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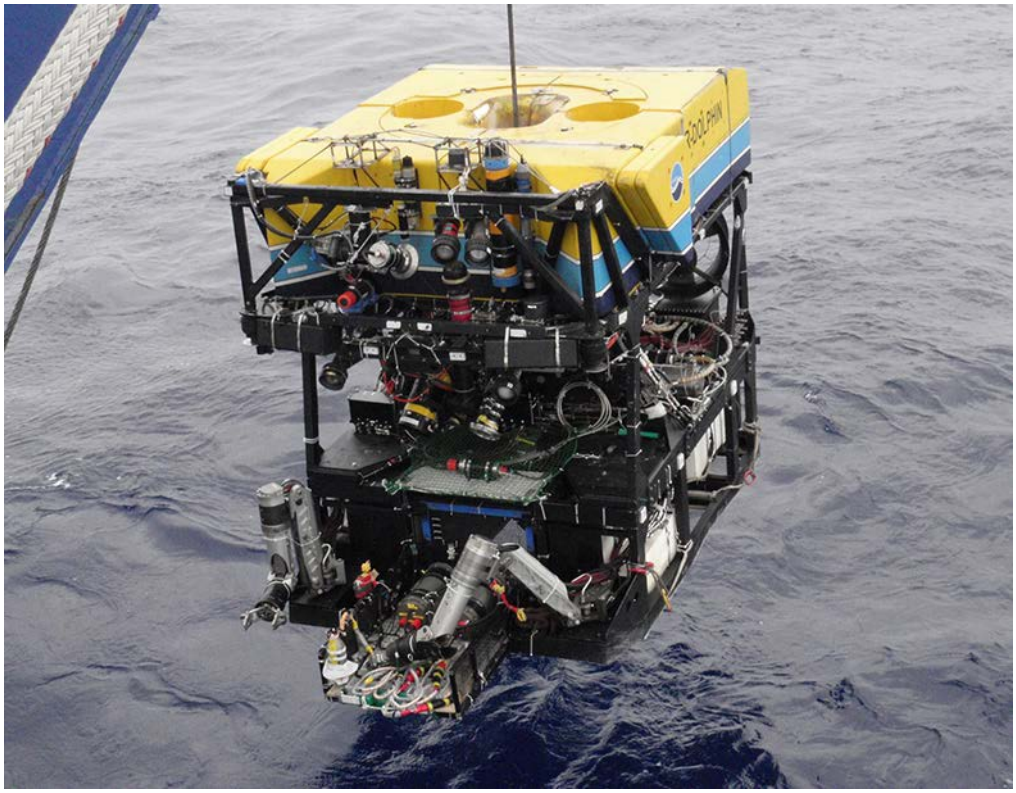
R/V *Natsushima* Cruise Report

NT12-28

Marine electromagnetic survey around the Iheya North Knoll, Okinawa Trough



Oct. 29 – Nov. 5, 2012

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

Contents

1. Cruise Information

- Cruise ID NT12-28
- Name of vessel R/V *Natsushima*
- Title of the cruise Marine electromagnetic survey around the Iheya North Knoll, Okinawa Trough
- Chief scientist Hideaki MACHIYAMA (JAMSTEC)
- Representative of the Science Party Takafumi KASAYA (JAMSTEC)
- Cruise period October 29 – November 5, 2012
- Ports of call Naha (Okinawa Pref.) to JAMSTEC Yokosuka (Kanagawa Pref.)
- Research area Iheya North Knoll, Okinawa Trough
- Research map (Fig. 1)

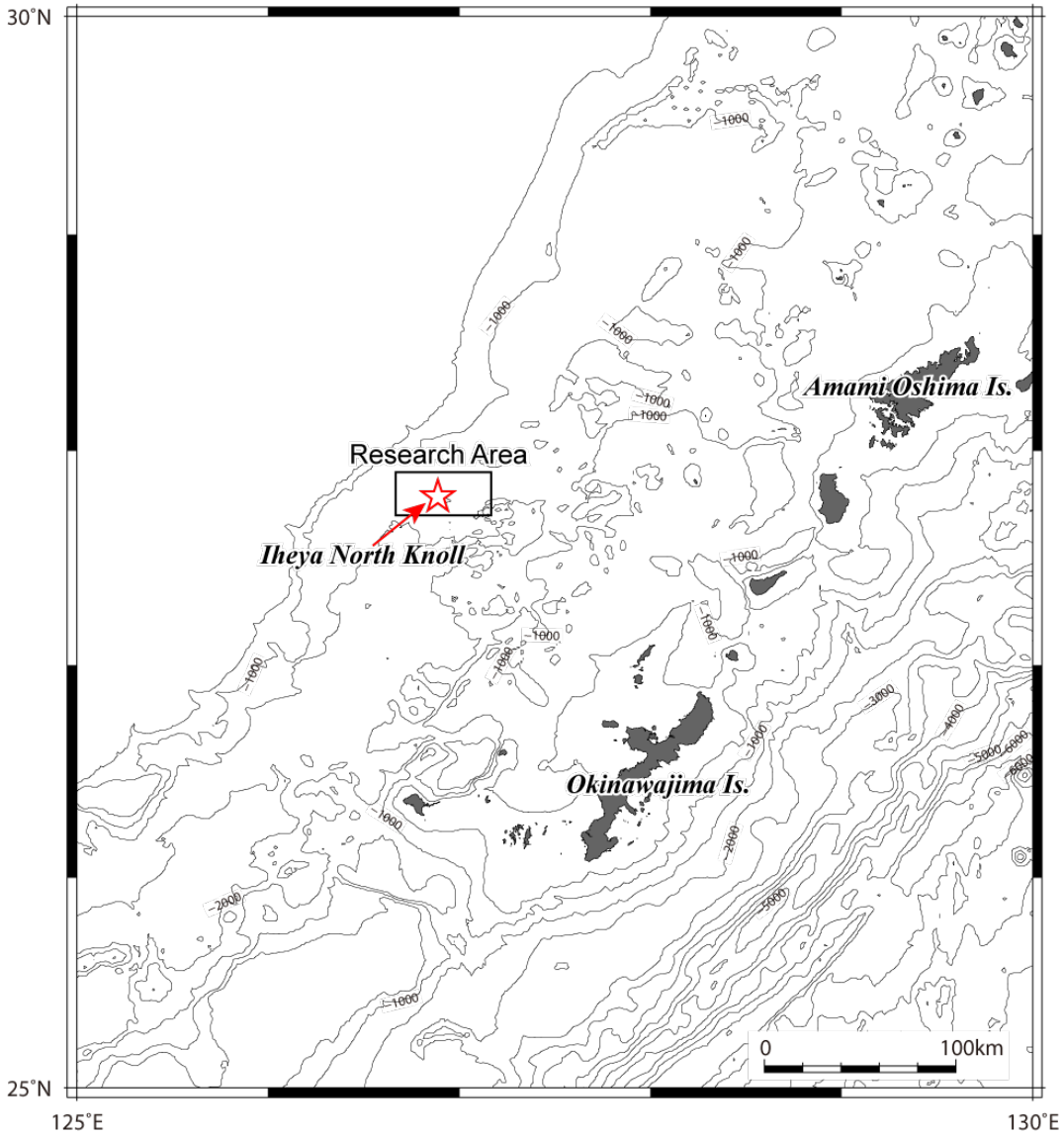


Figure 1 Location map of the Iheya North Knoll and the research area in the NT12-28 Cruise.

2. Researchers

● Chief scientist　MACHIYAMA Hideaki (JAMSTEC)

● Representative of the Science Party　KASAYA Takafumi (JAMSTEC)

● Science Party

KASAYA Takafumi (JAMSTEC)
MACHIYAMA Hideaki* (JAMSTEC)
GOTO Tadanori* (JAMSTEC/Kyoto Univ.)
IIJIMA Koichi* (JAMSTEC)
YAMAMOTO Fujio (JAMSTEC)

**Onboard Scientists*

IWAMOTO Hisanori (Marine Technician: Nippon Marine Enterprise, Ltd.)

● R/V *Natsushima* Crew

Captain	TANAKA Hitoshi
Chief Officer	AOKI Takafumi
2nd Officer	CHIBA Masato
3rd Officer	KOBAYASHI Yumihiko
Chief Engineer	FUNAE Koji
1st Engineer	TADOOKA Naohito
2nd Engineer	SHIRAKATA Kenichi
3rd Engineer	HASHIMOTO Koichi
Chief Electronics Operator	INOUE Yoichi
2nd Electronics Operator	ISHIWATA Hiroki
3rd Electronics Operator	KURAMOTO Yoshikazu
Boat Swain	ODA Hatsuo
Able Seaman	TAKUNO Shuji
Able Seaman	ISHII Yukito
Able Seaman	YOSHIDA Takumi
Sailor	ITO Hideo
Sailor	KUBOTA Tomoaki
Sailor	KANEDA Yusaku
No.1 Oiler	KITANO Masaru
Oiler	HARIMOTO Tuneo
Oiler	ABE Moriya
Assistant Oiler	MATSUI Toshinori
Assistant Oiler	SATO Daiki
Chief Steward	MORITA Tomihisa
Steward	KIRITA Koji
Steward	KOSUJI Kiyotaka
Steward	SONODA Kazuma
Steward	NAKANO Mizuki

● ROV *Hyper-Dolphin* Operation Team

Operation Manager	WAKAMATSU Homare
1st ROV Operator	UEKI Mitsuhiro

2nd ROV Operator	CHIBA Katsutoshi
2nd ROV Operator	UEKI Hirofumi
2nd ROV Operator	CHIDA Yosuke
2nd ROV Operator	KIDO Teppei
2nd ROV Operator	TAKENOUCHI Atsushi
3rd ROV Operator	URATA Daichi

3. Observation

● Observation Summary

The purpose of this cruise is to elucidate the nature of sub-seafloor hydrothermal system accompanied by an occurrence of polymetallic massive sulfide deposits in the Iheya North Knoll, where an occurrence of “kuroko (black ore)” was indicated by D/V *Chikyu* drilling. We conducted marine electromagnetic survey to understand the sub-seafloor electrical conductivity structure around this area.

We deployed three OBEM (ocean bottom electro magnetometer) around the Iheya North Knoll, in a direction perpendicular to the Okinawa Trough. Marine DC survey using ROV *Hyper-Dolphin* (Dive #1451) was carried out around the hydrothermal vents (chimneys) in the middle of the knoll. We also conducted another diving survey for geological observation and rock sampling (Dive #1452), and bathymetrical survey by R/V *Natsushima*. Fig. 2 shows the summary of OBEM deployment points and ROV diving points on bathymetry map.

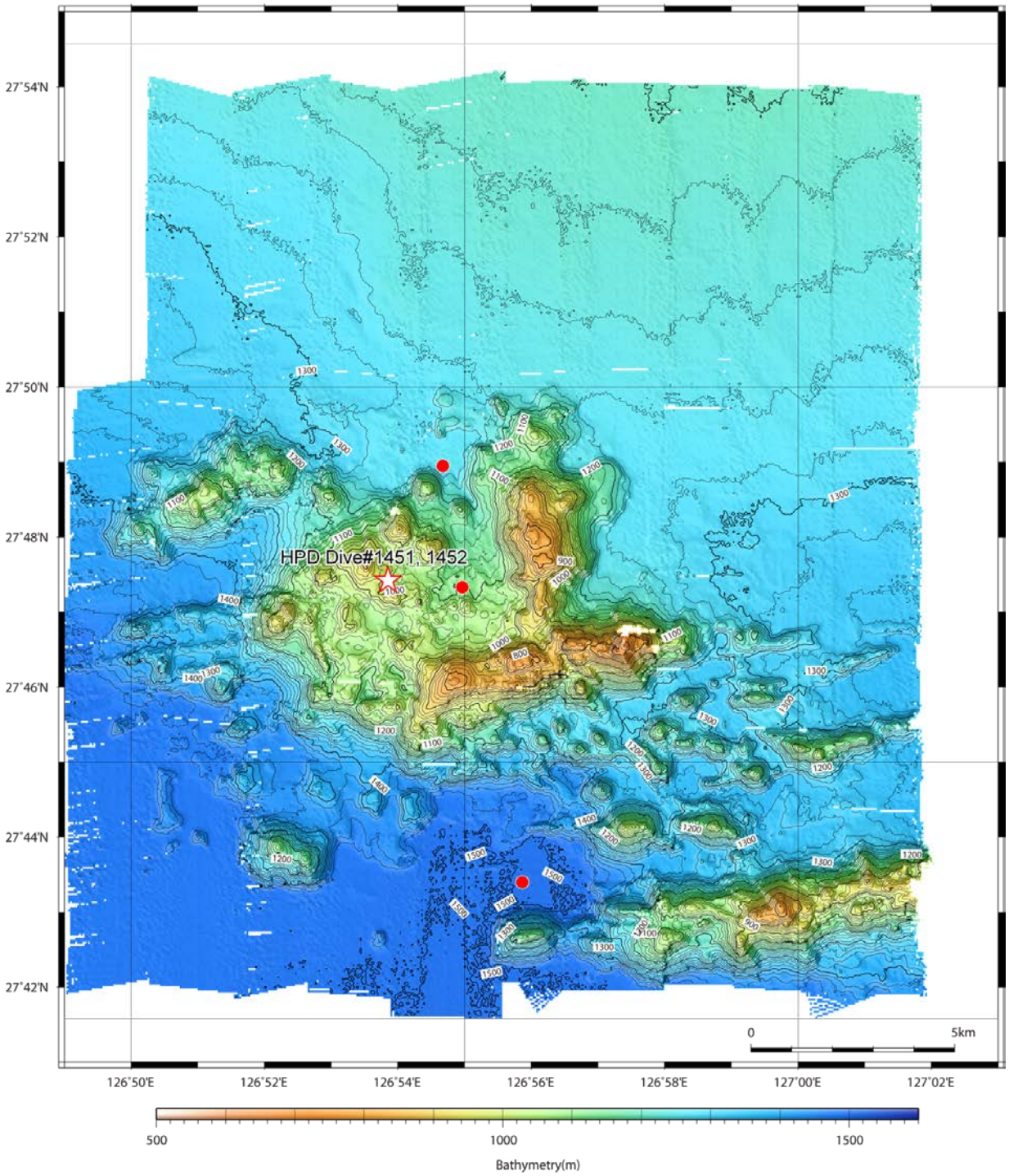


Figure 2 OBEM deployment points (red circles) and ROV dive points around the Iheya North Knoll. Bathymetry data were acquired by R/V *Natsushima*.

● Cruise Log

2012/10/29

Weather: fine but cloudy/ Wind direction: NE/ Wind force: 5/ Wave: 4 m/ Swell: 3 m/ Visibility: 6 nautical mile (12:00 JST)

09:00 Departure from Naha-shinko port, Okinawa
18:00 - 18:40 Scientists meeting
19:02 - MBES survey started
19:04 XBT

2012/10/30

Weather: rain/ Wind direction: North/ Wind force: 5/ Wave: 4 m/ Swell: 2 m/ Visibility: 5 nautical mile (12:00 JST)

05:12 MBES survey finished
06:48 OBEM #2 deploy
08:30 Launching HPD (HPD#1451Dive)
09:10 HPD landing (1,036m)
15:24 HPD leave the bottom (990m)
16:01 HPD come up to surface
16:48 OBEM #3 deploy
18:00 OBEM #1 deploy
18:00-19:10 OBEM #3 and OBEM #1 location calibration by SSBL
19:20- MBES survey started

2012/10/31

Weather: overcast/ Wind direction: North/ Wind force: 7/ Wave: 5 m/ Swell: 4 m/ Visibility: 6 nautical mile (12:00 JST)

05:40 MBES survey finished
HPD#1452Dive was postponed
18:00-18:50 Scientists meeting

2012/11/1

Weather: fine but cloudy/ Wind direction: North/ Wind force: 4/ Wave: 3 m/ Swell: 4 m/ Visibility: 8 nautical mile (12:00 JST)

08:13 Launching HPD (HPD#1451Dive)
09:05 HPD landing (1,041m)
14:58 HPD leave the bottom (1,053m)
15:28 HPD come up to surface
16:44-18:14 MBES survey
18:00-18:20 Scientists meeting
Transit to JAMSTEC

2012/11/2

Weather: overcast/ Wind direction: North/ Wind force: 4/ Wave: 3 m/ Swell: 3 m/ Visibility: 8 nautical mile (12:00 JST)

Transit to JAMSTEC

2012/11/3

Weather: fine but cloudy/ Wind direction: NNW/ Wind force: 4/ Wave: 3 m/ Swell: 3 m/ Visibility: 8

nautical mile (12:00 JST)

Transit to JAMSTEC

2012/11/4

Weather: fine but cloudy/ Wind direction: North/ Wind force: 3/ Wave: 2 m/ Swell: 3 m/ Visibility: 8 nautical mile (12:00 JST)

Transit to JAMSTEC

09:00-10:10 Onboard seminar

2012/11/5

08:30 Arrival at JAMSTEC

10:00 Disembark the R/V *Natsushima*

Wind force criteria

0 = 0 - 0.2 m/sec.

1 = 0.3 - 1.5

2 = 1.6 - 3.3

3 = 3.4 - 5.4

4 = 5.5 - 7.9

5 = 8.0 - 10.7

6 = 10.8 - 13.8

7 = 13.9 - 17.1

8 = 17.2 - 20.7

9 = 20.8 - 24.4

10 = 24.5 - 28.4

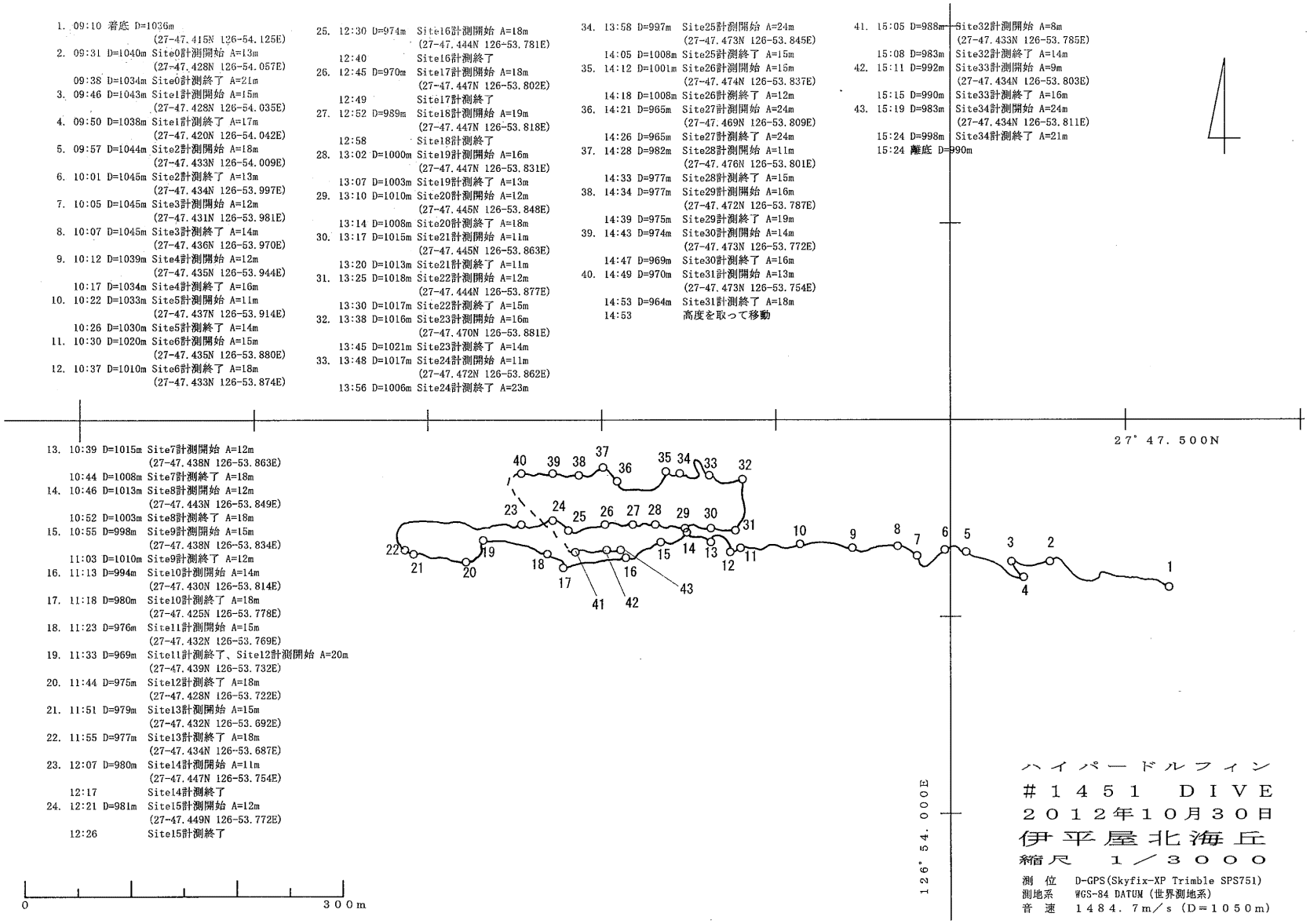
11 = 28.5 - 32.6

12 = 32.7 -

● ROV *Hyper-Dolphin* Dive Information

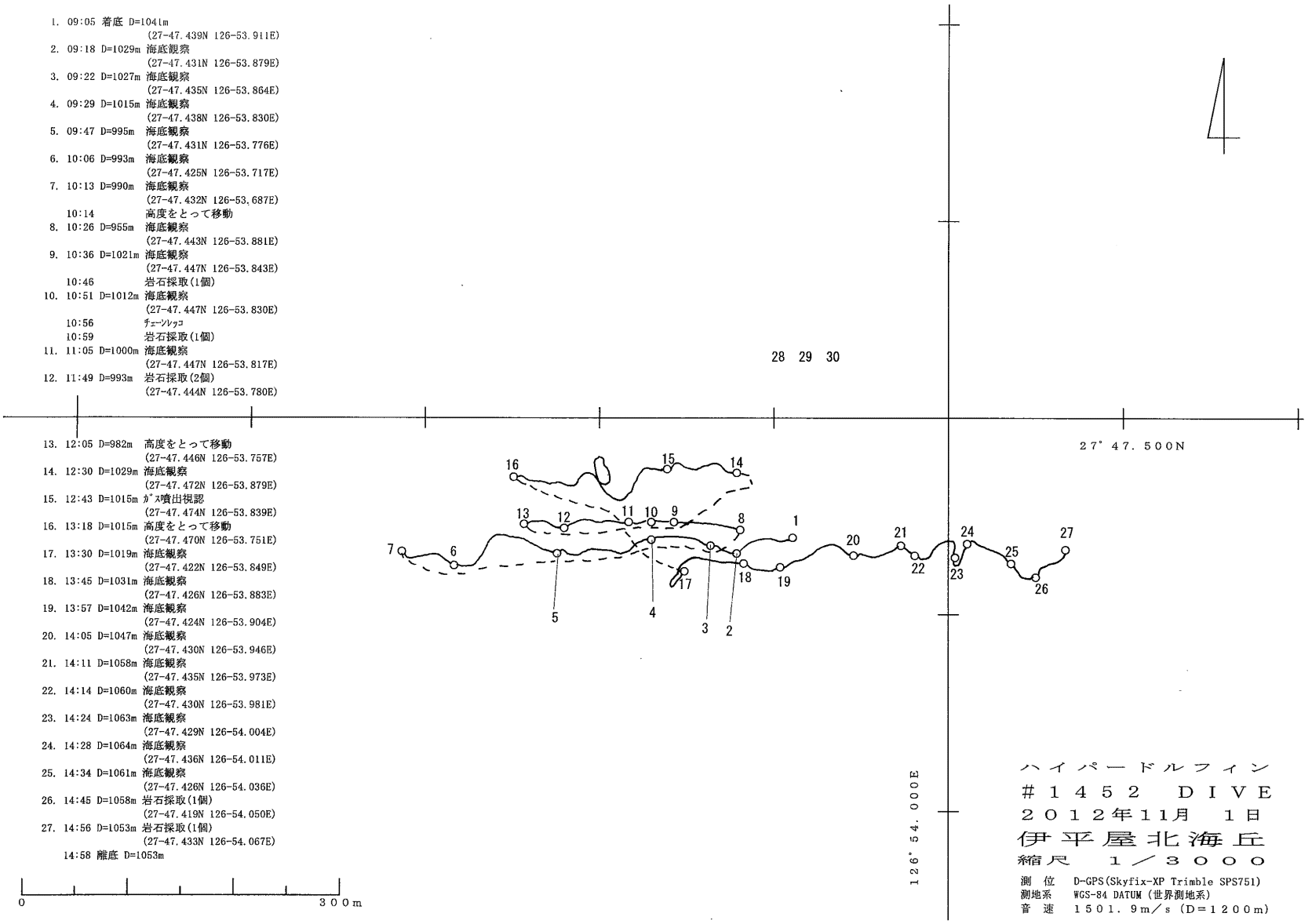
HPD Dive #1451 Track

1. 09:10 着底 D=1036m
(27-47.415N 126-54.125E)
2. 09:31 D=1040m Site0計測開始 A=13m
(27-47.428N 126-54.057E)
09:38 D=1034m Site0計測終了 A=21m
3. 09:46 D=1043m Site1計測開始 A=15m
(27-47.428N 126-54.035E)
4. 09:50 D=1038m Site1計測終了 A=17m
(27-47.420N 126-54.042E)
5. 09:57 D=1044m Site2計測開始 A=18m
(27-47.433N 126-54.009E)
6. 10:01 D=1045m Site2計測終了 A=13m
(27-47.434N 126-53.997E)
7. 10:05 D=1045m Site3計測開始 A=12m
(27-47.431N 126-53.981E)
8. 10:07 D=1045m Site3計測終了 A=14m
(27-47.436N 126-53.970E)
9. 10:12 D=1039m Site4計測開始 A=12m
(27-47.435N 126-53.944E)
10:17 D=1034m Site4計測終了 A=16m
10. 10:22 D=1033m Site5計測開始 A=11m
(27-47.437N 126-53.914E)
10:26 D=1030m Site5計測終了 A=14m
11. 10:30 D=1020m Site6計測開始 A=15m
(27-47.435N 126-53.880E)
12. 10:37 D=1010m Site6計測終了 A=18m
(27-47.433N 126-53.874E)
13. 10:39 D=1015m Site7計測開始 A=12m
(27-47.438N 126-53.863E)
10:44 D=1008m Site7計測終了 A=18m
14. 10:46 D=1013m Site8計測開始 A=12m
(27-47.443N 126-53.849E)
10:52 D=1003m Site8計測終了 A=18m
15. 10:55 D=998m Site9計測開始 A=15m
(27-47.438N 126-53.834E)
11:03 D=1010m Site9計測終了 A=12m
16. 11:13 D=994m Site10計測開始 A=14m
(27-47.430N 126-53.814E)
17. 11:18 D=980m Site10計測終了 A=18m
(27-47.425N 126-53.778E)
18. 11:23 D=976m Site11計測開始 A=15m
(27-47.432N 126-53.769E)
19. 11:33 D=969m Site11計測終了、Site12計測開始 A=20m
(27-47.439N 126-53.732E)
20. 11:44 D=975m Site12計測終了 A=18m
(27-47.428N 126-53.722E)
21. 11:51 D=979m Site13計測開始 A=15m
(27-47.432N 126-53.692E)
22. 11:55 D=977m Site13計測終了 A=18m
(27-47.434N 126-53.687E)
23. 12:07 D=980m Site14計測開始 A=11m
(27-47.447N 126-53.754E)
12:17 Site14計測終了
24. 12:21 D=981m Site15計測開始 A=12m
(27-47.449N 126-53.772E)
12:26 Site15計測終了
25. 12:30 D=974m Site16計測開始 A=18m
(27-47.444N 126-53.781E)
12:40 Site16計測終了
26. 12:45 D=970m Site17計測開始 A=18m
(27-47.447N 126-53.802E)
12:49 Site17計測終了
27. 12:52 D=989m Site18計測開始 A=19m
(27-47.447N 126-53.818E)
12:58 Site18計測終了
28. 13:02 D=1000m Site19計測開始 A=16m
(27-47.447N 126-53.831E)
13:07 D=1003m Site19計測終了 A=13m
29. 13:10 D=1010m Site20計測開始 A=12m
(27-47.445N 126-53.848E)
13:14 D=1008m Site20計測終了 A=18m
30. 13:17 D=1015m Site21計測開始 A=11m
(27-47.445N 126-53.863E)
13:20 D=1013m Site21計測終了 A=11m
31. 13:25 D=1018m Site22計測開始 A=12m
(27-47.444N 126-53.877E)
13:30 D=1017m Site22計測終了 A=15m
32. 13:38 D=1016m Site23計測開始 A=16m
(27-47.470N 126-53.881E)
13:45 D=1021m Site23計測終了 A=14m
33. 13:48 D=1017m Site24計測開始 A=11m
(27-47.472N 126-53.862E)
13:56 D=1006m Site24計測終了 A=23m
34. 13:58 D=997m Site25計測開始 A=24m
(27-47.473N 126-53.845E)
14:05 D=1008m Site25計測終了 A=15m
35. 14:12 D=1001m Site26計測開始 A=15m
(27-47.474N 126-53.837E)
14:18 D=1008m Site26計測終了 A=12m
36. 14:21 D=965m Site27計測開始 A=24m
(27-47.469N 126-53.809E)
14:26 D=965m Site27計測終了 A=24m
37. 14:28 D=982m Site28計測開始 A=11m
(27-47.476N 126-53.801E)
14:33 D=977m Site28計測終了 A=15m
38. 14:34 D=977m Site29計測開始 A=16m
(27-47.472N 126-53.787E)
14:39 D=975m Site29計測終了 A=19m
39. 14:43 D=974m Site30計測開始 A=14m
(27-47.473N 126-53.772E)
14:47 D=969m Site30計測終了 A=16m
40. 14:49 D=970m Site31計測開始 A=13m
(27-47.473N 126-53.754E)
14:53 D=964m Site31計測終了 A=18m
14:53 高度を取って移動
41. 15:05 D=988m Site32計測開始 A=8m
(27-47.433N 126-53.785E)
15:08 D=983m Site32計測終了 A=14m
42. 15:11 D=992m Site33計測開始 A=9m
(27-47.434N 126-53.803E)
15:15 D=990m Site33計測終了 A=16m
43. 15:19 D=983m Site34計測開始 A=24m
(27-47.434N 126-53.811E)
15:24 D=998m Site34計測終了 A=21m
15:24 離底 D=990m



ハイパードルフィン
＃１４５１ ＤＩＶＥ
２０１２年１０月３０日
伊平屋北海丘
縮尺 １／３０００
測 位 D-GPS(Skyfix-XP Trimble SPS751)
測地系 WGS-84 DATUM (世界測地系)
音 速 １４８４．７ｍ／ｓ (D＝１０５０ｍ)

1. 09:05 着底 D=1041m
(27-47.439N 126-53.911E)
2. 09:18 D=1029m 海底観察
(27-47.431N 126-53.879E)
3. 09:22 D=1027m 海底観察
(27-47.435N 126-53.864E)
4. 09:29 D=1015m 海底観察
(27-47.438N 126-53.830E)
5. 09:47 D=995m 海底観察
(27-47.431N 126-53.776E)
6. 10:06 D=993m 海底観察
(27-47.425N 126-53.717E)
7. 10:13 D=990m 海底観察
(27-47.432N 126-53.687E)
10:14 高度をとって移動
8. 10:26 D=955m 海底観察
(27-47.443N 126-53.881E)
9. 10:36 D=1021m 海底観察
(27-47.447N 126-53.843E)
10:46 岩石採取(1個)
10. 10:51 D=1012m 海底観察
(27-47.447N 126-53.830E)
10:56 ﾁｪｰﾝﾚｯｺ
10:59 岩石採取(1個)
11. 11:05 D=1000m 海底観察
(27-47.447N 126-53.817E)
12. 11:49 D=993m 岩石採取(2個)
(27-47.444N 126-53.780E)
13. 12:05 D=982m 高度をとって移動
(27-47.446N 126-53.757E)
14. 12:30 D=1029m 海底観察
(27-47.472N 126-53.879E)
15. 12:43 D=1015m ｶﾞｽ噴出視認
(27-47.474N 126-53.839E)
16. 13:18 D=1015m 高度をとって移動
(27-47.470N 126-53.751E)
17. 13:30 D=1019m 海底観察
(27-47.422N 126-53.849E)
18. 13:45 D=1031m 海底観察
(27-47.426N 126-53.883E)
19. 13:57 D=1042m 海底観察
(27-47.424N 126-53.904E)
20. 14:05 D=1047m 海底観察
(27-47.430N 126-53.946E)
21. 14:11 D=1058m 海底観察
(27-47.435N 126-53.973E)
22. 14:14 D=1060m 海底観察
(27-47.430N 126-53.981E)
23. 14:24 D=1063m 海底観察
(27-47.429N 126-54.004E)
24. 14:28 D=1064m 海底観察
(27-47.436N 126-54.011E)
25. 14:34 D=1061m 海底観察
(27-47.426N 126-54.036E)
26. 14:45 D=1058m 岩石採取(1個)
(27-47.419N 126-54.050E)
27. 14:56 D=1053m 岩石採取(1個)
(27-47.433N 126-54.067E)
14:58 離底 D=1053m



ハイパードルフィン
＃１４５２　ＤＩＶＥ
２０１２年１１月　１日
伊平屋北海丘
縮尺　１／３０００
測　位　D-GPS(Skyfix-XP Trimble SPS751)
測地系　WGS-84 DATUM (世界測地系)
音　速　１５０１．９m／s (D＝１２００m)

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This report may not be corrected even if changes on contents (i.e. taxonomic classifications) may be found after its publication. This report may also be changed without notice. Data on this cruise report may be raw or unprocessed. If you are going to use or refer to the data written on this report, please ask the Chief Scientist for latest information.
Users of data or results on this cruise report are requested to submit their results to the Data Management Group of JAMSTEC.