MPL REPORT TO DESSC, 9 Dec., 2001

I. Deep Tow

The MPL Deep Tow system continues as a multi-sensor, transponder navigated seafloor survey vehicle, including 23 kHz echo sounder, 4 kHz subbottom sounder, 110 kHz sidelooking sonar, multiple proton magnetometers, video and still cameras with strobe and continuous lighting, CTD, Paroscientific pressure gauge, etc (Fig. 1). With NSF funding, Fish 6 implemented a transition to fiber optic telemetry making it compatible with the 0.68 FO wire now available using either installed or transient winches on most of the larger UNOLS ships, and on some intermediates (New Horizon).

Operations in the past year included a survey of the seaward portions of the Hilina slump area on the southeast flank of Kilauea, Hawaii, and site surveys for USN ranges. The Hawaii survey was made as a prelude to installation of a precision transponder GPS/Acoustic geodetic net (Poster by Phillips, et al, this meeting), the installation being made on the same expedition leg. John Hildebrand was chief scientist. Chris de Moustier was chief scientist for the Navy surveys.

2. Control vehicle

The Control Vehicle (CV) is a heavy lift ROV with vertical positioning controlled by wire out and horizontal position adjusted using hydraulically driven thrusters. Its primary characteristics and configuration are shown in Fig. 2. The vehicle was built under contract with JOI, with guidance from USSAC, and was upgraded in 2000 with NSF funds to take advantage of 0.68 FO wire.

The vehicle was used in three operations last year. Two of these were in support of the MPL seafloor geodesy program – John Hildebrand PI for the Hawaii installation and C. David Chadwell PI for a Peru/Chile Trench installation. In the geodetic operations the CV was used for two kinds of tasks. First was in recovery of transponders that were not operating properly. More important, it was used in precise determination of the depths of the transponders after they had been placed on the seafloor. A package was built (Fig. 3) that could be placed on the bottom a few meters from any given transponder, remaining connected by a soft tether to the CV. The package included a set of Paroscientific pressure gauges, a transponder interrogation transducer, and a video survey telescope to measure the vertical angle of view of a reference point on the transponder as seen from the package. With the elevation angle, distance from the package and package depth, the depth of the transponder is determined. The CV provides package placement control, electrical power and telemetry, as well as illumination of the scene. In spite of the considerable sediment cloud raised by the landing of the vehicle on the seafloor, the fact that the illumination was from above

made viewing of the transponder from the package acceptable within a minute or so of landing.

The third CV operation was a wireline installation of CORKS in DSDP/ODP holes 504B and 896A, Keir Becker PI with Earl Davis, Fred Spiess and Christian de Moustier as co-Pi's. A poster paper concerning this operation was presented at the morning session on Dec. 11- OS21B-0454.

Before installation of the CORKs, it was necessary to reconnoiter the holes. At 504B it was found that the glass ball floats installed originally on the 3 504B corner reflectors were still in place (Fig. 4). Not wanting to cope with the possible shock waves from breaking of one of these during installation, the CV was rigged with a cutter and maneuvered to cut each ball free.

The initial work at 896A included logging with the slim tool built for a previous operation, and shown in Fig. 5. The hole entry TV lead-in camera continued to operate as the tool went down the hole, providing the first video view of the inside of a DSDP/ODP hole (Fig. 6). The casing was surprisingly heavily coated with deposits of some kind, and the uncased portion clearly shows the physical structure of the rock being penetrated, and a depth at which there is a washout and particles moving inferring influx of fluids. This scene was available for viewing at the Dec. 11 poster display.

The concept of the CORK installation process is shown in Fig. 7. The string to be deployed is assembled over the stern of the ship. In this case the strings consisted of a lead-in package, including video camera, light, depth (pressure gauge) and transponder navigation transducer, an instrument string, one or two packers, a support package and the CV, all on the end of the ship's 0.68 FO wire. The total distance from lead-in package to CV was of the order of 400 m. The support package houses the telemetry for the installation process, pumps for inflating the packers, and the data recording package. It is configured to be similar to the drillship-installed CORKS with regard to use of a submersible or conventional ROV to download data and draw water samples. Two of the packers are shown in Fig. 8. Figure 9 shows the support package suspended over the stern of R/V Revelle, with the wire below to the upper packer, and before transfer of load to the CV. Fig. 6 shows the support package in place in hole 504B at a depth of about 3500 m.

It is expected that Alvin will be used for a data-collection visit to the site some time in 2002.

3. ATV

Last year the Navy transferred its ATV, a 6 km depth capable ROV (Fig.10), to SIO and SOEST on a 5 year, renewable loan. This vehicle is a highly capable system

including two manipulators, multiple video cameras and other sensors. SIO is working on vehicle preparation, with a plan for a trial operation in the fall of 2002 using either R/V Revelle or R/V New Horizon. Anyone wanting to use the vehicle or learn about its capabilities should contact fspiess@ucsd.edu or jhildebrand@ucsd.edu

MPL REPORT TO DESSC, 9 Dec., 2001 - Figure List

Figure 1. Deep Tow Fish 6

Fig. 2. MPL Control Vehicle

Fig. 3. Control Vehicle with auxiliary survey package.

Fig. 4. DSDP Hole 504B entry cone with supplementary glass ball floats for sonar reflectors. Glass balls were removed using the Control Vehicle.

Fig. 5. Slim logging tool for use with Control Vehicle.

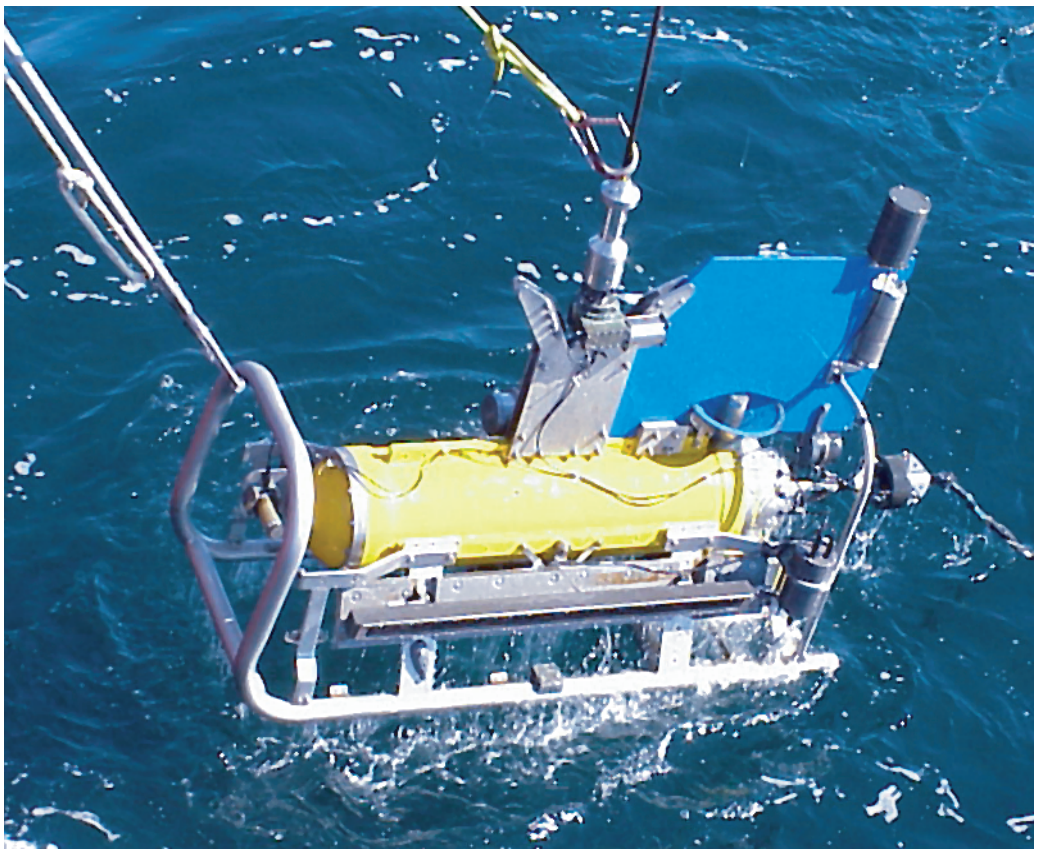
Fig. 6. Logging tool video views in hole 896A, and support package in place in hole 504B.

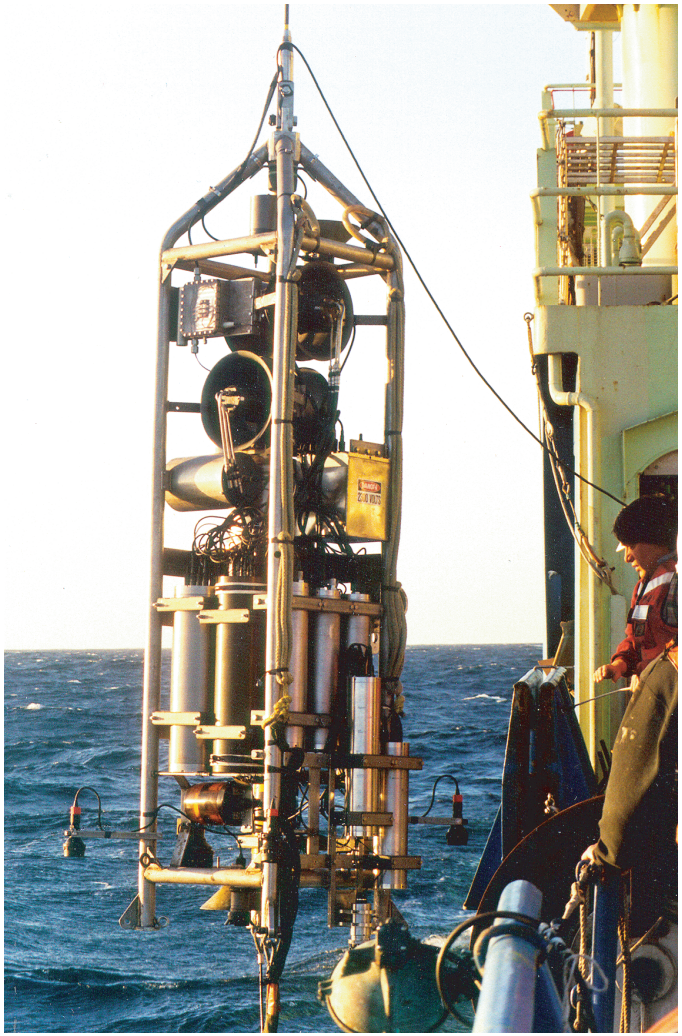
Fig. 7. Wireline CORK concept.

Fig. 8. Packers and support package on deck in preparation for launching.

Fig. 9. Support Package over the stern of R/V Revelle during launch process.

Fig. 10. ATV – Deep Submergence ROV.





MPL CONTROL VEHICLE (CV)

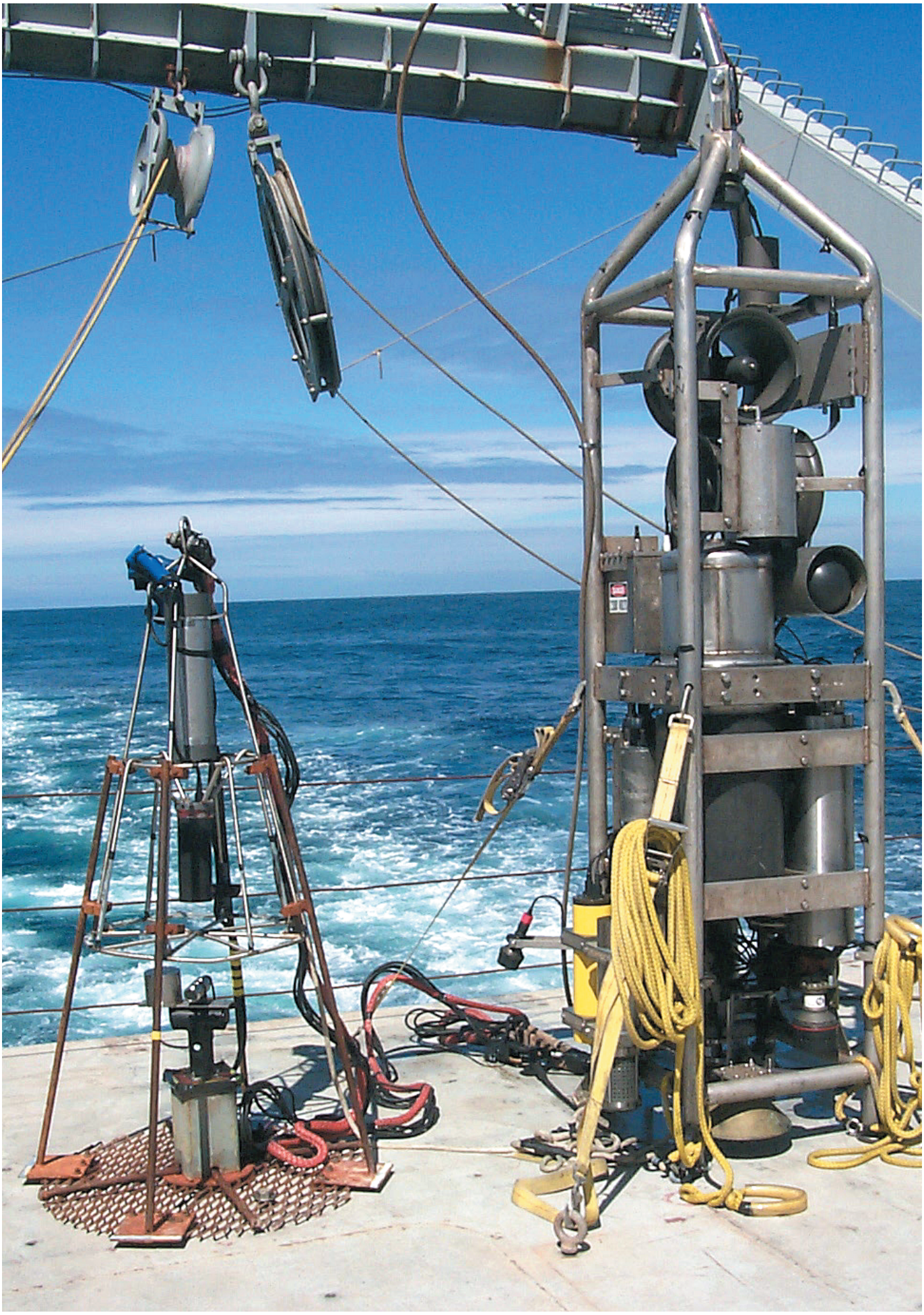
2 Horizontal Hydraulic Thrusters
(~100 lbf max thrust)

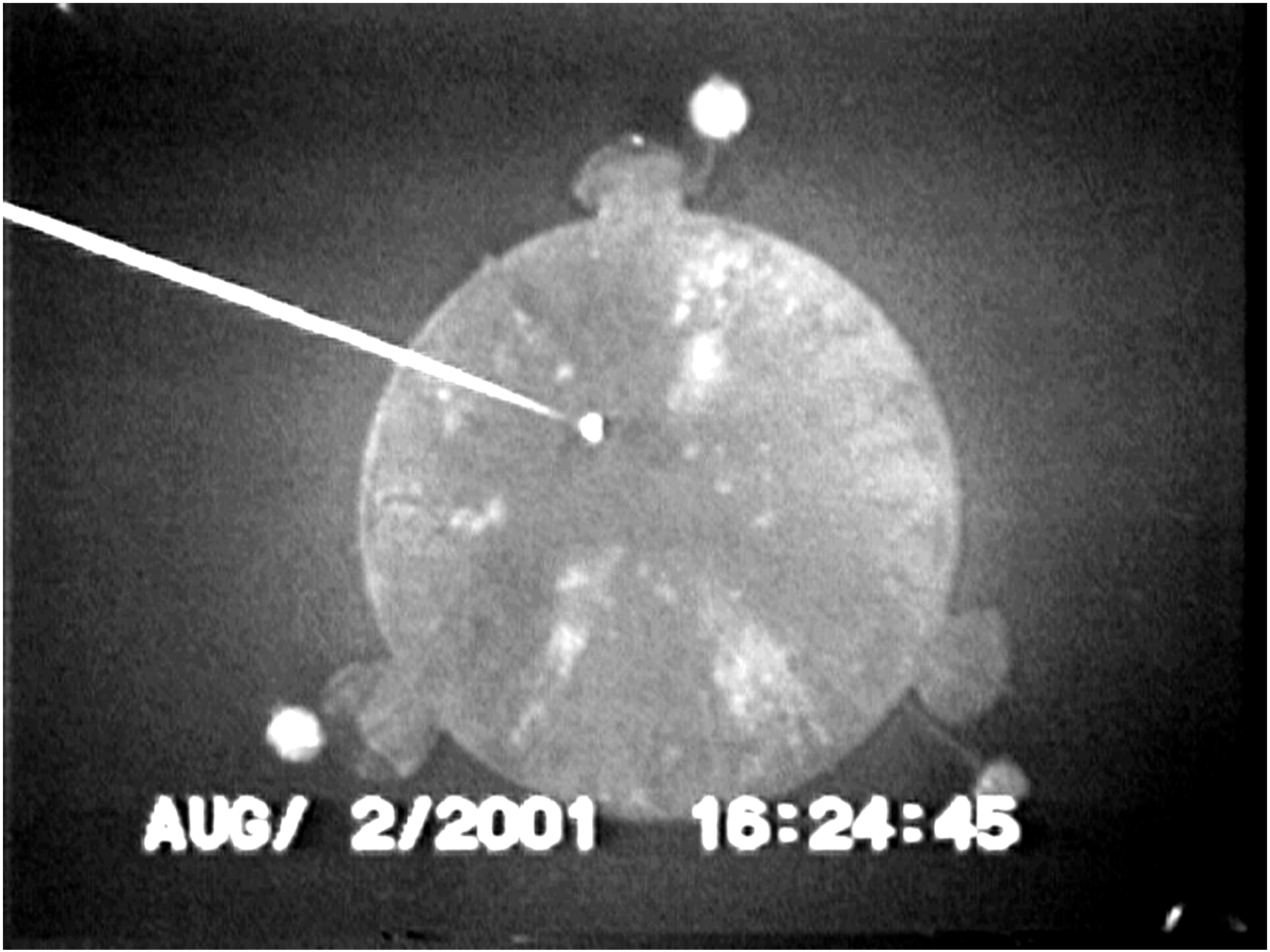
Sonars: 12 kHz LBL Navigation
23.5 kHz Altimeter
325 kHz Sector Scanning

Video: B&W Low-Light Camera
250 W Low Voltage Lights (4)

Power: 1800 V at ship
1 10 V & 220 V @ 60 Hz at CV
Nominal 10 kVA at CV

Compass, Pressure Gauge
Height -- 3.5 m Footprint -- 0.4 M^2
Weight -- 500 kg (water), 1000 kg (air)

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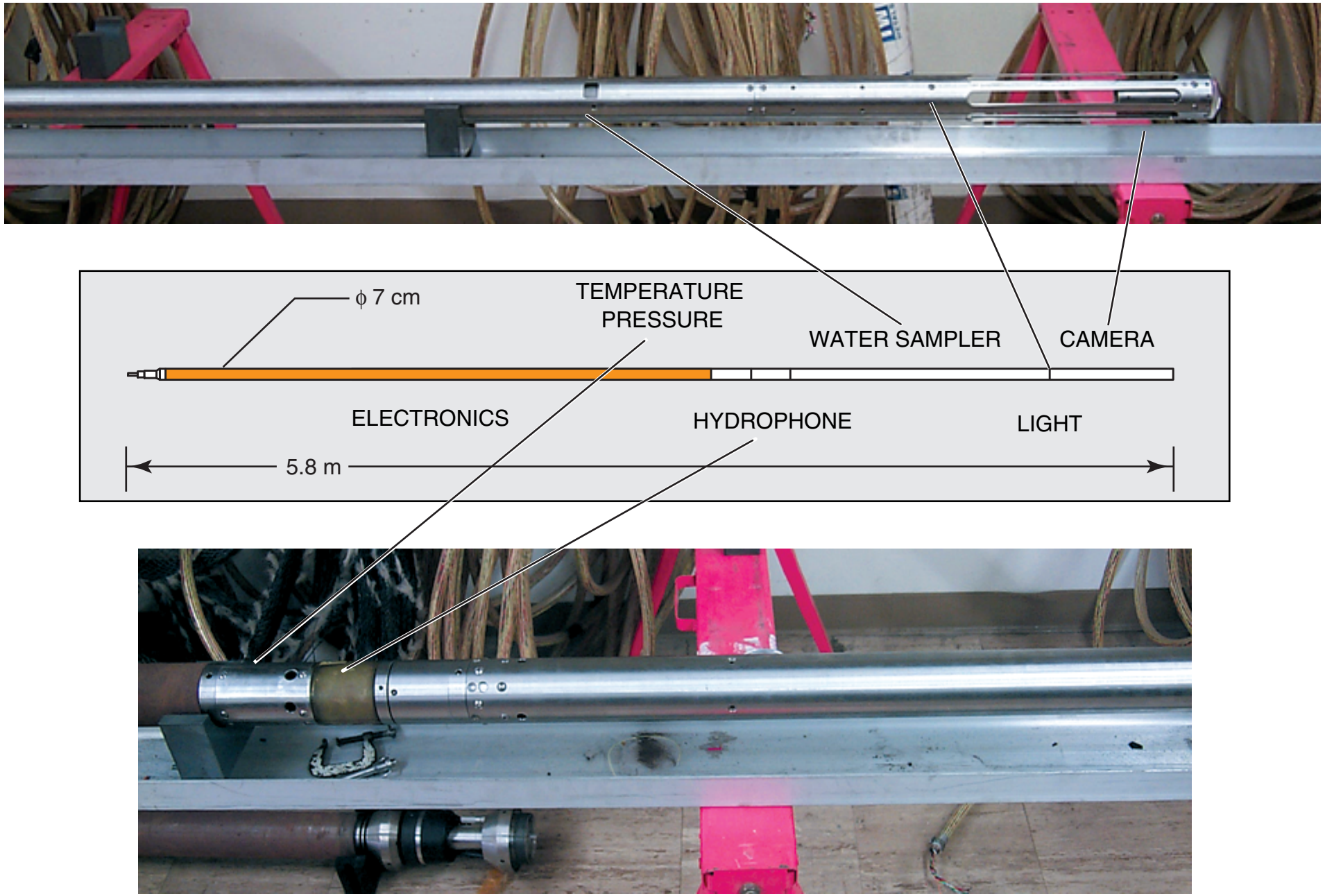
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TEMPERATURE
PRESSURE
WATER SAMPLER
CAMERA
ELECTRONICS
HYDROPHONE
LIGHT
5.8 m


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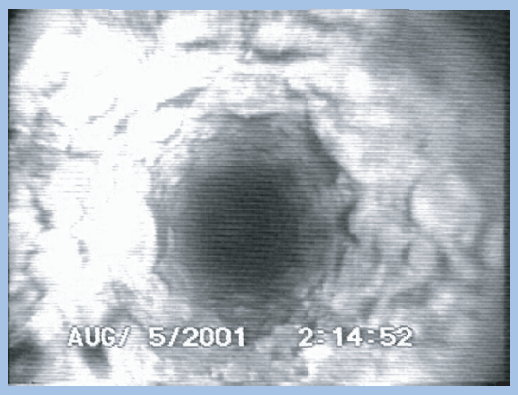
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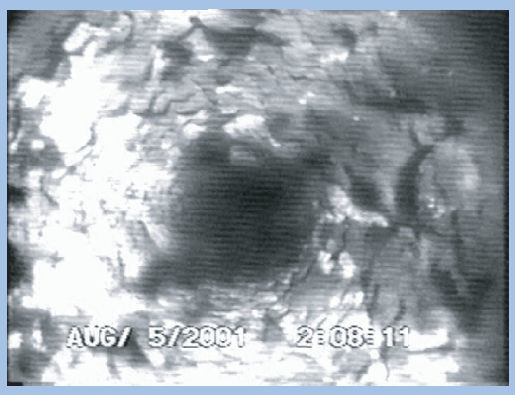
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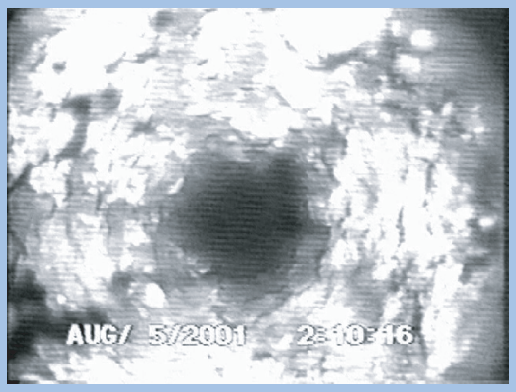
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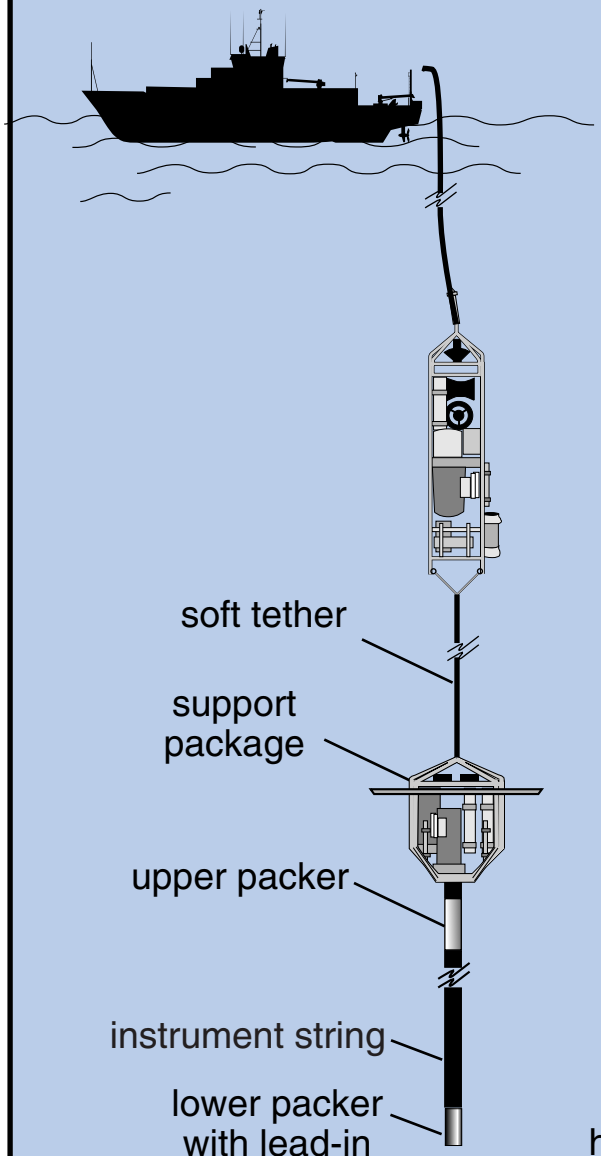
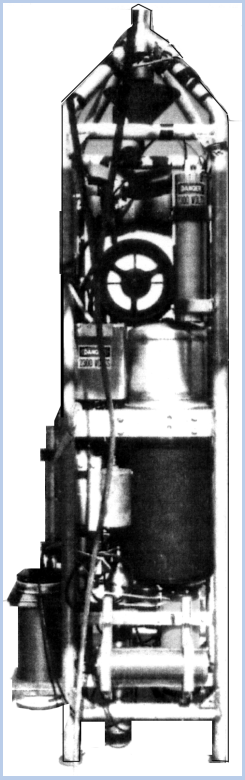
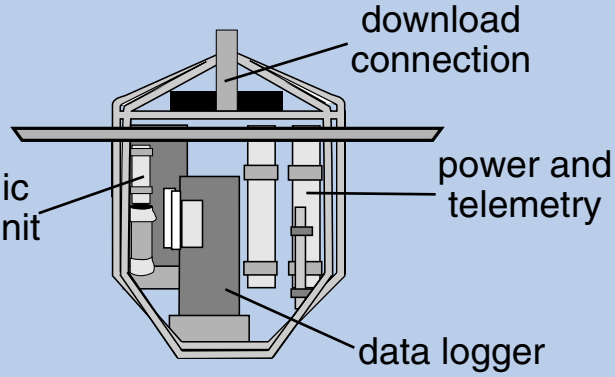
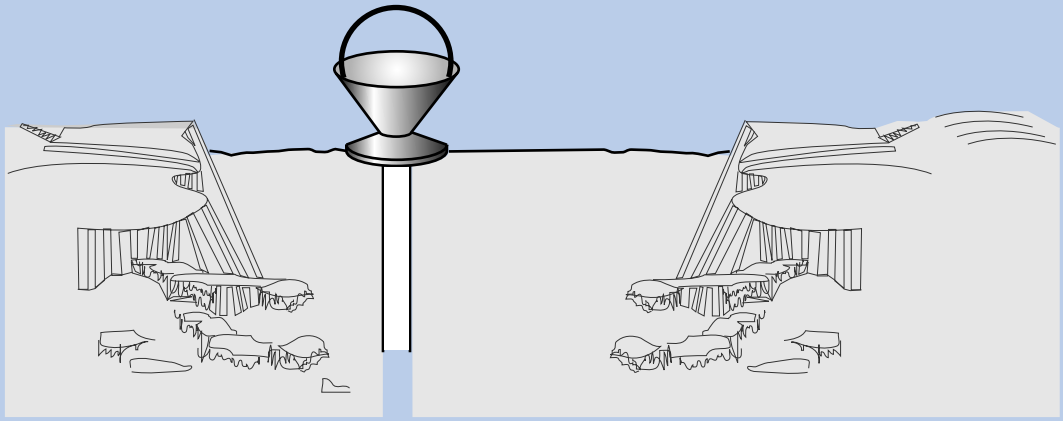


CONTROL VEHICLE





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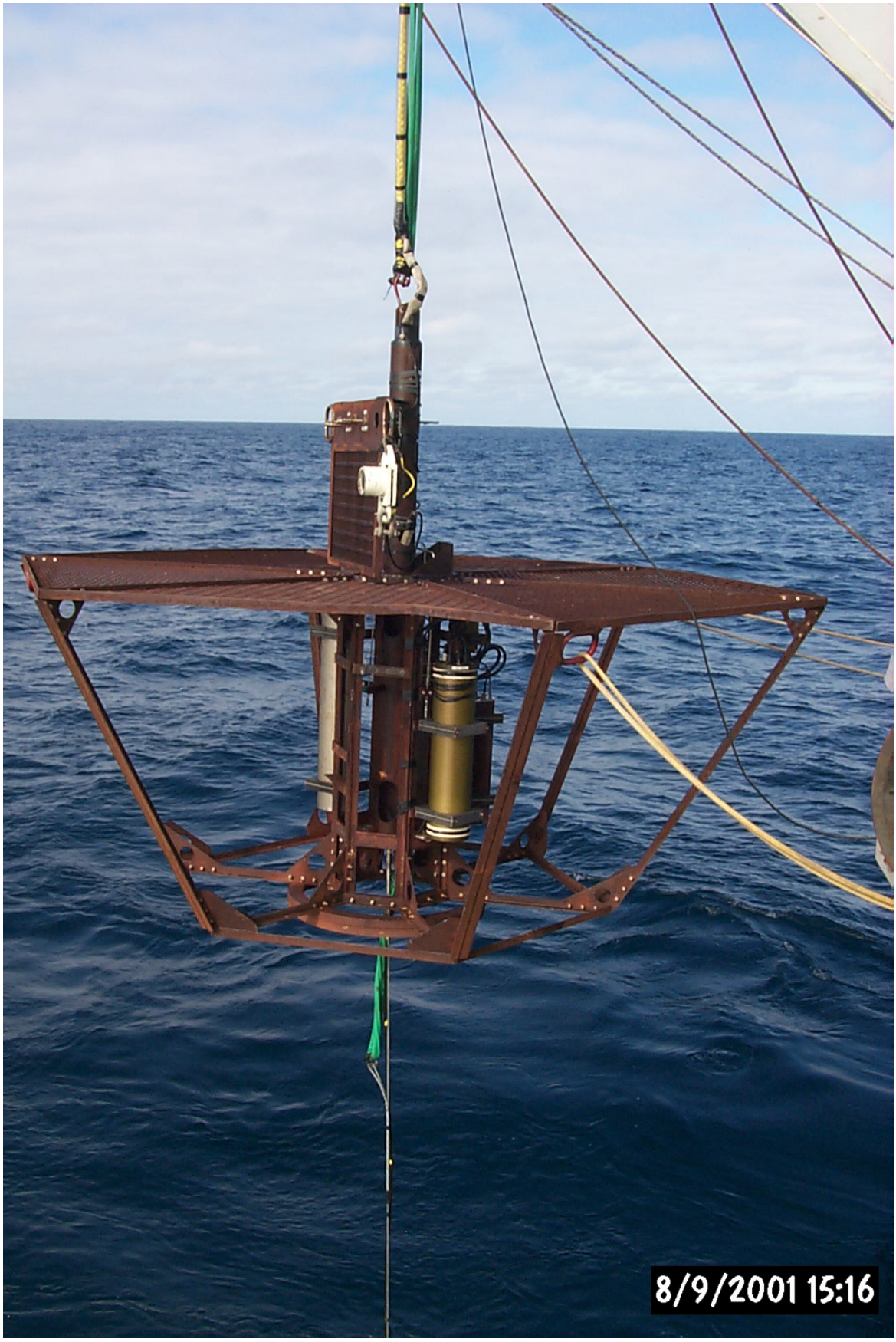
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