



R/V Yokosuka Cruise Report YK18-05

Acoustic investigation testing relationship between
“acoustically characteristic seafloor”
and shallow inter plate earthquake



Discover “acoustically characteristic seafloor” and Mud Volcano
at off-Shikoku & Hyuga-nada

Off-Shikoku ~ Hyuga -nada

April 29 ~ May 03, 2018

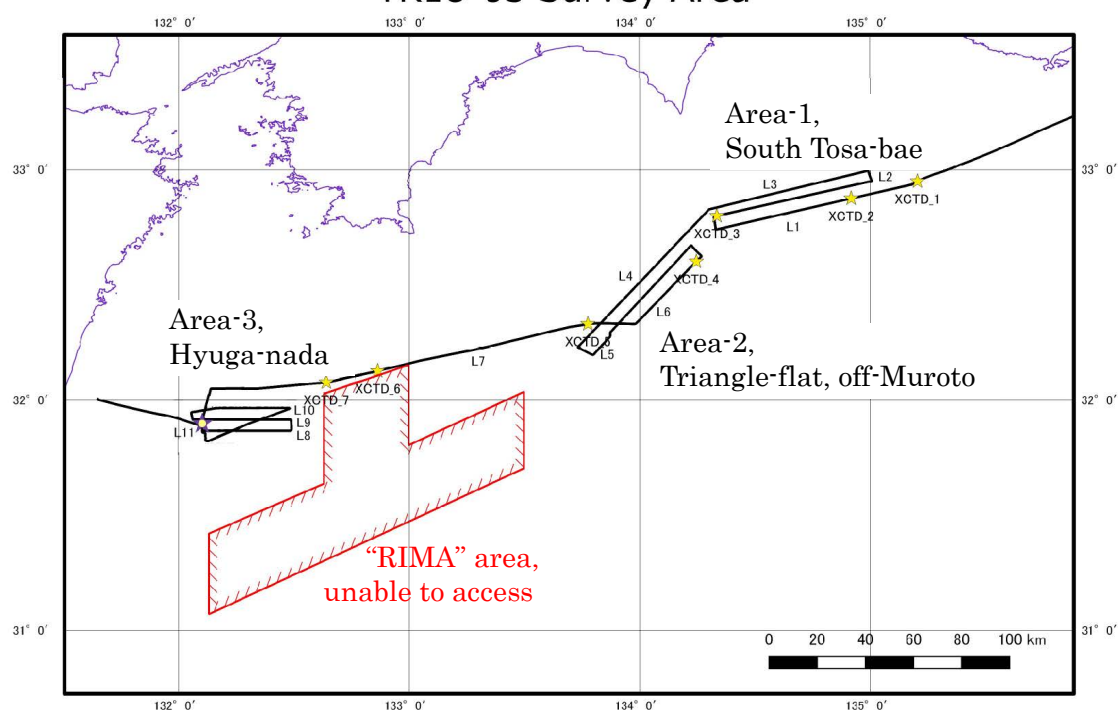
Japan Agency for Marine-Earth Science and Technology
(JAMSTEC)

1. Cruise Information

- cruise number: YK18-05
- research ship: R/V Yokosuka
- Title of cruise:
Acoustic investigation testing relationship between “acoustically characteristic seafloor” and shallow inter plate earthquake
- chief-scientist: Miho Asada [JSPS research fellow/ JAMSTEC]
- date of cruise: 29 April (Yokosuka, JAMSTEC) ~ 03 May 2018 (Miyazaki port), off-Shikoku and Hyuga-nada

- Research map

YK18-05 Survey Area



[QGIS2.18.13] Datum: WGS-84, Scale: 1/1,200,000(A4) Datasource: TERA Shapefile [Copyright 2016-2017 NME]

2. Science Party

• Science Party [Affiliation, assignment etc.]

Chief Scientist	浅田 美穂/ Miho Asada [学振特別研究員/JSPS・JAMSTEC]
Co-chief scientist	岩井 雅夫/ Masao Iwai [高知大学/Kochi University]
Scientist	蔣 景彩/ Juang Jing-Cai [徳島大学/Tokushima University]
Scientist	川村 喜一郎/ Kiichiro Kawamura [山口大学/Yamaguchi University]
Scientist	福地 里菜/ Rina Fukuchi [東京大学大気海洋研/AORI, Univ. of Tokyo]
Student	権 容大/ Yodai Gon [徳島大学/ Tokushima Univ.]
Student	久高 大志/ Taishi Kudaka [山口大学/ Yamaguchi Univ.]
Scientific Technician	久野 光輝/ Mitsuteru Kuno [日本海洋事業株式会社/MNE]

● Yokosuka Crew

船 長/Captain	中村 義行/ YOSHIYUKI NAKAMURA
一航士/Chief Officer	三森 靖彦/ YASUHIKO SAMMORI
二航士/2nd Officer	大原 登志世/ TOSHIYO OHARA
三航士/3rd Officer	山口 諒/ RYO YAMAGUCHI
機関長/Chief Engineer	阿部 正/ TADASHI ABE
一機士/1st Engineer	黒瀬 航/ WATARU KUROSE
二機士/2nd Engineer	池口 健太/ KENTA IKEGUCHI
三機士/3rd Engineer	貝野 潤華/ YUNA KAINO
電子長/Chief Electronic Op.	小牧 洋介/ YOSUKE KOMAKI
二電士/2nd Electronic Op.	松井 凌允/ RYOSUKE MATSUI
三電士/3rd Electronic Op.	鬼久保 竜師/ RYUJI ONIKUBO
次三電士/Jr.3rd Electronic Op.	瀧 美里/ MISATO TAKI
甲板長/BoatSwain	大端 正則/ MASANORI OHATA
甲板手/Quarter Master	小笠原 一美/ KAZUMI OGASAWARA
甲板手/Quarter Master	村田 海人/ KAITO MURATA
甲板手/Quarter Master	永井 大誠/ HIROAKI NAGAI
甲板員/Sailor	小島 真也/ SHINYA KOJIMA
甲板員/Sailor	村井 恭平/ KYOHEI MURAI
甲板員/Sailor	朝國 知希/ TOMOKI ASAKUNI
甲板員/Sailor	徳永 拓真/ TAKUMA TOKUNAGA
操機長/No.1 Oiler	毛利 淳司/ JUNJI MORI
操機手/Oiler	小崎 誠/ MAKOTO KOZAKI
操機手/Oiler	渡辺 拓也/ TAKUYA WATANABE
操機手/Oiler	高宮 葵/ AOI TAKAMIYA
司厨長/Chief Steward	小路 清隆/ KIYOTAKA KOSUJI
司厨手/Steward	福村 秀夫/ HIDEO FUKUMURA
司厨手/Steward	村上 勘十郎/ KANJURO MURAKAMI
司厨員/Steward	柏木 孝一郎/ KOICHIRO KASHIWAGI
司厨員 Steward	篠原 晃基/ KOKI SHINOHARA

3. Research/Development Activities

● (Individual activity title)

- **Responsible personnel:** Miho Asada,

- **Purpose, background**

Mud volcano is one of geological features that brings sediment and fluid from depth to surface. Most of mud volcanoes in Japan have known in offshore areas, such as the Kumano basin and off-Tanegashima areas. Kumano Basin is also known as a field of shallow slow slip events occur. If mud volcano in the Kumano Basin brings sediment from depth within ten km below seafloor, it may cover a megasplay fault plane and plate boundary. And if there are origin of mud volcanoes along fault plane, it should be change slipping mechanism of fault. A similar tectonic setting may be considered at off-shikoku and Hyuga-nada areas. To test the idea that “relationship between offshore mud volcano distribution and shallow slow slip events”, we conducted acoustic investigation along coast of SW Japan to search unknown mud volcanoes, especially in off-shikoku and Hyuga-nada areas those mud volcanoes are not formally reported.

- **Activities (observation, sampling, development), Methods, and instruments**

1. Acoustic observation

- multibeam echo sounder (Kongsberg, EM122): bathymetry, backscatter intensity

Multi-beam echo sounder was used to draw high-resolution bathymetry map and distribution of backscatter strength on seafloor.

Model: EM122

Frequency (kHz): 12

Swath: 120° along the first night survey, and 100° for following lines

Beam Width: 2°

Number of receiving beams: 288

Number of points: 432 (2×2°)

Real-time Processing: inflection at seafloor and flexion of acoustic signals

Method of seafloor detection: Intensity and phase difference

Pulse length: 2, 5, 15 ms (FM chirp)

Range interval: 2kHz (37cm)

- sub-bottom profiler (EdgeTech, 3300-HM): subseafloor structure

Sub- Bottom Profiler was used to investigate stratigraphic and diapiric features of sedimentary layers during cruise YK18-05.

Model 4×4

Frequency Range (kHz) 2-16

Pulse type FM Chirp

Band width (kHz) 2-16

Pulse length (msec) 5-100

Resolution (cm) 8 (2-12kHz)

Penetration (m) 80 (Max)

Beam width (deg.) 33 (3.5kHz), 24 (4.5kHz), 20 (6kHz)

2. XCTD measurements

- Seven XCTD measurements are performed at the following places.

XCTD-1 : 32°56.2'N / 135°10.8'E,

XCTD-2 : 32°52.5'N / 134°54.9'E,

XCTD-3 : 32°48.0'N / 134°20.0'E,

XCTD-4 : 32°36.5'N / 134°14.6'E,

XCTD-5 : 32°19.8'N / 133°46.2'E,

XCTD-6 : 32°07.6'N / 132°51.5'E,

XCTD-7 : 32°04.6'N / 132°38.0'E.

3. Gravity

- Gravity (LACOSTE and ROMBERG) measurement is conducted through the survey lines.

Model S-63

- Results

- We conducted acoustic investigation along off-Muroto and Hyuga-nada areas, ~2000 m water depth.
- landslide-like bathymetric features are detected by the acoustic investigation

- We discovered a high-backscatter strength area which characterized by isolate mound and shallow valley. A characteristic “scaly facies”, a kind of high-backscatter strength pattern, meaning relatively harder seafloor is also discovered over the area where ~25 km toward west from the high-backscatter area.
- Mud volcano-like acoustic features, those seems like off-Tanegashima area, have recognized over the observed Hyuga-nada area.
- Acoustic signals within water column have observed at the foot of scarp of the Hyuga-nada area. Other weaker signals within water column along ship’s track will be search after cruise using specific software and filters.
- There observed results suggest that mud volcano may exist at off-shikoku and Hyuga-nada areas. Confirming by sediment and/or water sampling etc. is required in future.

【Box name of survey areas】

Area-1, South Tosa-bae, off-Shikoku

Area-2, Triangle-flat, off-Shikoku

Area-3, Hyuga-nada

○ **4. Cruise Log**

29 Apr. 09 am, onboard scientific party, Sail out from JAMSTEC

30 Apr. 07 am, start survey at area-1

30 Apr. 10 pm, end of acoustic survey at area-1 ~ start survey at area-2

01 May 03 pm, end of survey at area-2

01 May 08 pm, start survey at area-3

02 May 02 pm, end of survey at area-3, leave survey area

03 May 09 am, arrive at Miyazaki port, scientific party leave the ship

● **5. Notice on Using**

Bathymetry and gravity data will open after a lapse of 2 years. Please mail to responsible personnel if you interesting in the data obtained during YK18-05 cruise within the period.

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