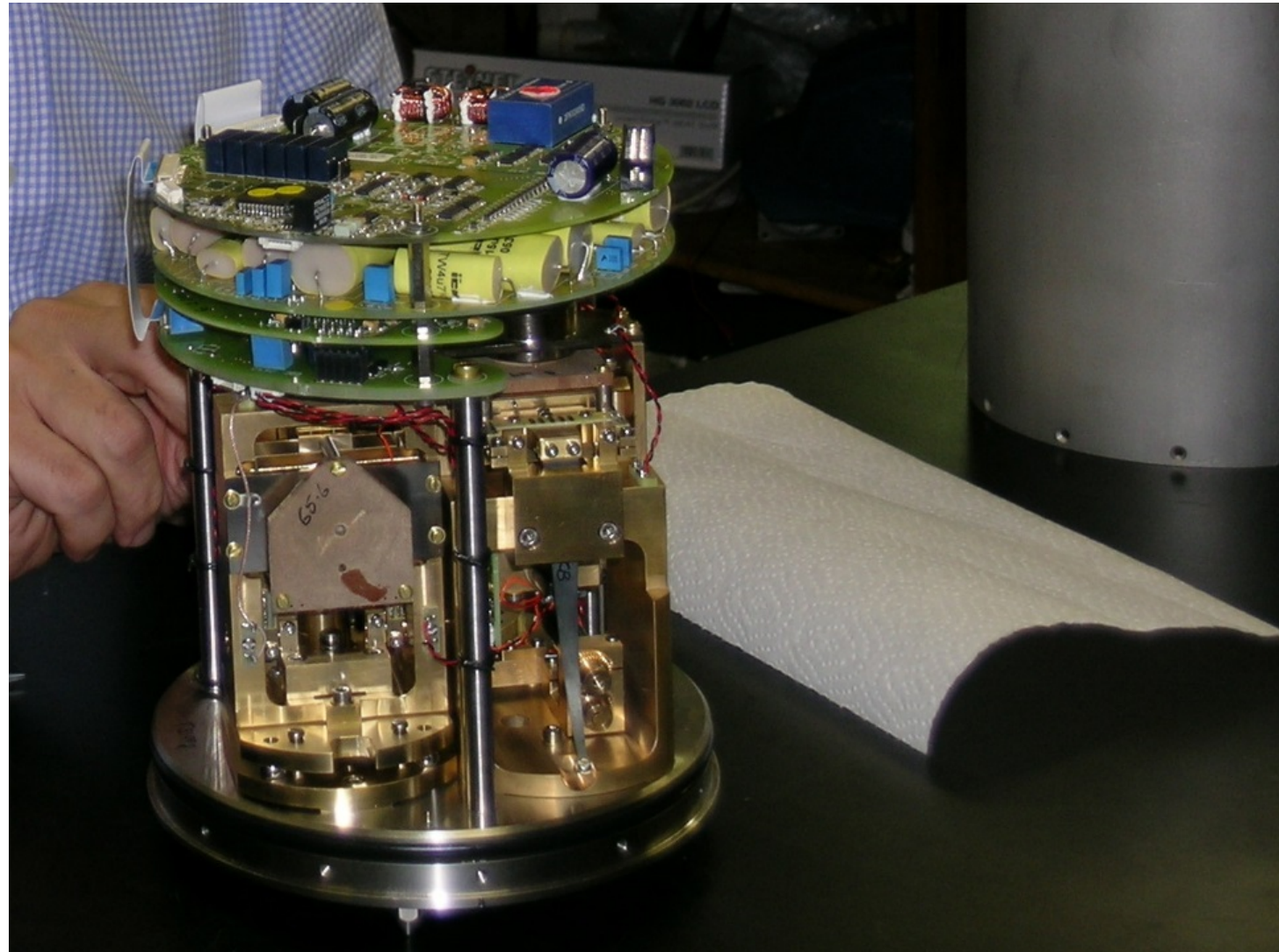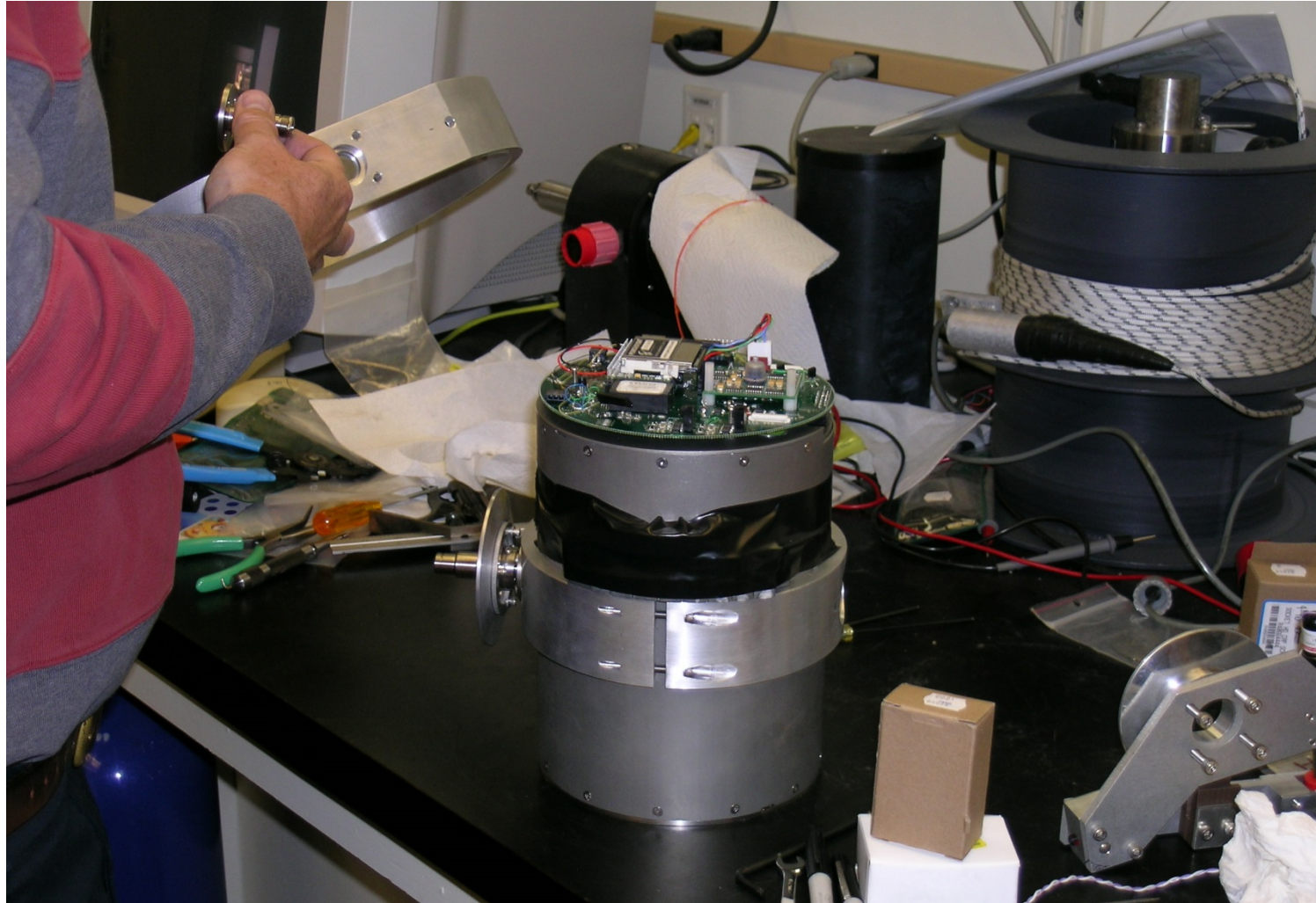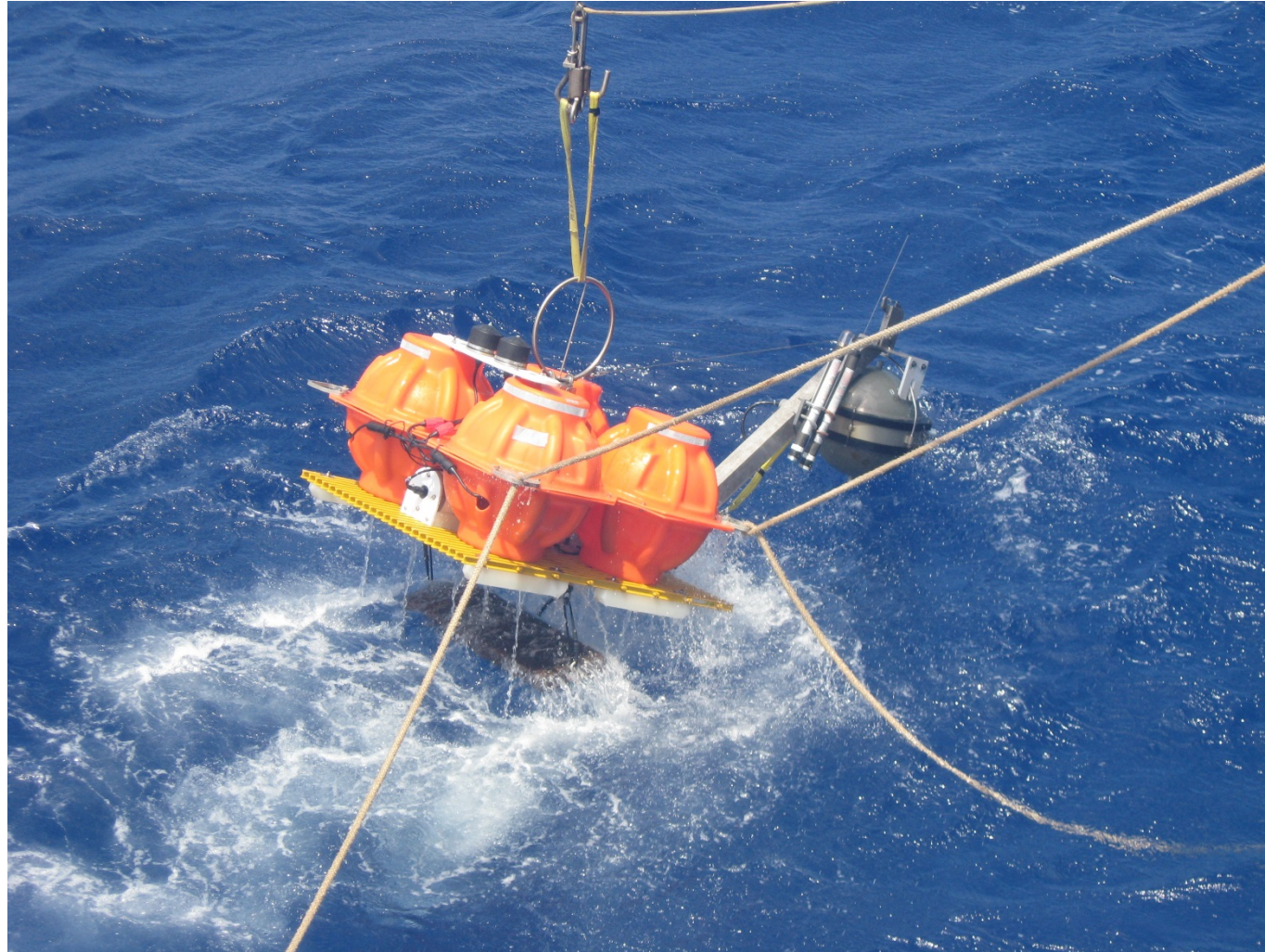# Challenges of Ocean Bottom Broadband Deployments
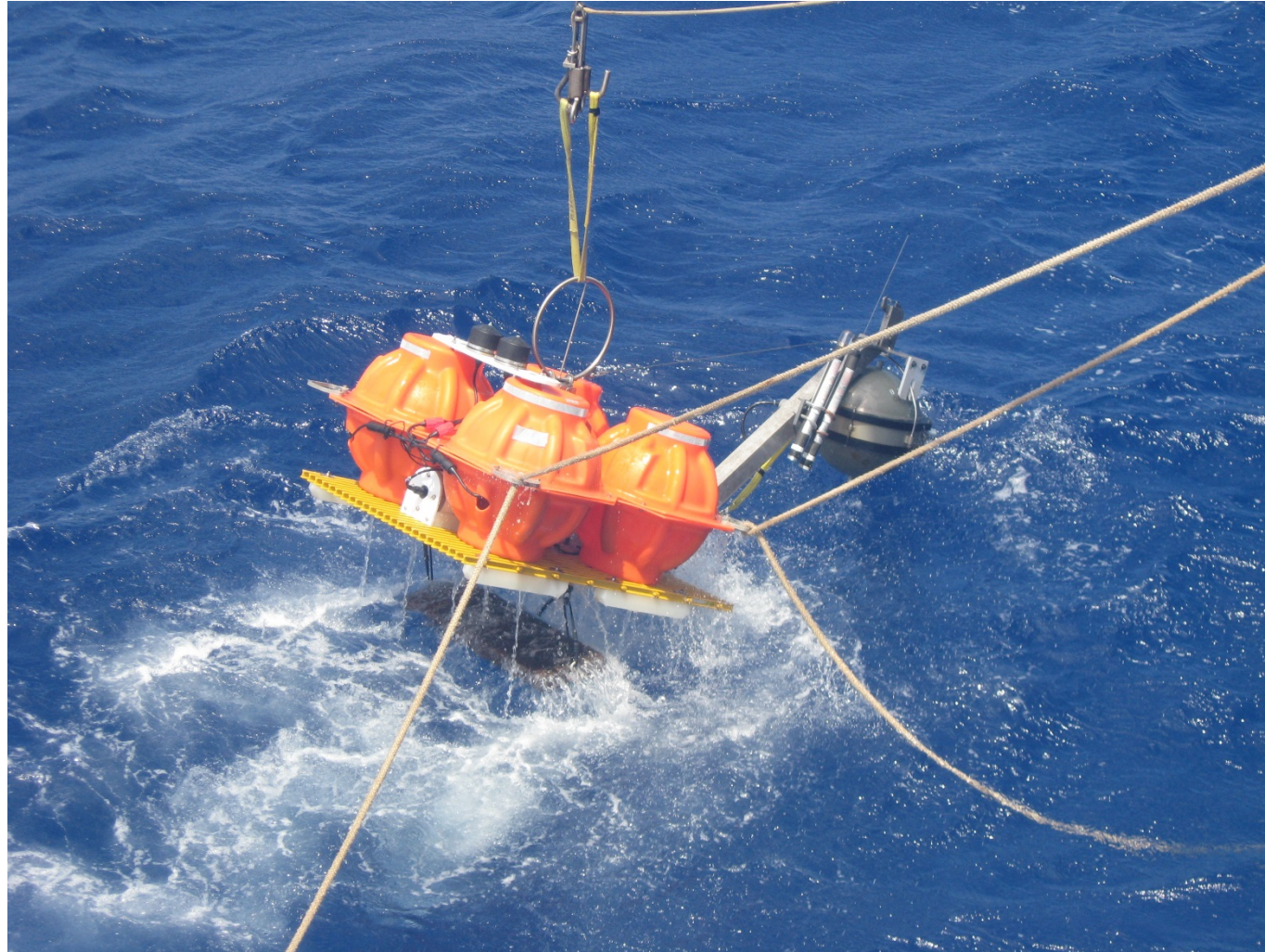
Packaging this delicate Guralp 3T broadband seismometer

into something

that can survive a 5000m fall to the ocean bottom,

level and unlock itself when it gets there,

and tell us which way it is heading.
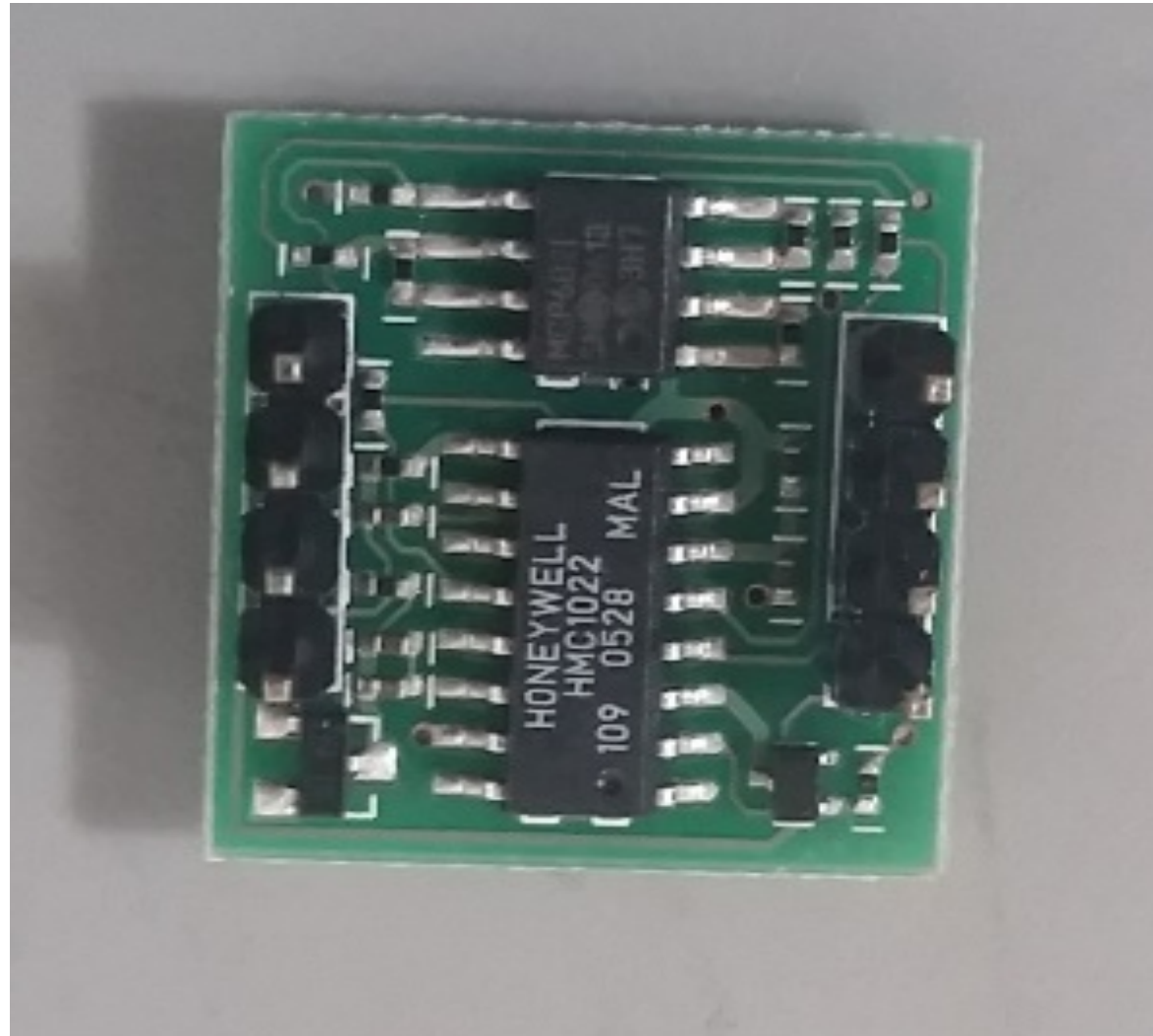
First generation Guralp 3T sensor sphere

- Applied Geomechanics Model 900 tilt sensor

- PNI Corp. Vector 2Xe compass

- Compass uses SPI interface

- Compass frequently does not give any reading

- Compass is discontinued by manufacturer

- Tilt and heading periodically recorded to Compact Flash card
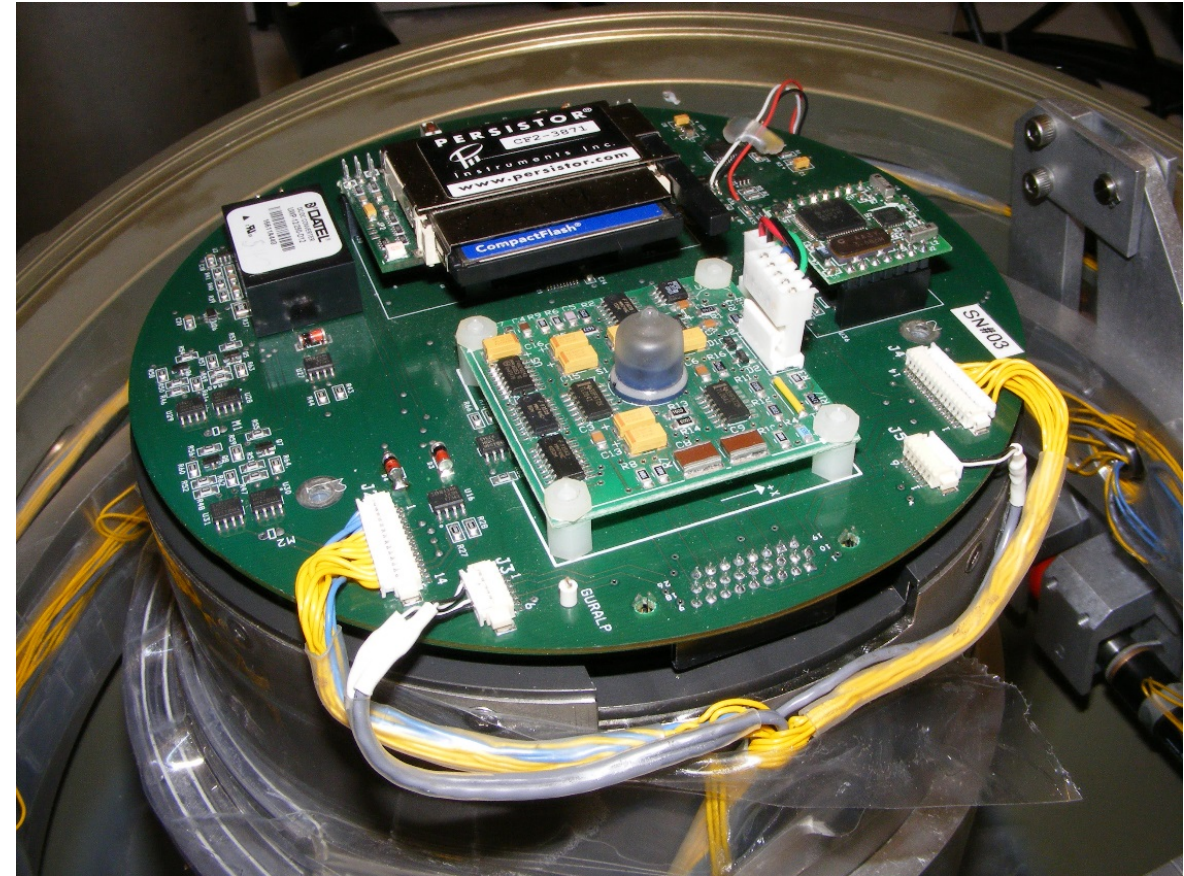
First generation Guralp 3T sensor sphere

- Uses gravity levelling with disk brakes to maintain rigidity

- Ultrafine wires used through Gimbal berrings

- Proven mechanical design, tested at Harvard Vault
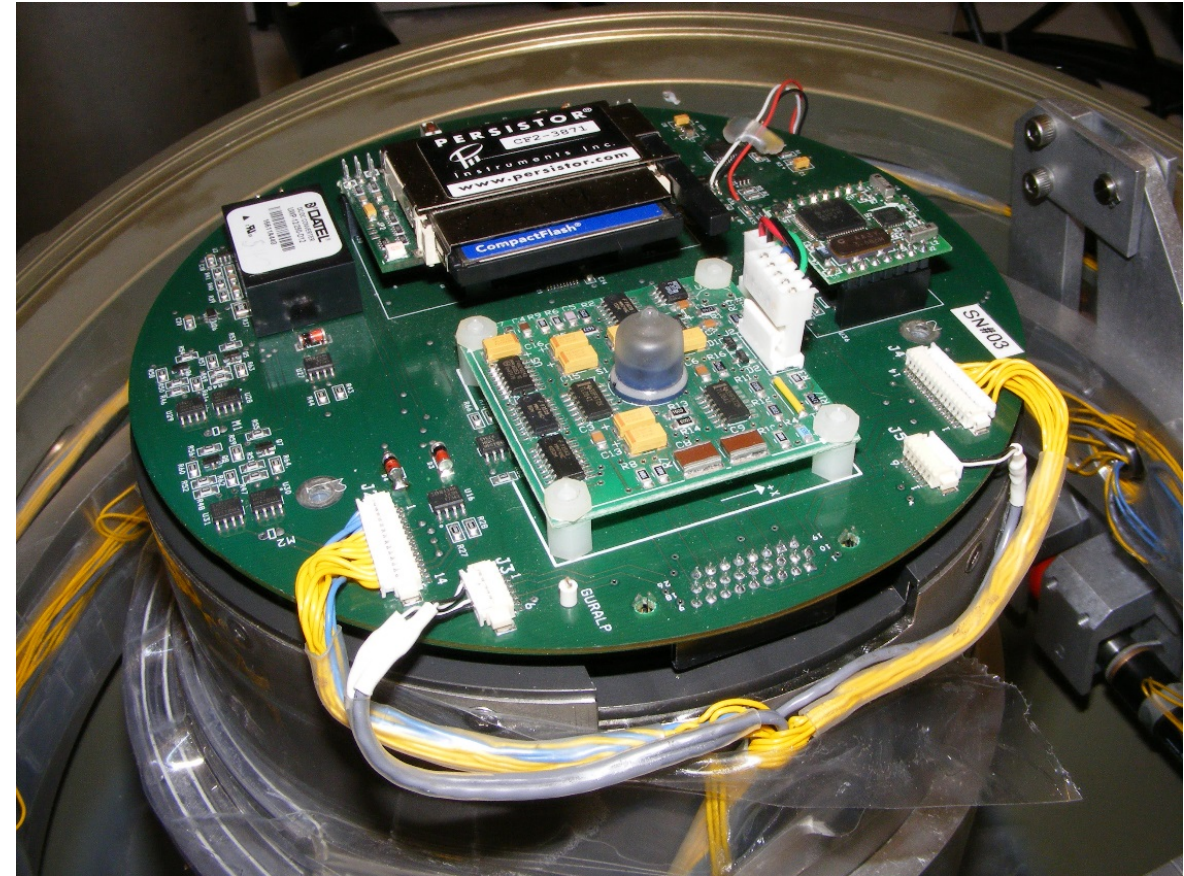
Second generation Guralp 3T sensor sphere

- Same mechanical levelling system
- Updates to obsolete parts, and addition of vacuum sensor
- Same Applied Geomechanics Model 900 tilt sensor (now Jewell Instruments)
- Honeywell HMR3100 compass
- Compass uses simpler UART intererface
- Compass is much more reliable than the older PNI compass
- Compass is now discontinued by manufacturer
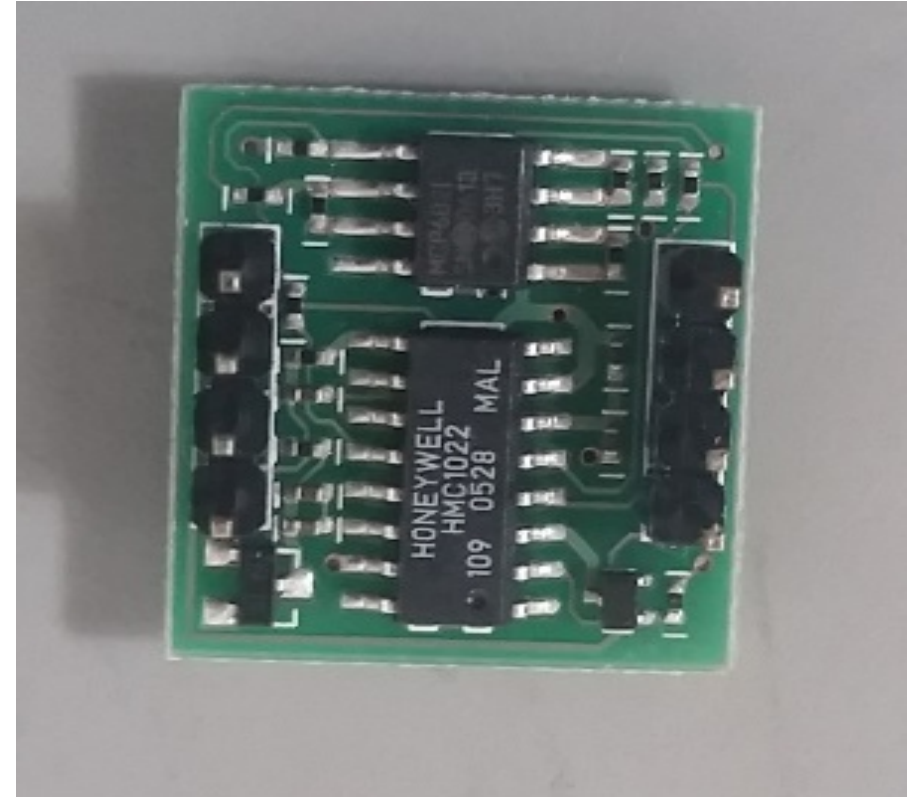
Orientation measured by compass versus derived from Earthquake for Cascadia Year 1
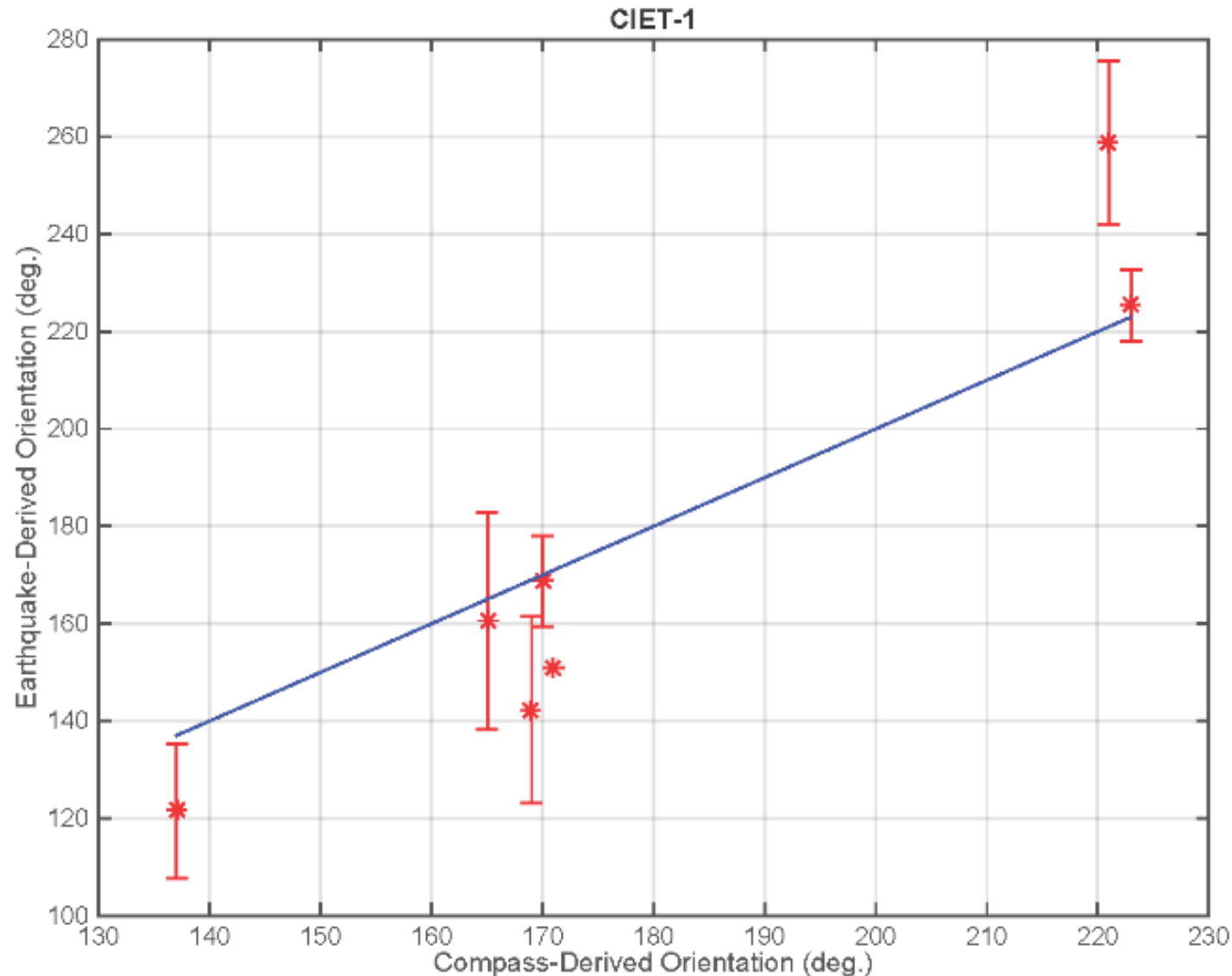
Third generation Guralp 3T sensor sphere?

- Make all spheres the same
- Make deployment more fool proof
- Make "Emergency Guralp Lock" more fool proof
- Possibly change to active levelling system?
- **Improve reliability of compass heading**

New Sensor Controller Board

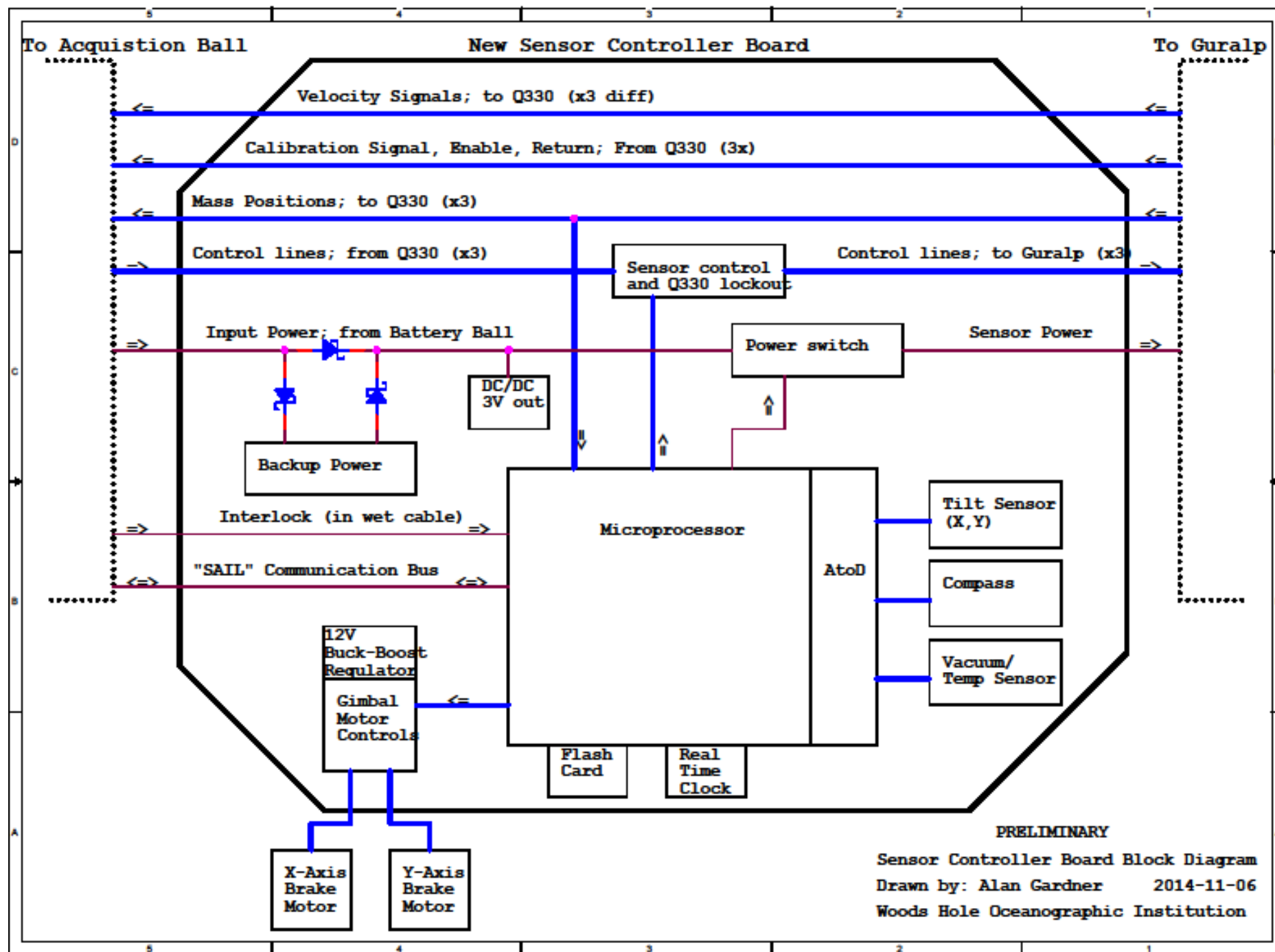To Acquistion Ball

To Guralp

Velocity Signals; to Q330 (x3 diff)

Calibration Signal, Enable, Return; From Q330 (3x)

Mass Positions; to Q330 (x3)

Control lines; from Q330 (x3)

Control lines; to Guralp (x3)

Sensor control and Q330 lockout

Input Power; from Battery Ball

Power switch

Sensor Power

DC/DC 3V out

Backup Power

Interlock (in wet cable)

Microprocessor

Tilt Sensor (X,Y)

AtoD

Compass

"SAIL" Communication Bus

Vacuum/ Temp Sensor

12V Buck-Boost Regulator

Gimbal Motor Controls

Flash Card

Real Time Clock

X-Axis Brake Motor

Y-Axis Brake Motor

PRELIMINARY

Sensor Controller Board Block Diagram

Drawn by: Alan Gardner   2014-11-06

Woods Hole Oceanographic Institution

Ocean Server Technology Inc. OS5000 Compass

- One of the new compasses we are evaluating for replacement of compass in Guralp 3T sensor sphere

- 0.1° heading resolution

- 0.5° RMS heading accuracy

- Includes tilt sensor