



June 16, 2008

Japan Agency for Marine-Earth Science and Technology

“ABISMO,” Automatic Bottom Inspection and Sampling Mobile, Succeeds in World’s First Multiple Vertical Sampling from Mid-ocean, Sea Floor and Sub-seafloor over Depth of 10,000 m in Mariana Trench

1.Outline

Automatic Bottom Inspection and Sampling Mobile “ABISMO([*1](#)),” operated by the Japan Agency for Marine-Earth Science and Technology (JAMSTEC: Yasuhiro Kato, President), successfully carried out the multiple vertical sampling of water mass at depths of 150 to 10,258 meters at the Challenger Deep in the Mariana Trench. It also succeeded in collecting 1.6m-long core samples of the deep-sea sediment, together with overlaying water, at a depth of 10,350 meters (photo [1 – 4](#)). The multiple sampling of water and sediment from mid-ocean, sea floor and sub-seafloor over a depth in excess of 10,000 meters was the first in the world.

Since the development of the Remotely Operated Vehicle “KAIKO,” which dived down to 10,900 meters in July 1999, JAMSTEC has been developing a new 10,000m-class unmanned research vehicle. ABISMO succeeded in diving to 9,707 meters in December 2007 and was able to dive deeper to a depth of 10,258 meters during three test dives this time at the Challenger Deep in the Mariana Trench.

Through the test dives, ABISMO delivered excellent performance as the only 10,000m-class remotely operated vehicle in the world, raising expectations for discovering unknown microbes and life living in deep-sea extreme environments.

2.Test Dive Details

Location: Challenger Deep, Mariana Trench (11°22’N, 142°43’E: [Map](#))

The first dive (June 1): Diving depth: 10,245 m, Water depth: 10,320m

The second dive (June 2): Diving depth: 10,252 m, Water depth: 10,330m

The third dive (June 3): Diving depth: 10,258 m, Water depth: 10,350m

Content of test: underwater cruising, launch and retrieval of the probe system, sediment core sampling, and vertical sampling through the water column

3.Results

- 1) "ABISMO" succeeded in diving to a depth of 10,258m in the waters at the Challenger Deep in the Mariana Trench - the area with a maximum depth of about 10,350m. Its ability to dive deeper than any other unmanned research submersibles and collect samples was confirmed.
- 2) 1.6m-long cores of deep-sea sediment at a depth of 10,350 meters were collected for the first time in the world.
- 3) Multiple water samples were collected vertically (from one another) through the water column to a depth of 10,000 meters (10,258m) for the first time in the world.

4.Future prospective

The success in the multiple vertical sampling from mid-ocean, sea floor and sub-seafloor, over a depth of more than 10,000 meters, has paved the way to unravel some of the fundamental scientific mysteries such as, how the ecosystems in extreme marine environments at greatest depths and under immense water pressure can exist; how they interact with environments in upper, middle, and deep layers of the ocean; and what and where the limits of earth's life activity are. The ABISMO's success holds promise for exploring new life forms and genomic resources in deep oceans, as well as shedding light on unknown interactions between the atmosphere, ocean and earth's crust.

ABISMO is planned to be used for several more functional and performance tests in deep waters, as a facility to validate new element technologies for the development of the "Next-Generation Deep-sea Exploration Technology," one of the nation's critical technologies. Furthermore, as the only submersible in the world able to work in the deepest parts of the ocean, ABISMO will be used to explore life in extreme environments and material cycles at great depths.

***1: ABISMO's Specifications**

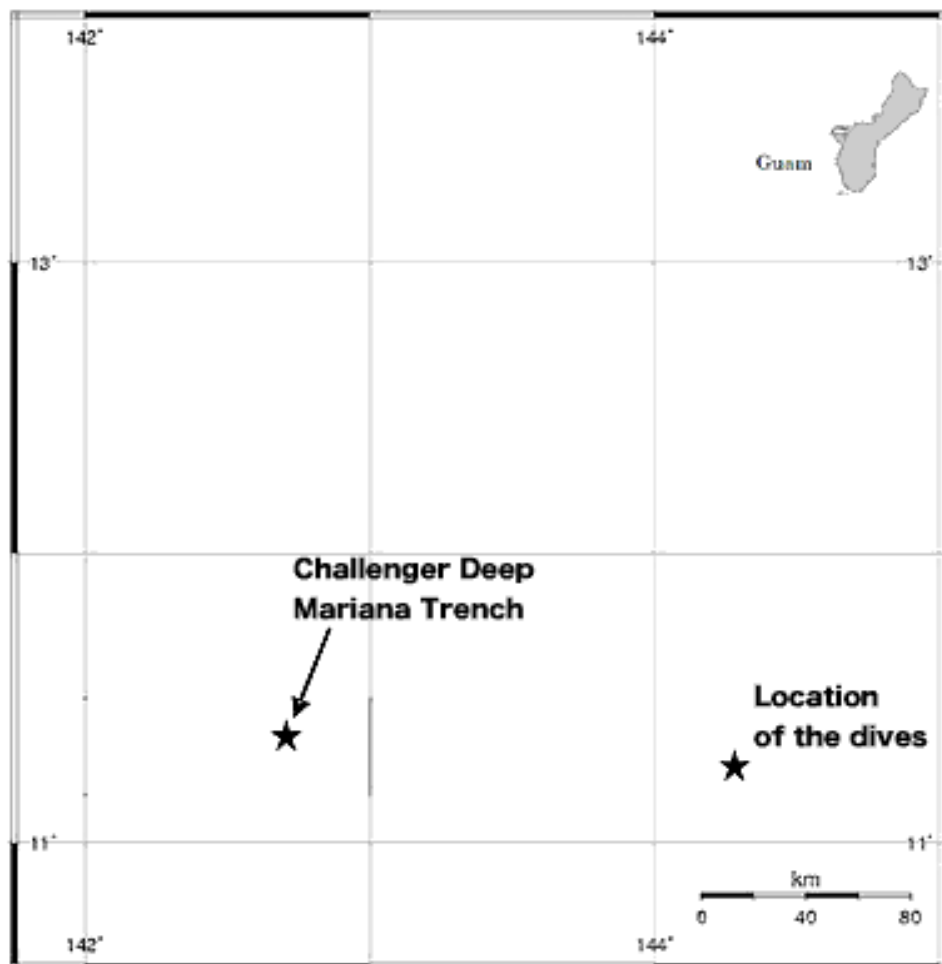
1) Vehicle

- (1) Type: Open framework structure
- (2) Dimensions (approx.): Length:1.3m × Width: 0.9m × Height: 1.1m
- (3) Air weight (approx.): 350kg
- (4) Propulsion: Thrusters (horizontal direction: 400W×2 sets, vertical direction: 400W×2 sets), Crawler (horizontal direction: 400W×2sets)
- (5) Imagery device: NTSC type color TV×1ch

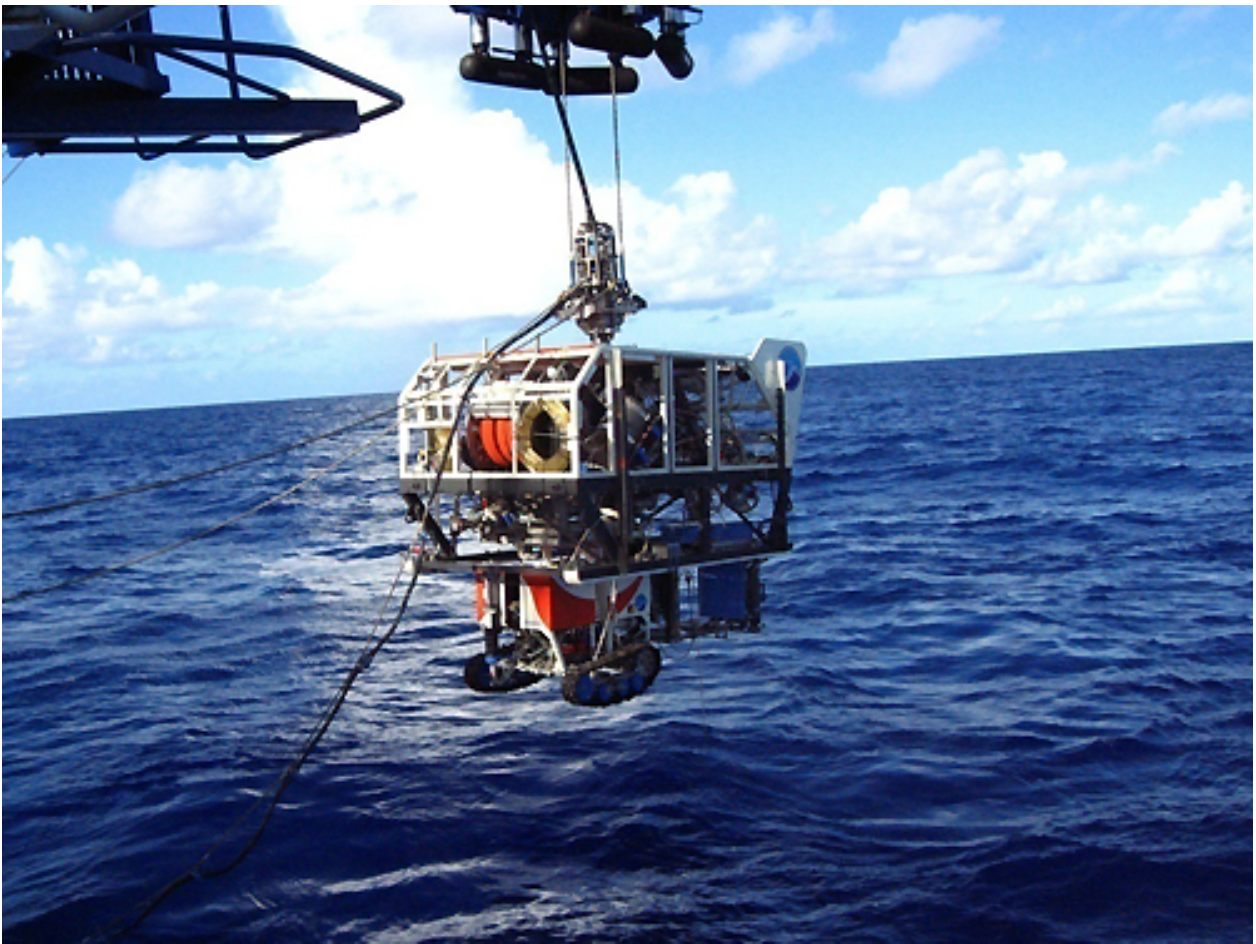
2) Launcher

- (1) Type: Open framework structure
- (2) Dimensions (approx.): Length: 3.3m × Width: 2.0m × Height: 1.8m
- (3) Air weight (approx.): 3,000kg
- (4) Propulsion: Thrusters (horizontal direction: 1kW×2 sets)
- (5) Work device: Gravity Core Sampler×1set
- (6) Imagery device: NTSC type color TV×2ch

MAP



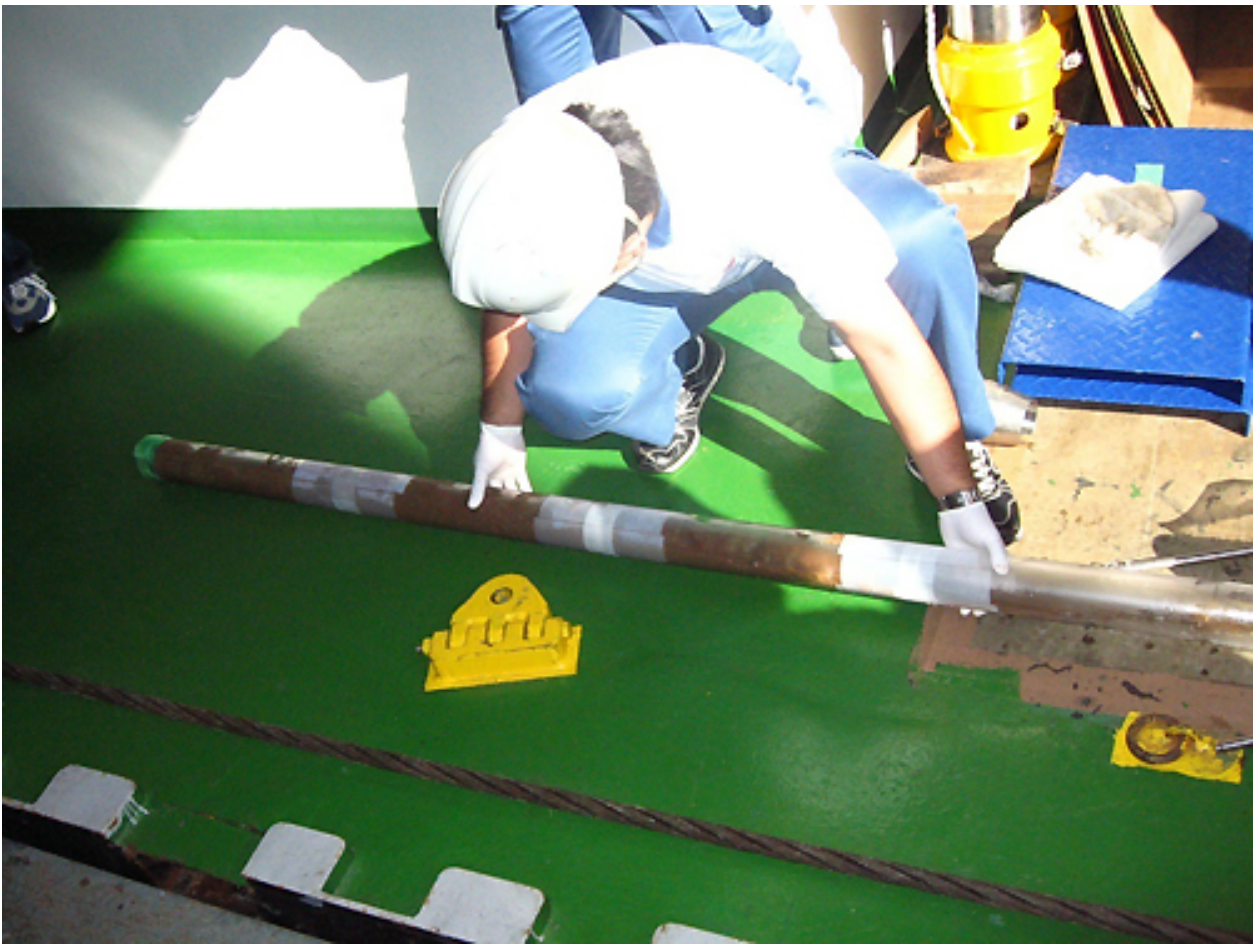
Test Area



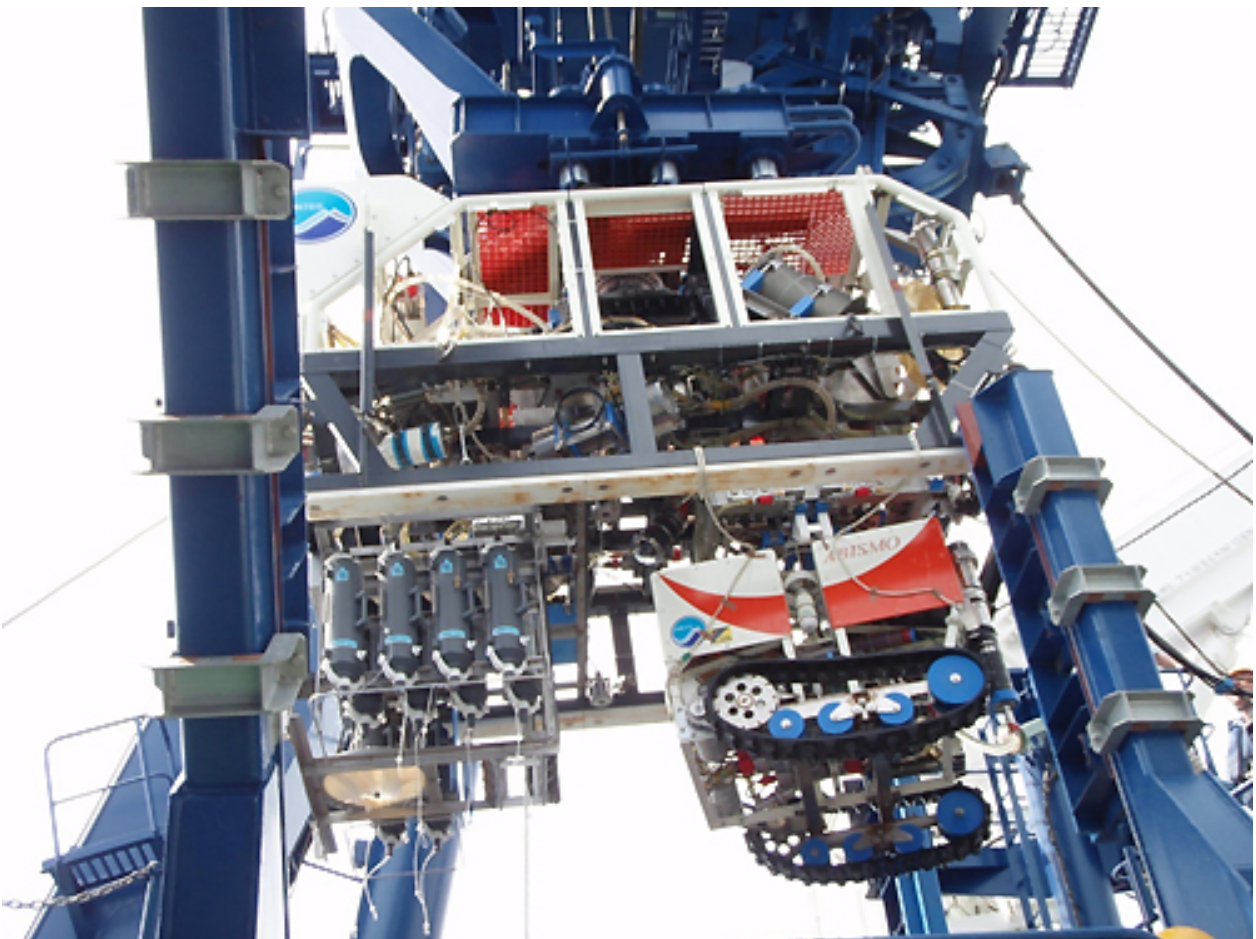
Photograph 1: "ABISMO" at the Challenger Deep in the Mariana Trench



Photograph 2: Communication Control Unit of "ABISMO"



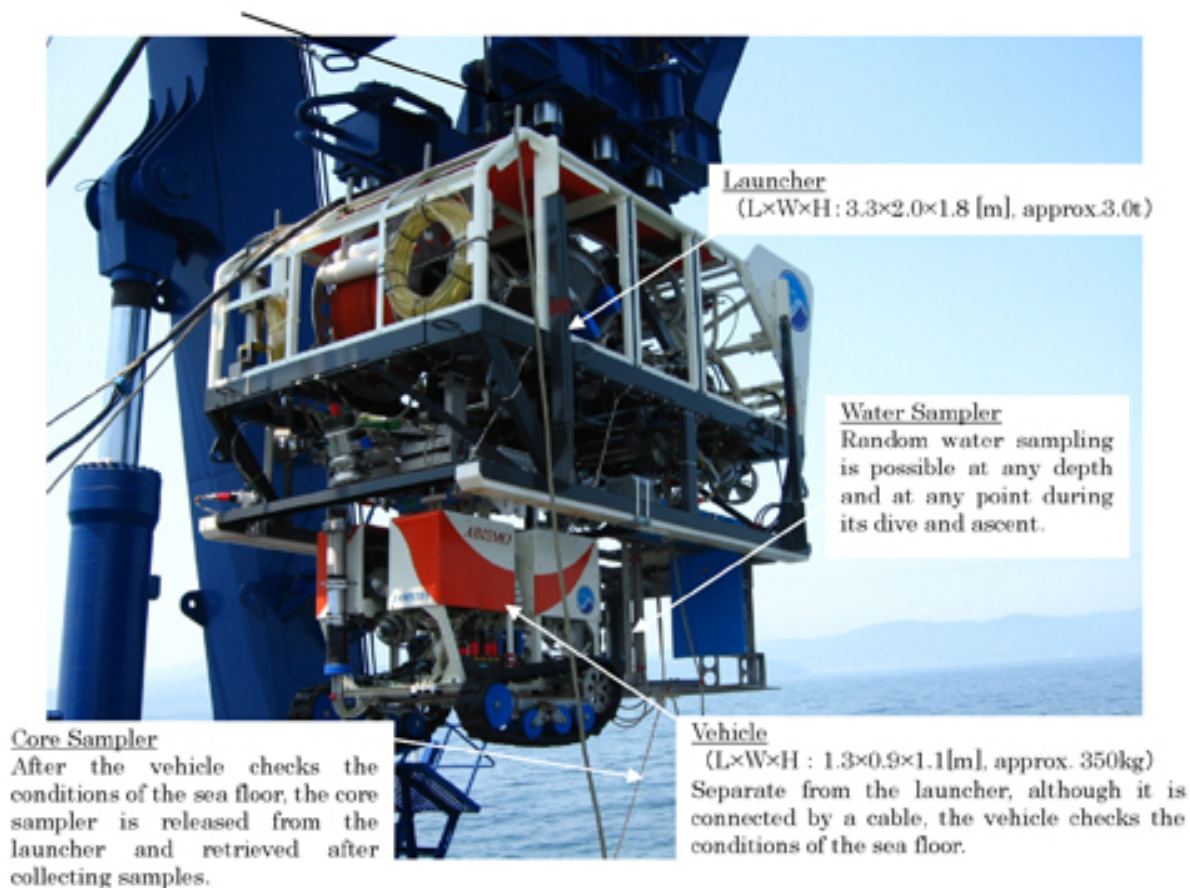
Photograph 3: Approximately 1.6m-long core sample of the deep-sea sediment collected from a depth of 10,350m in the Mariana Trench.



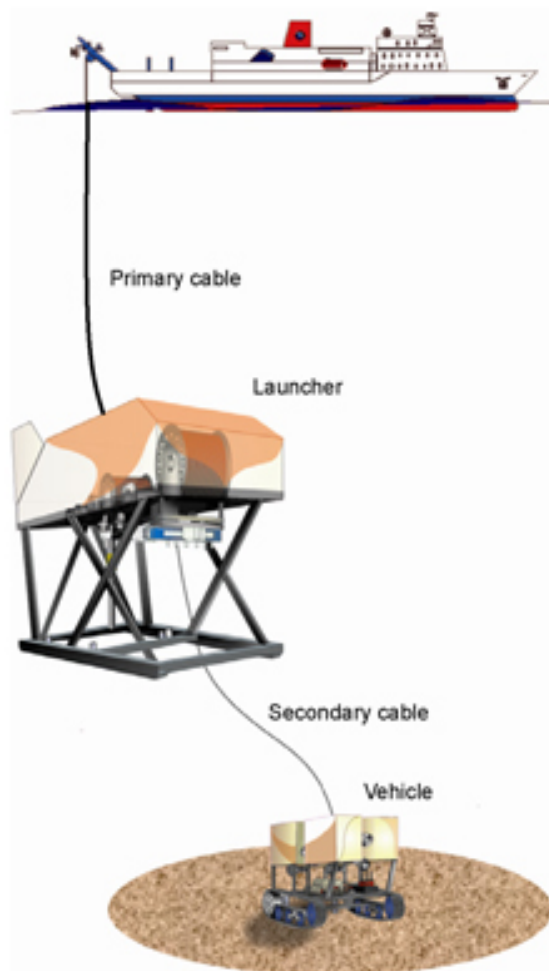
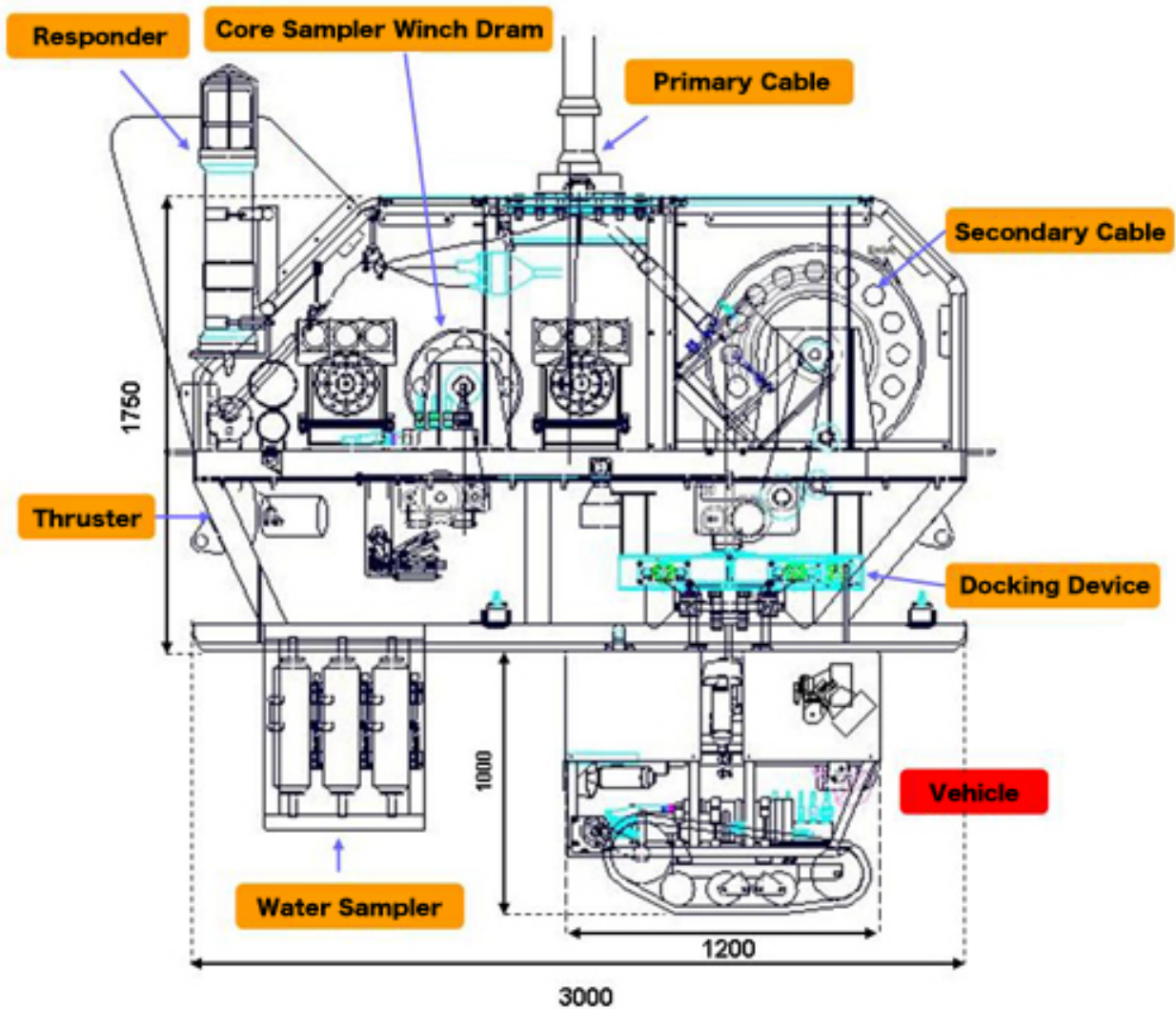
Photograph 4: Water sampler used to collect water mass samples from depths up to 10,258m in the Mariana Trench.

Reference

(Utilizing the primary cable of the "KAIKO" system)



Overview of "ABISMO"



“ABISMO” consists of a launcher and a vehicle. The launcher and the vehicle were newly developed and constructed. It utilizes the KAIKO’s winch system and a primary cable which are onboard “KAIREI”. The launcher holds the vehicle and the bottom sampler during descent and surfacing, and releases the vehicle near the seafloor to conduct research. The launcher also performs as a relay station connecting devices onboard “KAIREI” and

the vehicle. The vehicle is connected to the launcher with a 160m long secondary cable. Research using a TV camera is anticipated in the near future within the reachable range of the cable.

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