



KAIMEI Cruise Report
KM21-E01

Development of continuous real-time observation system for
crustal deformation

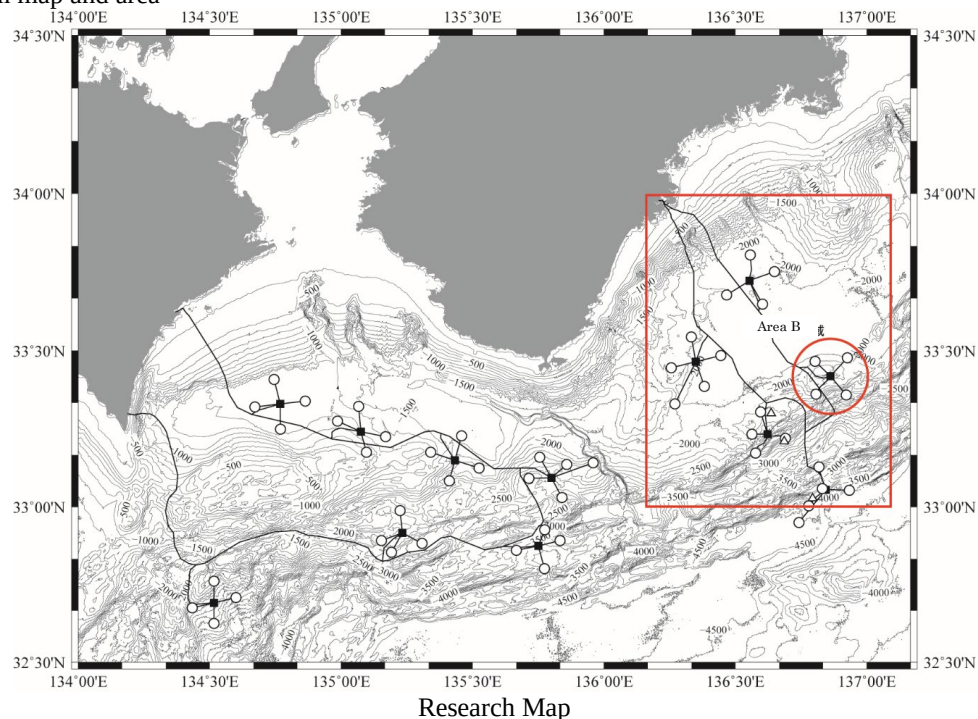
Kumano-nada

19-31 January 2021

Japan Agency for Marine-Earth Science and Technology
(JAMSTEC)

1. Cruise Information

- Cruise ID KM21-E01
- Name of vessel R/V Kaimei
- Title of cruise Development of continuous real-time observation system for crustal deformation
- Chief Scientist [Affiliation] Takashi YOKOBIKI [JAMSTEC]
- Cruise period 19 January 2021 – 31 January 2021
- Ports of departure / call / arrival JAMSTEC Yokosuka – JAMSTEC Yokosuka
- Research map and area



2. Research Proposal and Science Party

- Title of proposal: Development of continuous real-time observation system for crustal deformation
- Representative of Science Party Eiichiro ARAKI [JAMSTEC]
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Toshinori KIMURA [JAMSTEC]
- Science Party Shuhei NISHIDA [JAMSTEC]
Kouji TAKASE [JAMSTEC]
Takashi MURASHIMA [JAMSTEC]
Yoshinobu NANBU [JAMSTEC]
Keisuke TAKAHASHI [JAMSTEC]
Morifumi TAKAESU [NME]
Hisanori IWAMOTO [NME]
Toshikatsu NASU [NME]

3. Research/Development Activities

3.1 BMS#13 on 20 January 2021: Large Diameter Drilling operation.

Drilling operation was conducted to construct the borehole for the tiltmeter. The BMS landed at 33-23.344N 136-53.716E where the depth is 1,881m. The distance between the DONET connection interface unit and the landing point was 67.3m that was measured using the miniature transponder ID:68 on the interface unit. The BMS started drilling operation at 10:58 using the customized drilling tools. The depth of borehole BMS#13-1 was 19m below sea floor. The drilling tools recovering operation was finished at 22:24. Then the BMS shifted to the next drilling point named BMS#13-2. The position of the BMS#13-2 is 33-23.343N and 136-53.686E, the depth is 1880m. The second drilling operation was started at 23:19 and finished the drilling operation at 02:51 in 21st Jan. the borehole BMS#13-2 was made using 5 drilling pipes, and the depth of the borehole is 12m below sea floor. The drilling tools was recovered at 05:27 and the BMS leaved the seafloor.



Fig 3-1 Boring Machine System (BMS)

3.2 KM-ROV Dive#144 on 22 January 2021: Preparation for installation of the tilt-meter.

In this dive, KM-ROV had made flat place on the seabed to place the sensor installation device. in addition, weights were put near the borehole for weight adjustment of KM-ROV when the sensor will be installed. At first, KM-ROV landed southern side of the borehole, and cleared the mud using a suction pump named Dorothy. KM-ROV put two 20kg-weights and a miniature transponder ID:57 and moved toward the borehole BMS#13-2. We glanced at the BMS#13-2 and KM-ROV leaved the seafloor.



Fig. 3-2.1 Borehole BMS#13-1

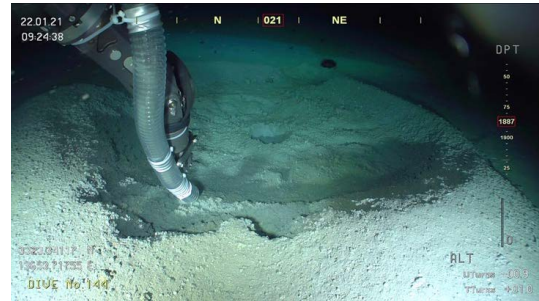


Fig. 3-2.2 Remove the mud using a suction pump

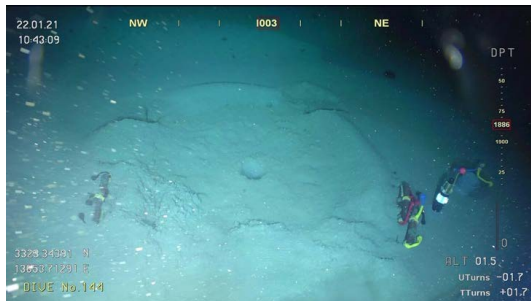


Fig.3-2.3 Miniature transponder ID:57 and weights

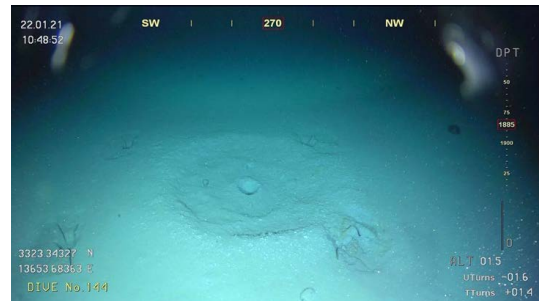


Fig. 3-2.4 Borehole BMS#13-2

3.3 KM-ROV#145 on 23 January 2021: Dummy Run

The depth of the boreholes was checked by dummy run operation using 40kg-weight and hydraulic winch system. The depth of the borehole BMS#13-1 was 19m and the BMS#13-2 was approximately 11m. This dive started at 6 am and finished at 12 am due to bad weather in the afternoon.

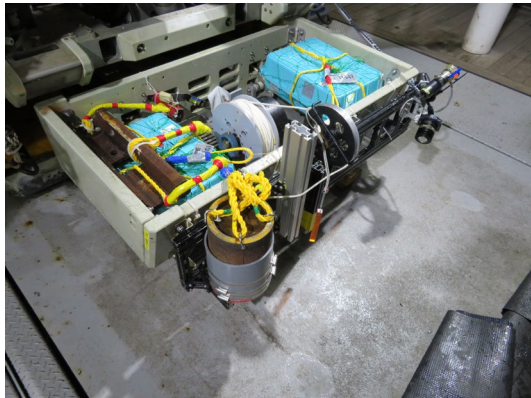


Fig. 3-3.1 40kg-weight and winch system

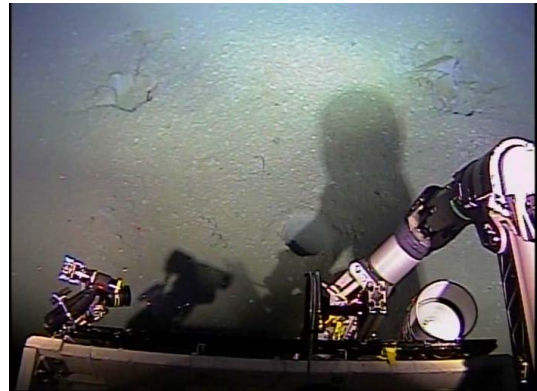


Fig. 3-3.2 Before dummy run at BMS#13-1

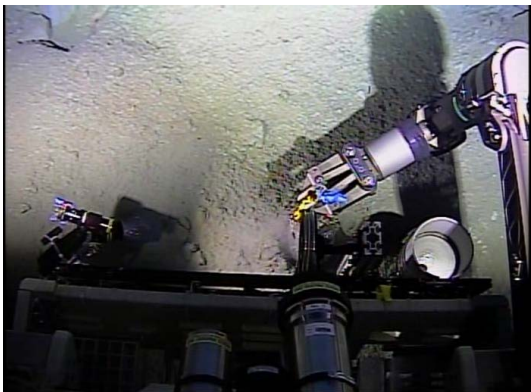


Fig.3-3.3 Check the tension

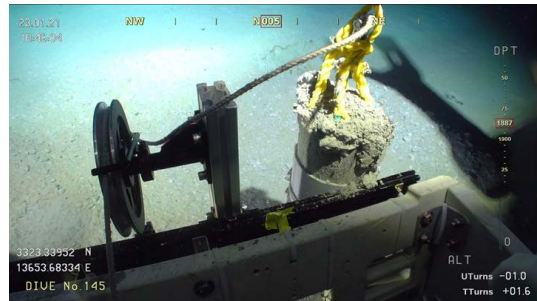


Fig. 3-3.4 After dummy run at BMS#13-1

3.4 KM-ROV#146 on 25 January 2021: Mortar placement

Before dive, we started mortar mixing work from 8 am, and the mortar was pumped to the tank mounted on the back of KM-ROV from 2 pm to 4 pm. The dive was started at 16:51, and KM-ROV landed near the borehole BMS#13-1 at 18:05. The mortar was flow down into the borehole through the 20m hose using mortar pump and the borehole was filled with mortar up to 2m from the bottom. KM-ROV leaved the seafloor at 21:41 and back to the deck at 22:48.

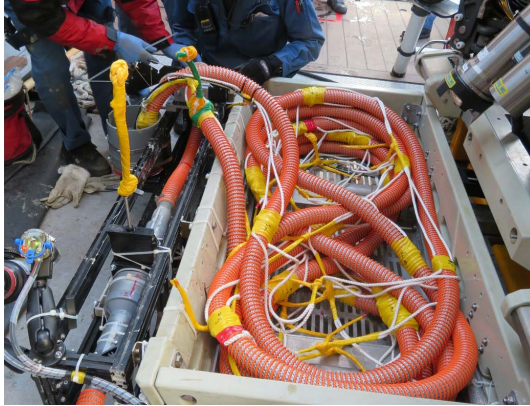


Fig. 3-4.1 20m-hose with mortar in payload space



Fig. 3-4.2 borehole protector

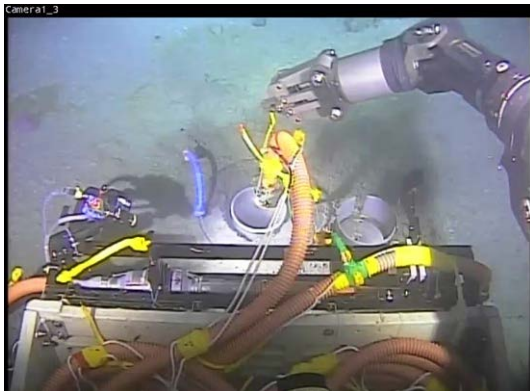


Fig.3-4.3 Starting hose-descent operation

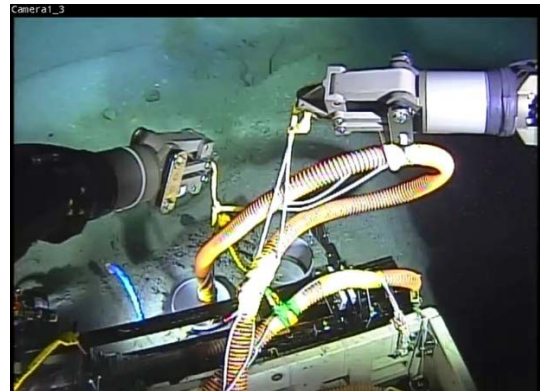


Fig. 3-4.4 Hose-descent operation

3.5 KM-ROV#147 on 26 January 2021: Tilt-meter installation

The Tilt-meter was installed in the borehole BMS#13-1. Tilt-meter was set to the installation device that had hydraulic winch for descending tilt-meter in the borehole. The winch was connected to the hydraulic system of the KM-ROV, and the installation device was attached to the customized payload stage. KM-ROV started diving at 5:38, and she arrived at the borehole at 6:30. The installation operation was conducted from 6:30 to 8:45, and the tilt-meter was installed in the mortar at an inclination of 0.2 degrees. After disconnecting the installation device, she leaved the seafloor at 9:45.

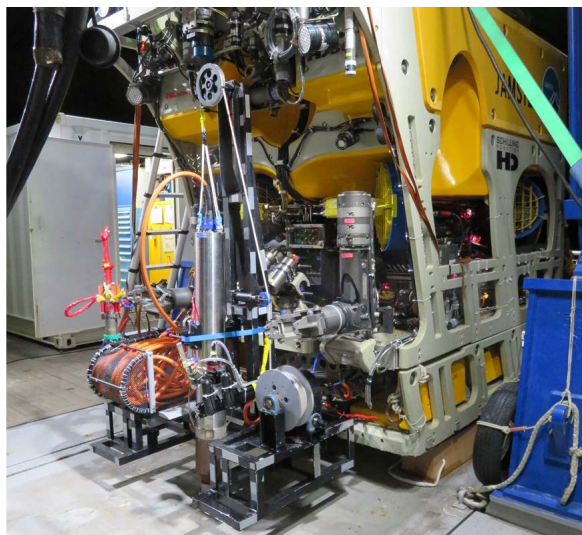


Fig. 3-5.1 Tilt-meter and installation device

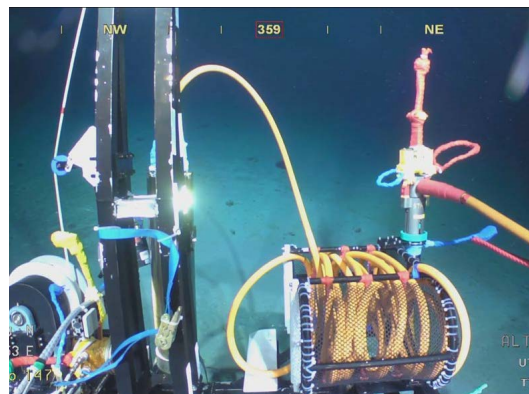


Fig. 3-5.2 Starting descent the tilt-meter

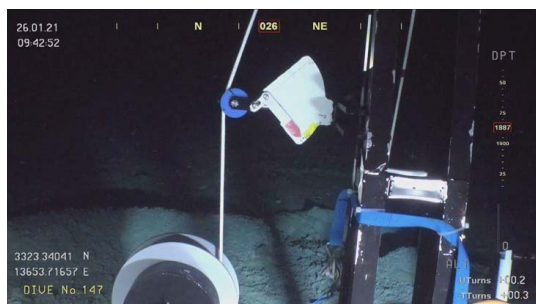


Fig.3-5.3 Confirmed by tension that the tilt-meter reached the bottom

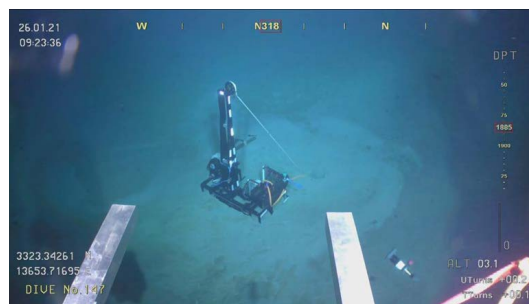


Fig. 3-5.4 Installation device detached from KM-ROV

3.6 KAIMEI Winch on 26 January 2021: Sandbags placement

The sandbags were placed on the seabed using the on-board winch, to fill the borehole with sand in the next dive. The operation was carried out from 13:00 to 16:30, and total 59 sandbags were dropped approximately 60m north of the borehole BMS#13-1 in two operations.

3.6 KM-ROV#148 on 30 January 2021: Preparation of back-filling

In this dive, the sandbags which were dropped on the seafloor on 26 January were moved near the borehole BMS#13-1. The sandbags were in two groups on the seabed. we found Group#1 at 33-23.377N, 136-53.704E in depth of 1,881m and Group#2 were in 33-23.377N, 136-53.713E in 1,883m depth. Miniature transponder ID:60 was put near the group#2. Three sandbags were located outside the two groups, so KM-ROV picked them up and carried them to the borehole BMS#13-1 and conducted trial of burial operation. 18 sandbags were carried near the borehole BMS#13-1, and then KM-ROV leaved the seafloor.



Fig. 3-6.1 Sandbags of Group #1



Fig. 3-6.2 Sandbags of Group #2



Fig.3-6.3 Backfilling trial



Fig. 3-6.4 Moved sandbags

4. Notice on Using

This cruise report is a preliminary documentation as of the end of cruise.
This report is not necessarily corrected even if there is any inaccurate description (i.e. taxonomic classifications). This report is subject to be revised without notice. Some data on this report may be raw or unprocessed. If you are going to use or refer the data on this report, it is recommended to ask the Chief Scientist for latest status.
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