



R/V Yokosuka Cruise Report

YK22-03

Research of automatic observation method
using AUV-NEXT

Feb. 7, 2022 - Feb. 16, 2022

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

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1. Cruise Information

- Cruise ID: YK22-03
- Name of vessel: R/V Yokosuka
- Title of the cruise:
Research of automatic observation method using AUV-NEXT
- Cruise period: February 7, 2022 - February 16, 2022
- Ports of departure / call / arrival: Yokosuka (JAMSTEC) - Yokosuka (JAMSTEC)
- Research area: Sagami Bay, Suruga Bay, and Off Kii Peninsula
- Research Map

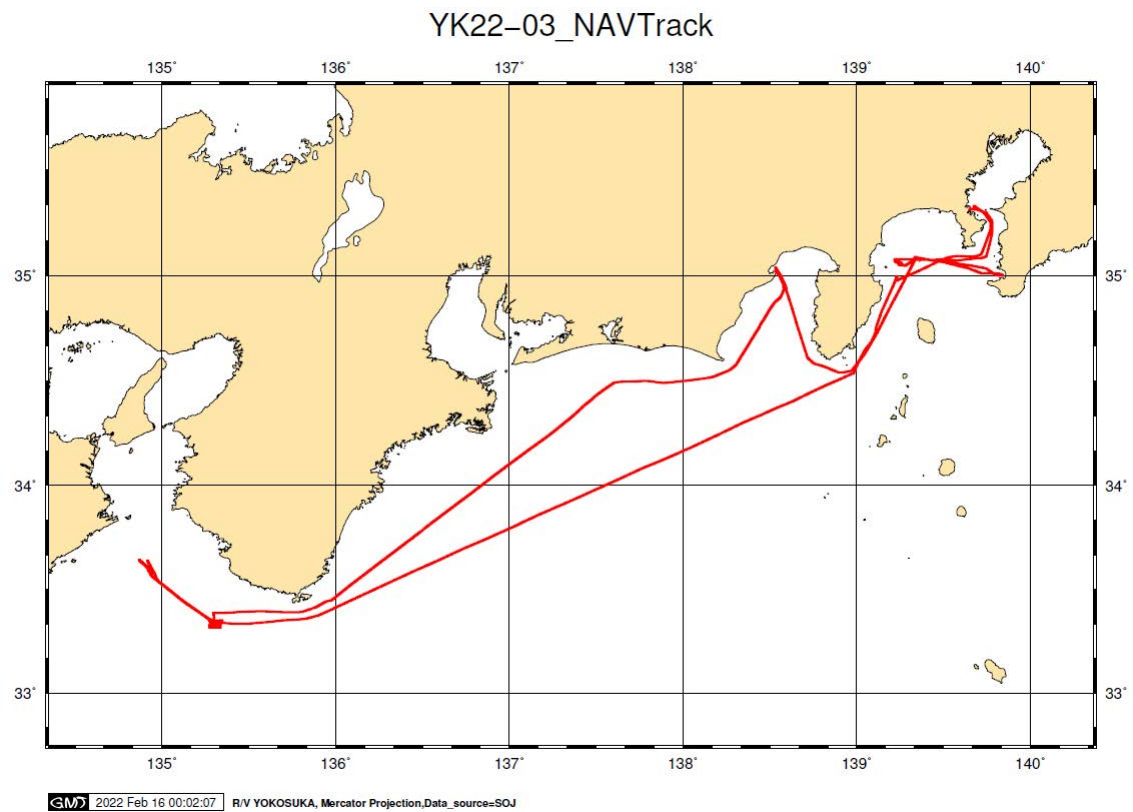


Fig.1 Cruise track of YK22-03

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]
 - Yosaku Maeda [JAMSTEC]
 - Tatsuya Aso [JAMSTEC]
 - Takafumi Omura [Clover tech Inc.]
 - Masanao Sumiyoshi [Japan Coast Guard]
 - Kitoshi Tanaka [Japan Coast Guard]
 - Ryo Oyama [Nippon Marine Enterprises, Ltd.]

3. Research of automatic observation method using AUV-NEXT

● Purpose

In this cruise, tests of optical communication and acoustic positioning were conducted as elemental technologies for robotics-based automation of ocean observations. In the tests, AUV-NEXT cruised above the Free-Fall Camera system (FFC) installed on the seabed,

Firstly, we conducted tests of data collection from FFC to AUV-NEXT via optical communication. Next, we conducted tests of acoustic positioning using FFC as a base station.

In addition, we acquired seafloor topography data for research to contribute to quality unification related to the acquisition and processing of bathymetric data by AUV.

● 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(knot)	4.5
Duration	40hrs@3knot
Power supply	Li-ion

- Free-Fall Camera system

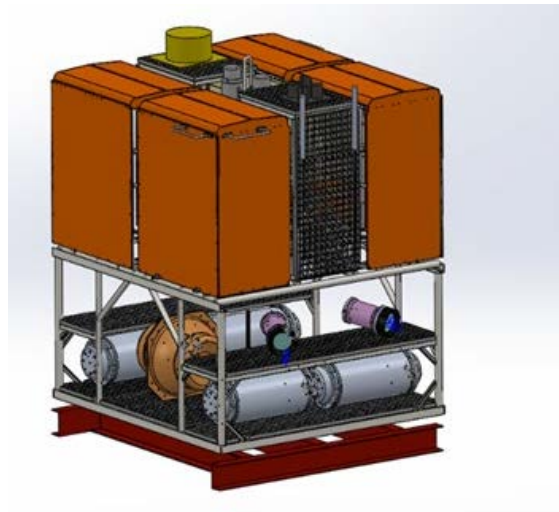


Fig.3 Free-Fall Camera system

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 test dive of “AUV-NEXT” at Sagami Bay. Then, two dives of AUV-NEXT were carried out off Kii Peninsula. Next, tests of optical communication and acoustic positioning were conducted at Suruga Bay and Sagami Bay using AUV-NEXT and FFC. Fig. 4 shows the test configuration in the optical communication.

Table 3 Schedule of YK22-03 cruise

Date	Activities
Feb. 7	Departured from YOKOSUKA (JAMSTEC pier) “AUV-NEXT” Dive#22 (Sagami Bay) Bound for research area (Off Kii Peninsula)
Feb. 8	“AUV-NEXT” Dive#23 (Off Kii Peninsula)
Feb. 9	“AUV-NEXT” Dive#24 (Off Kii Peninsula) Bound for research area (Suruga Bay)
Feb. 10	“Free-Fall Camera system” #010 (Suruga Bay)
Feb. 11	“AUV-NEXT” Dive#25 (Suruga Bay) – Test of optical communication
Feb. 12	"AUV-NEXT" Dive#26 (Suruga Bay) – Test of acoustic positioning Recovery of “Free-Fall Camera system”
Feb. 13	Bound for research area (Sagami Bay) “Free-Fall Camera system” #011 (Sagami Bay)
Feb. 14	Rough State
Feb. 15	"AUV-NEXT" Dive#27 (Sagami Bay) – Test of optical communication Recovery of “Free-Fall Camera system” Bound for YOKOSUKA
Feb. 16	Arrived at YOKOSUKA (JAMSTEC pier)

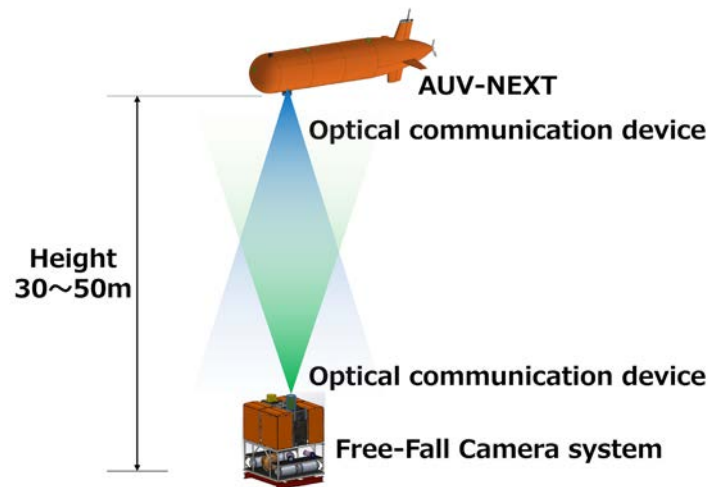


Fig.4 Data collection from a lander using optical communication

- Results

We succeeded in optical communication and acoustic positioning using AUV-NEXT and FFC. For example, Dive #26 was conducted as tests of acoustic positioning. The trajectory and vertical profile of the Dive #26 are shown in Fig.5 and Fig.6, respectively.

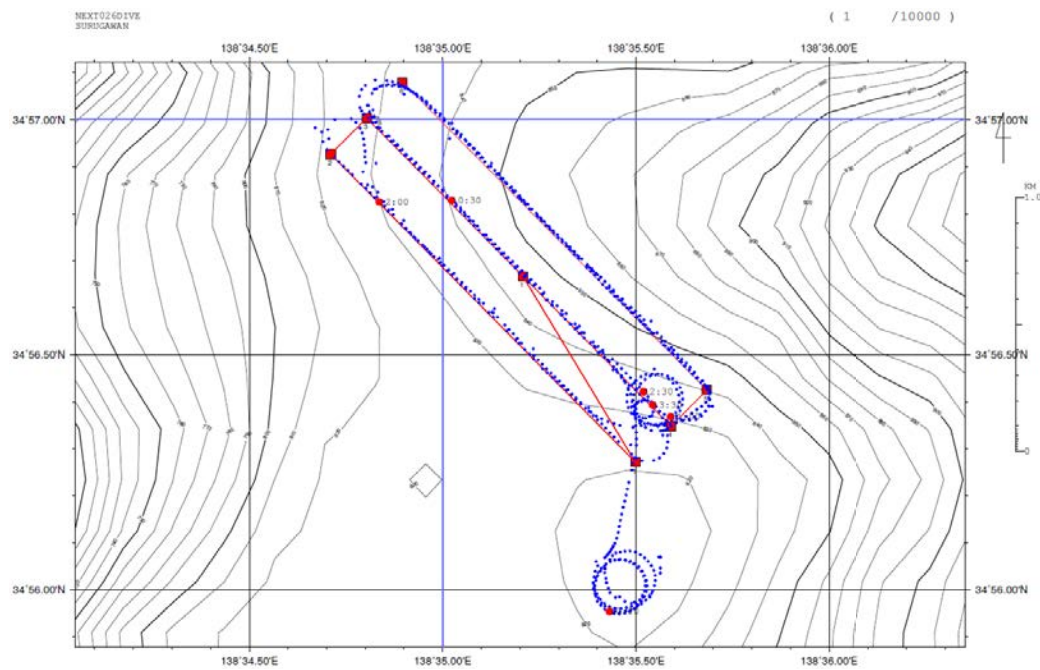


Fig.5 Trajectory of "AUV-NEXT" during Dive #26

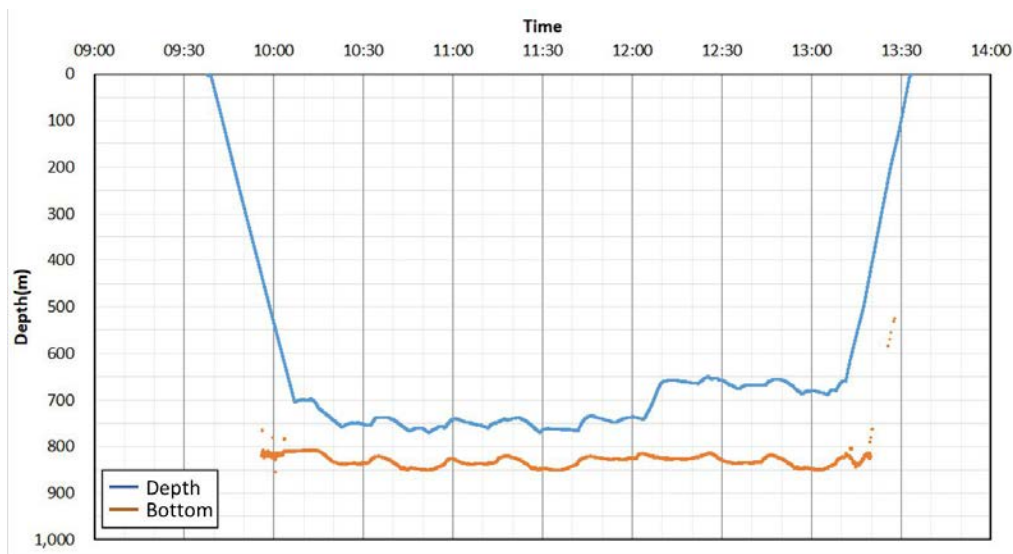


Fig.6 Vertical profile of “AUV-NEXT” during Dive #26

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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