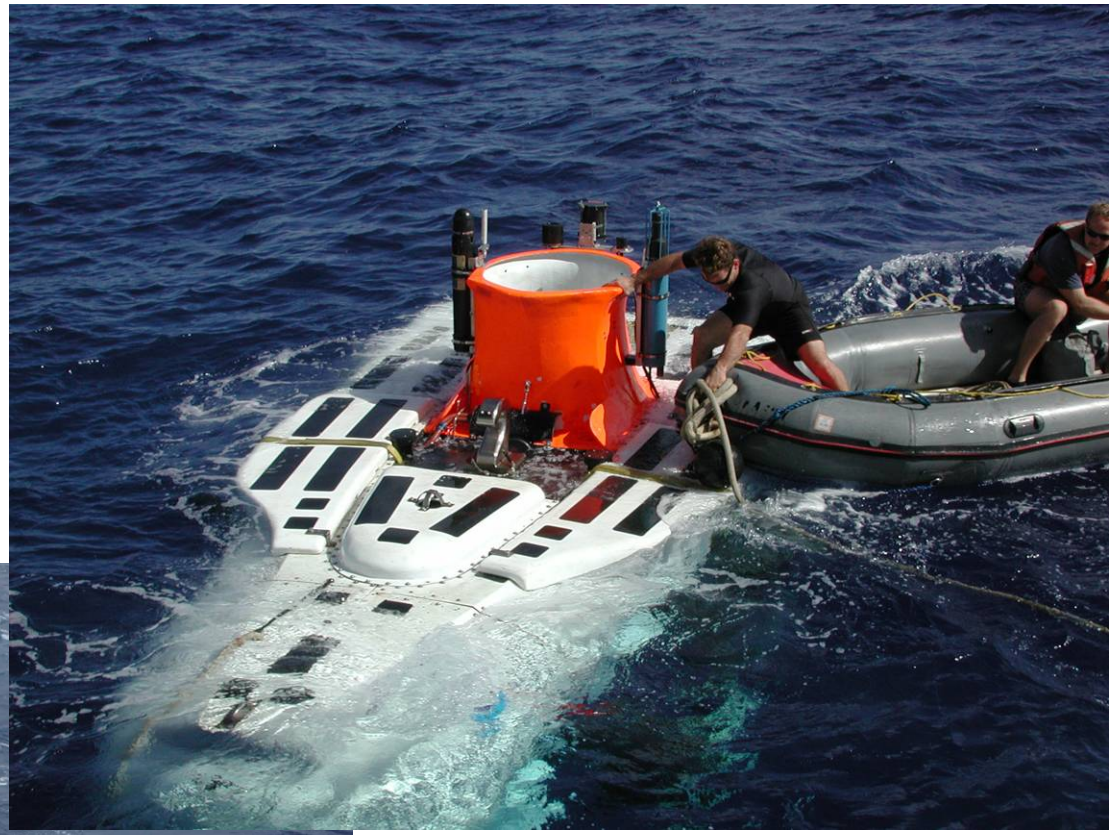
Submersibles, support ship and crew are available for a range of projects beginning Spring 2015

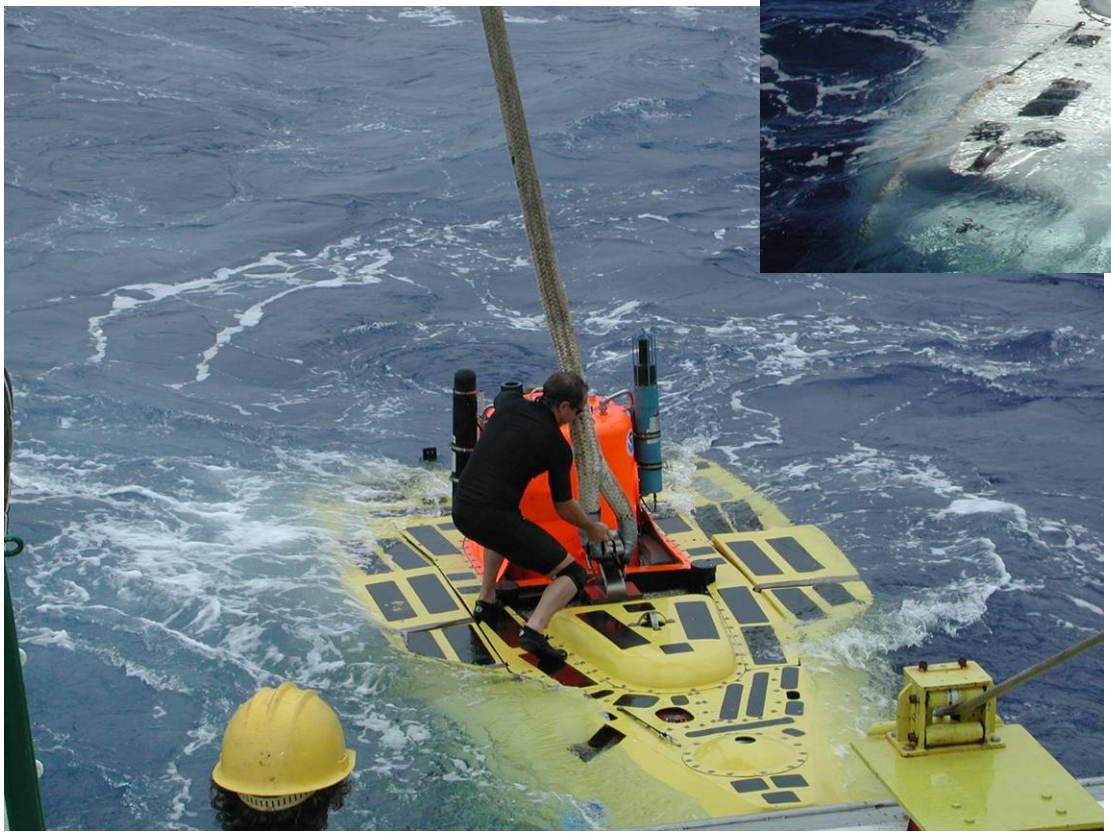
Makai Pier

being developed as an ‘in-water’ enclosed test facility

- Current focus is on general submersible maintenance
- Electronics test facility, machine shop, overhead bridge crane, moon pool

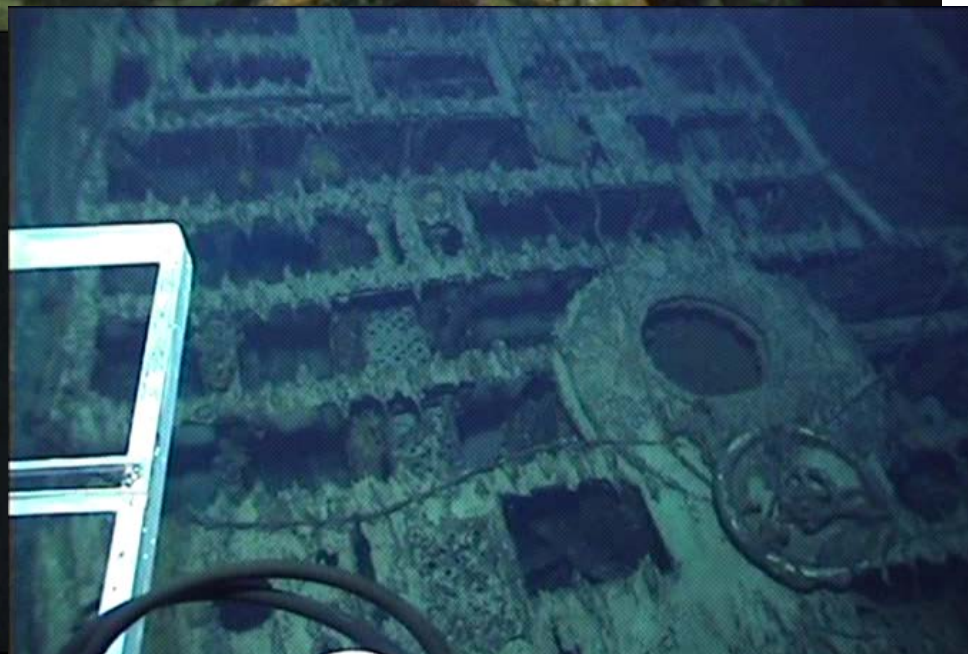
Pisces submersibles offer a good training experience for future submersible operators. Training courses have been structured.



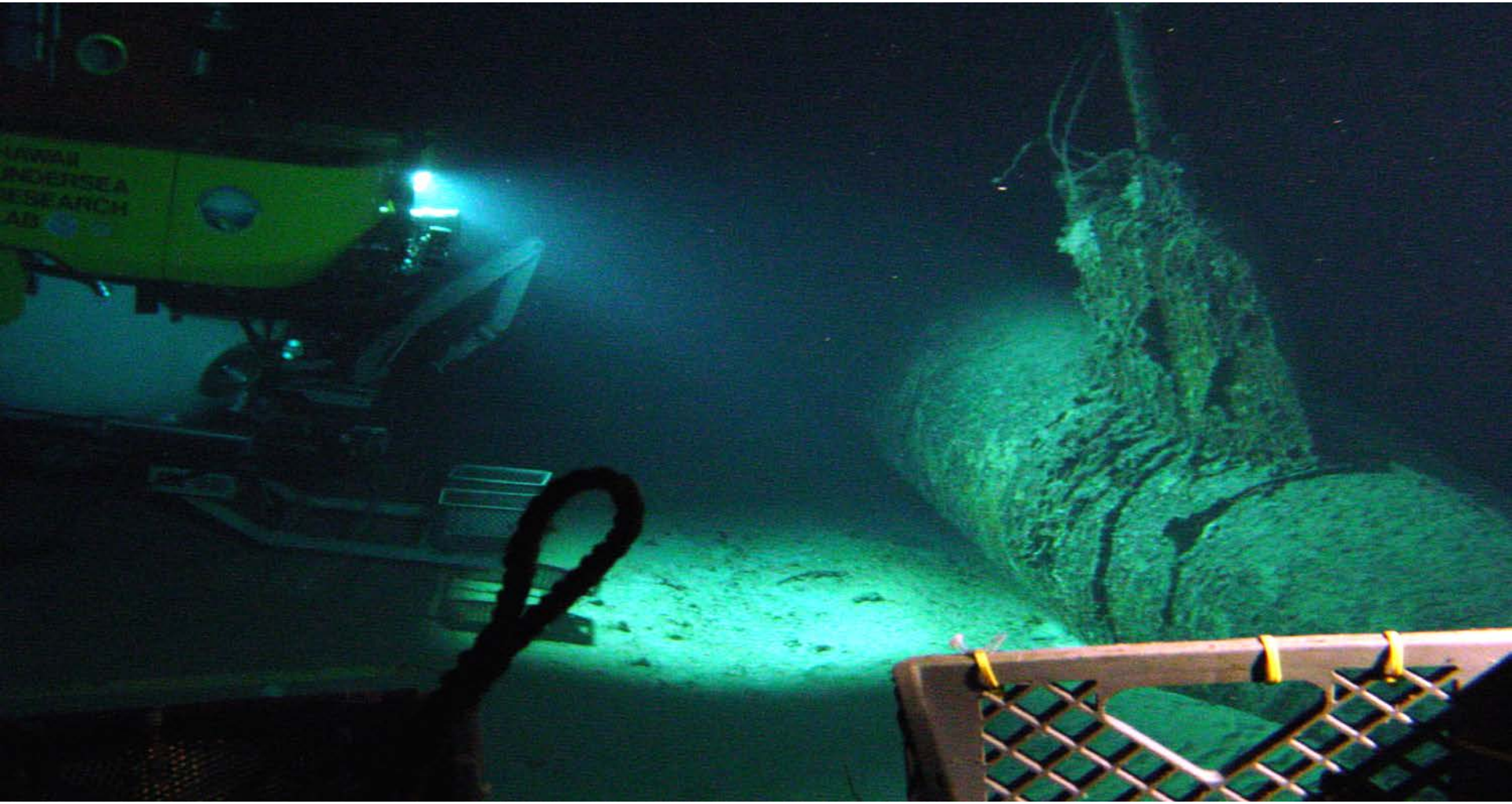


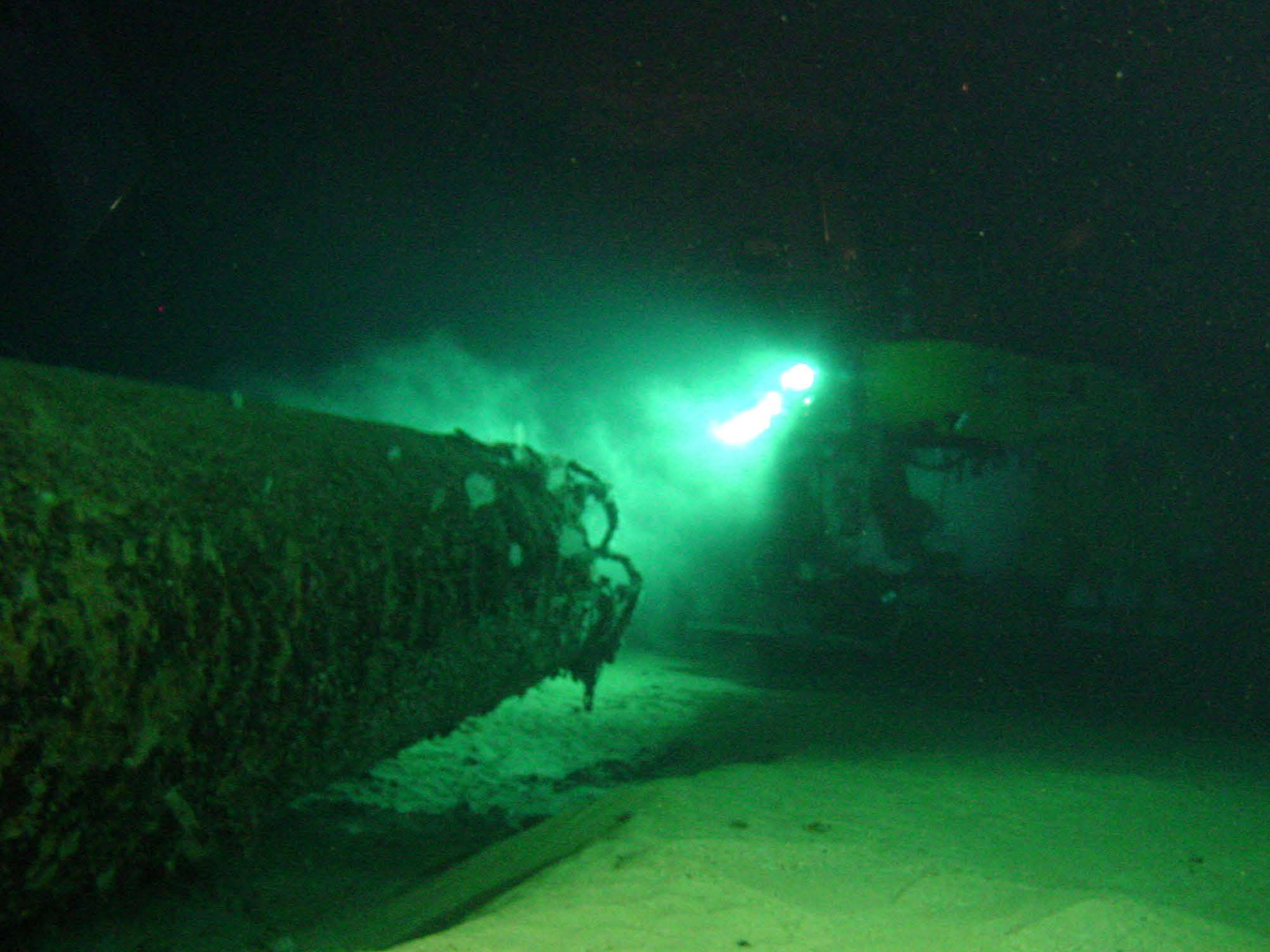
Two Pisces submersibles operating together on the bottom are ideal for film making as independent camera and lighting platforms.

Recent TV Special for NHK on sunken Japanese aircraft-carrying subs

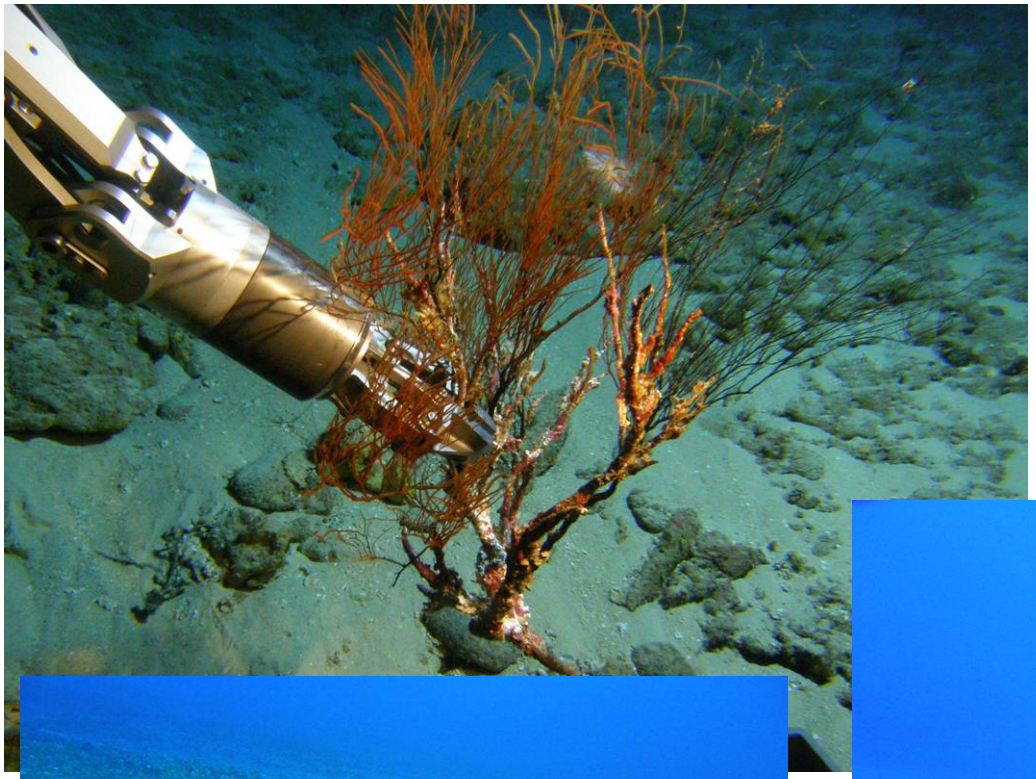


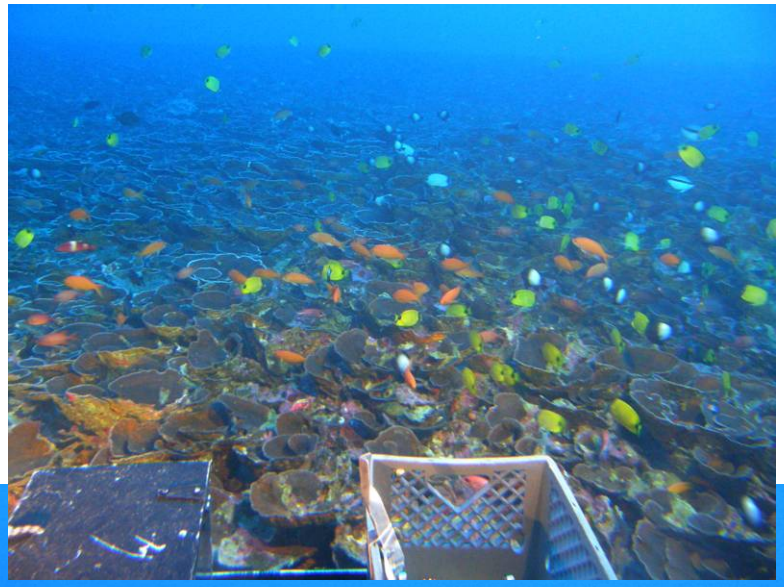
Maritime Heritage Dives on Japanese Midget Submarine

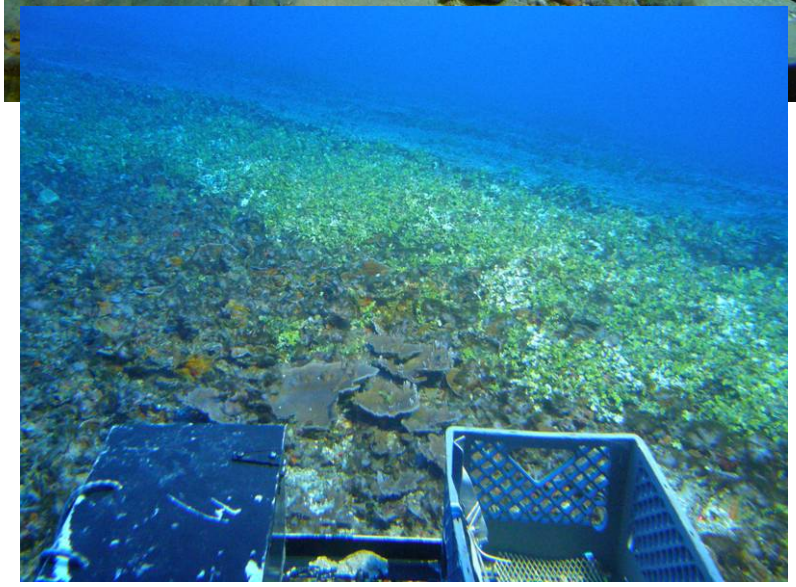


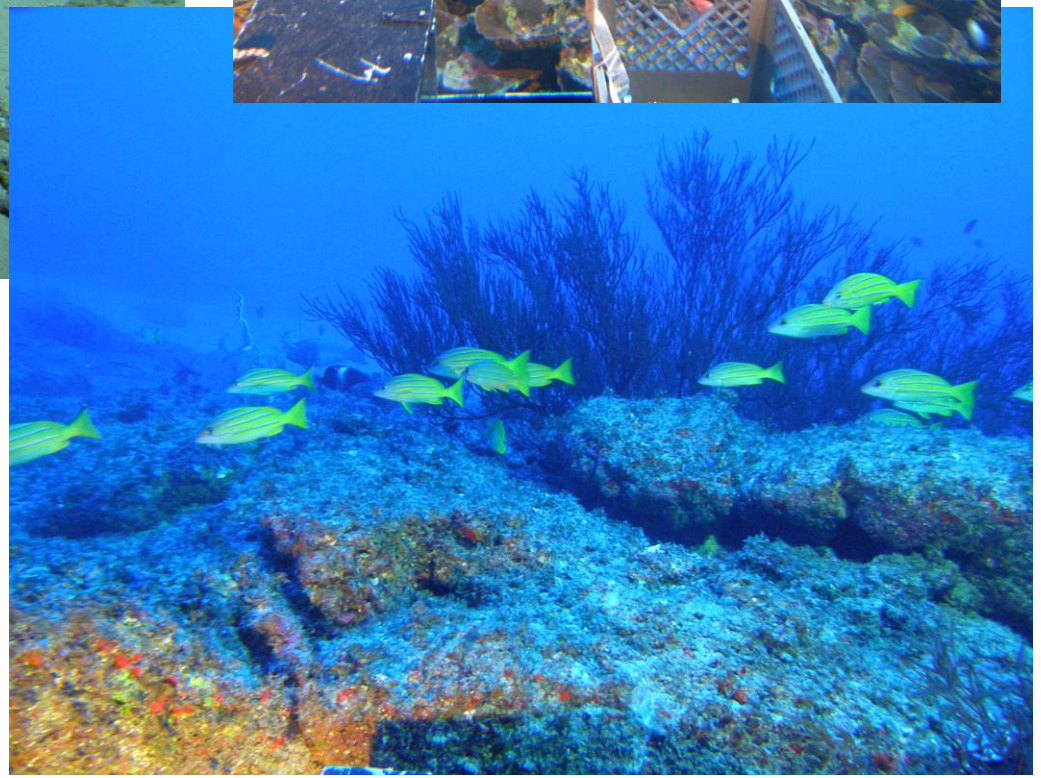


Investigating the Deep Coral Reefs off Hawaii

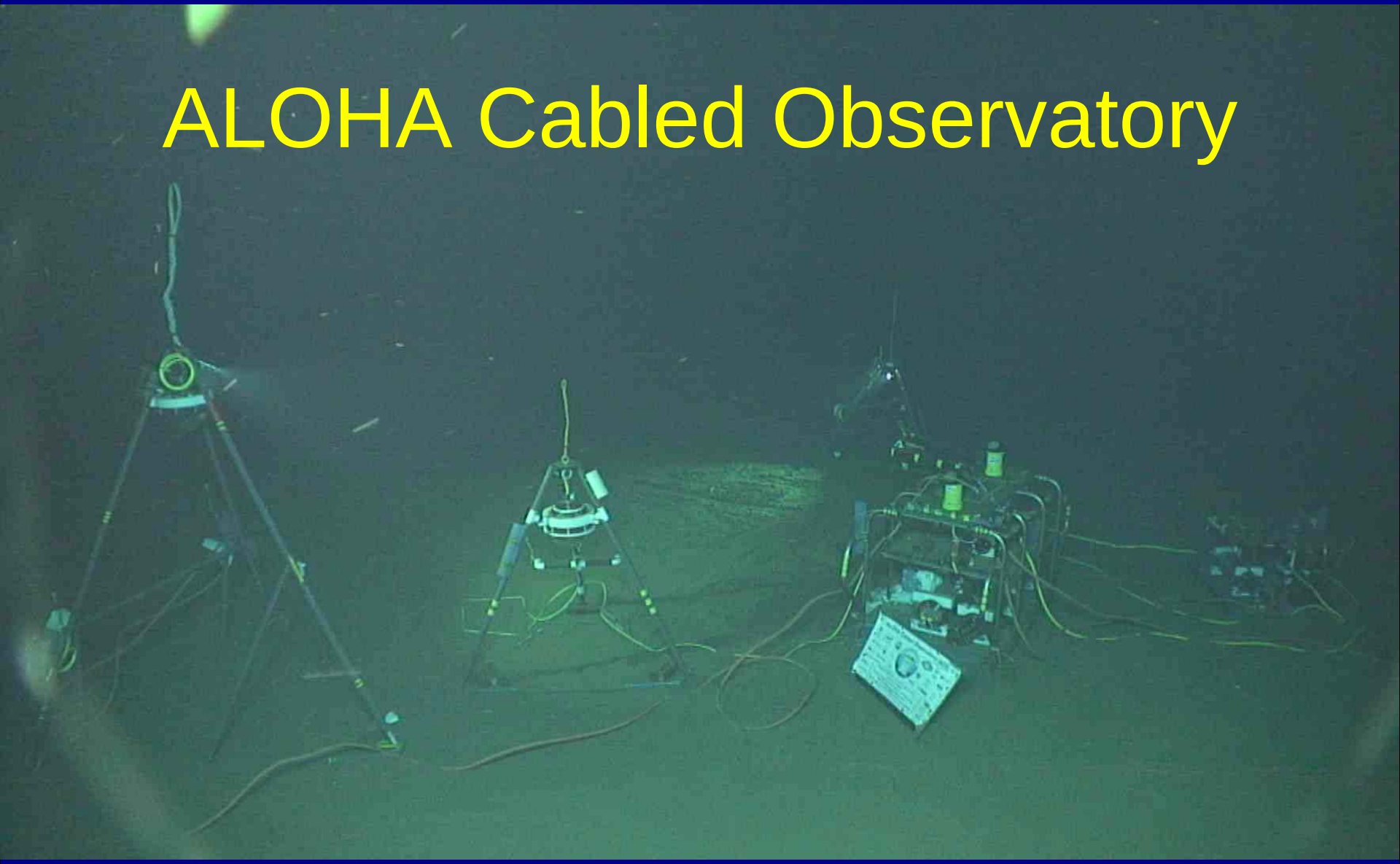






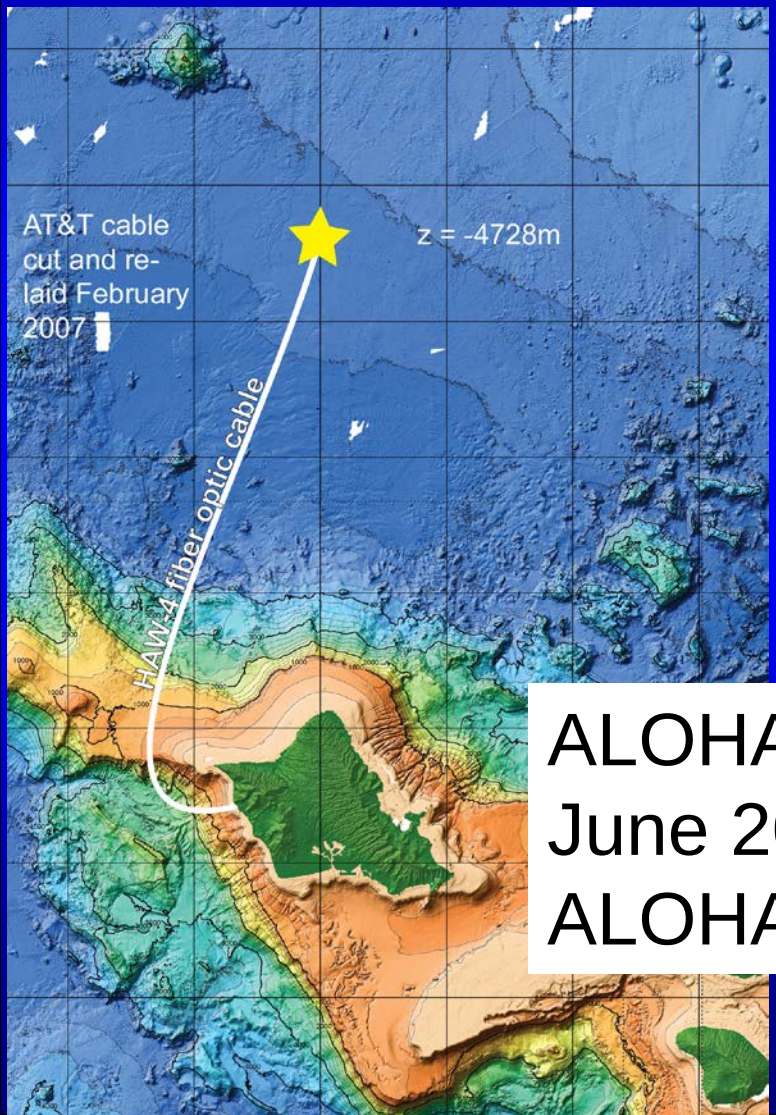


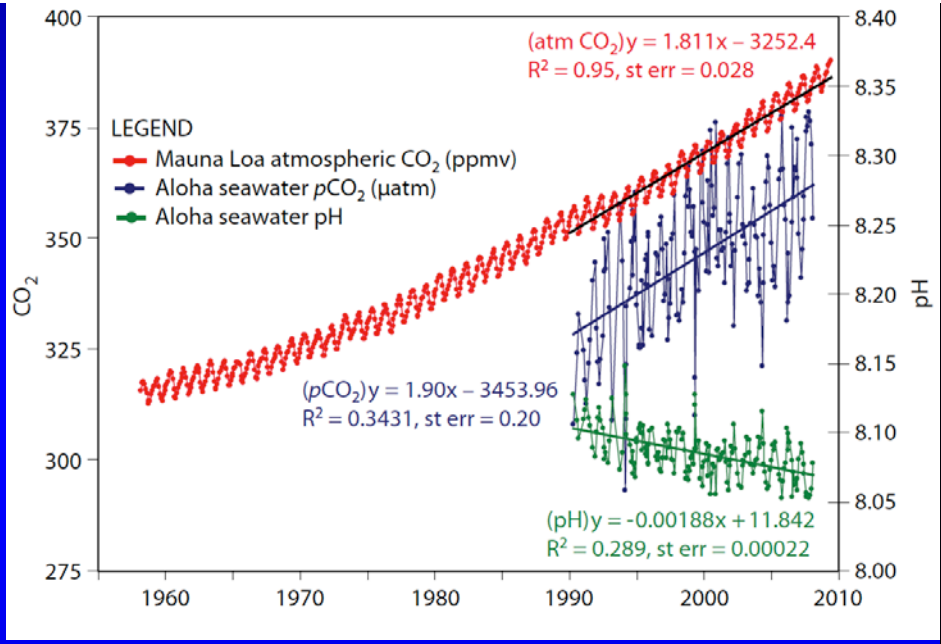
ALOHA Cabled Observatory



Station ALOHA

Hawaii Ocean Time-series (HOT)
25 years, 250 cruises, and continuing
M. Church, R. Lukas, D. Karl
and many others





ALOHA Cabled Observatory
June 2011 – to facilitate science at ALOHA

ACO – 2 Nov 2014

CAM2:
Camera
2 lights
hydrophone

Light

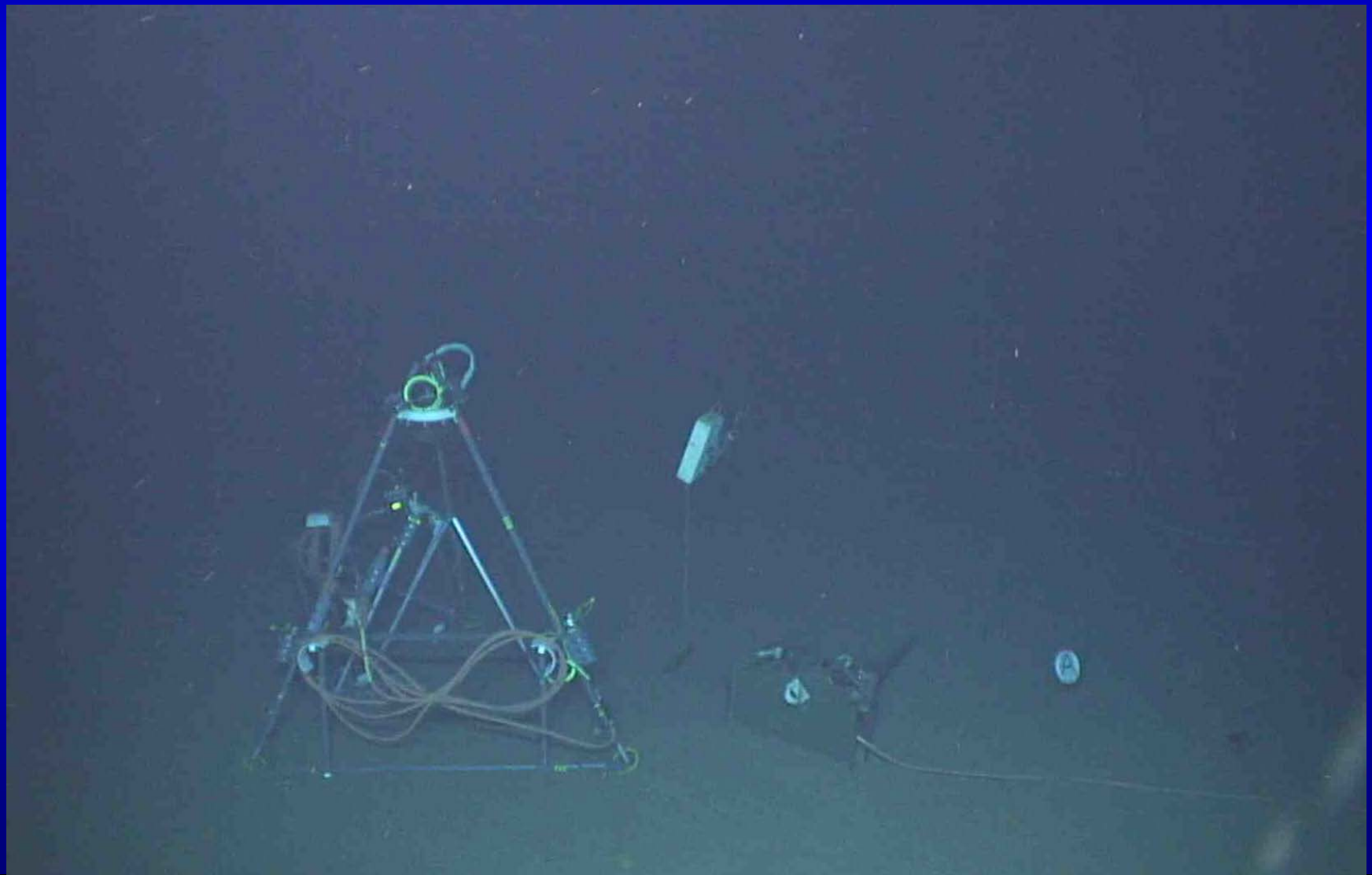
CT
ADCP
2 Hydrophones

Camera

Jason
service dive

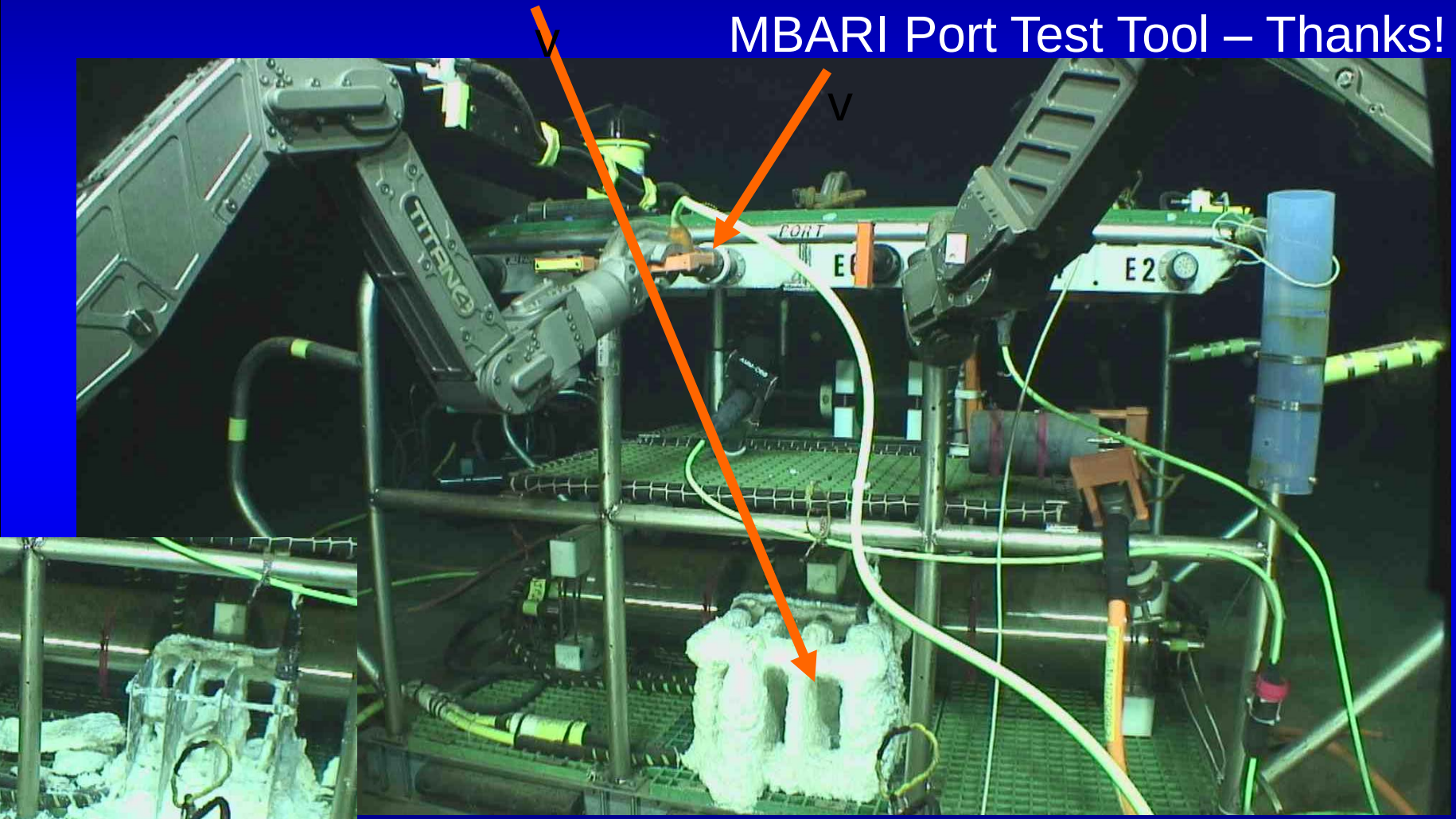
BSP:
CTDO2, ADCP
Modem, Pressure
FLNTU

Camera landed next to cable termination frame



Aragonite – sea water electrode

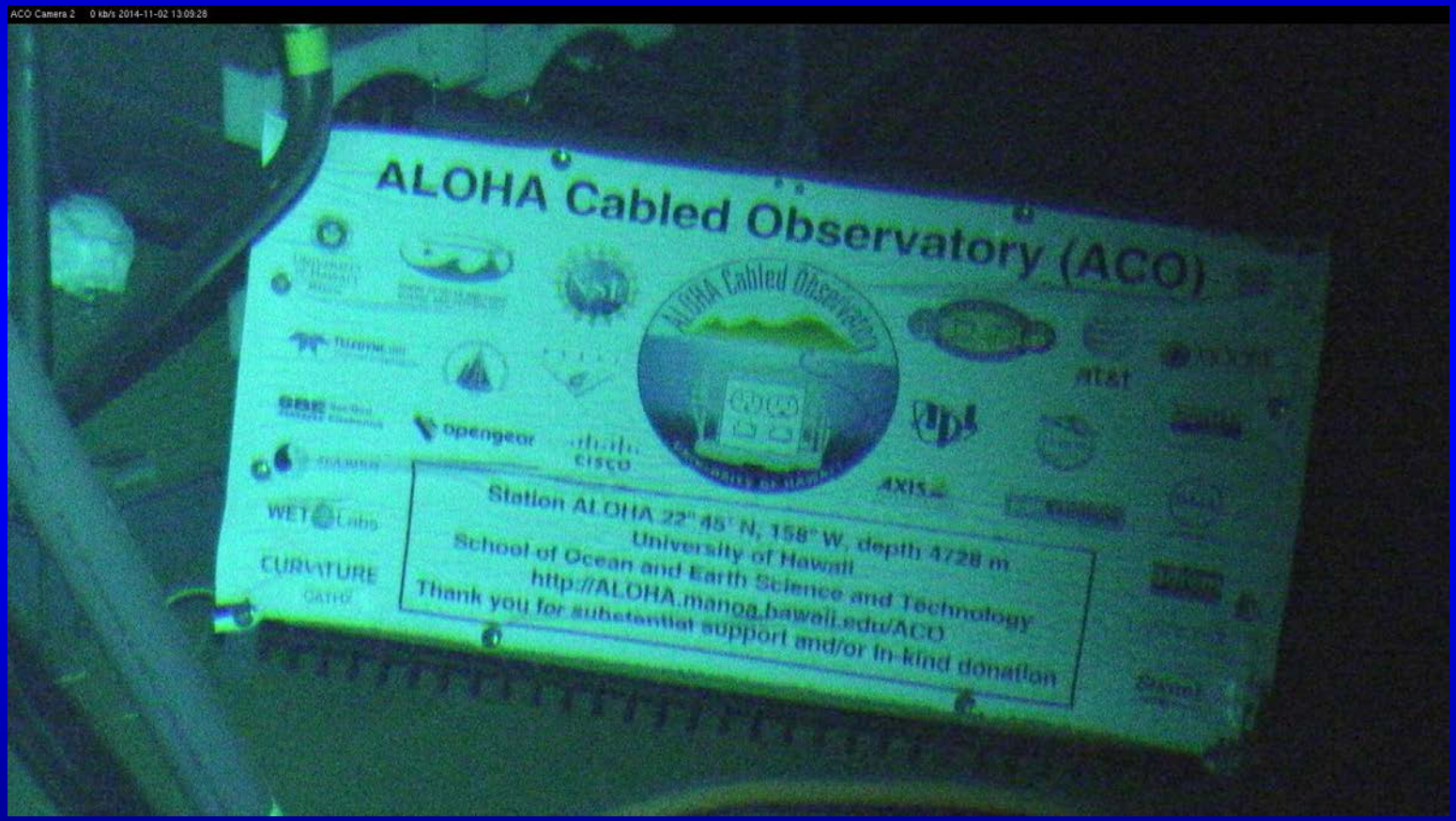
MBARI Port Test Tool – Thanks!



Saw hydrogen bubbles - electrolysis

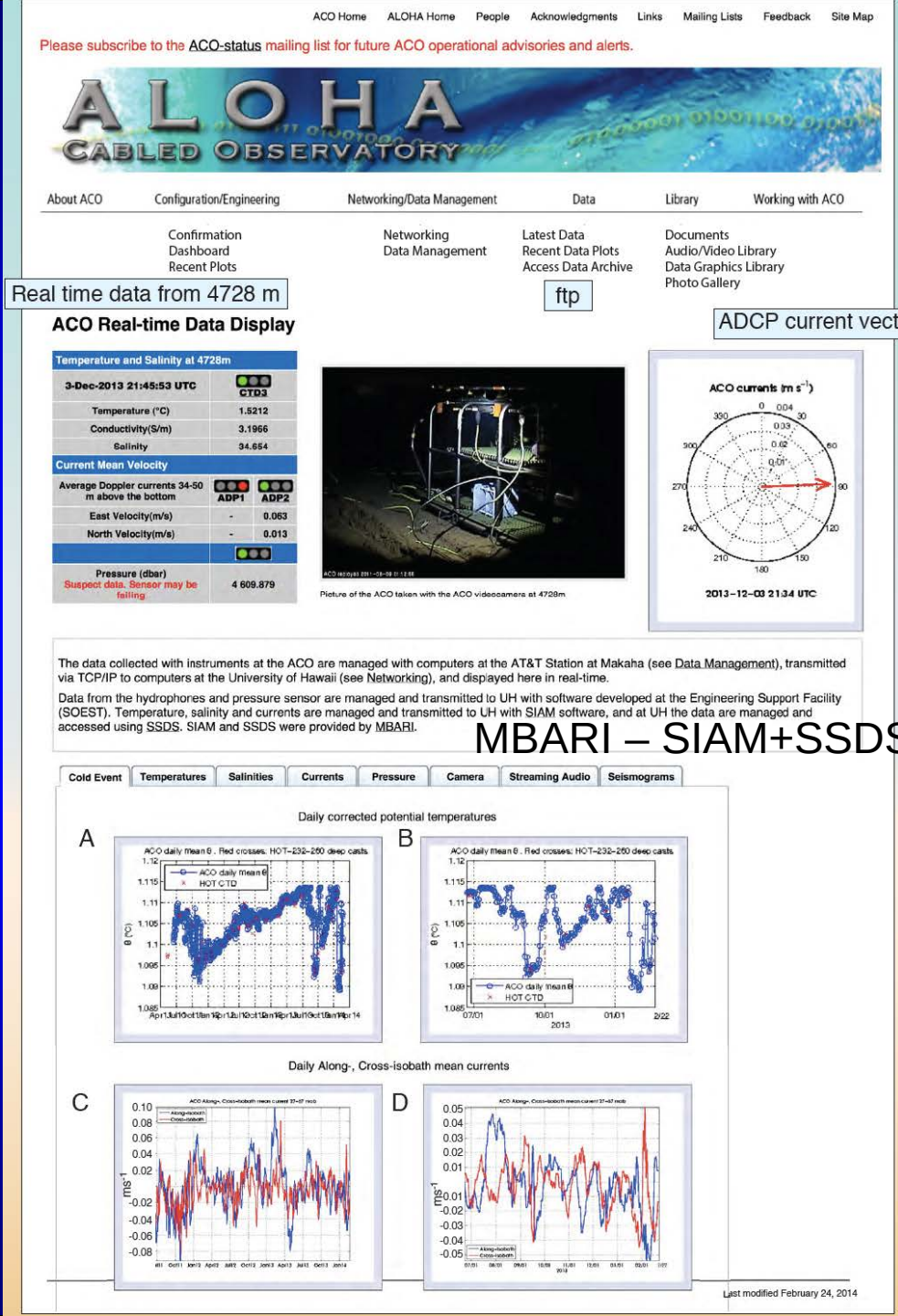
Basic sensor package – cutting off buoyancy

ACO Sponsors

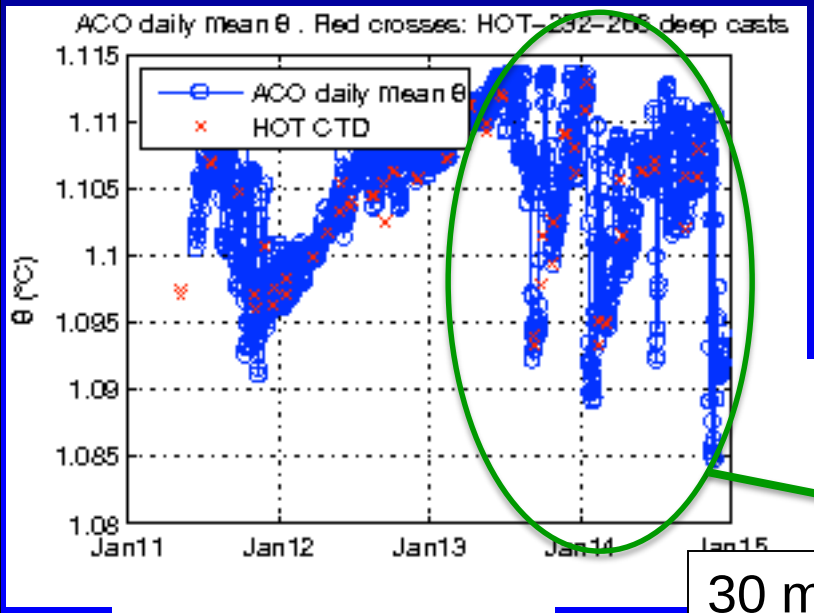


ACO web page

- Tabs for real time sensor data
- Also:
  - System history
  - Photo/audio libraries
  - Dashboard – engineering data
  - FTP to data
  - How to connect

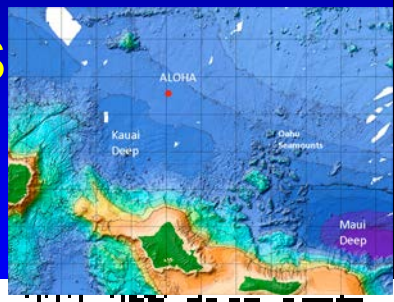


Daily averaged temperature at 4726 m

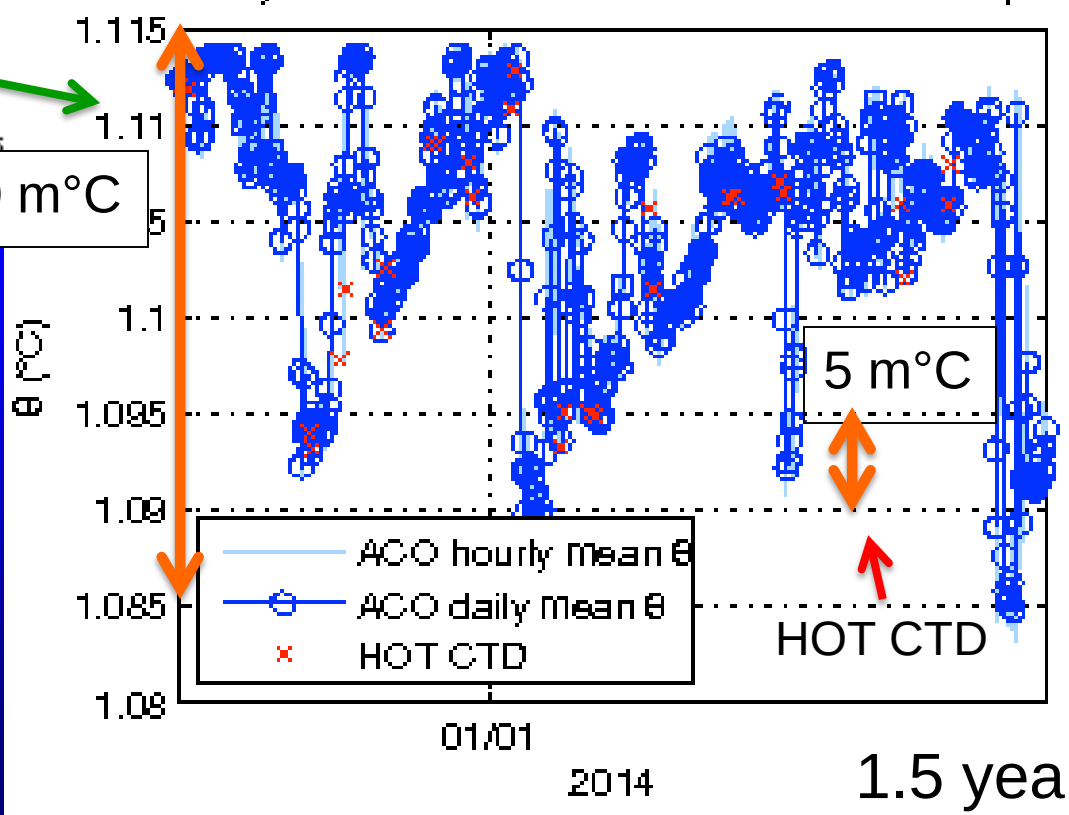


3.5 years now

cold overflow events
large oscillations
slow recovery



30 m°C



1.5 year

Need:
Continuous sampling!

ACO Status and next steps

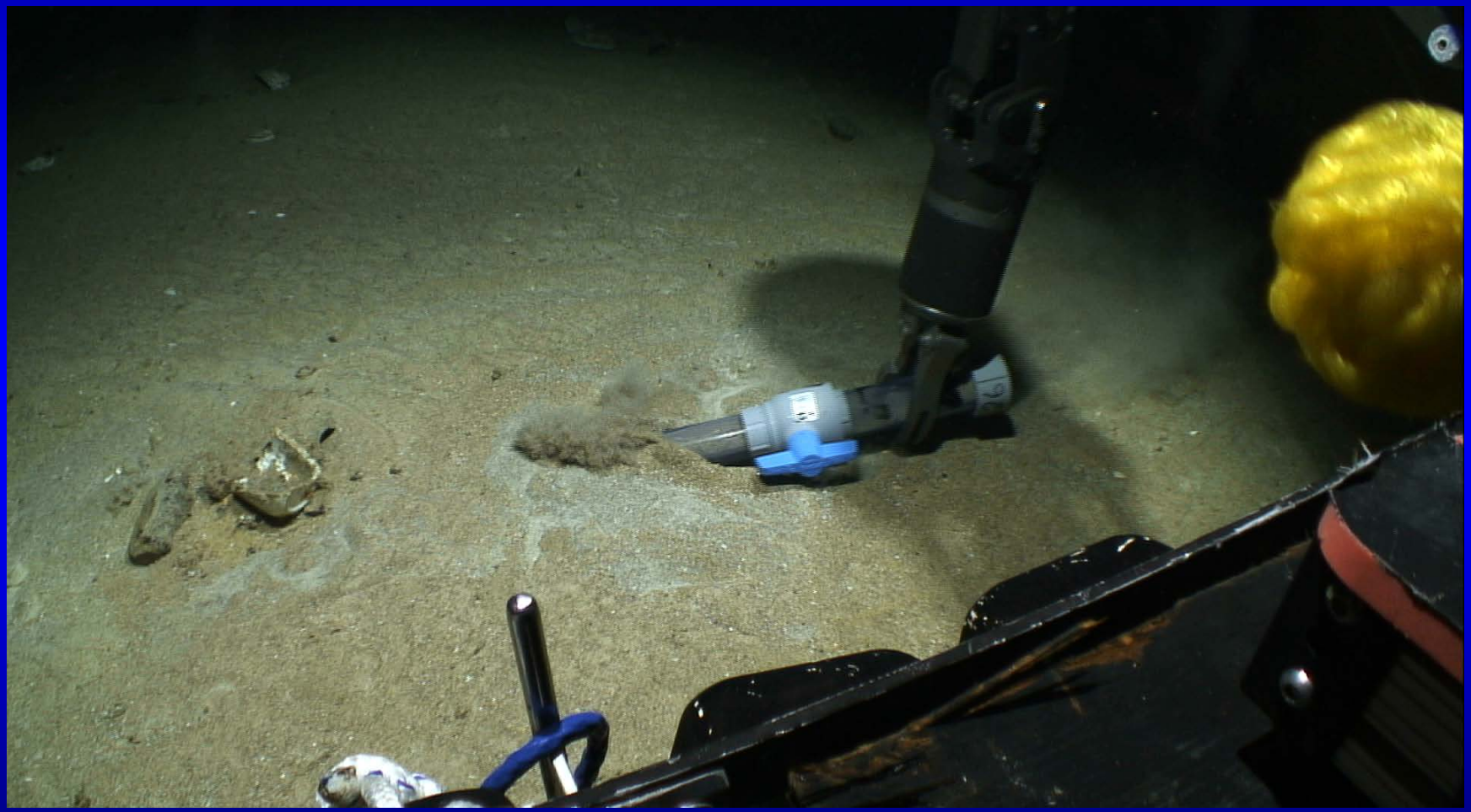
- Data flowing
- NSF OTIC O&M project
  - 2012-2015
  - Barebones
  - Must re-new 2015
  - November 2014 service
    - More sensors, more working
- 2015+ service
  - use UH ROV *Lu'ukai*
  - Add second basic sensor package
    - CTDO2, Fluorometer, pressure
  - Refurb secondary node and deploy
- New projects
  - RAP tomography ONR✓
  - Noise interferometry – Feb - NSF
  - Deep sea biology and carbon cycle J. Drazen and K. Smith - NSF?
  - Mooring with profilers – 2016 MRI - NSF?
- http://aloha.manoa.hawaii.edu

UH ROV *Lu'ukai* - Sea Diver

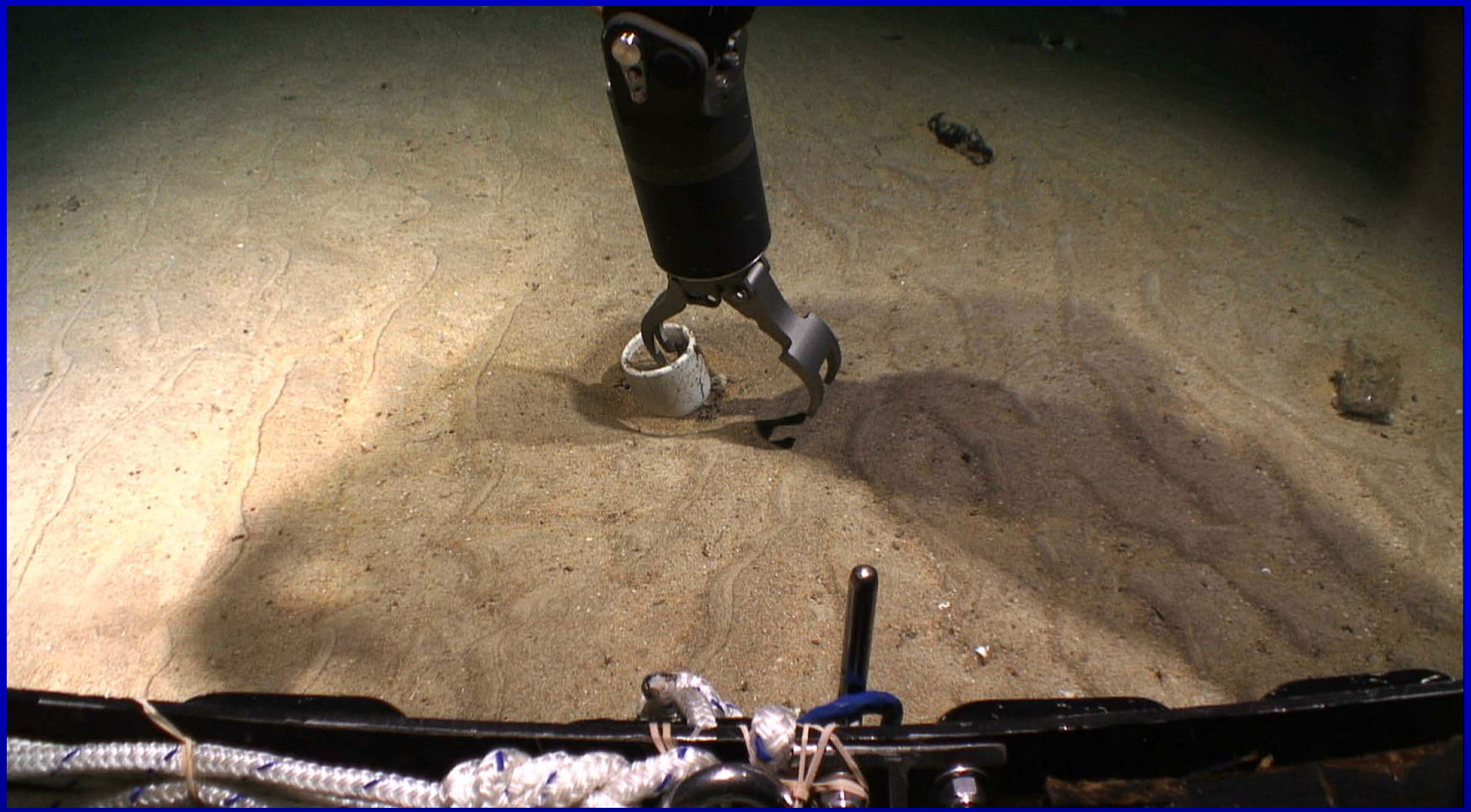
ROV Lu'ukai

- Acquired June 2013
- At-sea testing started October 2013
- Some dives as deep as 4700 m
- Most recent dives 37-39, 4-6 December 2014, 432 m and 2600 m
- Next 6 months, work to operational status
- ACO (4728 m)
- Others

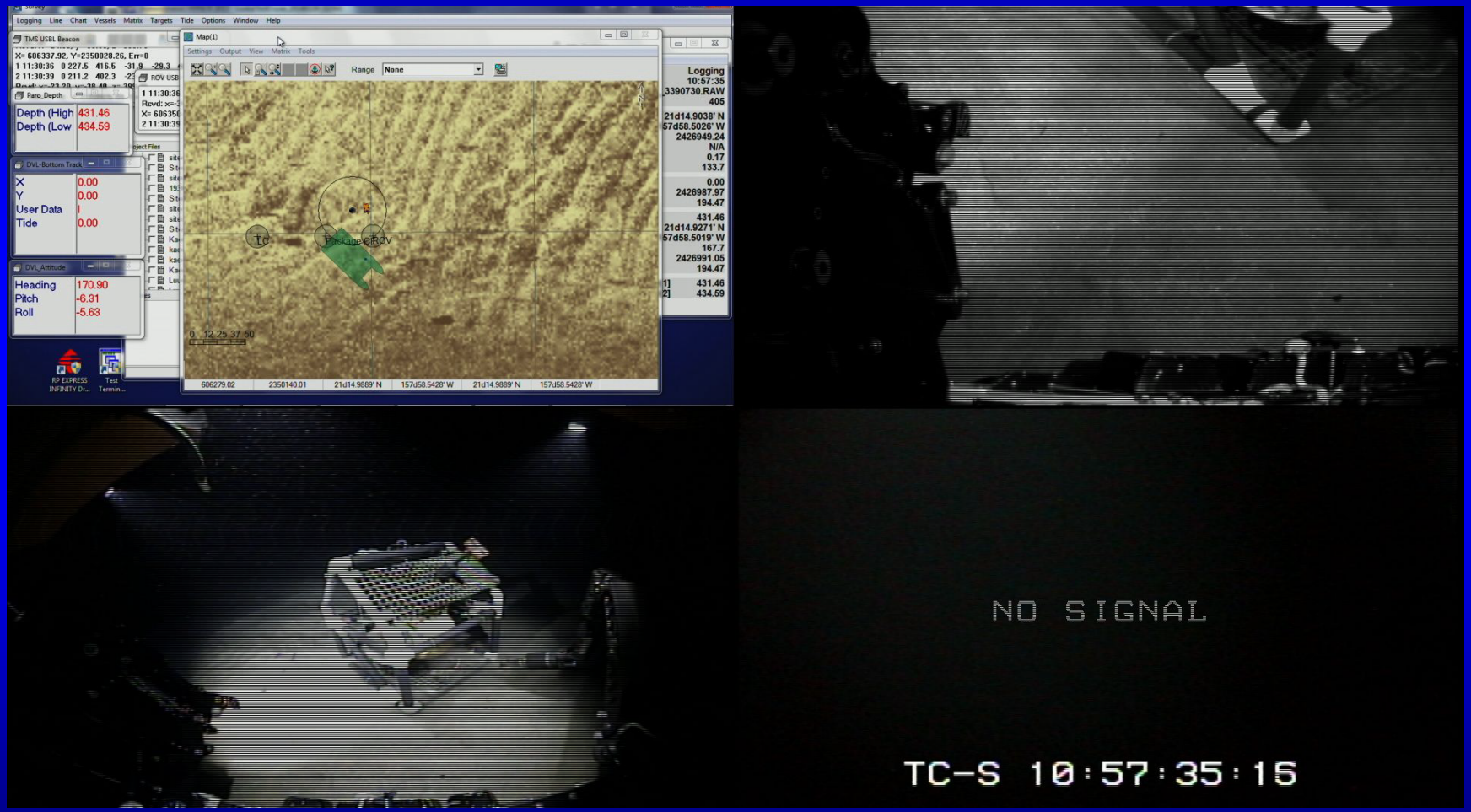
Sediment sampling



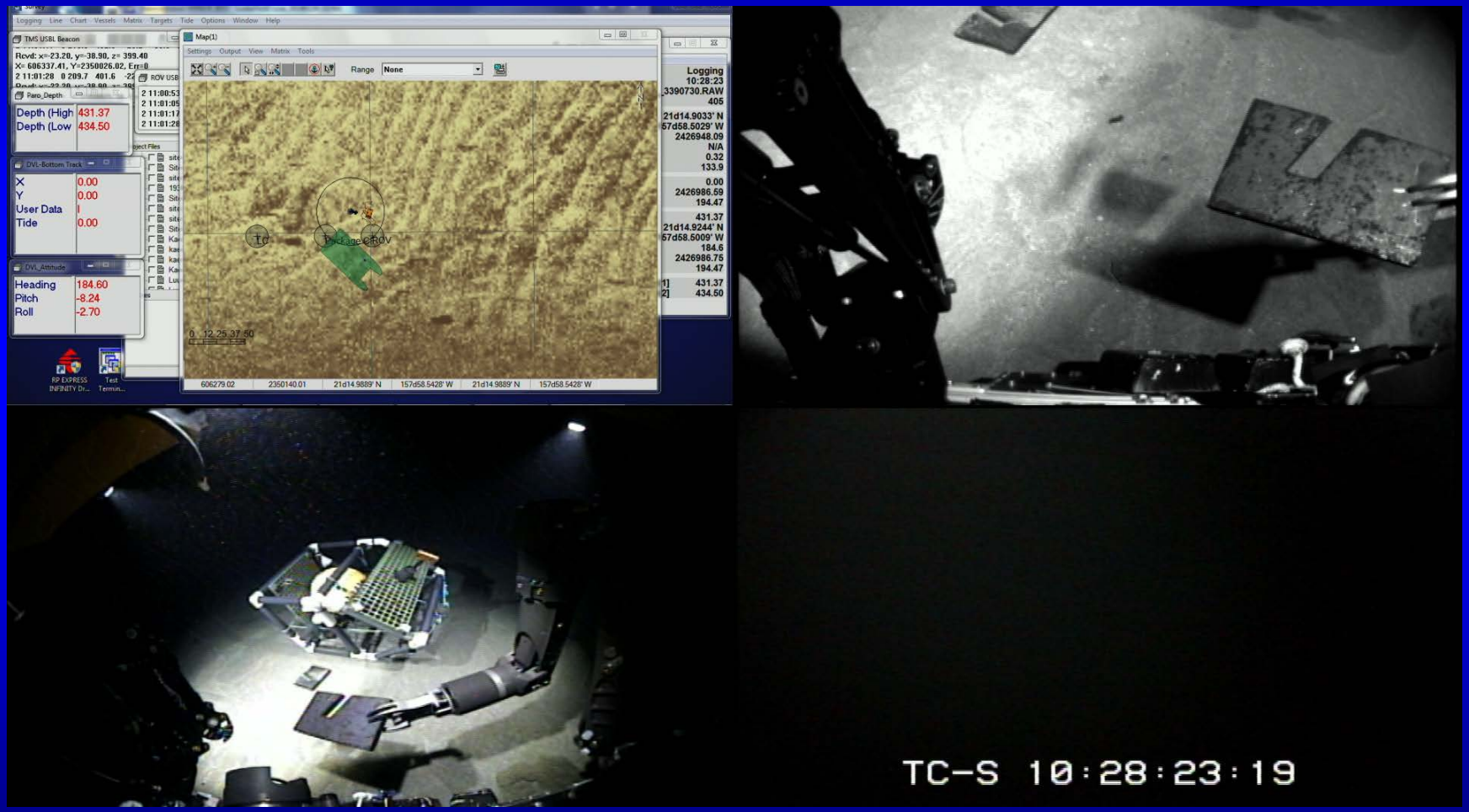
Picking up a cup – 432 m



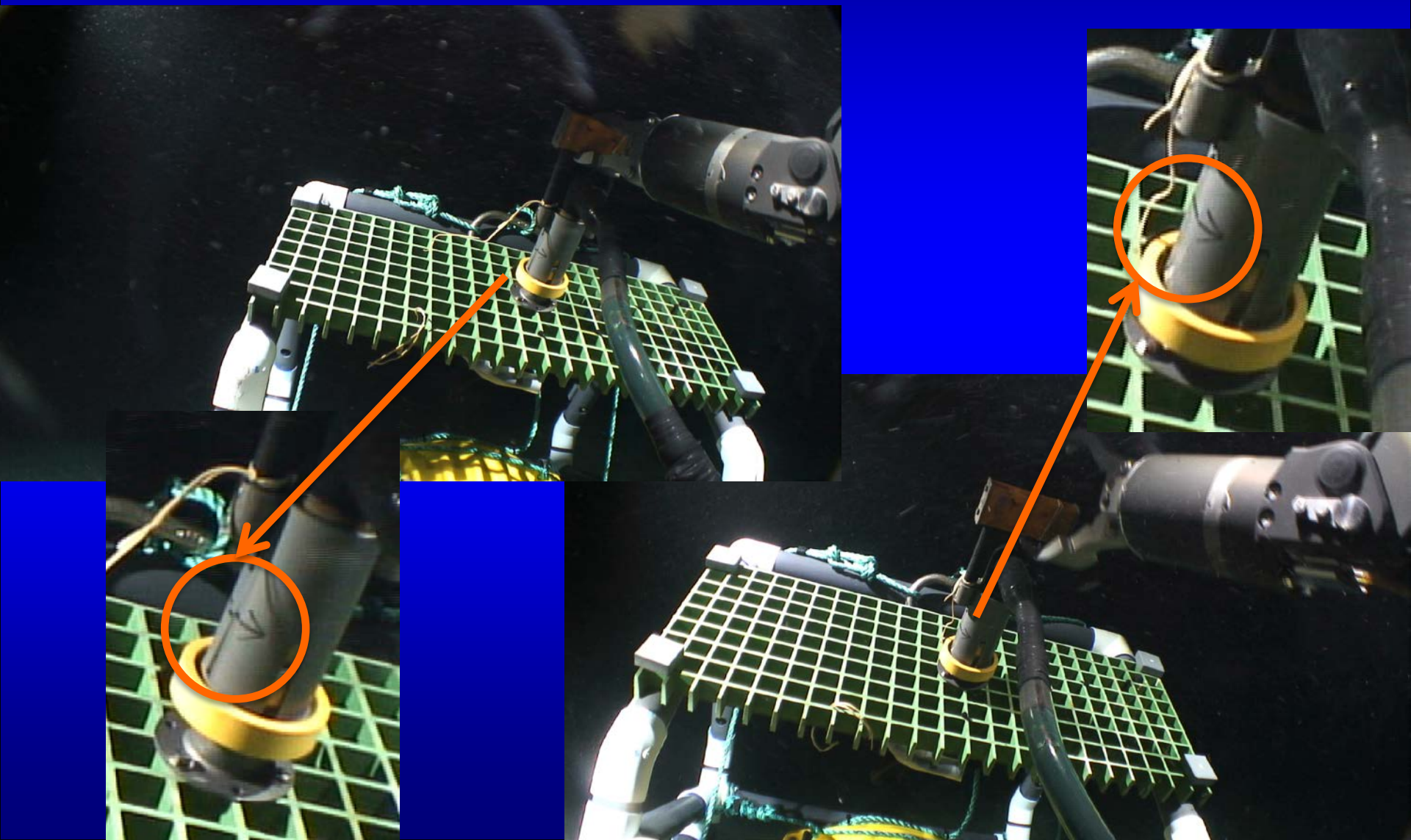
Connector test frame



Adjusting weights on package



ODI Connector practice – 432 m



2600 m

For Future Consideration: Green cable systems

For Future Consideration: Green cable systems

- Add sensors and instrumentation to commercial submarine telecommunications cable systems
- Hazard warning and mitigation – tsunami and earthquake
- Climate change and ocean observing

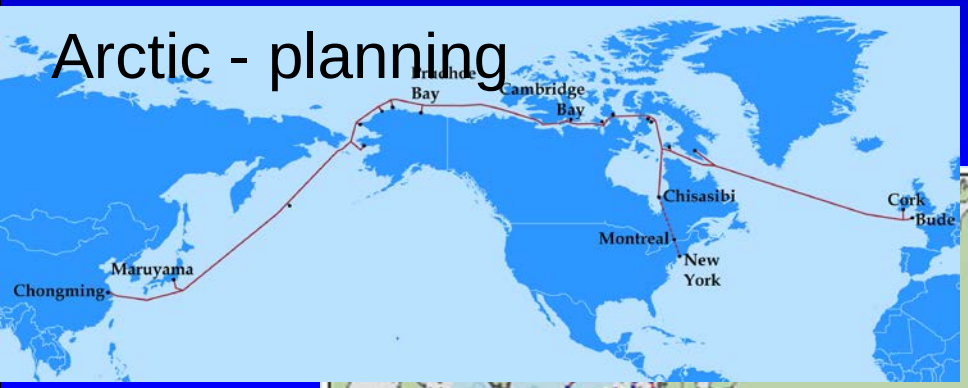
- Would need deep submergence capability

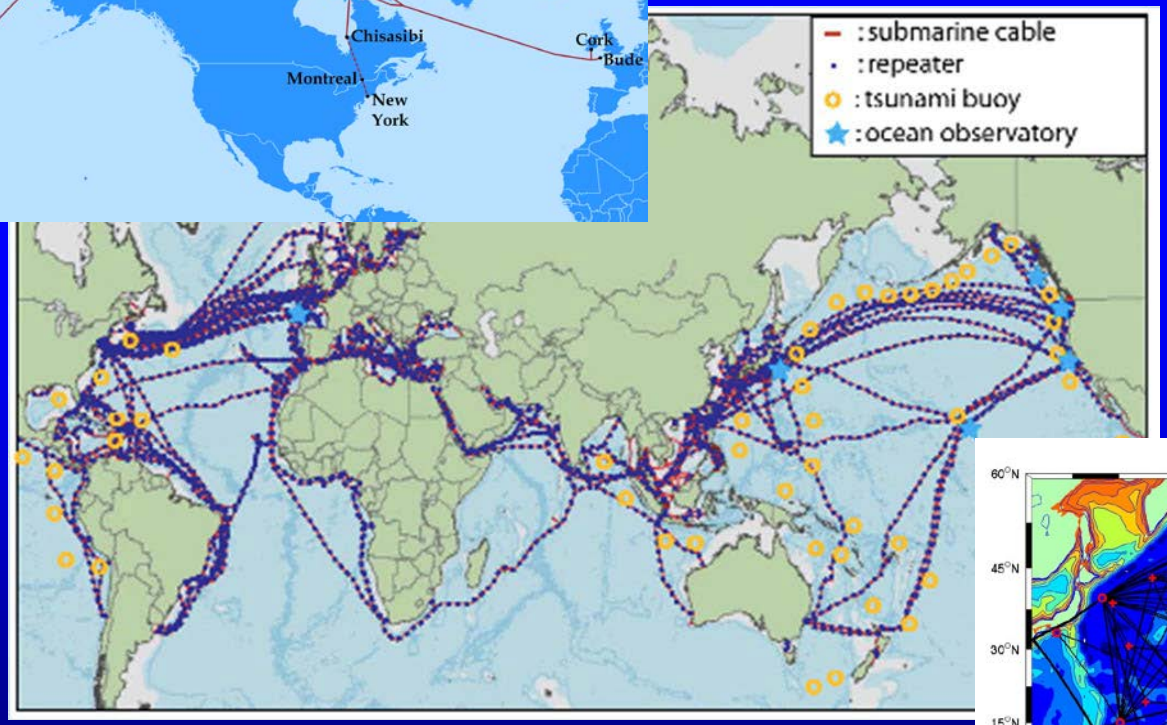
Green cable systems

- International Telecommunications Union
- UN agency of member states, industry, academia
- With WMO, IOC – Joint Task Force (JTF)
- Add ocean sensors to submarine cable telecommunications systems
  - Hazard mitigation (tsunami and seismic)
  - Climate change
  - Initial: temperature, pressure, acceleration
  - Future: acoustic modem/IES/hydrophone, chem/bio, *nodes*…
- Governments buy share of system (buy comms redundancy/expansion/resiliency as well)
- Slowly build up global coverage over 25 year life cycle (last longer)

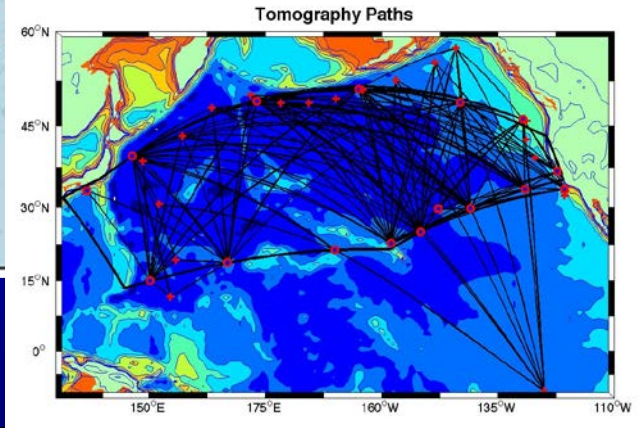
“Green” submarine telecom cable systems

- Current cables – 10-25 year cycle
- New ones always going in – take advantage!





Acoustic Tomography



www.itu.int/en/ITU-T/climatechange/task-force-sc

Thank you

Questions