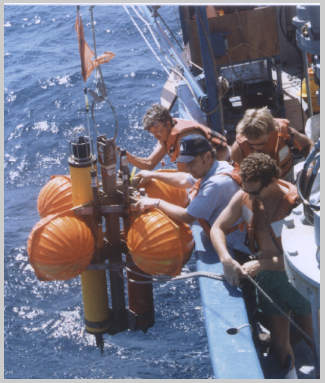
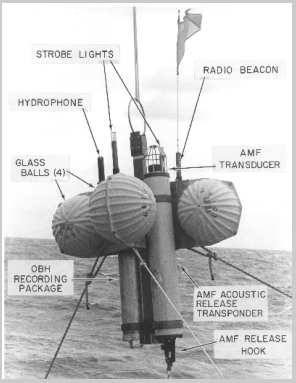
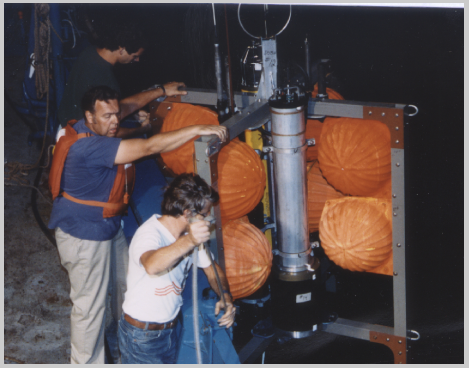
WHOI Ocean-Bottom Seismograph Lab

John Collins

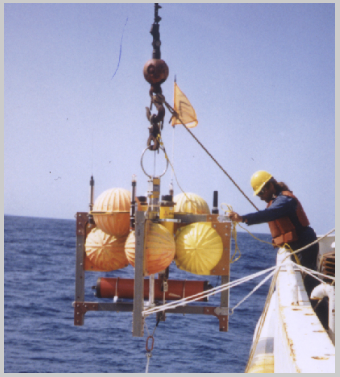


WHOI Analog OBH, 1976

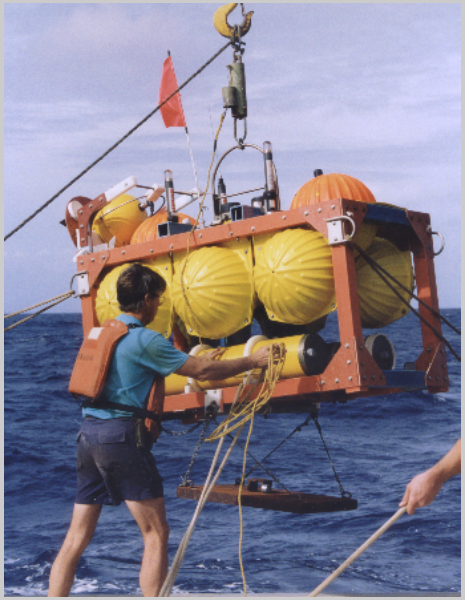




WHOI Digital OBH, 1981

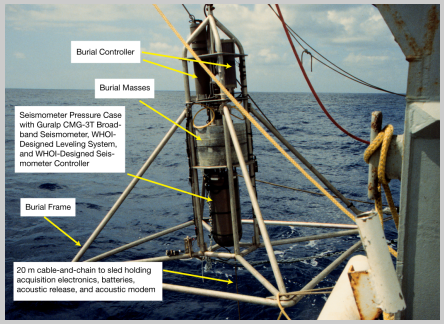


WHOI 2nd Gen. Digital OBH, 1991

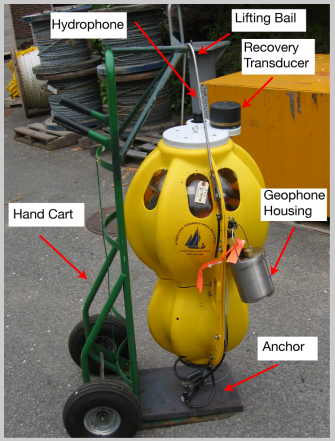


WHOI "ONR" OBS, 1991

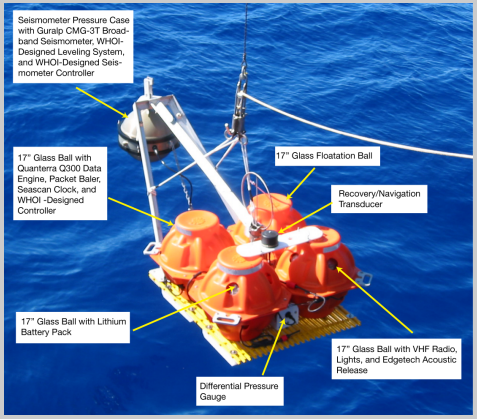
WHOI "ORB" 3rd-Gen. OBH, 1996



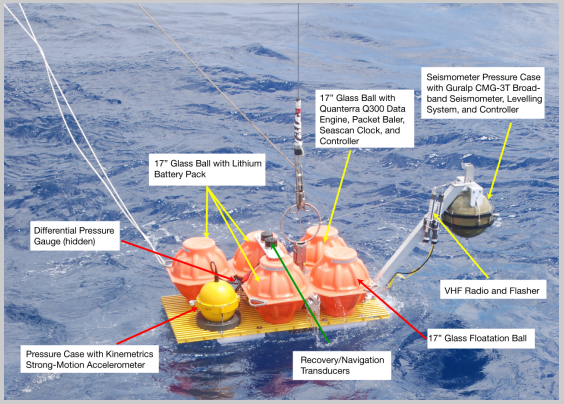
WHOI Buriable Broadband OBS, 1998



WHOI OBSIP Short-Period OBS, 2002



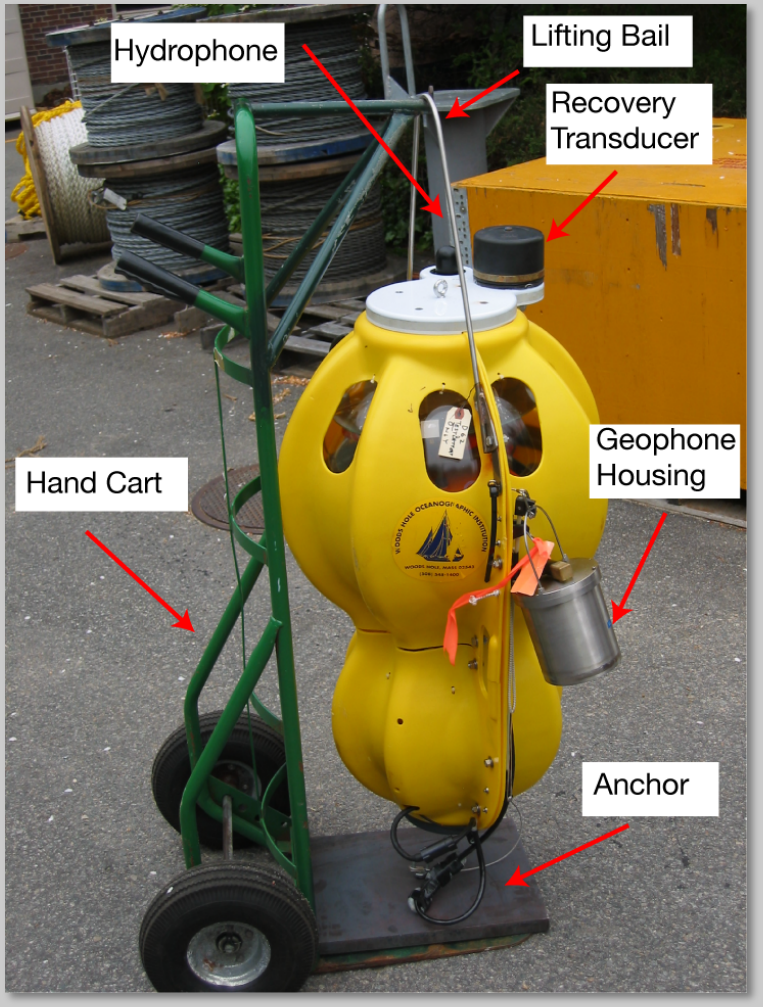
WHOI OBSIP BroadBand OBS, 2004



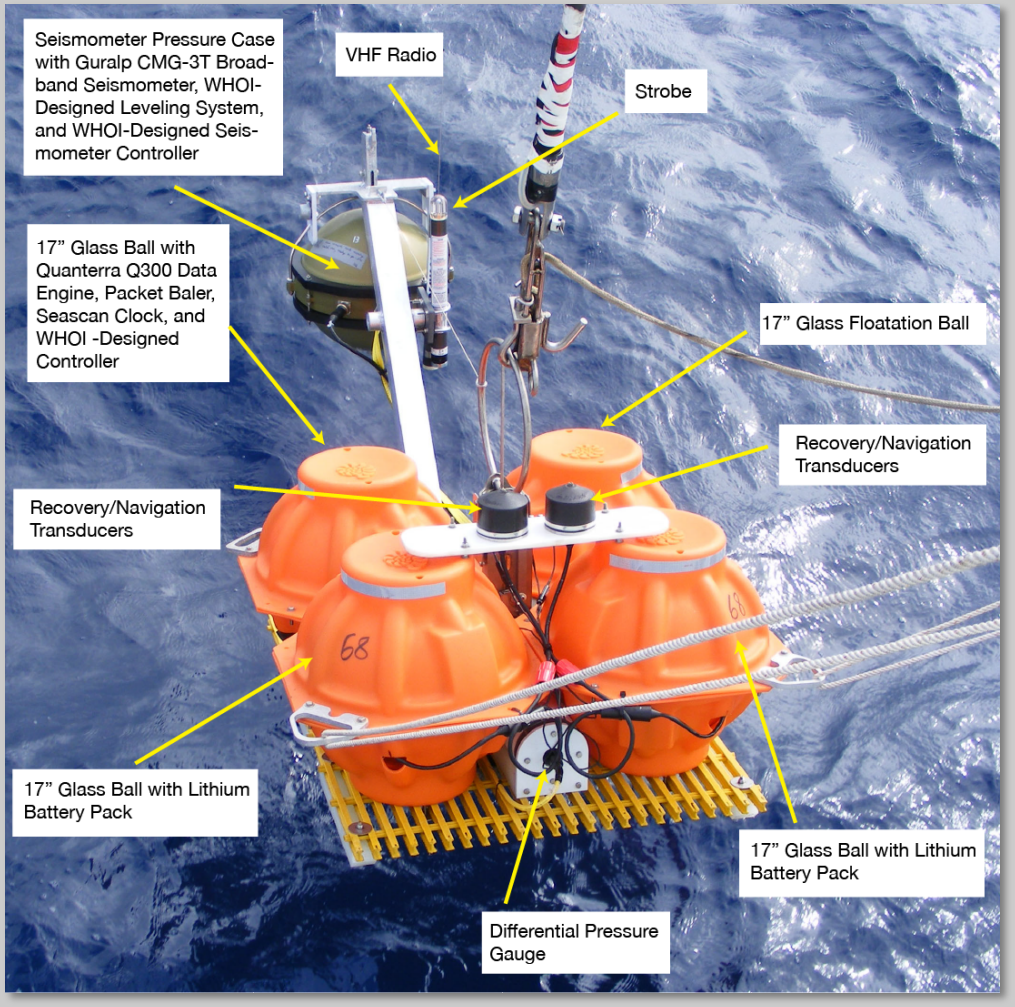
WHOI Keck OBS, 2007

Current instruments: "OBSIP" instruments

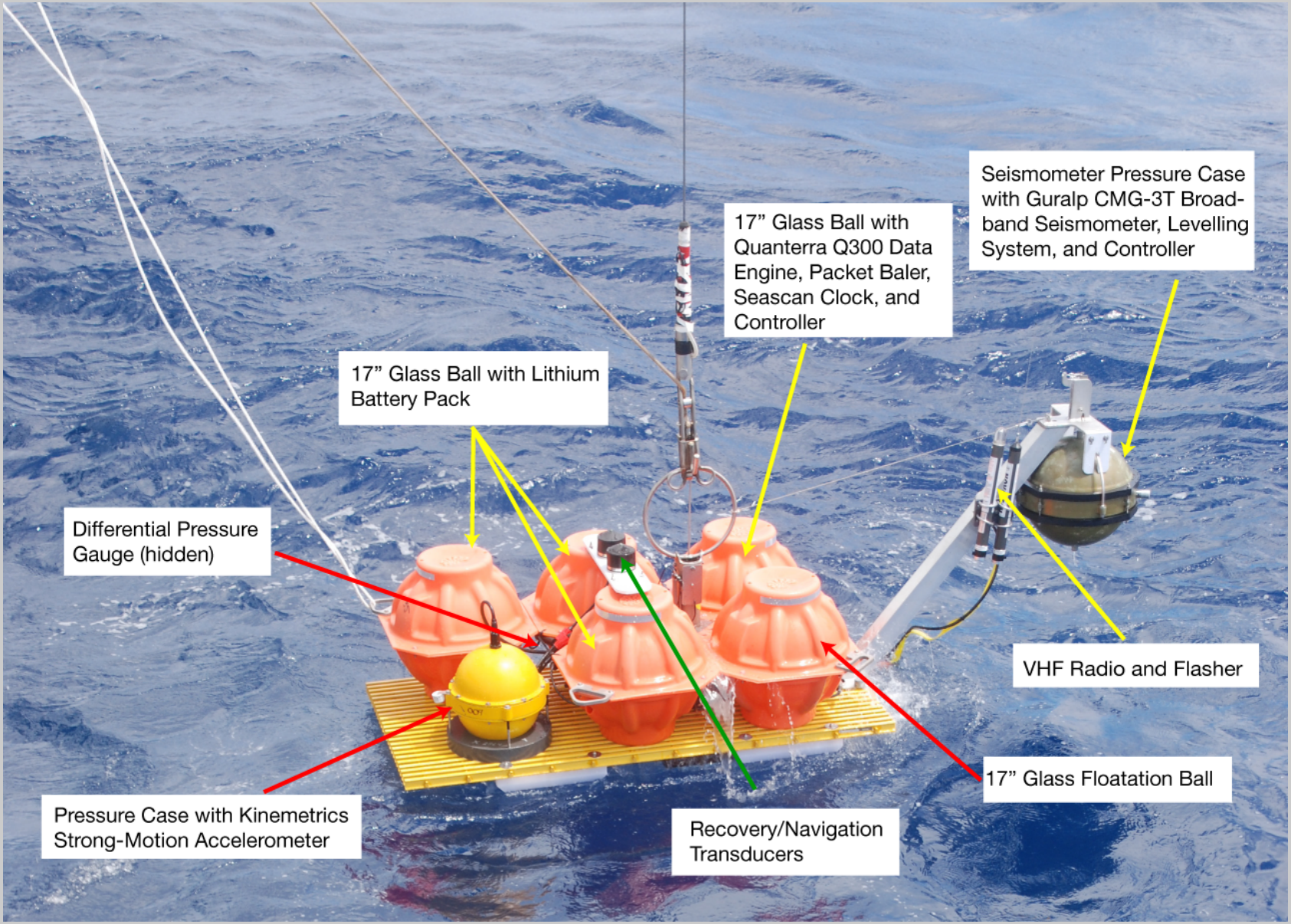
OBSIP SPOBS ("D2"), 2002



OBSIP BB OBS, 2004

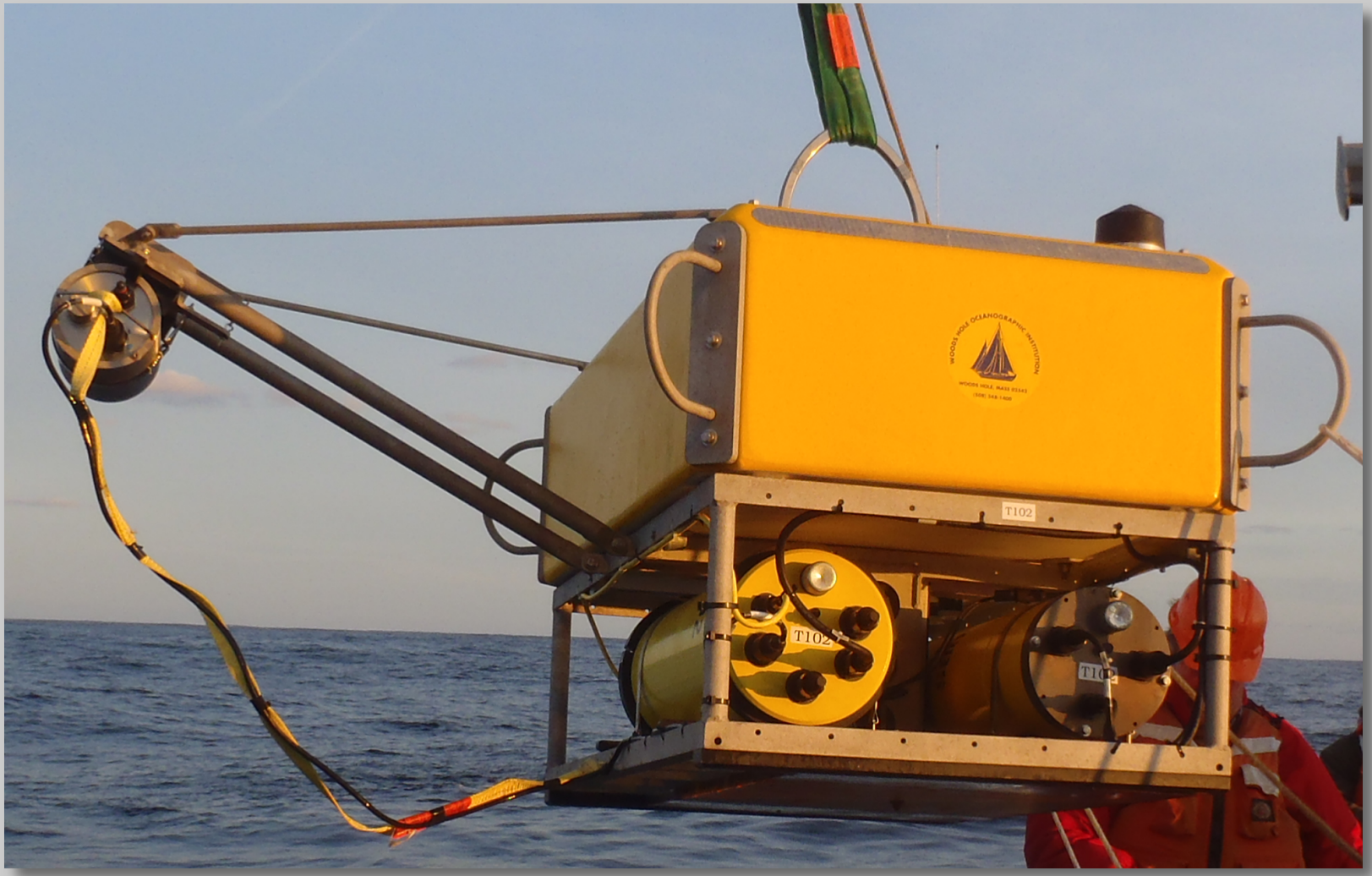


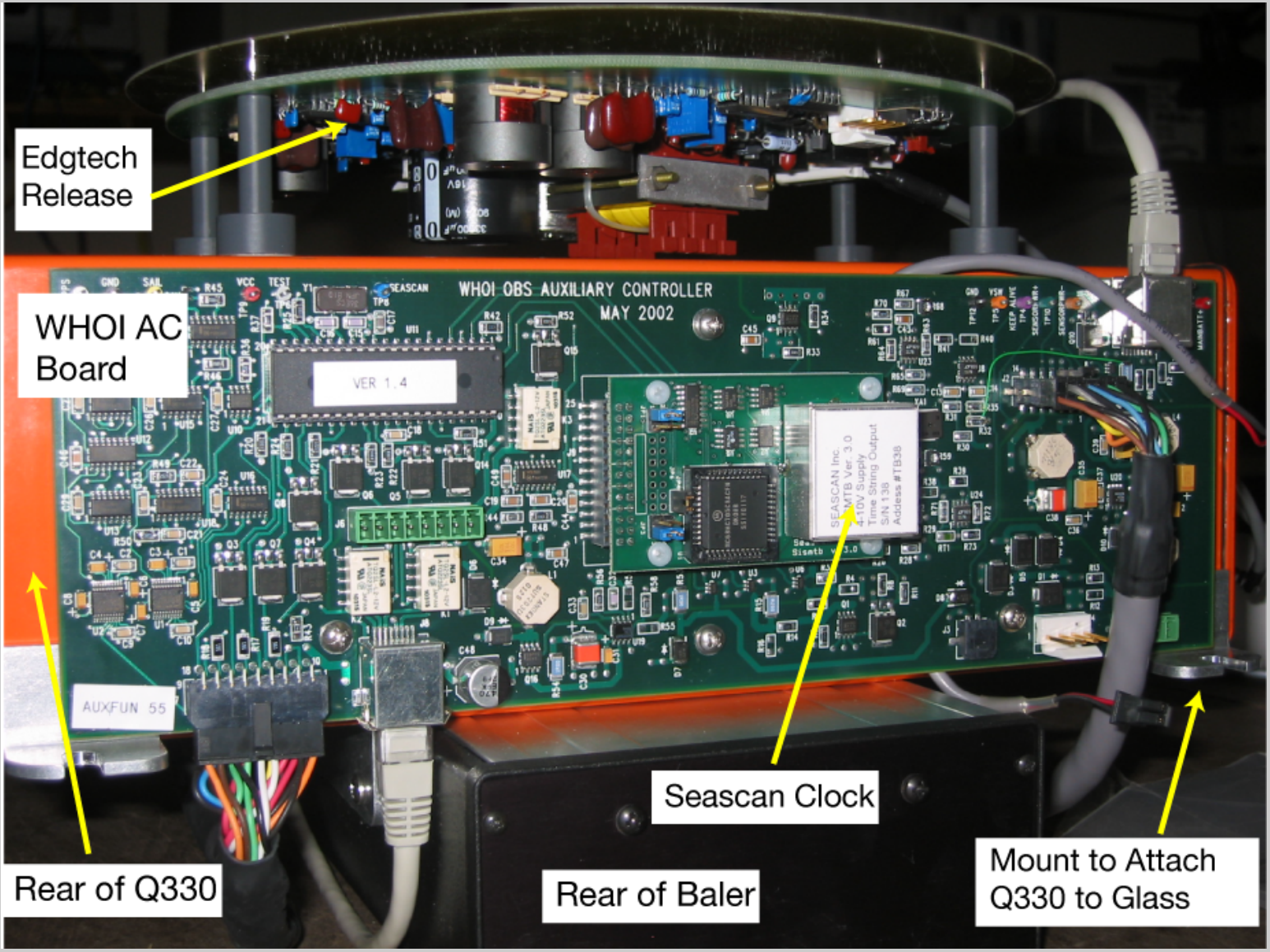
Keck Strong-Motion/Broad-Band OBS, 2007



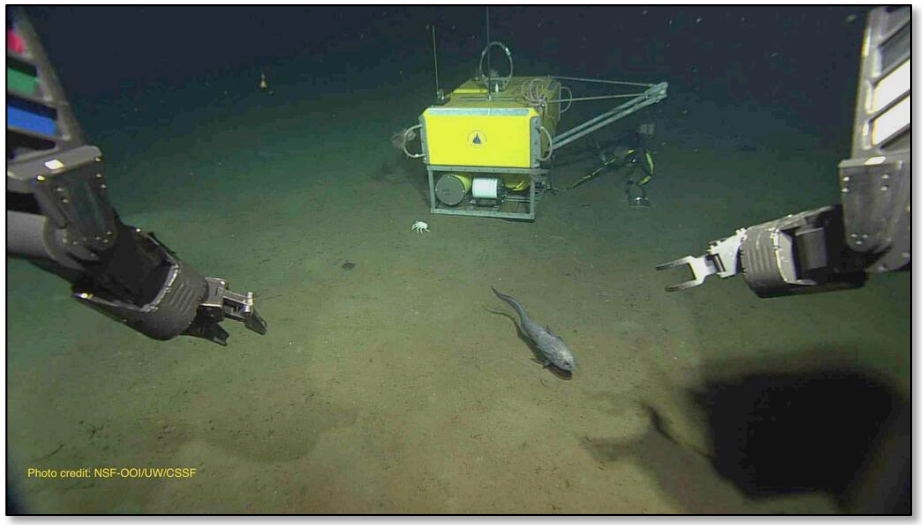
Current instruments: “Cascadia” instruments

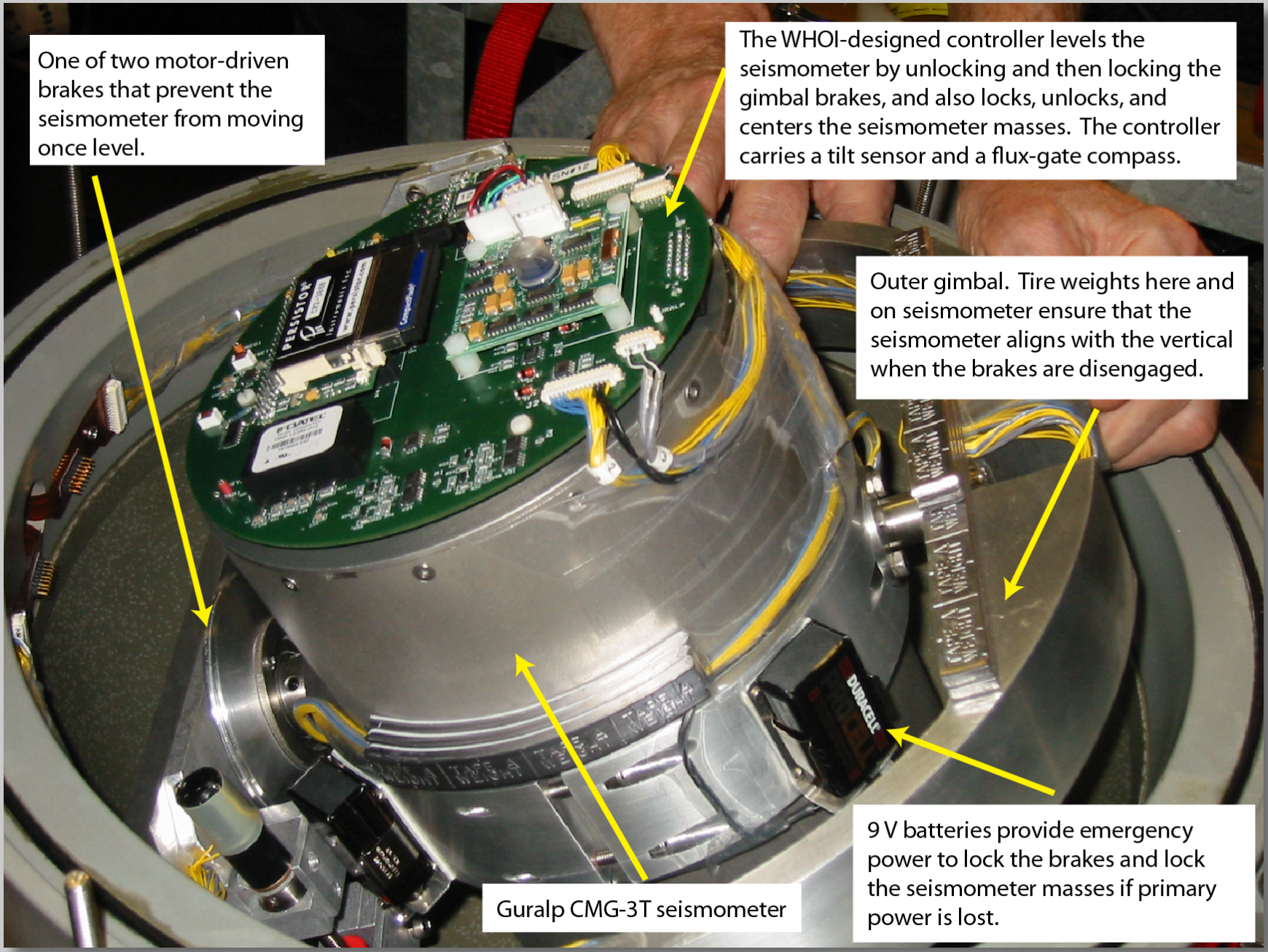
NSF ARRA-funded
Nanometrics Trillium Compact(2011)

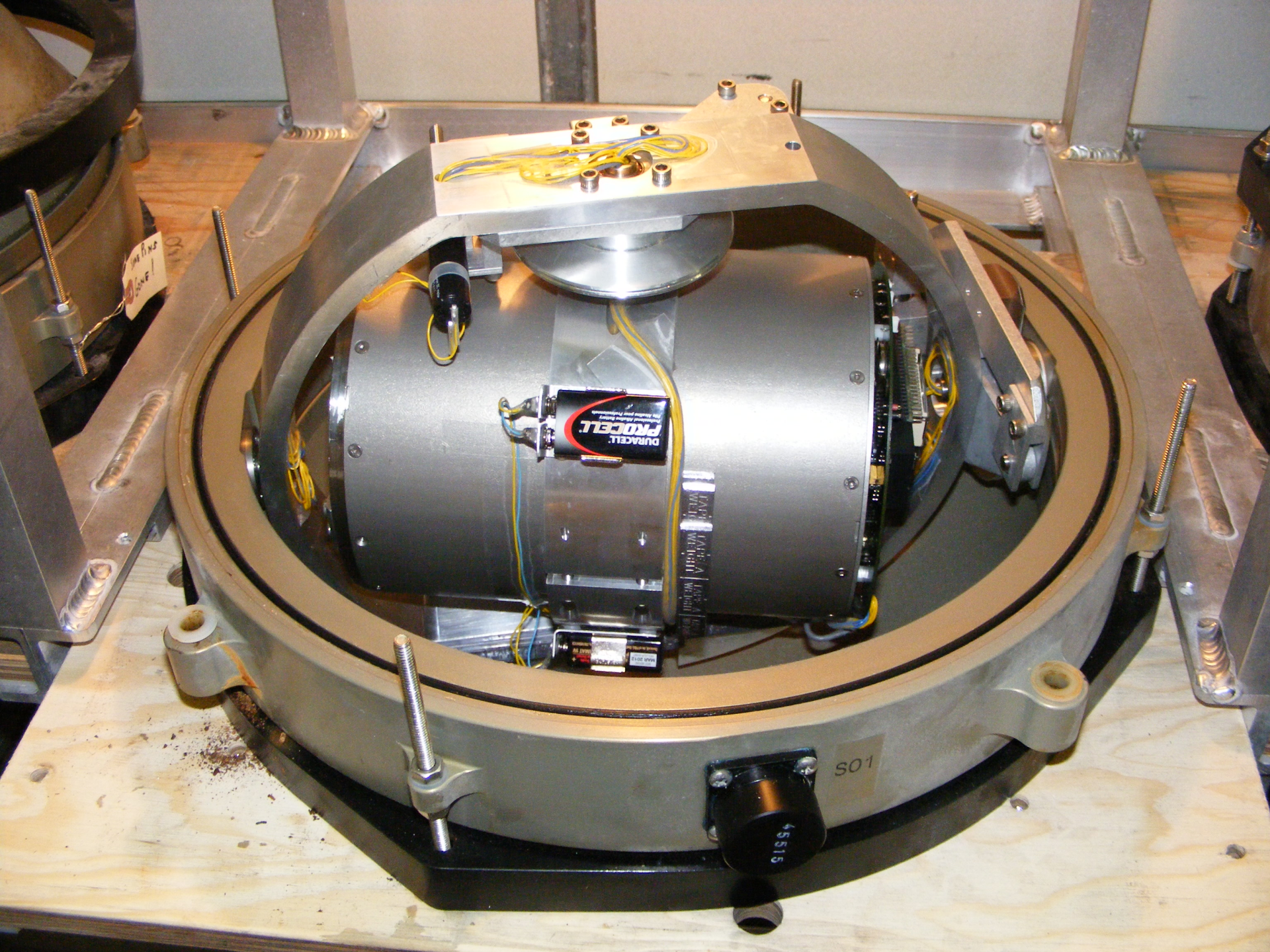



Edgtech Release
WHOI AC Board
WHOI OBS AUXILIARY CONTROLLER
MAY 2002
Rear of Q330
Seascan Clock
Rear of Baler
Mount to Attach Q330 to Glass

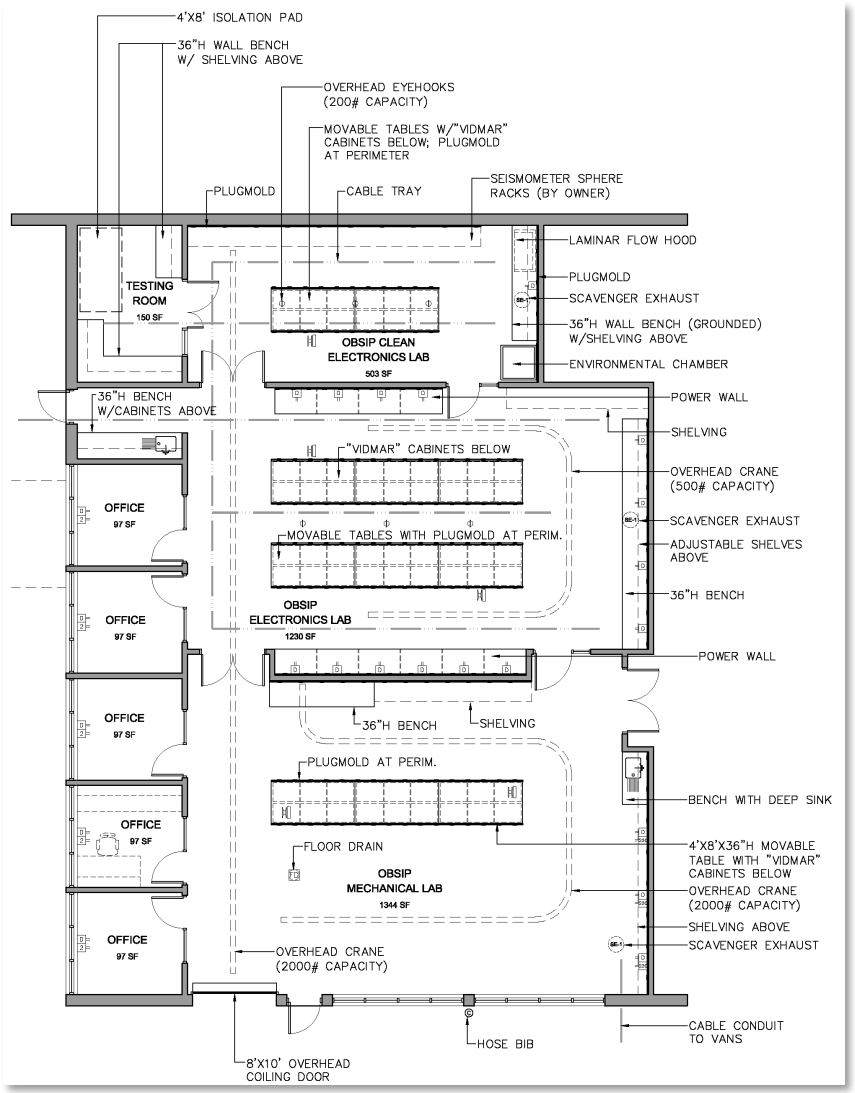
Coupling: Standard Deployment Procedure is “Drop and Pray”

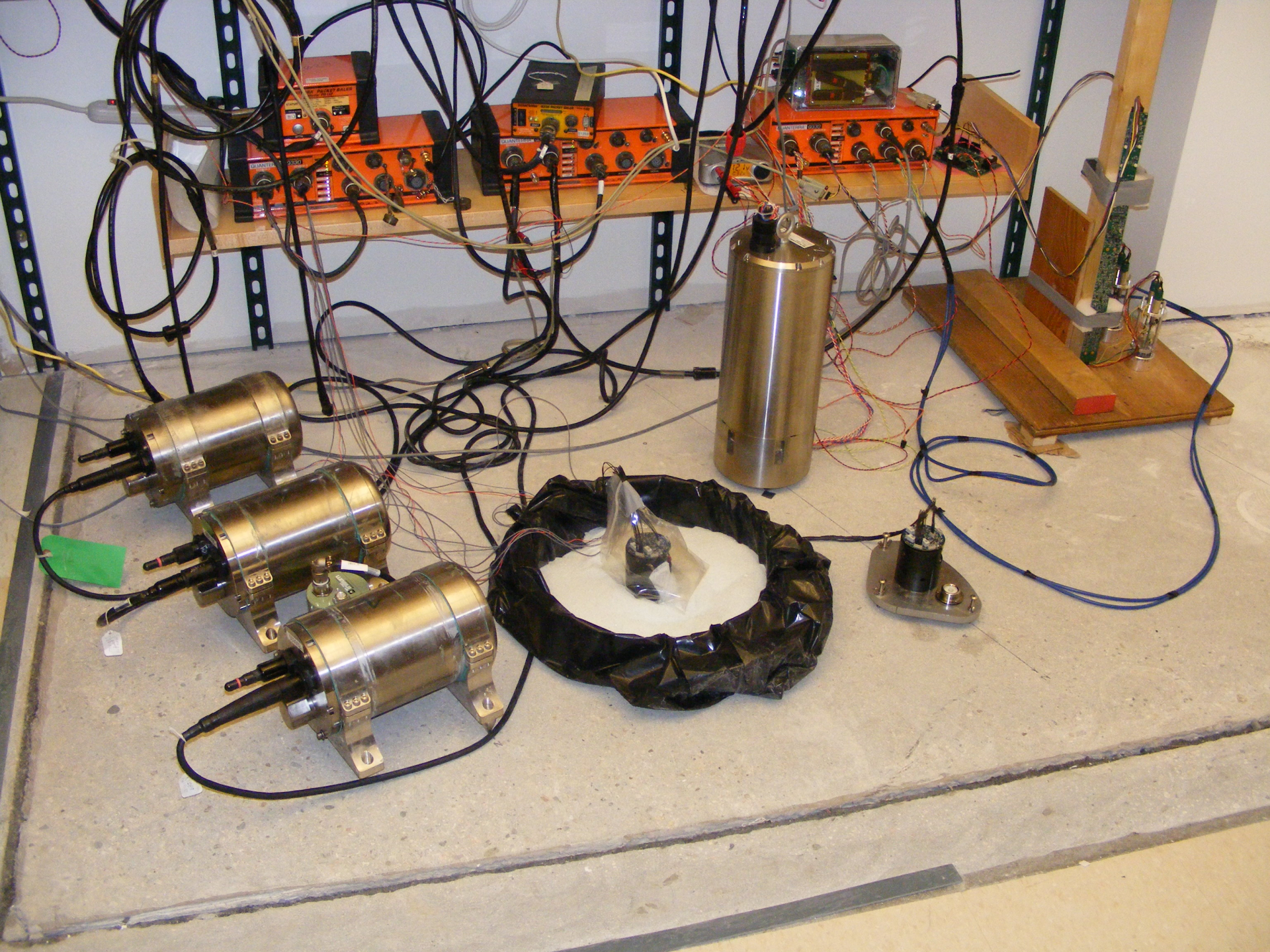



One of two motor-driven brakes that prevent the seismometer from moving once level.
The WHOI-designed controller levels the seismometer by unlocking and then locking the gimbal brakes, and also locks, unlocks, and centers the seismometer masses. The controller carries a tilt sensor and a flux-gate compass.
Outer gimbal. Tire weights here and on seismometer ensure that the seismometer aligns with the vertical when the brakes are disengaged.
Guralp CMG-3T seismometer
9 V batteries provide emergency power to lock the brakes and lock the seismometer masses if primary power is lost.

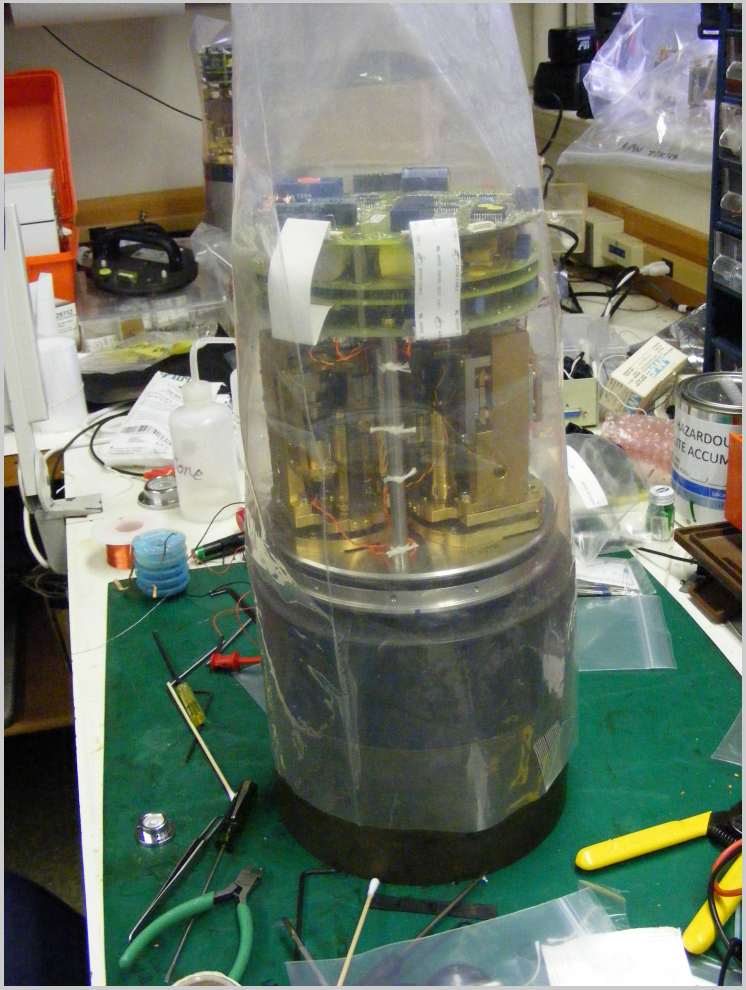

DURACELL
PROCELL
SO1

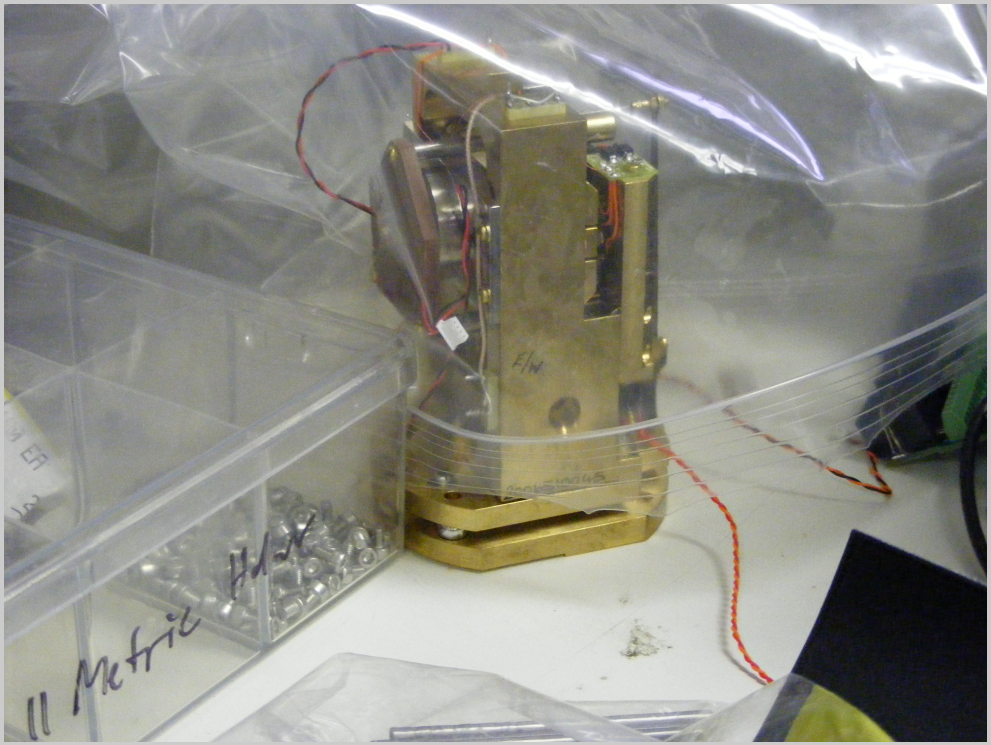
WHOI Ocean Bottom Seismograph Lab



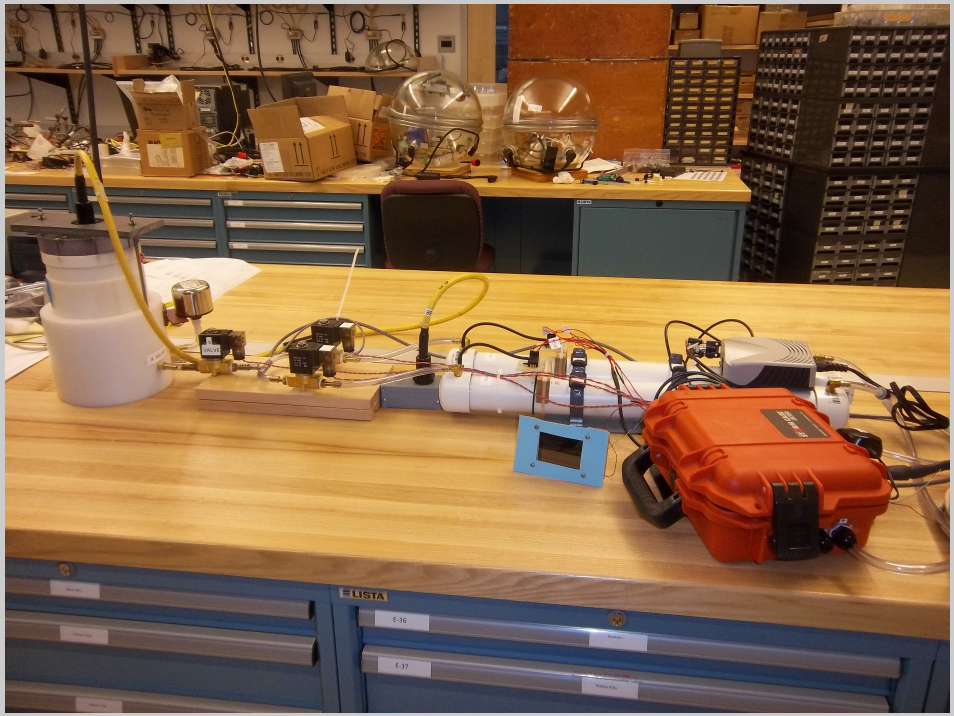


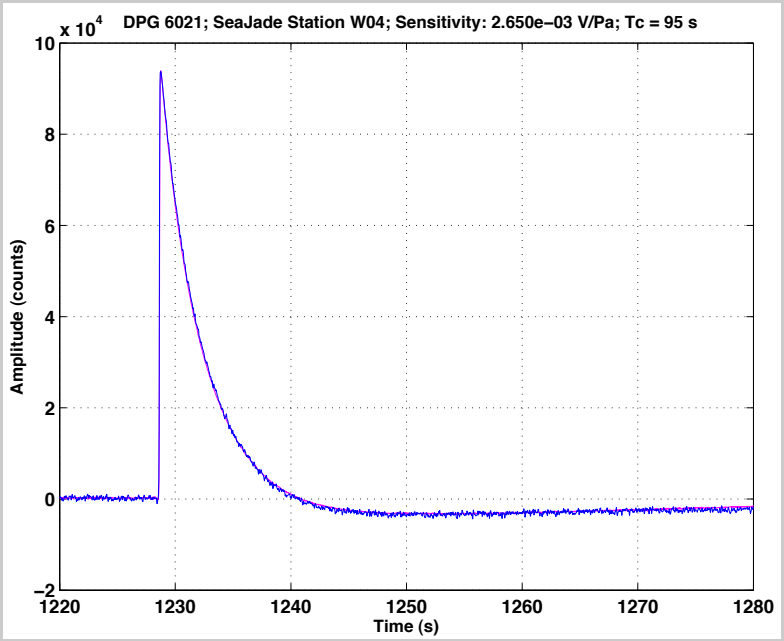
Guralp CMG-3T Repair at WHOI





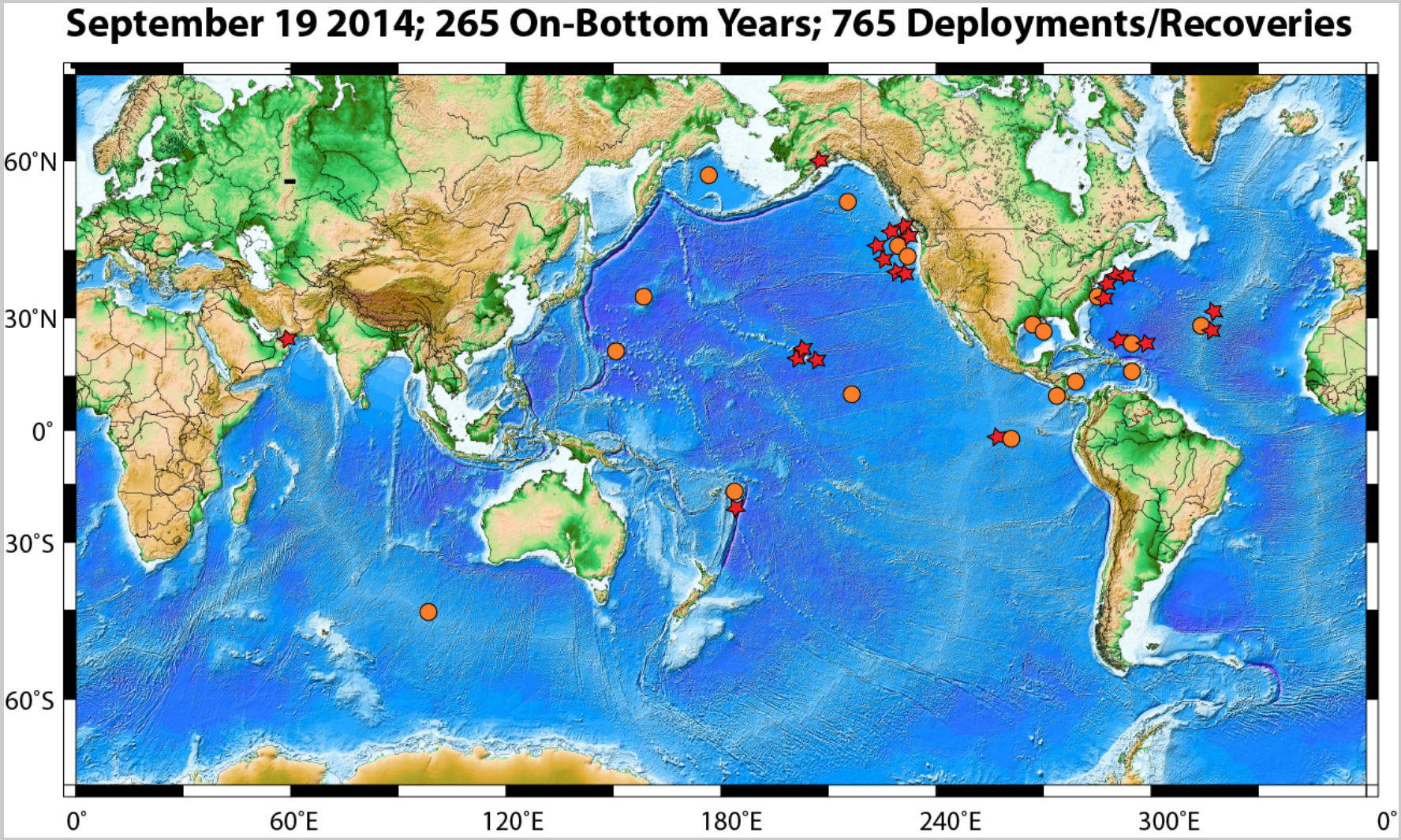
DPG Laboratory Calibration





Inject/extract slug of air into/from partially evacuated bell-jar. Change in pressure measured by an accurately calibrated (NIST traceable) SETRA Model 270 barometer. Both the DPG and SETRA outputs are logged by Q330 (same time reference). Knowing the change in pressure, we invert for the sensitivity of the strain gauge in the DPG, and for the time constant of the capillary leak.

WHOI OBSIP Experiment Locations



28 Experiments; 58 Cruises; 79 Unique P.I.s

WHOI OBSIP		**WHOI OBSIP with new OBS (Short-Period "D2" and Broadband)**	
Total Number of Deployments	842	Total Number of Deployments	818
Total Number of Recoveries	821	Total Number of Recoveries	797
# OBS Lost	21	# OBS Lost	21
Recovery Percentage	98	Recovery Percentage	97
Short-Period OBS		**Broad-Band OBS**	
Total Number of Deployments	590	Total Number of Deployments	252
Total Number of Recoveries	574	Total Number of Recoveries	247
# Short-Period OBS Lost	16	# Broadband OBS Lost	5
Recovery Percentage	97	Recovery Percentage	98

SP OBS at-sea van lab:
simultaneous programming and data offload

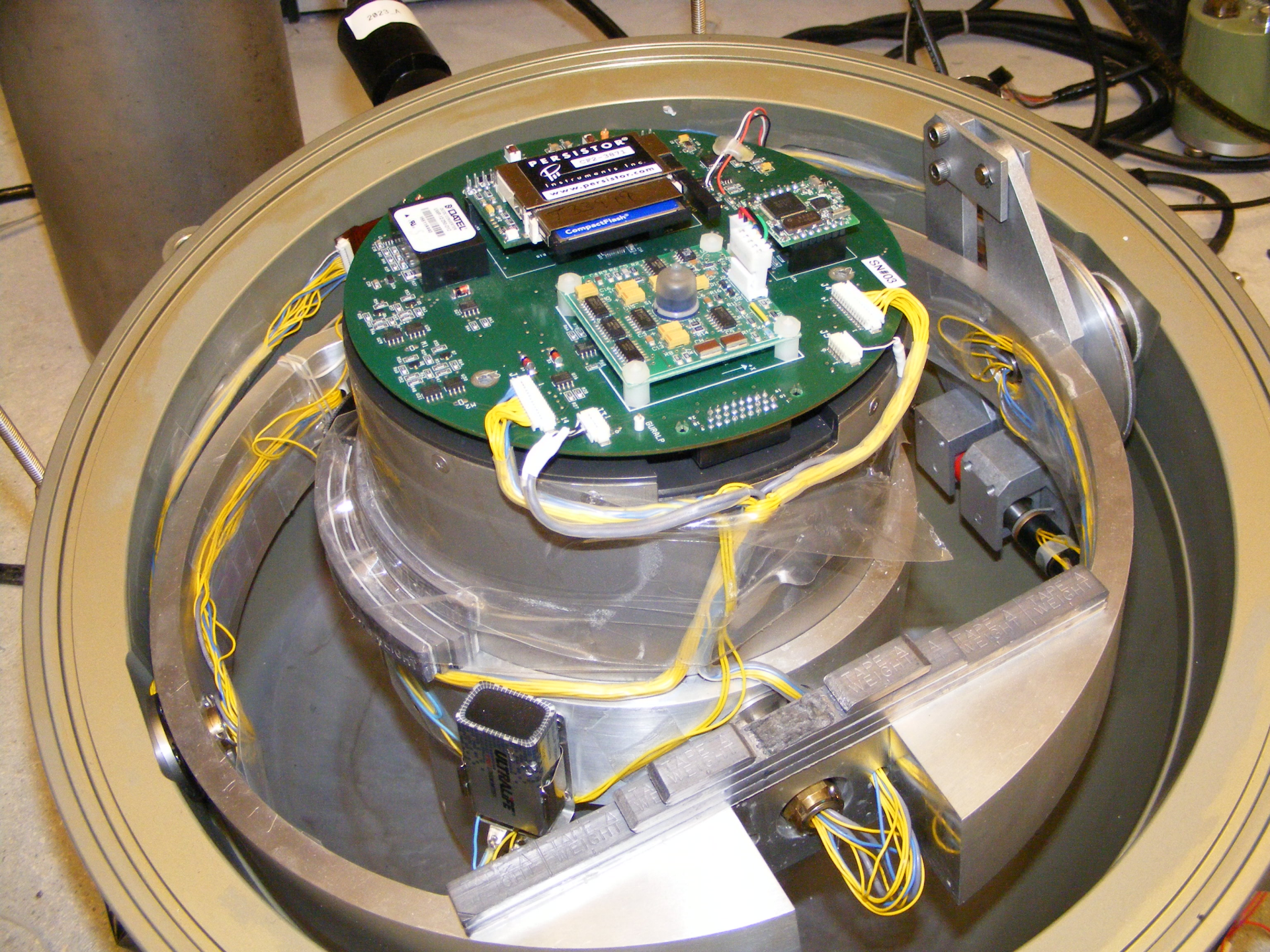
BB OBS secured to the deck at sea

WHOI OBSIP Personnel

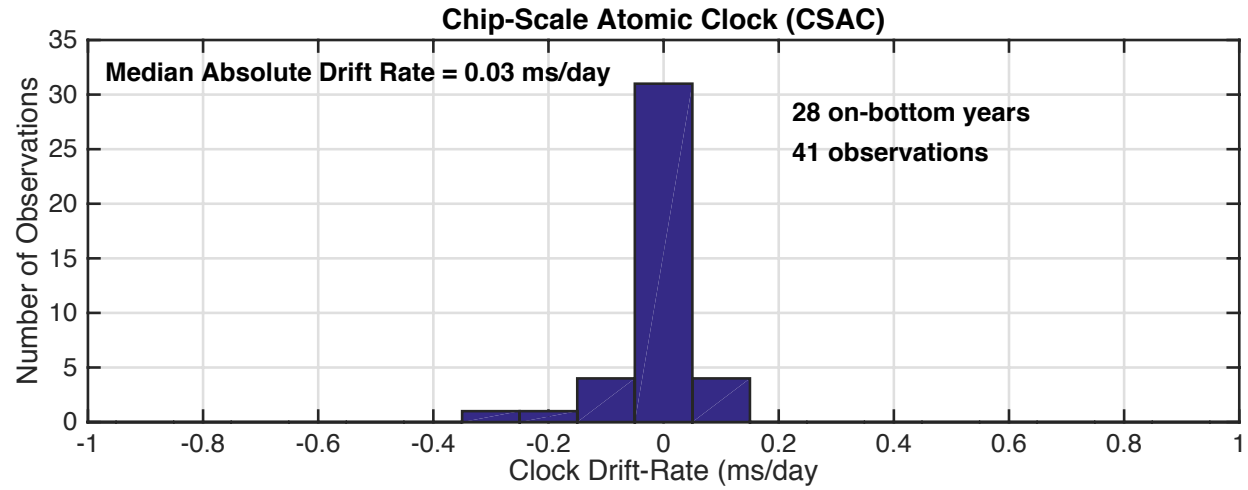
- 1 Engineer (9 mnths)
- 1 Electronics Tech. (12 mnths)
- 1 Mechanical Tech. (12 mnths)
- 1 tech (6 mnths)
- 1 Data Submitter, System Management (6 mnths)
- Management (3 mnths)
- Myself (6 mnths)

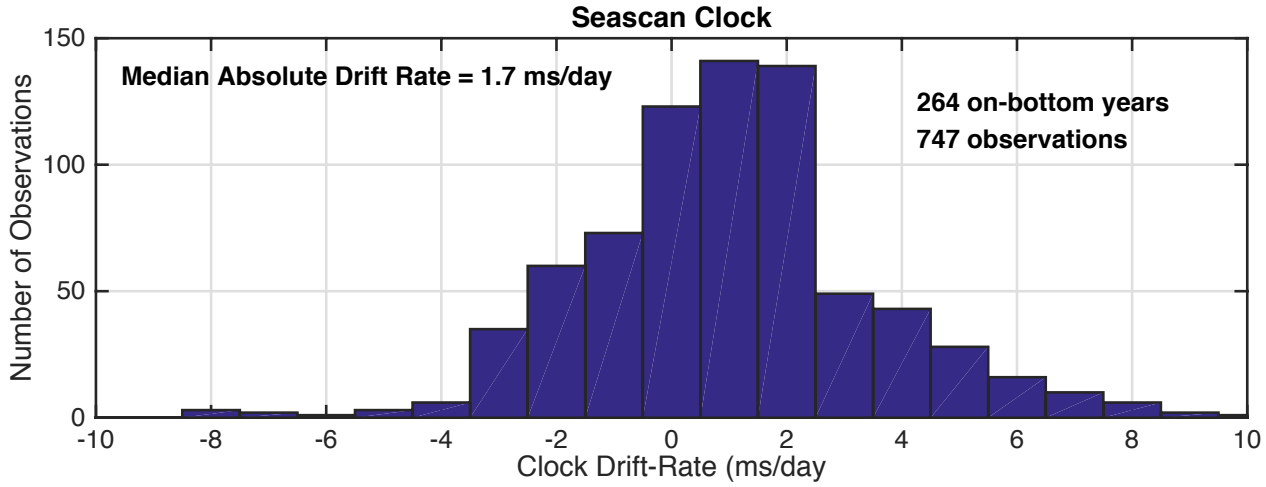
- $1.1M for 2015
- Expt Support (3): $351,720


580


PERSISTOR
Instruments Inc.
www.persistor.com
CompactFlash
DATEL
TAPE A
WEIGHT

Clock drift comparison





Ocean Bottom Seismology in the U.S.

- 1970's-1990's: Ocean Bottom Seismograph (OBS) development largely supported by ONR. A few institutions: WHOI, SIO, and UTIG.

- NSF funding primarily for experiments making use of OBS designed with ONR funds. No base salary support for engineers and technicians.

- 1970's-1990's: OBS available only to the institution's own investigators or their collaborators, scientific questions addressed were not necessarily of the deepest interest or the highest priority to the broad earth science community.

- 1999: NSF funds new OBS designs and establishes Ocean Bottom Seismic Instrumentation Pool (OBSIP). OBSIP is charged by NSF with providing state-of-the-art ocean-bottom seismic instrumentation and at-sea technical assistance for the collection of marine seismic data by the entire U.S. scientific community. Members are WHOI, SIO, and LDEO.

- Subscribed through 2015 (Cascadia Initiative).

Ocean Bottom Seismology at WHOI

- WHOI built its first Ocean Bottom Seismograph (OBS) in 1976. It carried a hydrophone only, so in fact it was an Ocean Bottom Hydrophone (OBH) rather than an OBS. First generation OBH was entirely analog. Used for recording airgun shots and mid-ocean ridge microearthquakes.

- 1982-2000: Multiple generations of digital OBH.

- 1990: Development of OBS with a three-component 1 Hz seismometer.

- 1998: First extended (4+ months) of an autonomous, broadband seismometer on and beneath the seafloor.

- 1999: Two OBS designs funded by OBSIP: (1) short-period OBS for active-source and micro-earthquake-monitoring experiments; and (2) a broadband OBS for long-term (1+ years) recording of regional and teleseismic events.