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KAIREI Cruise Report

KR11-04 Leg1

Off Cape Muroto

Feb.19, 2011-Feb.22, 2011

Japan Agency for Marine-Earth Science and Technology

(JAMSTEC)

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1. Cruise Information

- Cruise ID: KR11-04 Leg1
- Name of vessel: Kairei
- Title of the cruise KR11-04 Leg1
- Title of proposal: Development of repair method for submarine cables on the seabed
- Cruise period: 19 Feb. 2011 – 22 Feb. 2011
- Ports of call: Wakayama port – Wakayama port
- Research area: Off cape Muroto
- Research Map

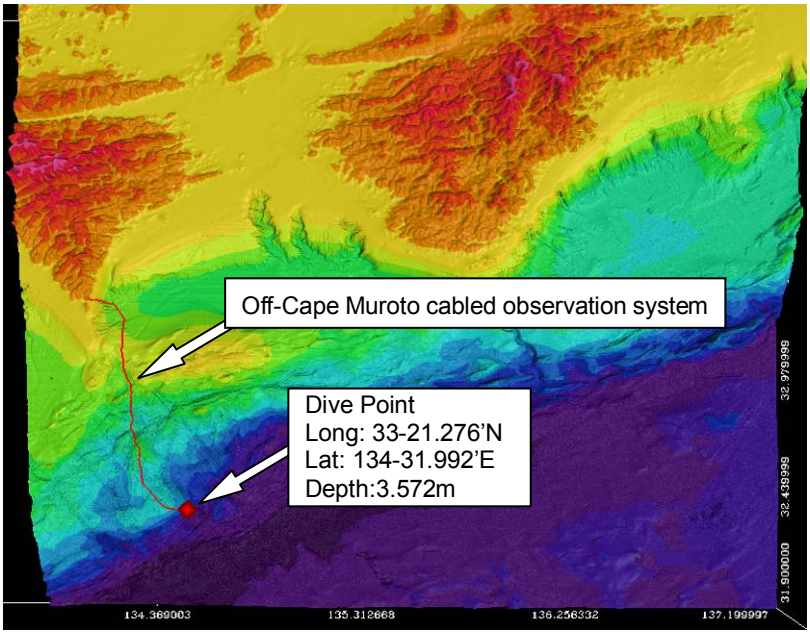

Figure 1 Dive point and Off-cape Muroto cabled observation system

2. Researchers

- Chief scientist Takashi Yokobiki[JAMSTEC]
- Representative of the science party: None
- Science party (List) :None

3. Observation

(1) Background

Submarine cabled observation system can provide wide band communication line and it can also feed electric power to the deep-sea observatories. Therefore, it is possible to carry out long-term real-time monitoring with several kinds of sensors.

Optical submarine telecommunication cable is utilized for deep-sea cabled observation systems. In case of cable failure, it is repaired by the conventional repair method that is developed with the submarine telecommunication cable system. This method pulls up a damaged part of cable and lays a spare cable; therefore the operation requires a cable ship. In case of cable failure in a cabled observation system, it takes long period to prepare a cable ship and spare cable. As a result, it takes great cost and time to re-start the observation system. In this study, the underwater repair method for a damaged insulator of submarine cable has been developed to re-start the cabled observation system quickly. ROV is used instead of cable ship, and the spare cable is unnecessary in this new repair method.

(2) Field test

The main purpose of this field test was to find the damaged position of the submarine cable and to confirm the underwater repair method.

To find the damaged position, EL sensor was used. The sensor can measure 25Hz signal named TONE signal on seabed. The tone signal is transmitted from the landing station and the signal cannot pass through the damaged position; we can detect the damaged position with EL sensor.

To confirm the repair method, sample cable that was damaged on purpose will be repaired on seabed.

The method use equipment that is composed of two cylinders, mixer, installation jig, and shield. And the method use resin as insulator that is cured in pressured sea water. When two raw materials are mixed, the resin begins to polymerize and cure. In addition, one of the raw material and mixed material are immiscible to sea water. The two cylinders contain raw material individually. When the pistons are pushed down, this device acts as a pump. The mixer is the static mixer that uses flow energy to mix the materials. The shield is made by the two semicylindrical configurations that can cover and guard the damaged part of cable, and there is a space between the cable and the shield to fill a resin. The installation jig makes easy to attach the shield. Before dive, the raw materials are divided by the valve, and sea water is filled in the tube between the shield and the check valve. Figure 2 shows the conceptual diagram of the devices.

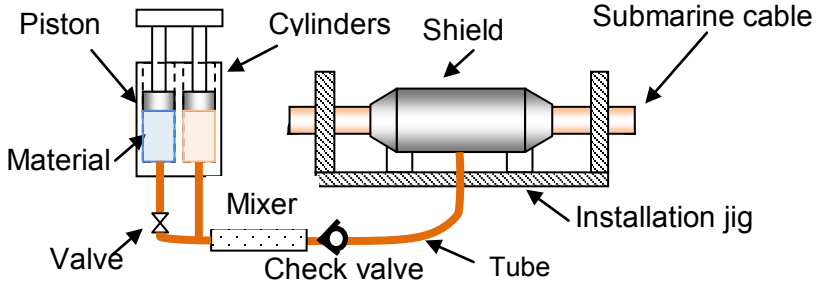

Figure 2 Conceptual diagram of underwater repair method

3) Results

Three dives were scheduled in the primary plan. But the first day of the dive was canceled to check the winch of KAIKO.

In 20th Feb, The KAIKO dived to the Deep Sea Observatory (DSO) of the off-cape Muroto cabled observation system. After the KAIKO touched down near the DSO, Tone signal transmitted from the landing station to detect the fault point, and the very slight tone signal was measured by the EL sensor. To find the fault point, KAIKO moved 140m along the submarine cable near the DOS. Because the weather became worse; we quitted searching and started to confirm the repair method at 11:44.

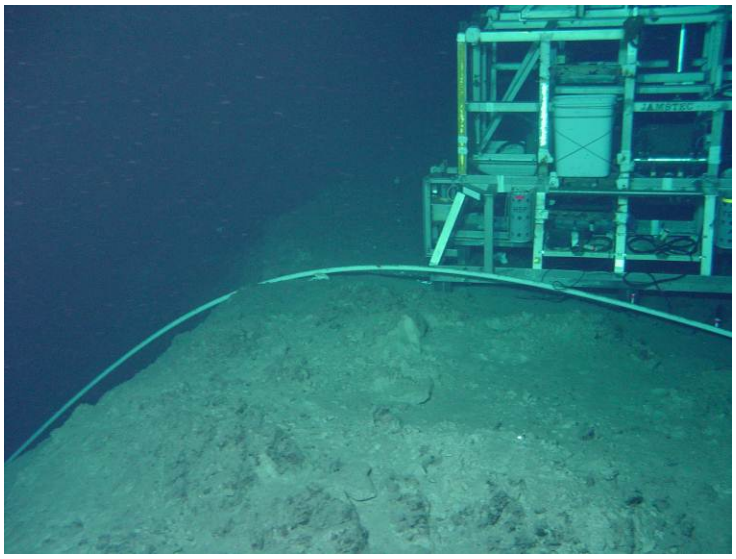

Photo 1 DSO and submarine cable of the off-cape Muroto cabled observation system

KAIKO returned to DOS and put the installation jig on the seabed. The submarine cable of the off-cape Muroto cabled observation system was laid on the jig, and confirmed that the shield can be attached to a laid submarine cable.

The shield was attached to a test cable to check the repair method. All equipment worked very well and the resin was injected into the shield. The test cable was get back onto the ship, and it was confirmed that the resistance between the copper tube and sea water were infinity ohm at 1000 volt. The field test of the underwater repair method was successful.

4. Notice on Using

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