



R/V Yokosuka Cruise Report

YK20-17

Research of long-distance navigation and observation
using AUV-NEXT

Nov. 16, 2020 - Nov. 25, 2020

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

Contents

1. Cruise Information

2. Researchers

3. Research of long-distance navigation and observation using AUV-NEXT

4. Notice on Using

1. Cruise Information

- Cruise ID: YK20-17
- Name of vessel: R/V Yokosuka
- Title of the cruise:
Research of long-distance navigation and observation using AUV-NEXT
- Cruise period: November 16, 2020 - November 25, 2020
- Ports of departure / call / arrival: Yokosuka (JAMSTEC) - Yokosuka (JAMSTEC)
- Research area: Sagami Bay, Suruga Bay, and Off Kii Peninsula
- Research Map

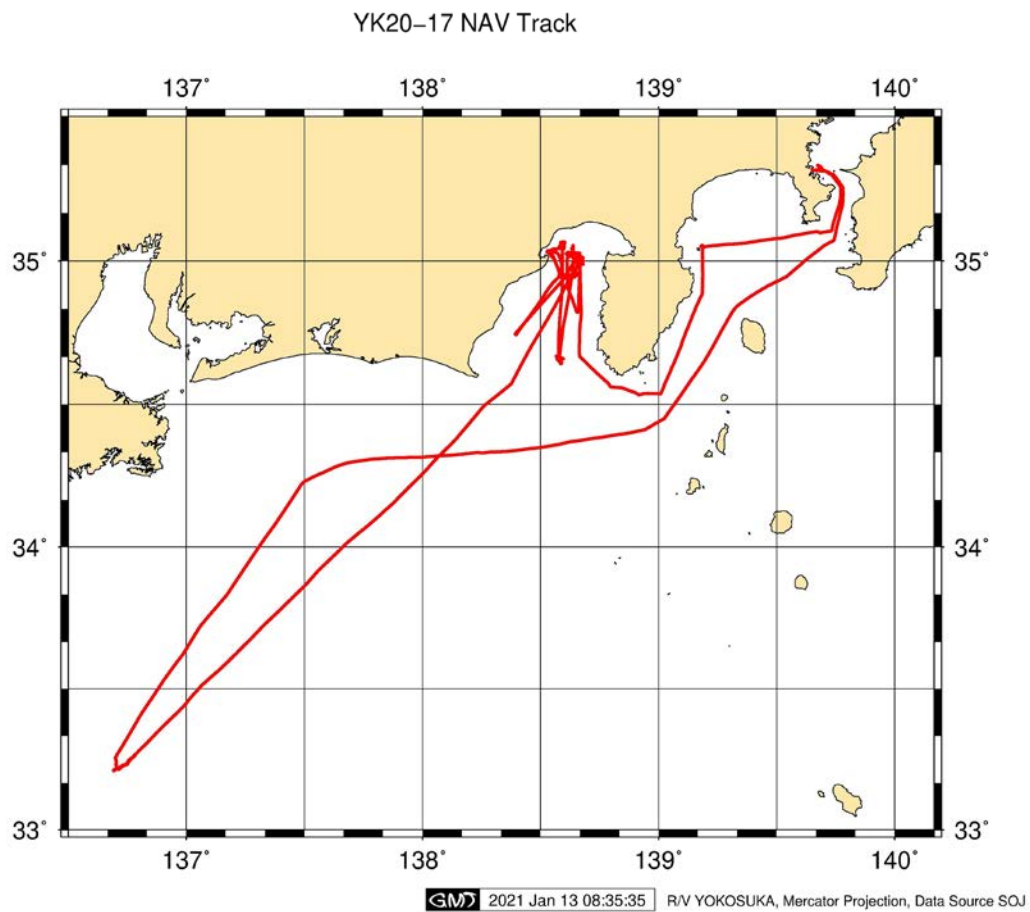


Fig.1 Cruise track of YK20-17

2. Researchers

- Chief Scientist [Affiliation]: Takeshi Nakatani [JAMSTEC]
- Representative of the Science Party [Affiliation]: Kenji Nagahashi [JAMSTEC]
- Onboard scientist [Affiliation]
 - Takeshi Nakatani [JAMSTEC]
 - Tadahiro Hyakudome [JAMSTEC]
 - Takao Sawa [JAMSTEC]
 - Yosaku Maeda [JAMSTEC]
 - Tatsuya Aso [JAMSTEC]
 - Takafumi Omura [Clover tech Inc.]
 - Shigeo Matsuda [Clover tech Inc.]
 - Masanao Sumiyoshi [Japan Coast Guard]
 - Miki Morioka [Nippon Marine Enterprises, Ltd.]

3. Research of long-distance navigation and observation using AUV-NEXT

- Purpose

This cruise was conducted to test long-distance navigation of "AUV-NEXT" and data recovery via wireless optical communication. Sea trial off Kii Peninsula was planned to operate the vehicle all day and verify long-distance navigation system including navigation control, observation, and acoustic communication functions. And, a newly developed optical wireless communication device was mounted for the data recovery from "Free-Fall Camera system" on seafloor.

- AUV "AUV-NEXT"

AUV "AUV-NEXT" was developed as a testbed in a project "Development of next-generation system for deep-sea exploration" in JAMSTEC in 2018. "AUV-NEXT" is a 4,000m class cruising AUV. The main purpose is seafloor sonar mapping of vast area with high speed. The vehicle has a capability to cruise at 3knot for 40hours.



Fig.2 AUV "AUV-NEXT"

Table 1 Specifications of “AUV-NEXT”

Size[L×B×H] (m)	5.6 x 1.8 x 1.7
Mass in air(kg)	2,300
Max. operation depth (m)	4,000
Max. velocity(kn)	4.5
Duration	40hrs@3knot
Power supply	Li-ion

- Free-Fall Camera system

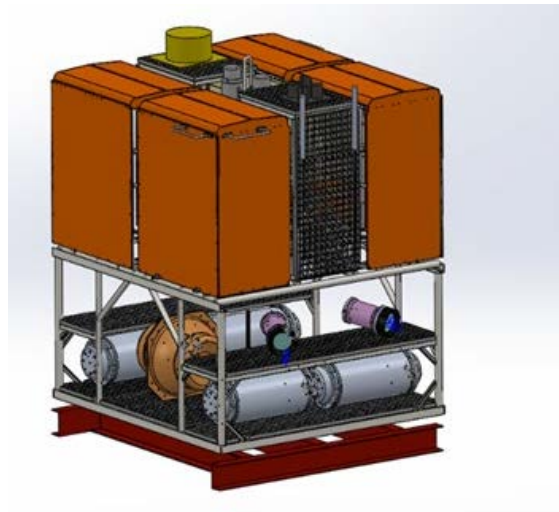


Fig.3 Free-Fall Camera system

Table 2 Specifications of Free-Fall Camera system

Size[L×B×H] (m)	1.6 x 1.7 x 2.2
Mass in air(kg)	1,600
Max. operation depth (m)	9,500
Power supply	Li-ion

- Activities

Table 3 shows the activities of the cruise. Firstly, we conducted tests of “AUV-NEXT” and “Free Fall Camera system (FFC)” respectively. Then, data recovery trial was conducted using optical communication. Fig. 4 shows the test configuration. And finally, a dive of AUV-NEXT was carried out off Kii Peninsula. The dive (AUV-NEXT #21) was conducted only in daytime because of rough sea condition.

Table 3 Schedule of YK20-17 cruise

Date	Activities
Nov. 16	Departured from YOKOSUKA (JAMSTEC pier) Wet test of AUV-NEXT; sonar test on sea surface (Sagami Bay)
Nov. 17	“AUV-NEXT” Dive#17 (Suruga Bay)
Nov. 18	“AUV-NEXT” Dive#18 (Suruga Bay)
Nov. 19	"AUV-NEXT" Dive#19 (Suruga Bay)
Nov. 20	“Free Fall Camera system” #008 (Suruga Bay)
Nov. 21	“Free Fall Camera system” #009 (Suruga Bay) "AUV-NEXT" Dive#20 (Suruga Bay)
Nov. 22	Bound for research area (Off Kii Peninsula)
Nov. 23	"AUV-NEXT" Dive#21 (Off Kii Peninsula)
Nov. 24	Bound for YOKOSUKA (JAMSTEC pier)
Nov. 25	Arrived at YOKOSUKA (JAMSTEC pier)

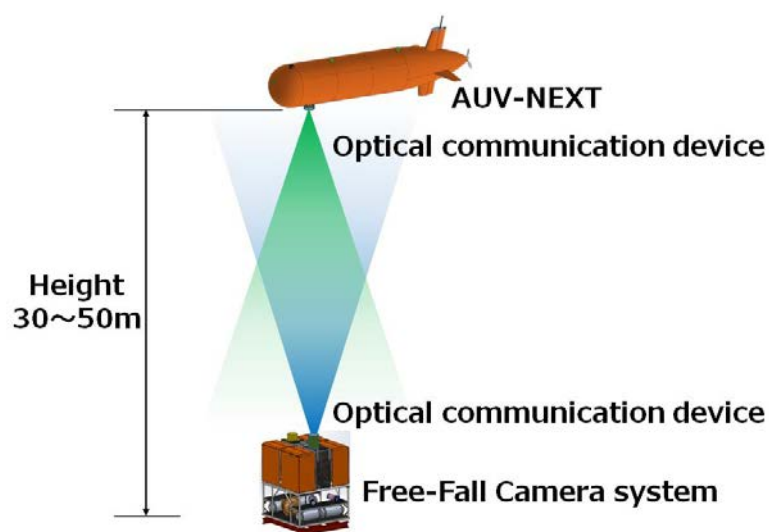


Fig.4 Data recovery from a lander using optical communication

- Results

Firstly, we verified whole system of AUV-NEXT and FFC's acoustic communication and camera logging functions. Then, AUV-NEXT succeeded in cruising above FFC keeping 30-50 meters height.

We succeeded in acquiring high-resolution bathymetry data of Nankai Trough accretionary prism off Kii Peninsula. The trajectory and vertical profile of Dive #21 are shown in Fig.5 and Fig.6, respectively. The maximum operation depth during YK20-17 was 2,683m(Dive#21) off Kii Peninsula.

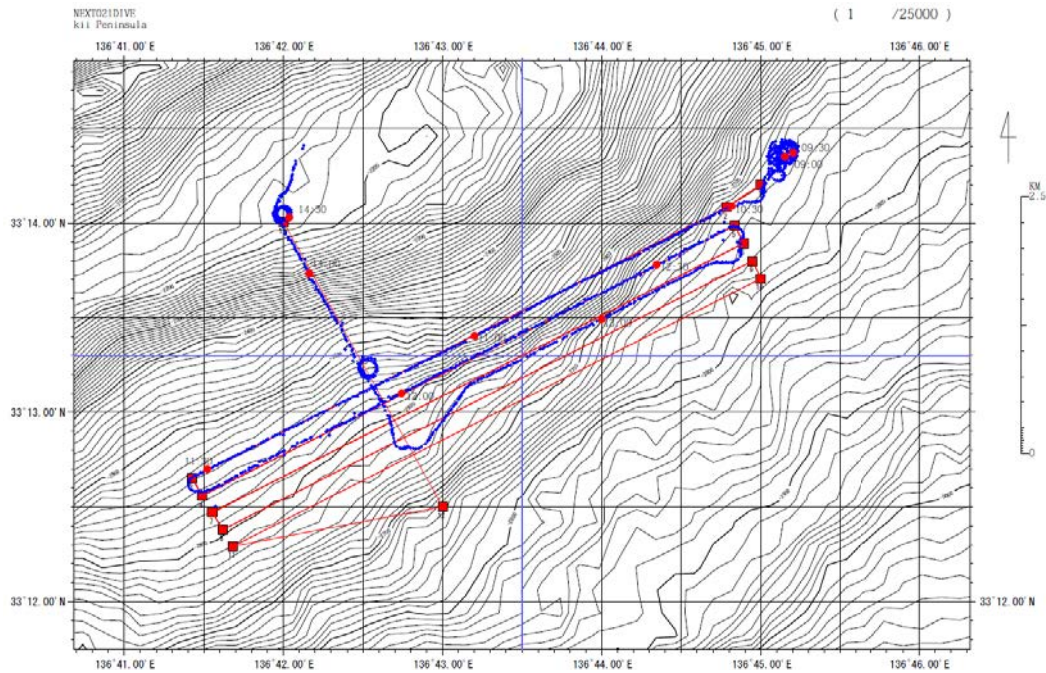


Fig.5 Trajectory of “AUV-NEXT” during Dive #21

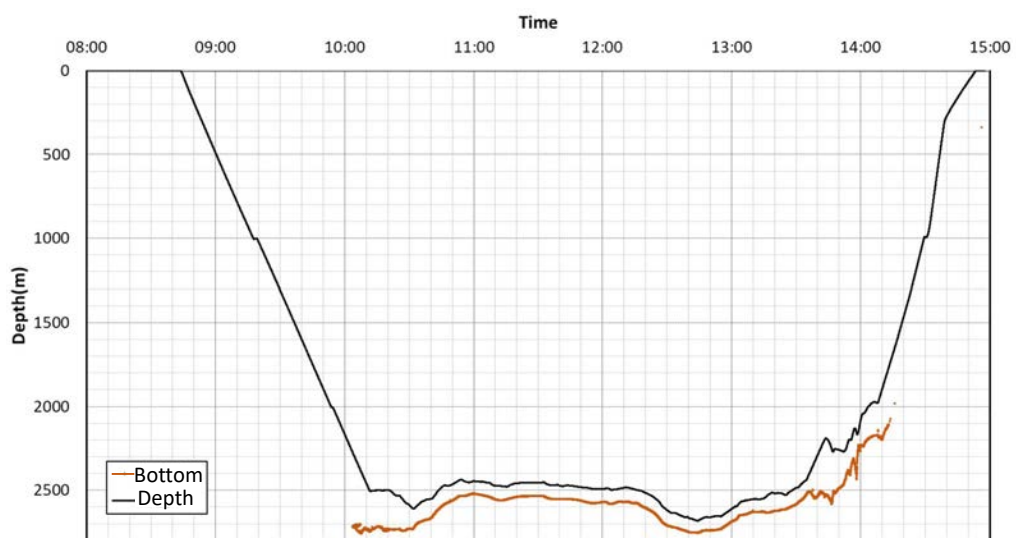


Fig.6 Vertical profile of “AUV-NEXT” during Dive #21

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.

Users of information on this report are requested to submit Publication Report to JAMSTEC.

<http://www.godac.jamstec.go.jp/darwin/explain/1/e#report>

E-mail: submit-rv-cruise@jamstec.go.jp

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