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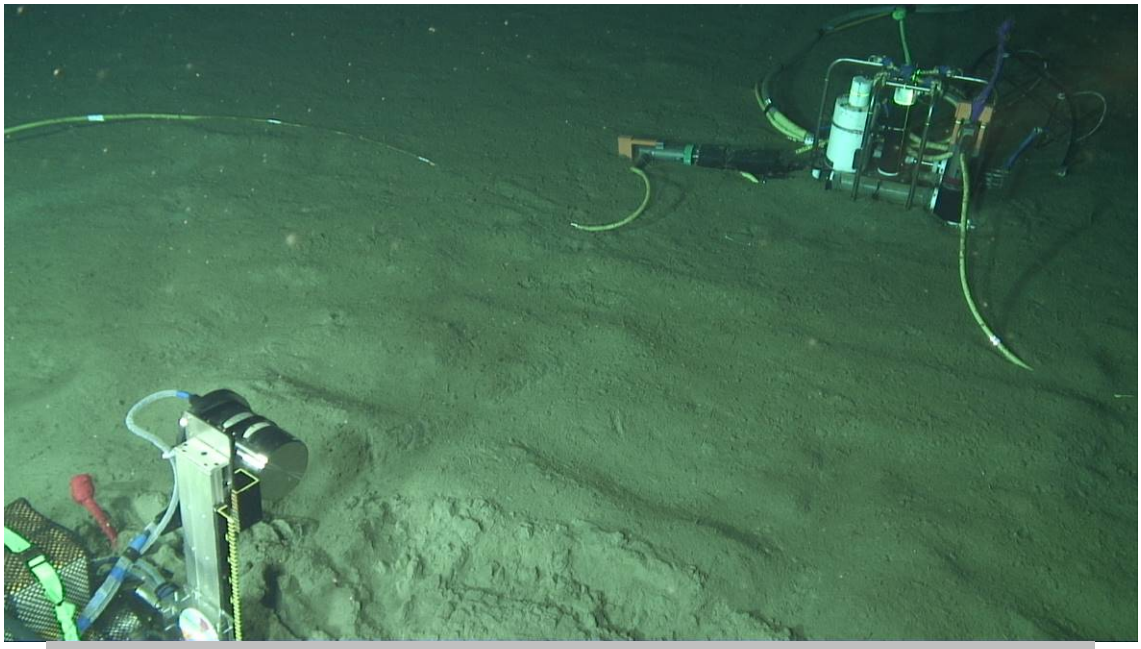
Shinsei-Maru / Hyper Dolphin 4500
KS-18-J07



Real time ocean bottom crustal movement observation

Off Kii Suido & Kumano-nada

Oct. 29th, 2018 - Nov. 7th, 2018

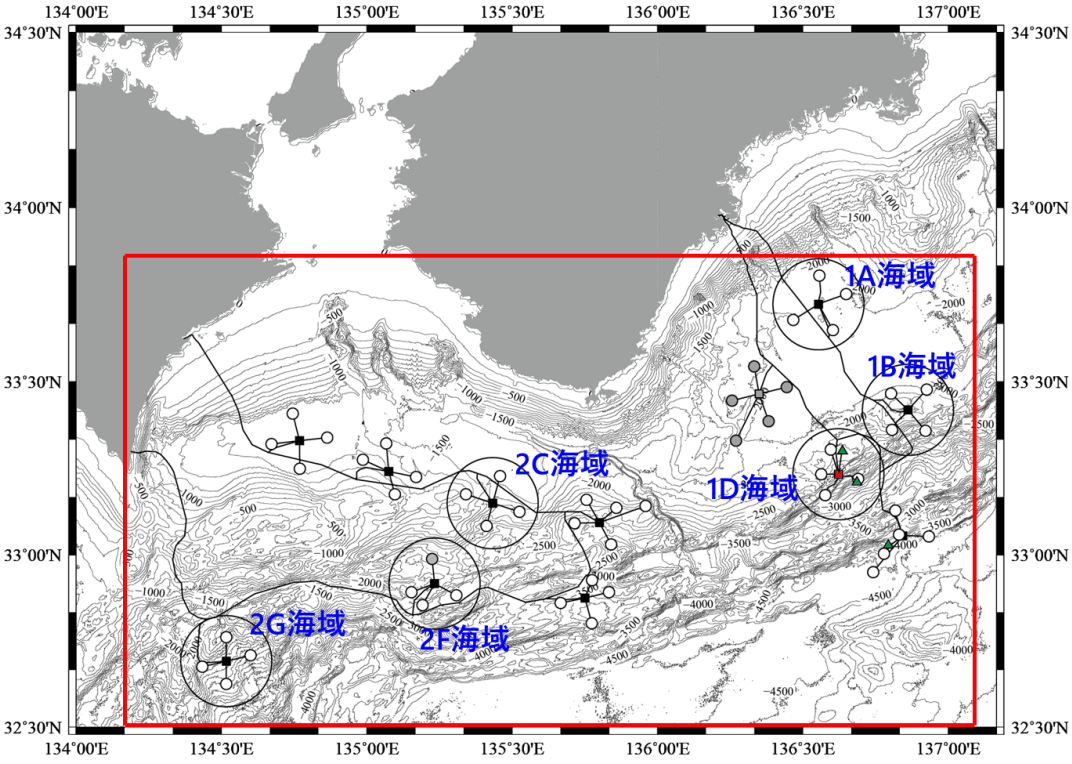
Ocean Floor observatory Technology Development Group
R&D Center for Earthquake and Tsunami
Japan Agency for Marine-Earth Science and Technology

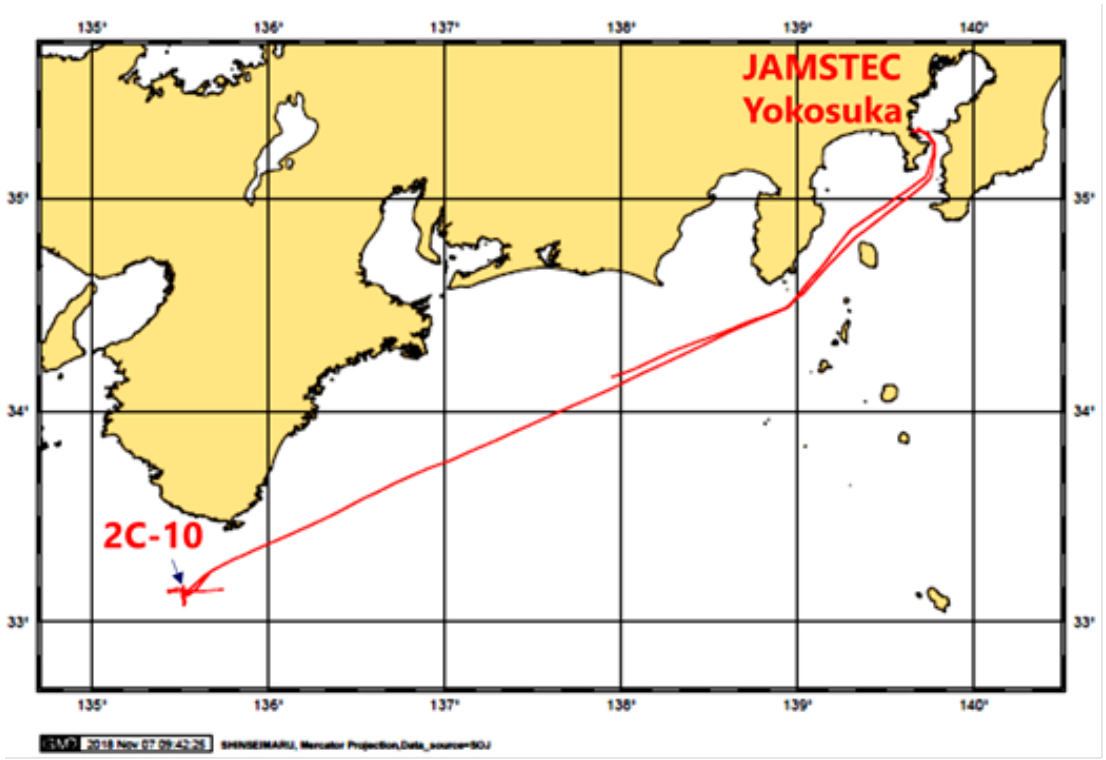
Contents

1. Cruise Information

Cruise ID:	**KS-18-J07**
Name of vessel:	Shinsei-maru
Title of cruise:	Real time ocean bottom crustal movement observation
Representative of the Science Party [Affiliation]	Shuichi Kodaira [JAMSTEC]
Chief Scientist [Affiliation]:	Shuhei Nishida [JAMSTEC]
Boarding Scientist	Toshinori Kimura [JAMSTEC] Yuya Machida [JAMSTEC] Toshimasa Nasu [NME]
Cruise period:	Oct. 29th, 2018 - Nov. 7th, 2018
Ports of departure / arrival:	JAMSTEC Yokosuka / JAMSTEC Yokosuka
Research area:	off Kii-suido, Kumano-nada

Research map





2. Research Proposal

JAMSTEC has been implementing the "Observation Project on wide area variation of ocean floor for building national resilience" since FY2017 in order to achieve the national mission of toughening the national land, securing people's safety and security. In this project, (1) development and deployment of ocean bottom crustal deformation observation technology based on the submarine cabled observation and monitoring system for earthquake and tsunami (DONET), using a pressure gauge, an inclinometer, a long-term borehole observation system installed in a borehole of "CHIKYU" deployed in the Nankai Trough. (2) High precision wide area survey of active submarine faults using three-dimensional seismic survey system of the ocean floor wide area research ship "KAIMEI" and etc., at Nankai Trough segment area, which is important for the evaluation of interactivity, and the Japan Trench outer rise area that may cause a tsunami earthquake. (3) Development and evaluation of more realistic simulation and transition prediction methods incorporating new survey and observation results obtained in (1) and (2) will be conducted. Through this, the prediction of the occurrence of huge earthquakes (Evaluation of urgency, scale and distribution) was imploded. In addition, the accuracy of tsunami inundation immediate prediction is improved by accurately estimating the epicenter area, its size, and the tsunami source immediately after the earthquake occurrence. The purpose is to realize disaster prevention and mitigation through these efforts.

3. Instruments

Figure 3-1 shows that the image of the in-situ calibration with the mobile pressure calibrator which is consist of a pressure measurement unit (PMU) and a level adjust unit. In order to realize the in-site calibration on ocean bottom, the PMU should reduce from environmental effect for the pressure sensor about pressure and temperature. And, the level adjust unit should measure the difference of level between the PMU to the pressure sensing system of DONET.

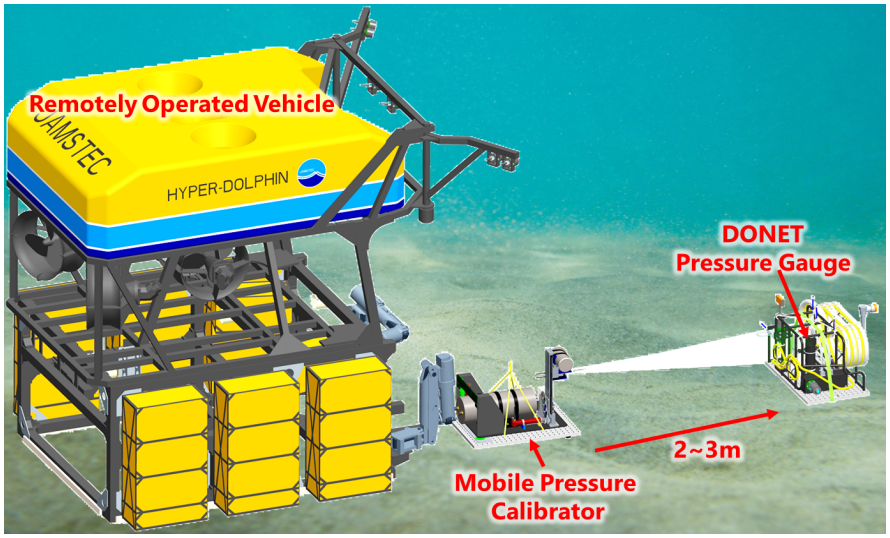
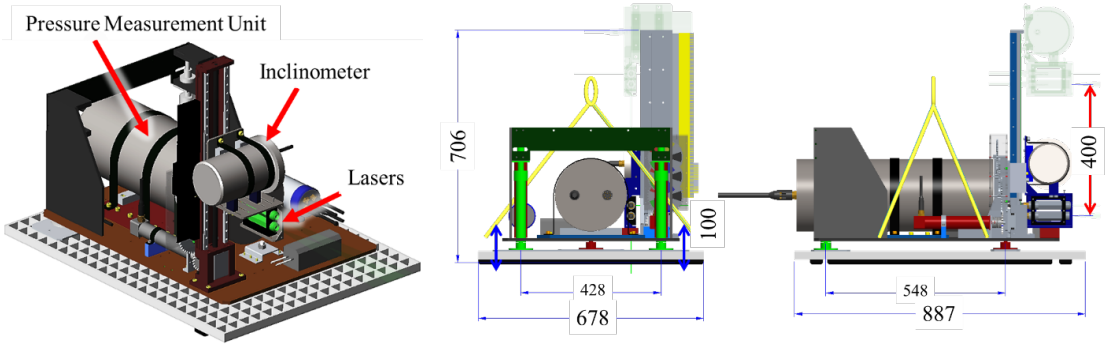


Fig.3-1 Concept image of in-situ calibration for bottom pressure gauge



(a) Overview (b) back and side views

Fig.3-2 3D–CAD Images of level adjust unit

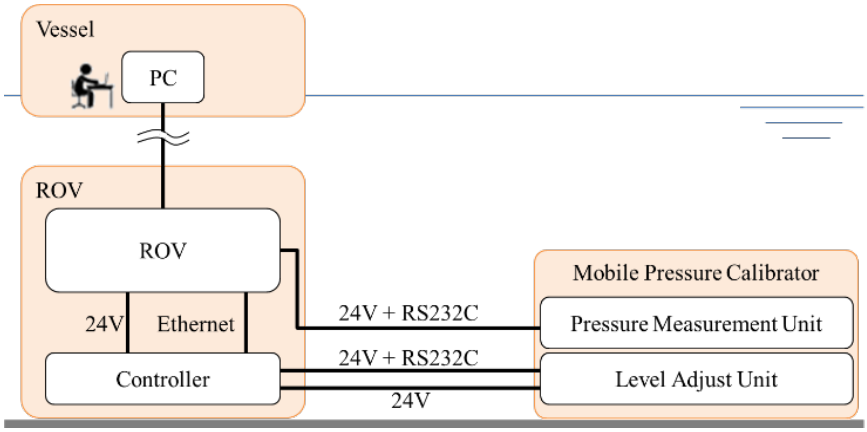


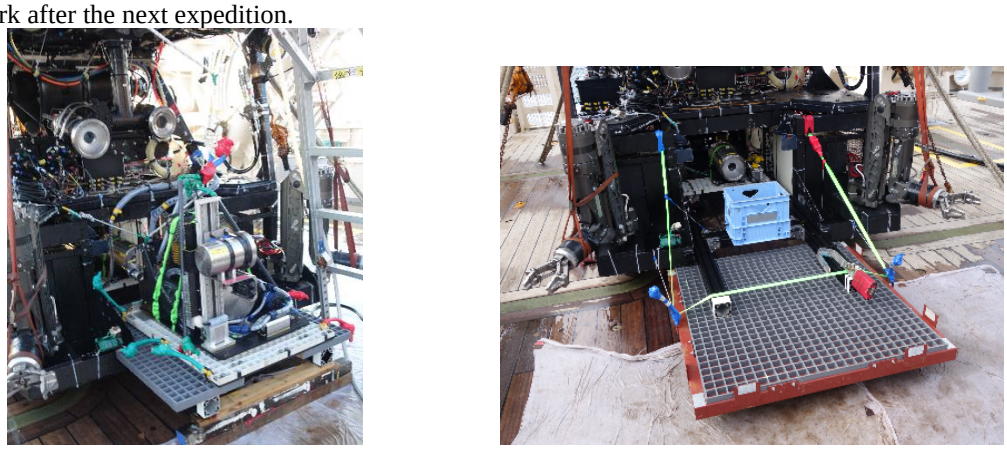
Fig.3-3 Interface connection diagram of mobile pressure calibrator

4. Activities and Results

The purpose of this research is the real time sea floor observation for crustal deformation based on submarine cabled monitoring system for the earthquake and tsunami (DONET) deployed in the Nankai Trough using various sensors, such as pressure gauges, inclinometers and borehole observation system.

The expedition KS-18-J07 was carried out to calibrate the pressure gauge of DONET using the mobile pressure calibrator. The measurement was done at 2C-10. Figure 3-4 shows the pictures taken before diving. The payloads were mounted in front of the ROV Hyper Dolphin shown in picture (a) and (b).

Figure 7 shows pictures taken during the measurement. In Fig.7-(a), the pressure gauge of DONET was shown on the upper right, and the mobile pressure calibrator was shown in the lower left. In this measurement, the calibrator was installed the position where the distance between them is about 2.5 m. As shown in Fig.7-(b), the laser was irradiated to the black and white boundary of the cylinder in the pressure gauge, and the level was measured. At the same time, by subtracting the pressure corresponding to the difference of level from the pressure measured by the MPU, the desired value of DONET pressure gauge can be obtained. A total of three dives were conducted to obtain evaluation data of in-situ calibration. A benchmark was deployed to evaluate the effects of placing on soft sediments for in-situ calibration shown in Fig3-6. The evaluation will be carried out by mounting the mobile pressure calibrator on the benchmark after the next expedition.



(a) mobile pressure calibrator (b) Benchmark

Fig.3-4 Payload with the ROV

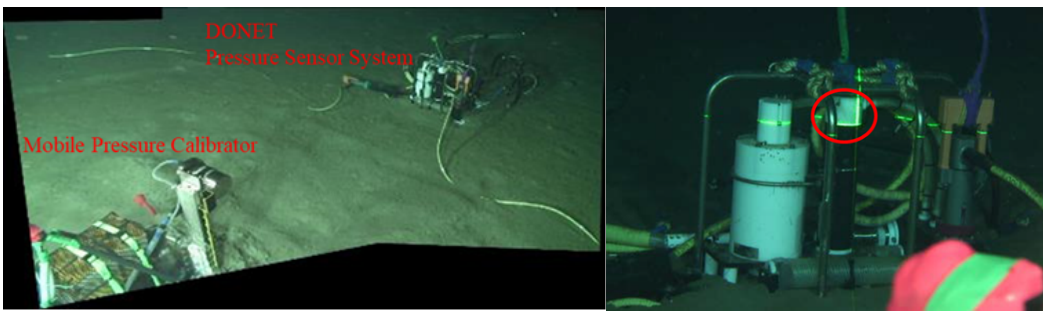


Fig.3-5 Overview of in-situ pressure calibration operation

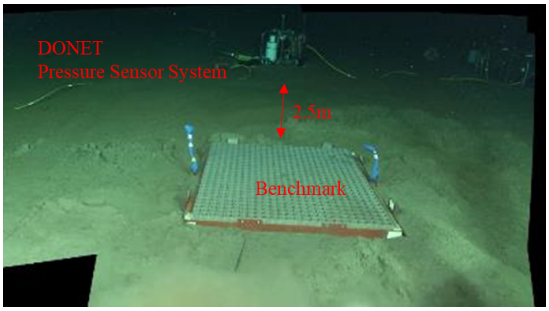
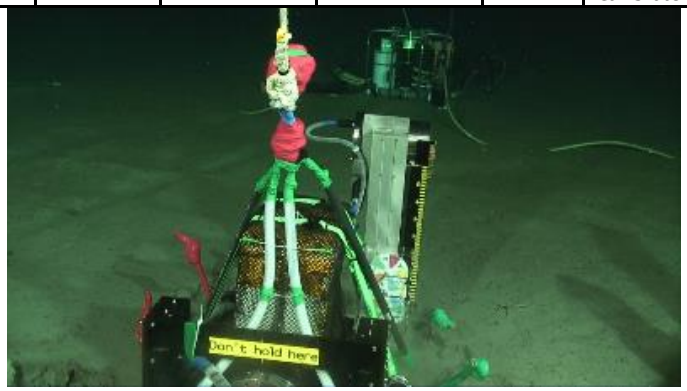
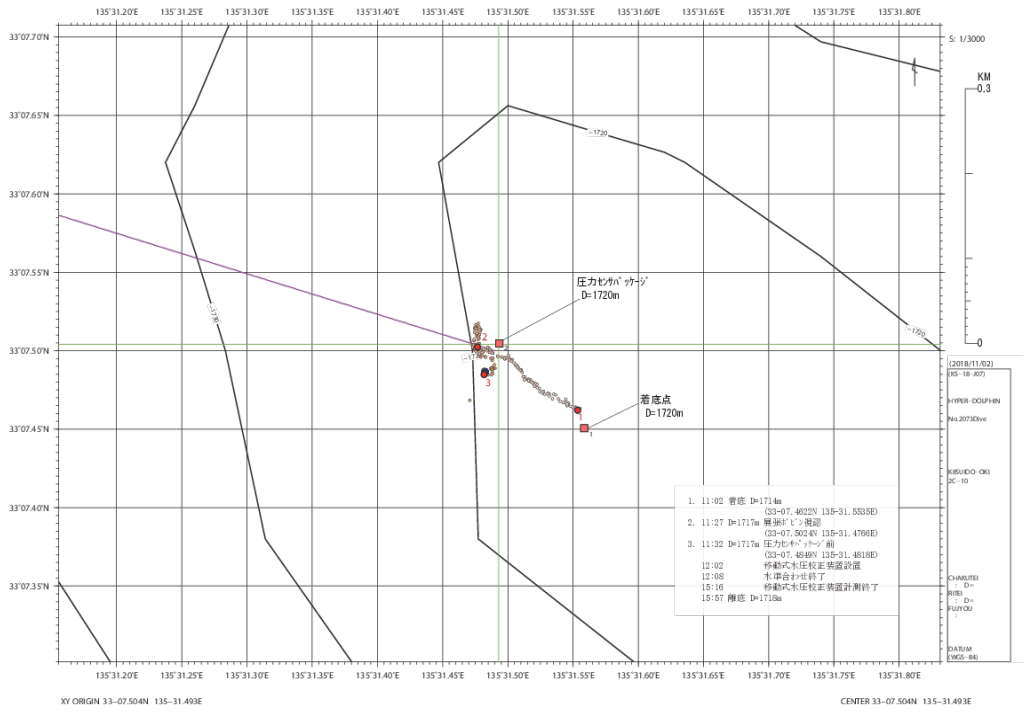


Fig. 3-6 Layout of Benchmark

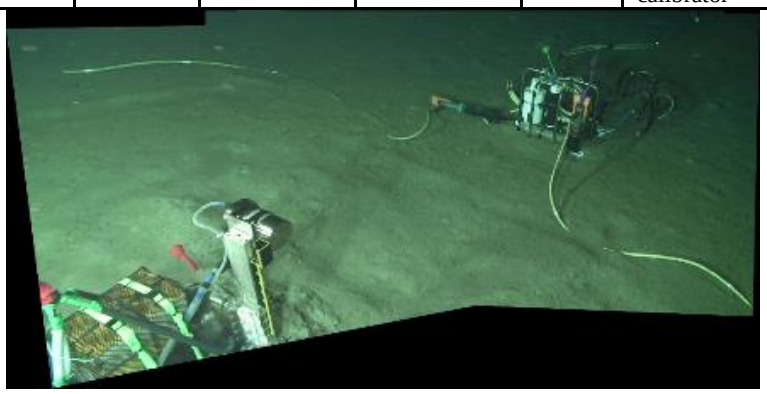
5. Dive Information

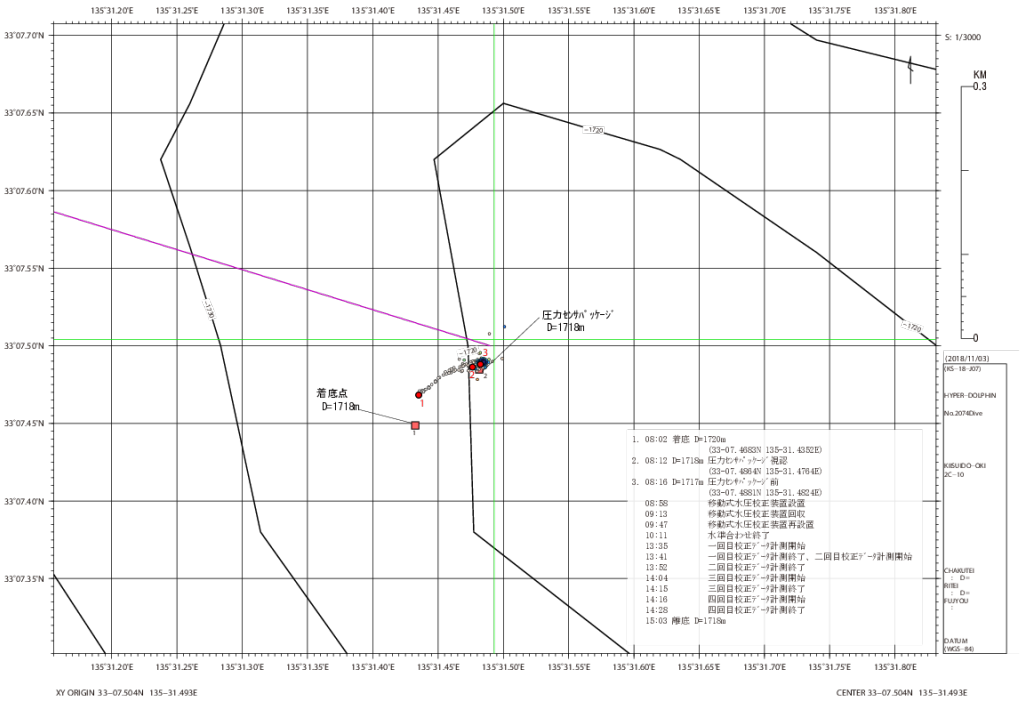
No.	Dive Num. Date	Dive Point	Arrival Time Departure Time	Latitude Latitude	Longitude Longitude	Depth Depth	Work Summary
01	HPD#2073 2018/11/02	2C-10	11:02	33-07.4622N	135-31.5535E	1,717m	After reaching in front of the DONET 2C-10 pressure sensing system, a mobile pressure calibrator was deployed. And then the level difference with the DONET pressure sensor system and the pressure was measured using the mobile pressure calibrator.
			15:57	33-07.4849N	135-31.4818E	1,718m	



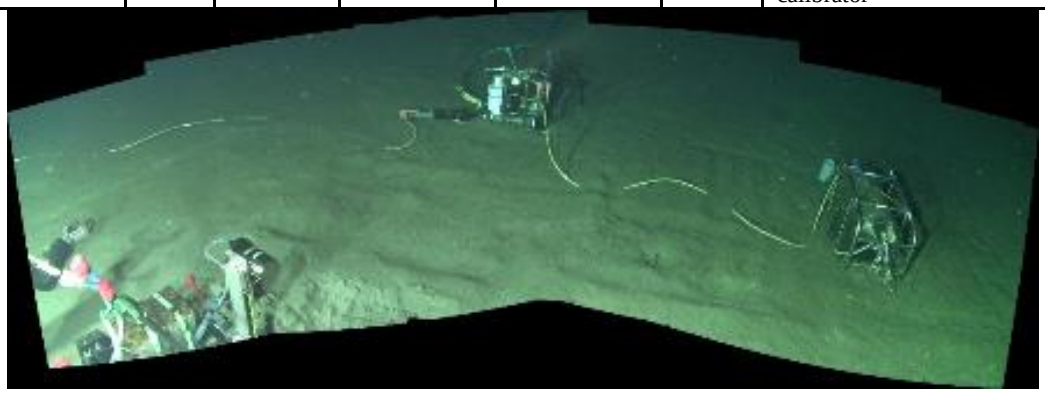


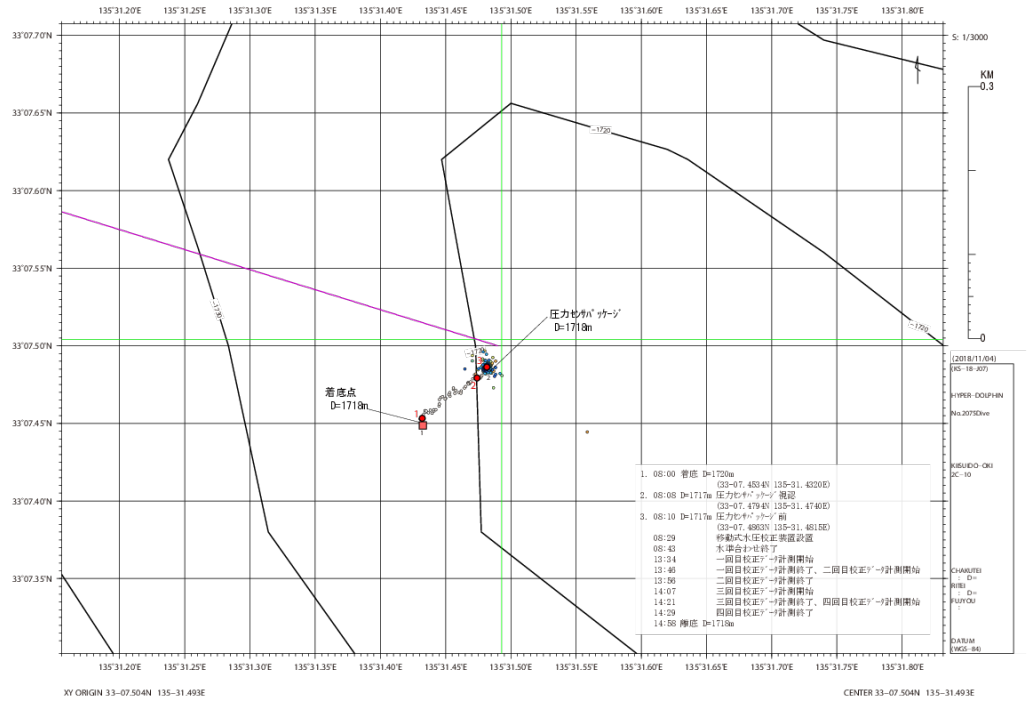
No.	Dive Num. Date	Dive Point	Arrival Time Departure Time	Latitude Latitude	Longitude Longitude	Depth Depth	Work Summary
02	HPD#2074 2018/11/03	2C-10	08:02	33-07.4683N	135-31.4352E	1,720m	After reaching in front of the DONET 2C-10 pressure sensing system, a mobile pressure calibrator was deployed. And then the level difference with the DONET pressure sensor system and the pressure was measured using the mobile pressure calibrator
			15:03	33-07.4881N	135-31.4824E	1,717m	



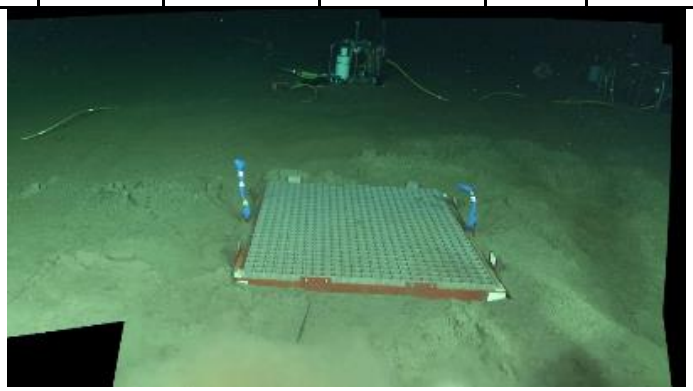


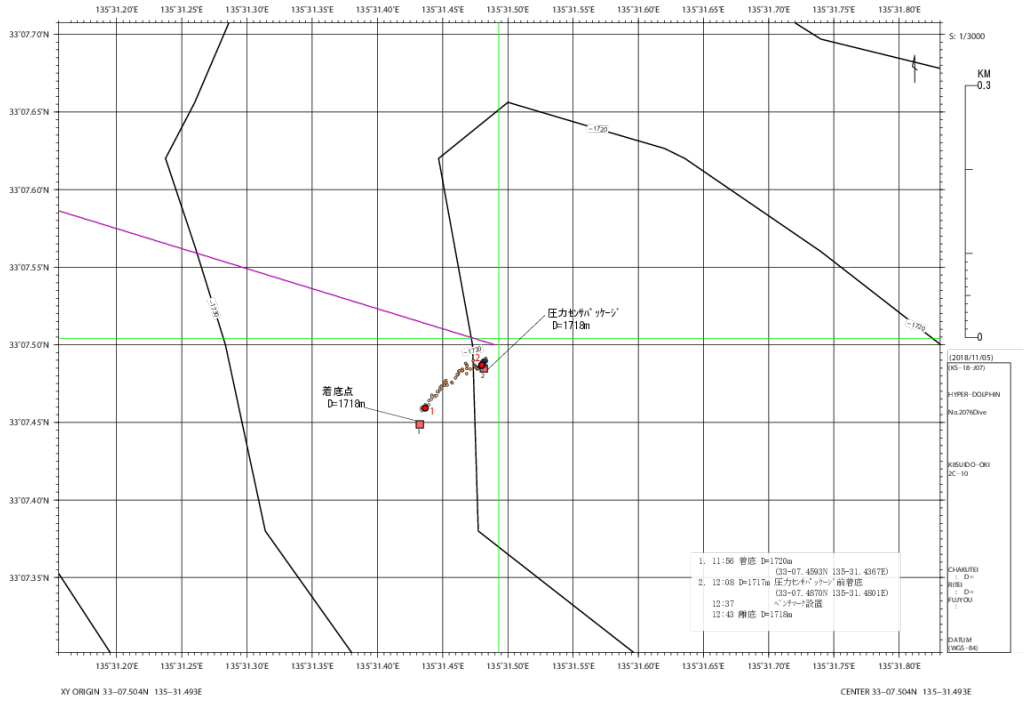
No.	Dive Num. Date	Dive Point	Arrival Time Departure Time	Latitude Latitude	Longitude Longitude	Depth Depth	Work Summary
03	HPD#2075 2018/11/04	2C-10	08:00 14:58	33-07.4534N 33-07.4863N	135-31.4320E 135-31.4815E	1,720m 1,718m	After reaching in front of the DONET 2C-10 pressure sensing system, a mobile pressure calibrator was deployed. And then the level difference with the DONET pressure sensor system and the pressure was measured using the mobile pressure calibrator





No.	Dive Num. Date	Dive Point	Arrival Time Departure Time	Latitude Latitude	Longitude Longitude	Depth Depth	Work Summary
04	HPD#2076 2018/11/05	2C-10	11:56	33-07.4593N	135-31.4367E	1,720m	After reaching in front of the DONET 2C-10 pressure sensing system, a benchmark was deployed.
			12:43	33-07.4870N	135-31.4801E	1,718m	





6. Notice on Using

This cruise report is a preliminary documentation as of the end of cruise.
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