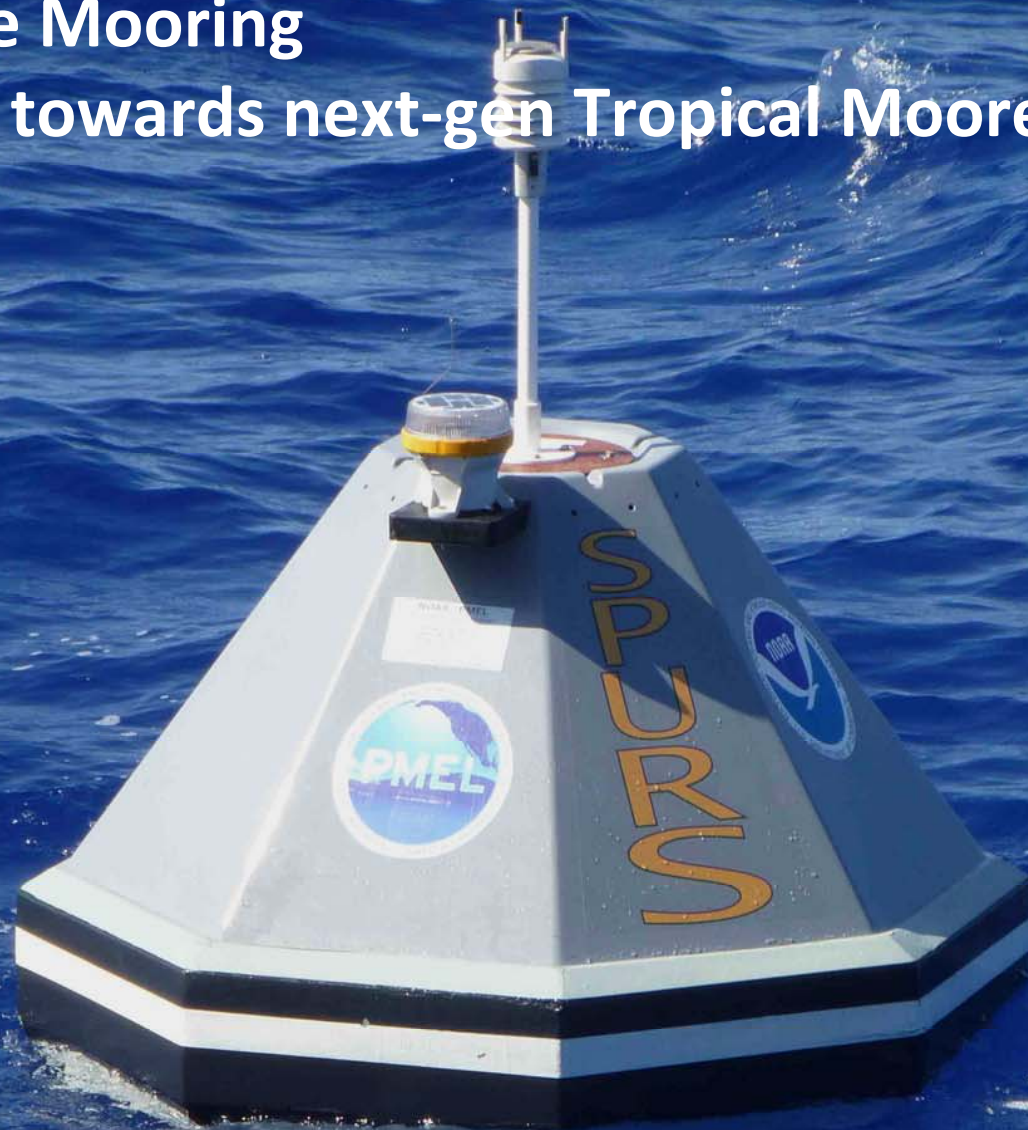


CTD Profiling using Wave Energy from a Surface Mooringsteps towards next-gen Tropical Moored Buoys

Christian Meinig
Scott Stalin
Billy Kessler
NOAA-PMEL
Seattle, WA

Hugh Milburn
Sole-Proprietor
Seattle, WA

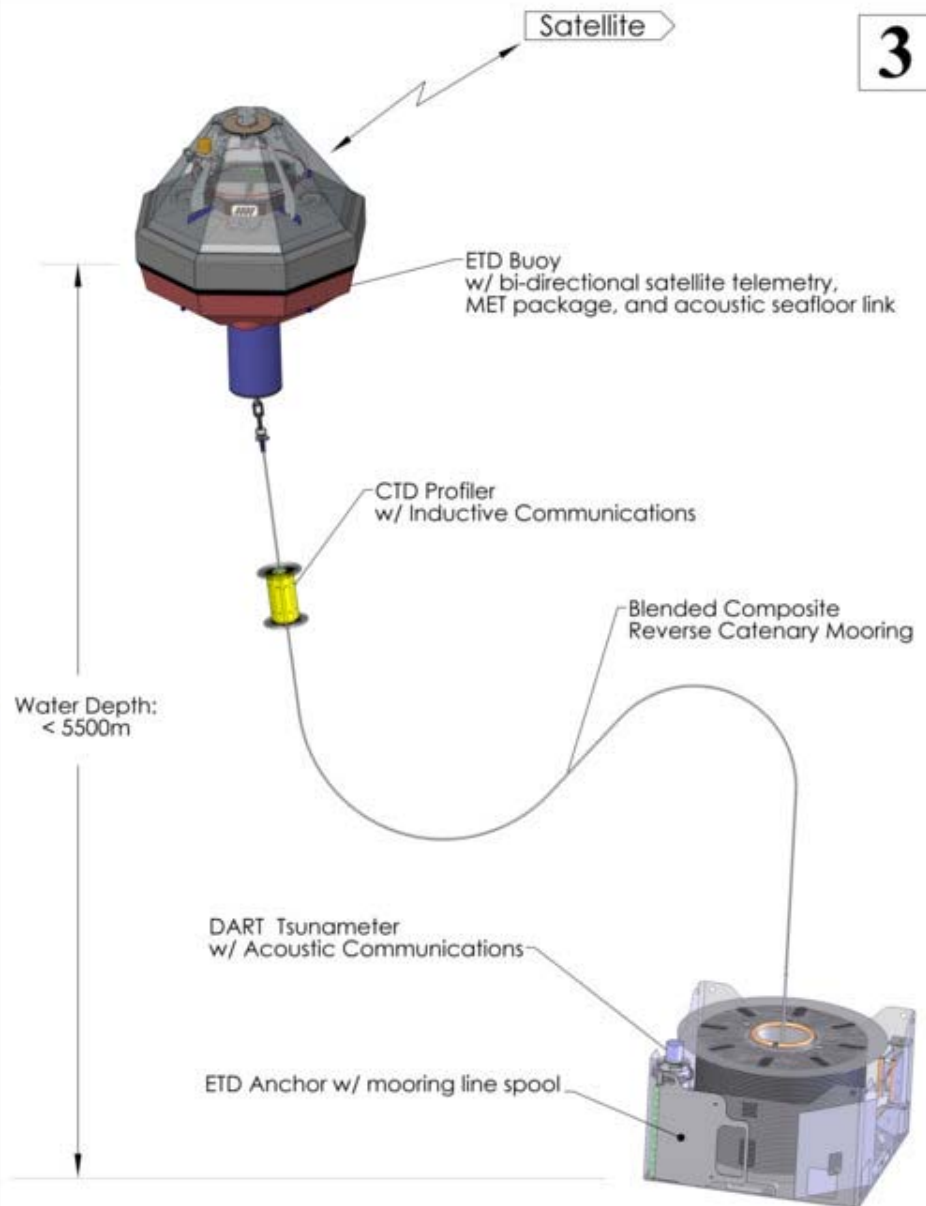
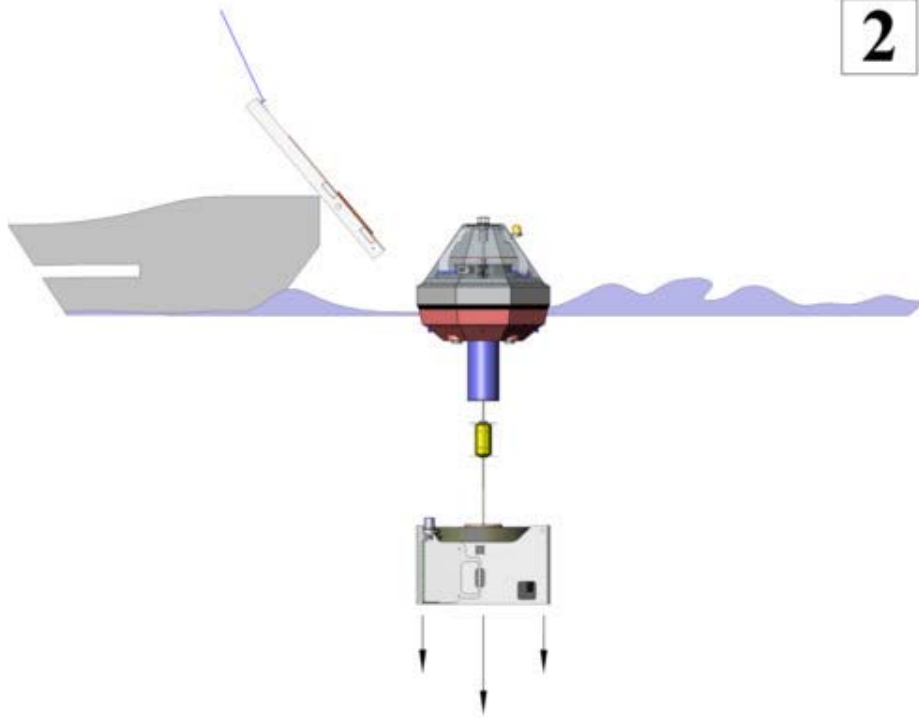
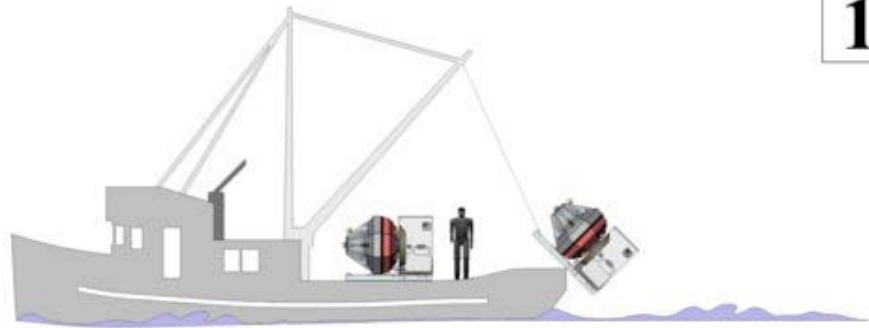
September 23, 2013



Topics

- Background
- Test Deployments
- Future

Big Picture: Operations Concept



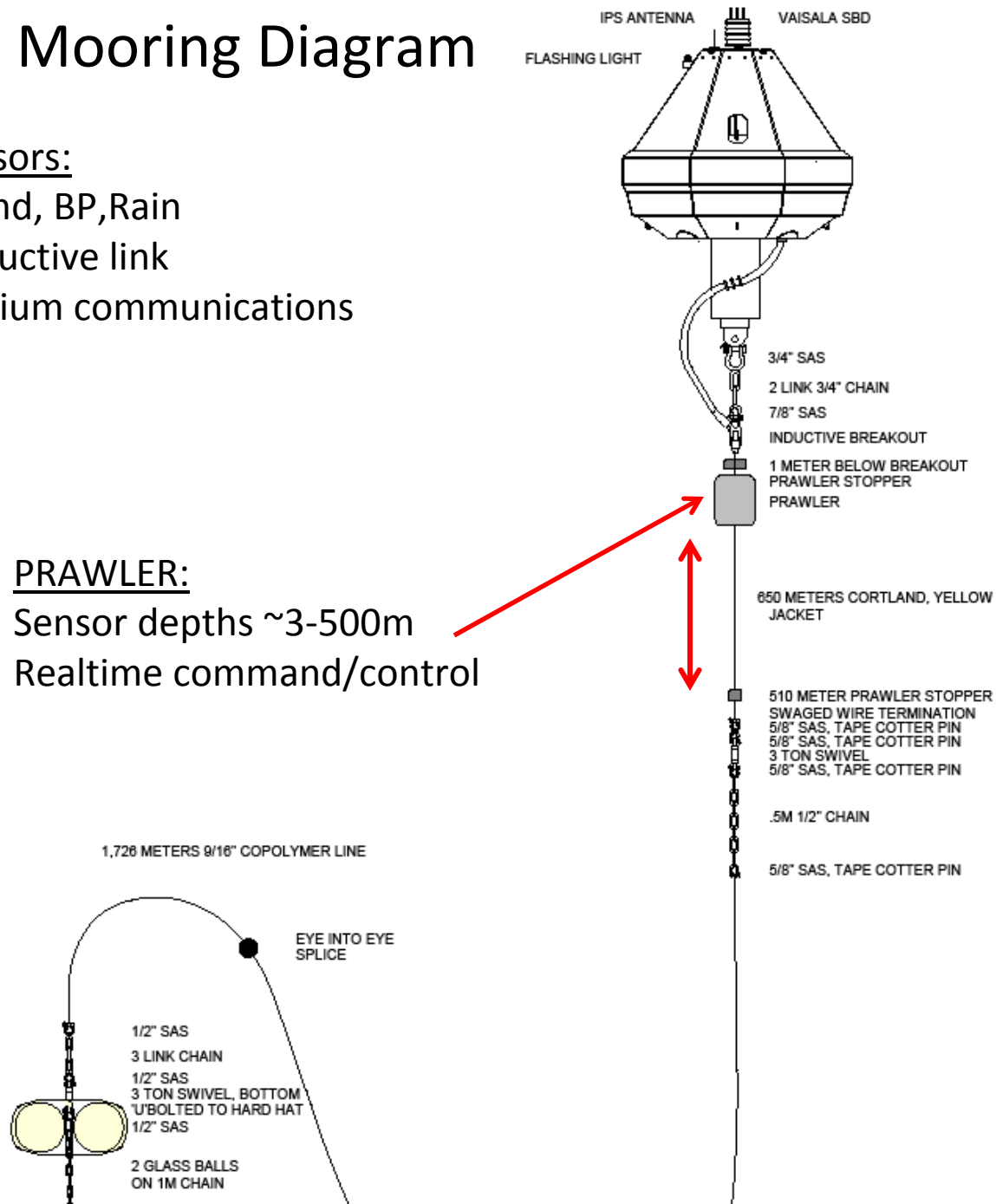
PICO Mooring Diagram

Sensors:

- Wind, BP, Rain
- Inductive link
- Iridium communications

PRAWLER:

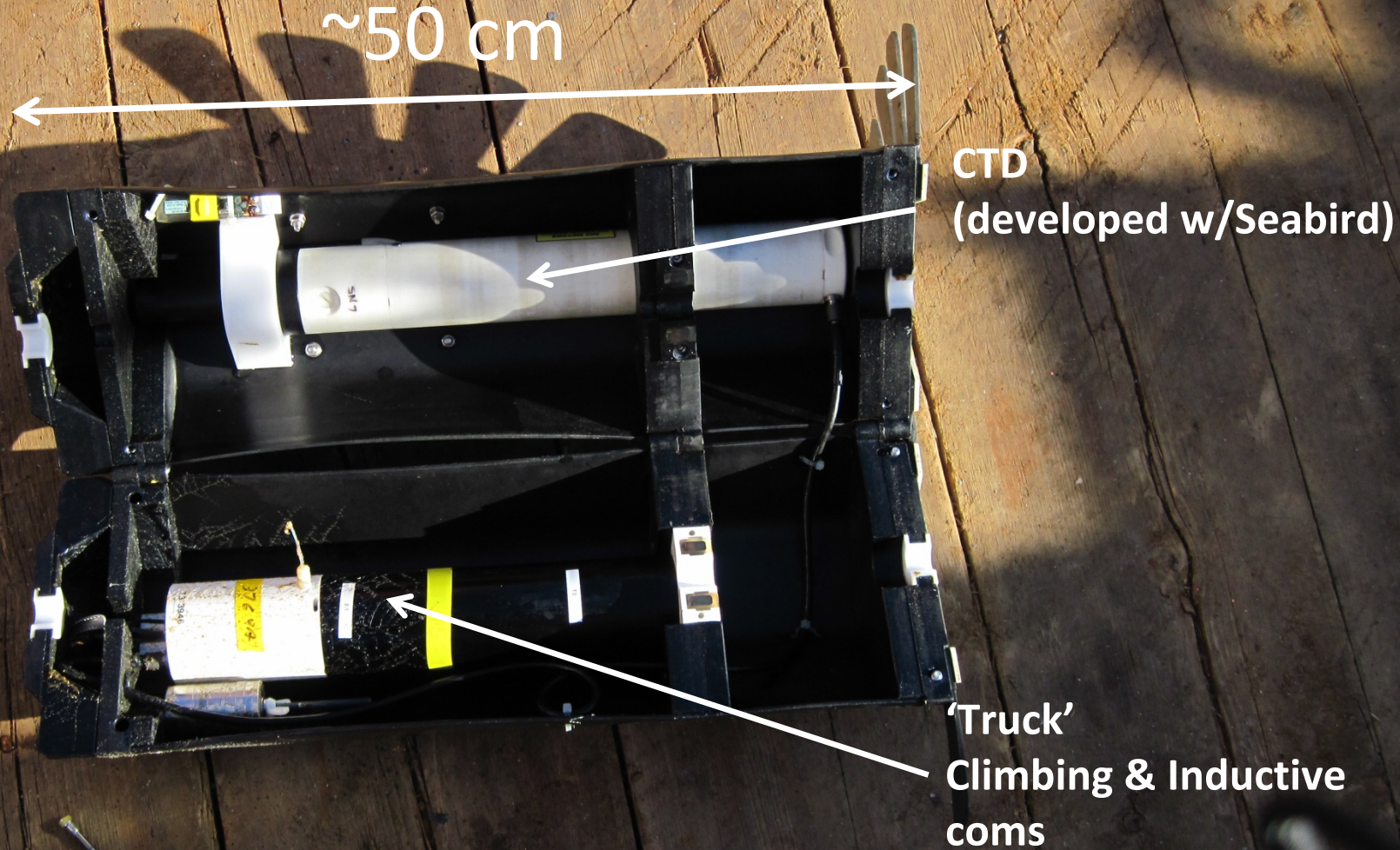
Sensor depths ~3-500m
 Realtime command/control



PRAWLERS as deployed on SPURs

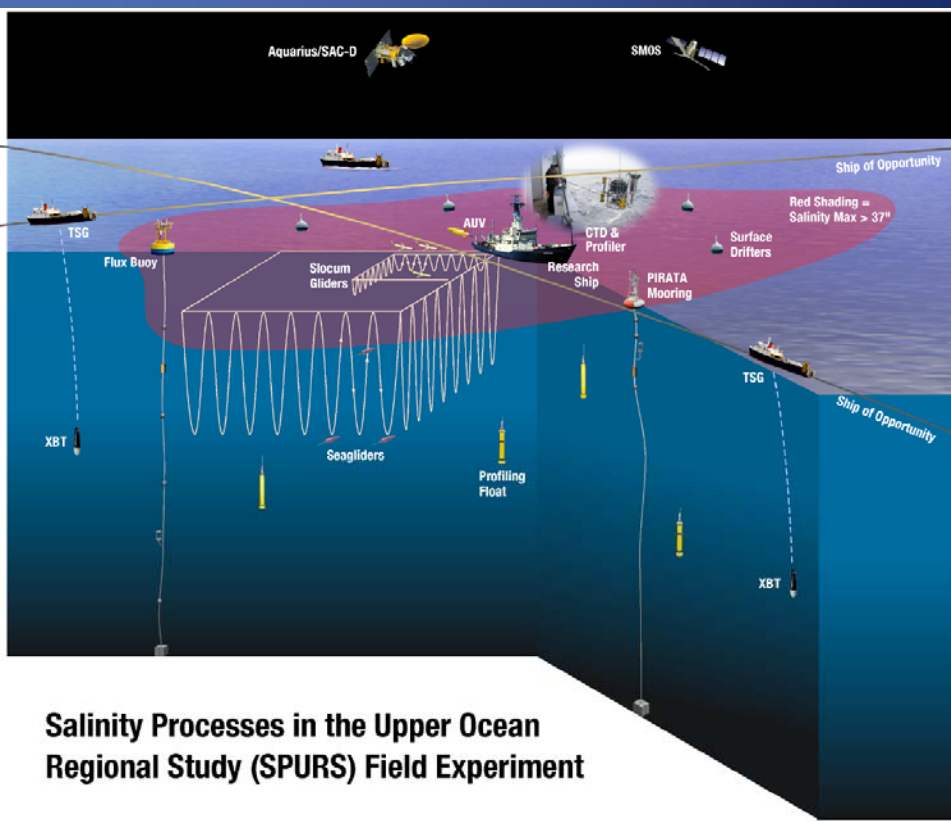
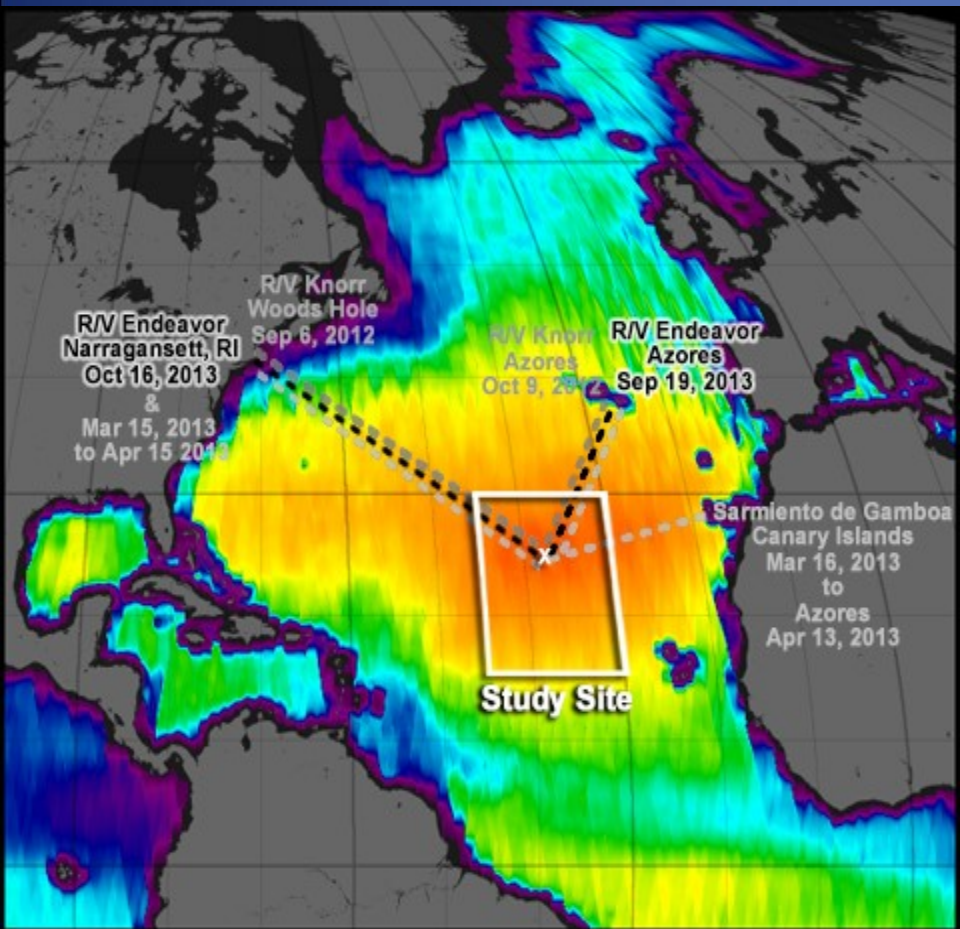


PRAWLER (Profiler+Crawler)



SPURS

Salinity Processes in the Upper Ocean Regional Study



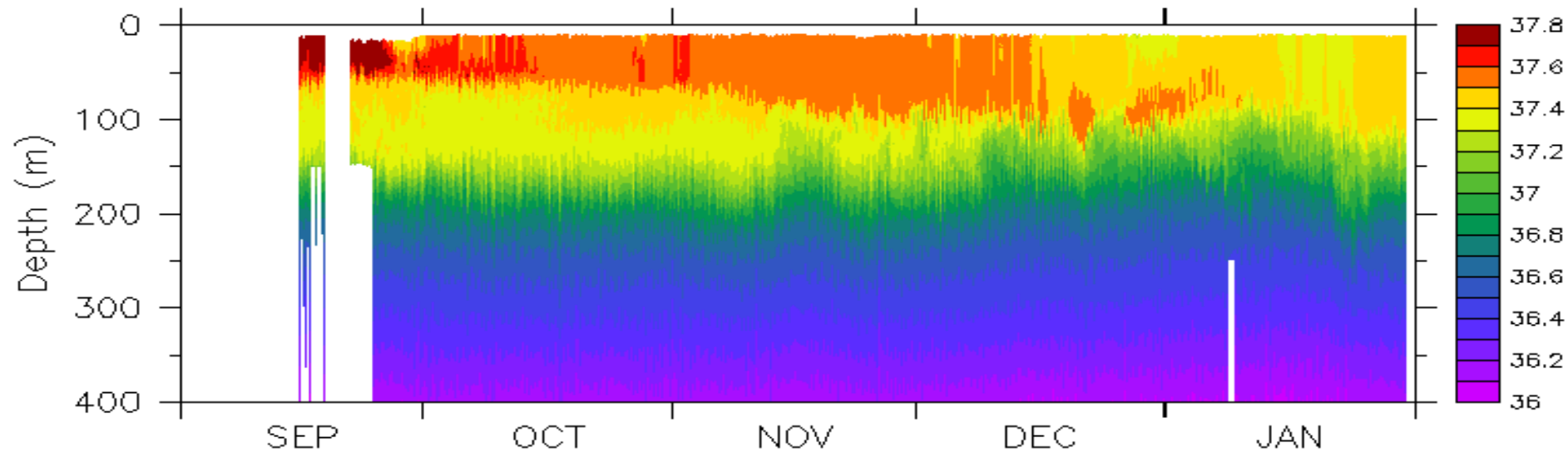
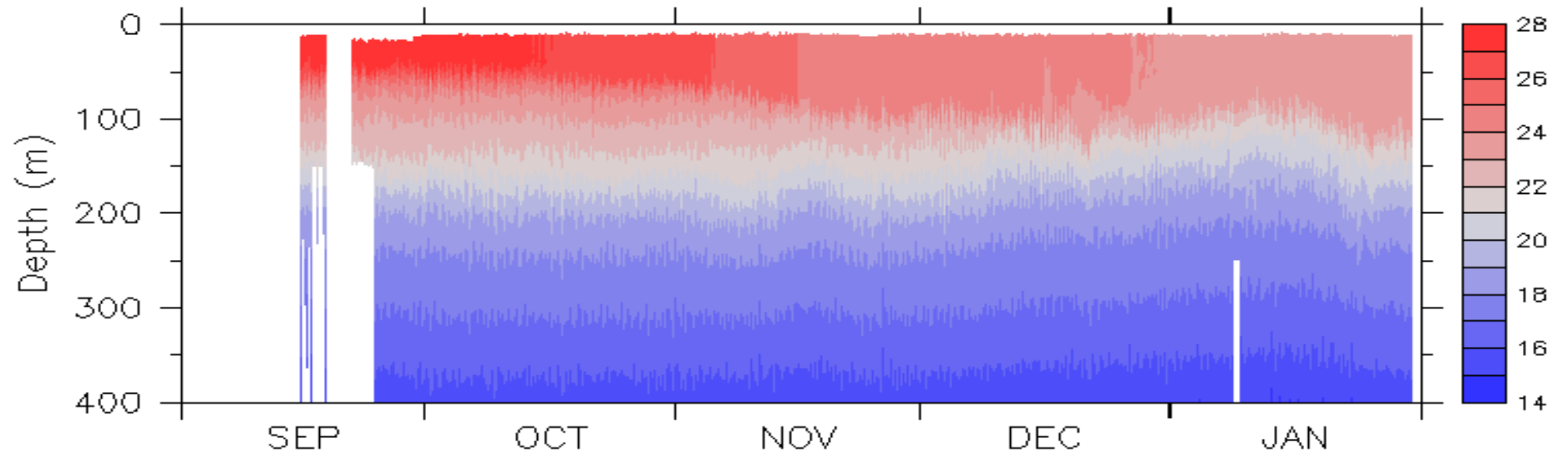
Salinity Processes in the Upper Ocean Regional Study (SPURS) Field Experiment

Figure 1. A schematic drawing of an experiment to examine the processes affecting the upper layer salinity of the ocean within a mid-ocean environment.



SPURS Prowler T and S: transition into winter

Prowler P1000

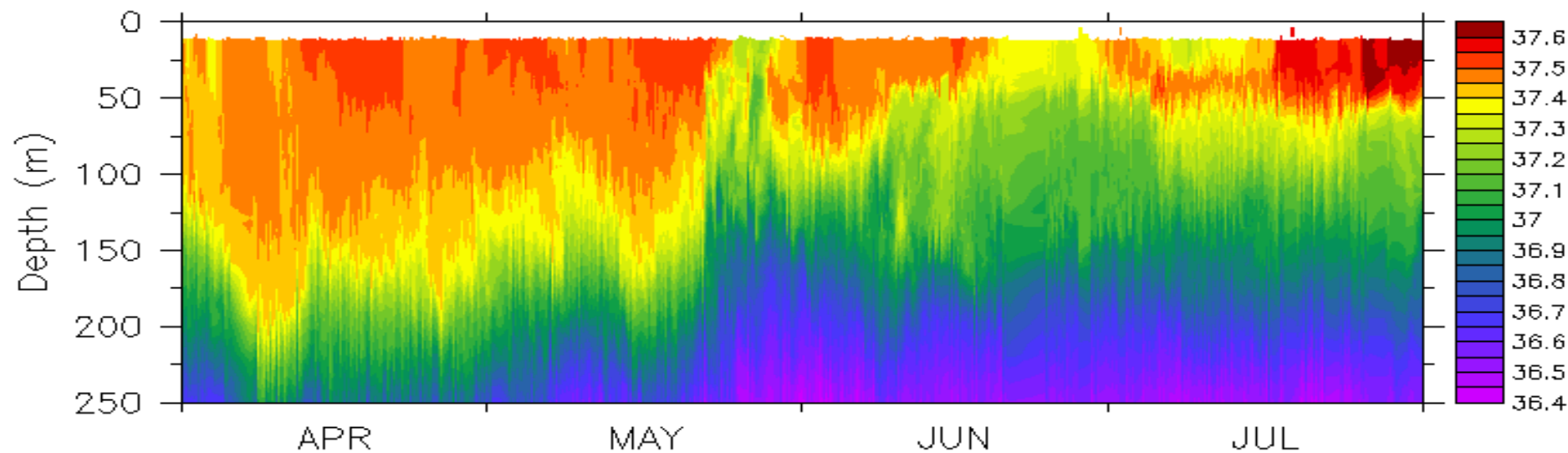
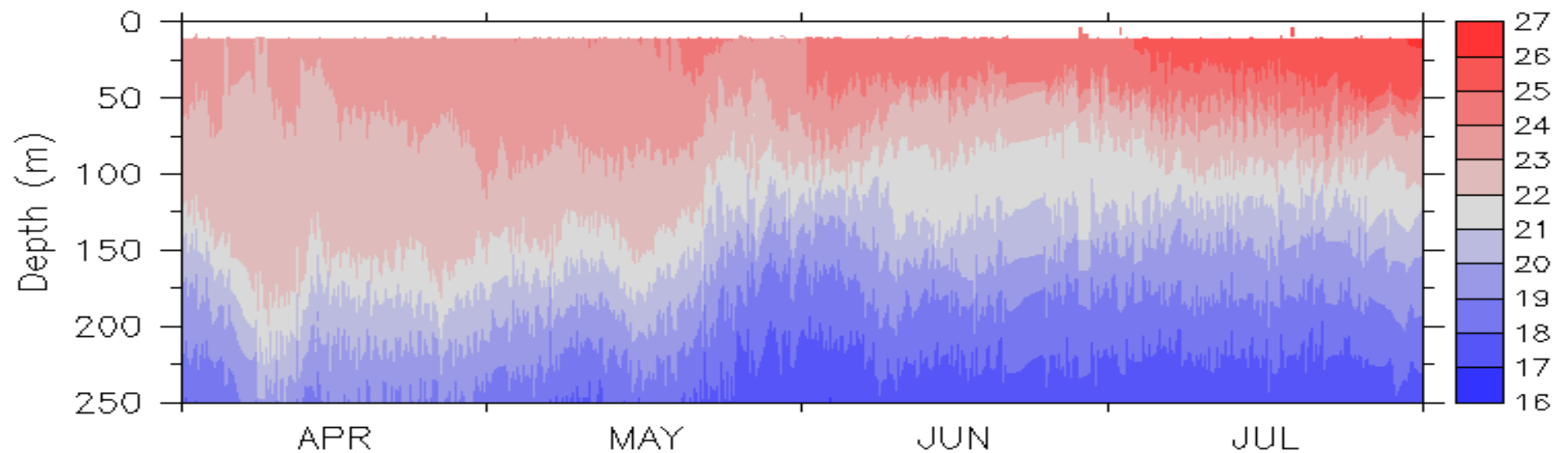


2012

>3000 CTD Profiles in ~1 year

SPURS Prowler T and S: transition into summer

Prowler P3000

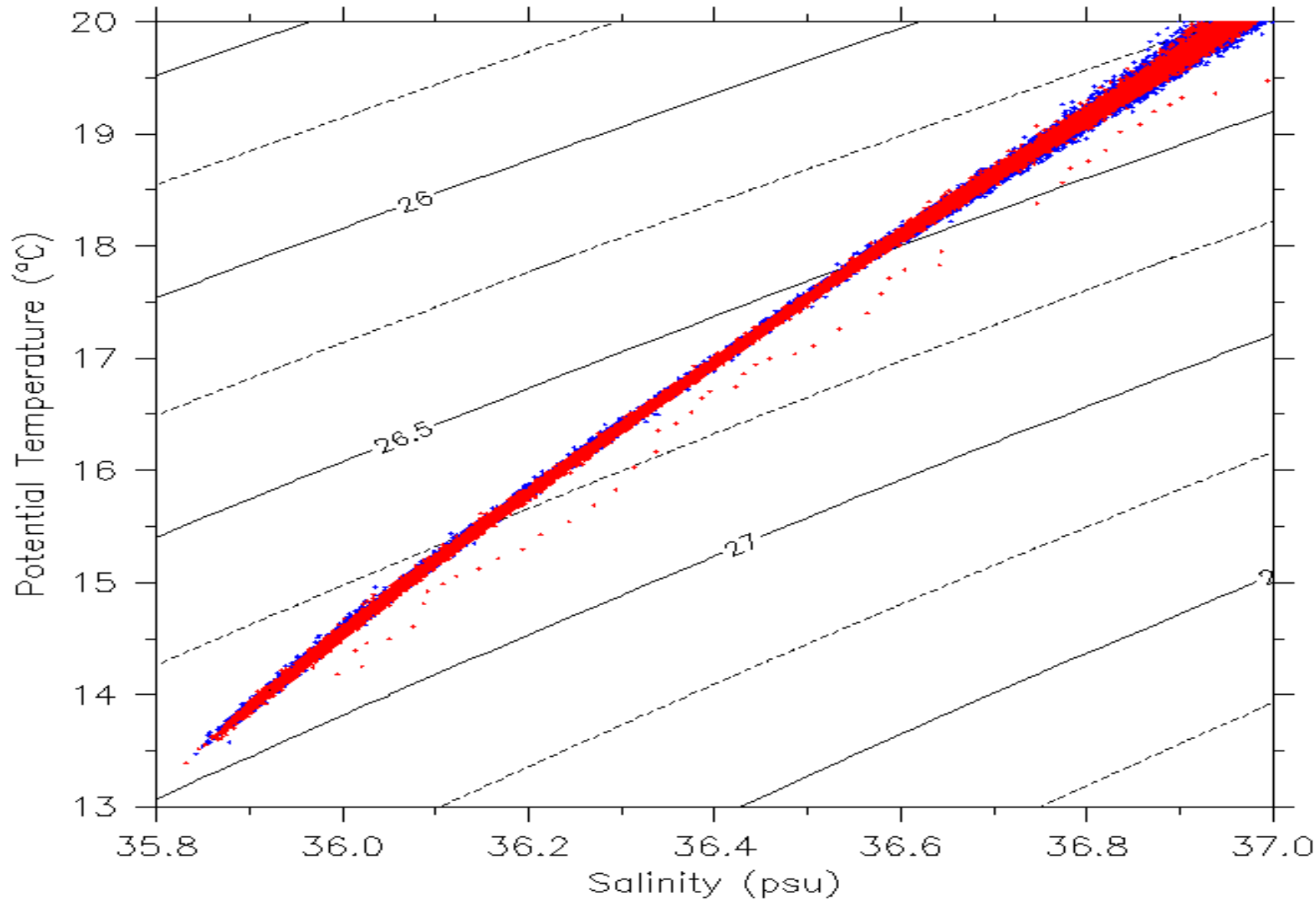


2013

>3000 CTD Profiles in ~1 year

T-S relation for Prawlers 1000 (blue) and 3000 (red)

Initial deployment (mid-September 2012) through December 2012



Challenges

- Only 6 month PRAWLER endurance demonstrated
- Always moving
- Two mooring breaks
- Transition from wire rope to synthetics

SHAKE DOWN MOORING SYSTEMS

"SHAKE DOWN" MOORING LINE

Outer extruded jacket technology can produce a profile of raised ridges that reduce strumming when towed through water or moored in high currents

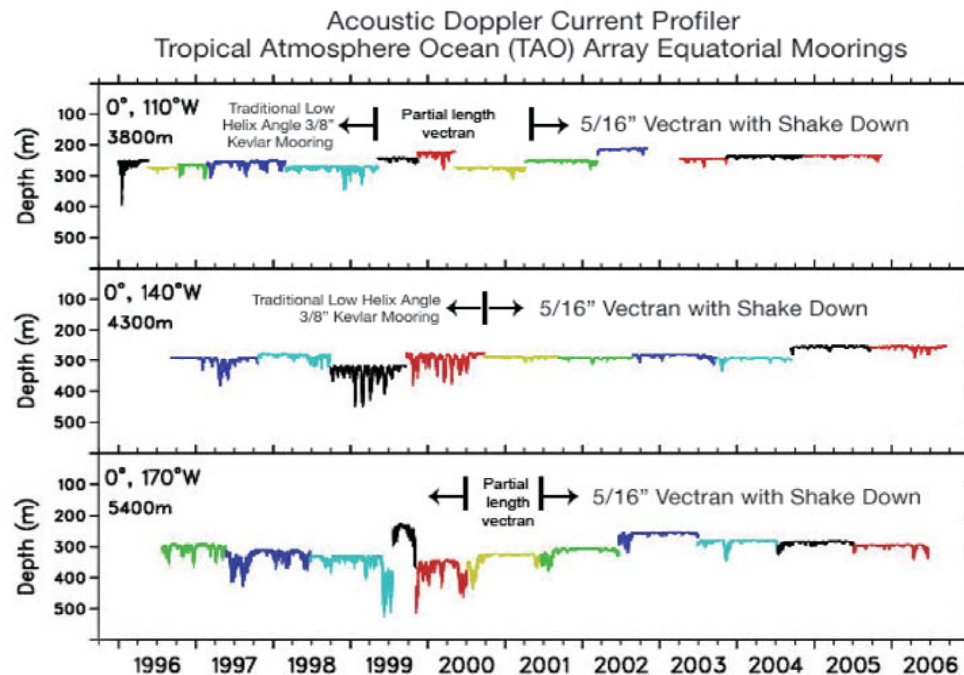
Raised ridges are more durable than hair fairing and can be less troublesome on winches

Extensively tested over 10 years

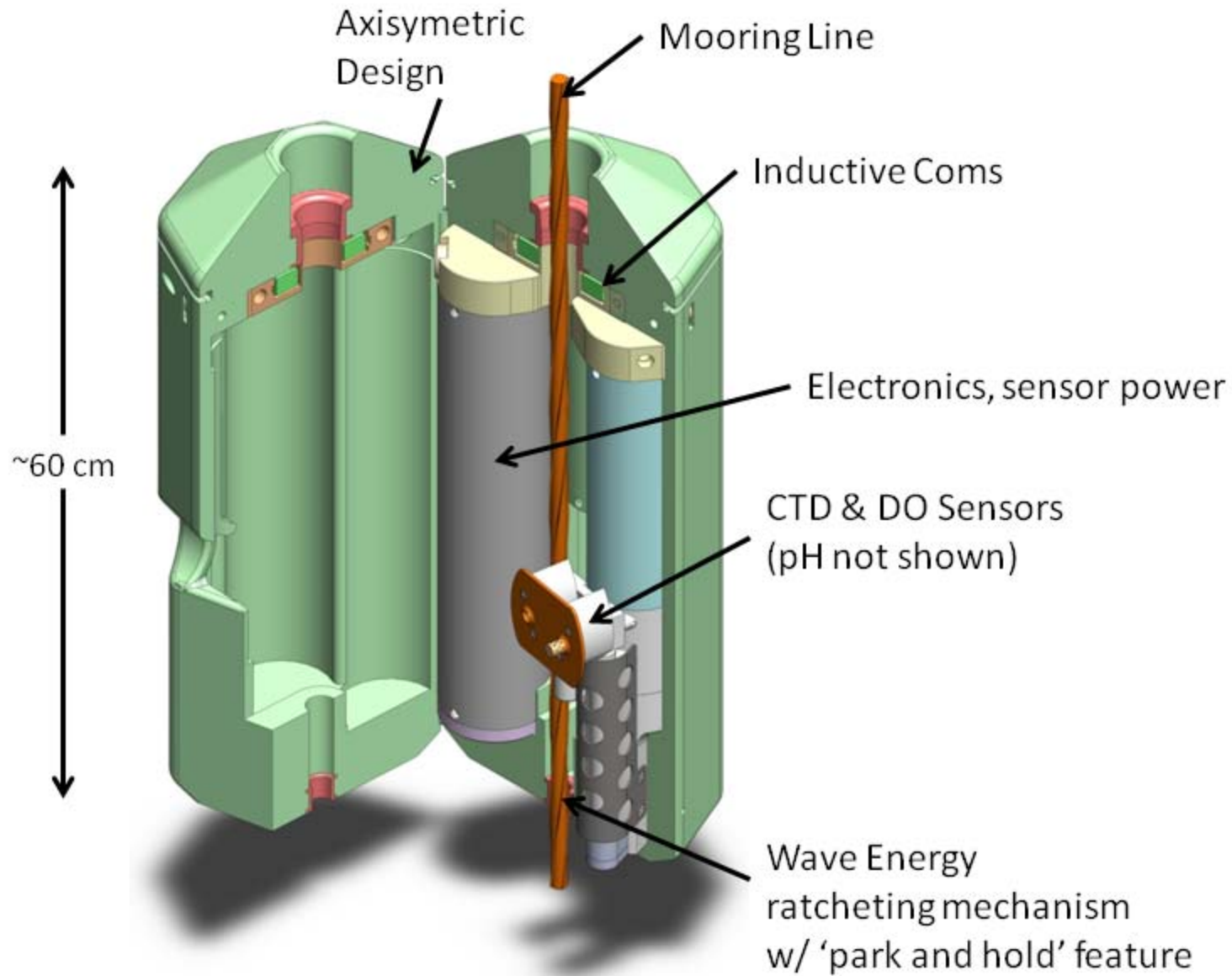


In the 1990's, NOAA used traditional low helix angle Kevlar mooring lines on subsurface ADCP moorings. As this chart shows, vertical excursions of the subsurface mooring float, presumably due to drag on the mooring line, were at times relatively large. NOAA began switching to Vectran mooring lines with "Shake Down" extrusions in the late 90's and early 2000's. As this chart shows, the subsurface buoys experienced far less severe depth excursions after the change in mooring line.

(Chart furnished by NOAA, but does not constitute an endorsement of any commercial company or product.)



Future: Carbon PRAWLER



Summary

- High vertical spatial & temporal sampling is possible from low-cost surface moorings
- SPURs data will be compared w/WHOI mooring and ship CTDs
- TMBA test in planning stages
- Still in R&D stage, other sensor soon

A large blue crane on the deck of a ship is lifting a white buoy into the air. The buoy is suspended by a cable and is positioned in the center of the frame. The ship's deck and superstructure are visible on the right side, and the sky is a clear, bright blue. The water is dark blue and visible at the bottom of the frame.

Thank You

Sponsors: NOAA Climate Office, PMEL

Ships: WHOI

www.pmel.noaa.gov/pico