Deep seismic profiling across the Mariana arc - backarc system

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In 2003, we carried out deep wide-angle seismic experiments using a large airgun array and total 152 ocean bottom seismographs (OBSs) by R/V Kaiyo of Japan Marine Science and Technology Center (JAMSTEC) around the middle Mariana area (KY03-01 and KY03-06 cruises), in collaboration with JAMSTEC, Earthquake Research Institute, University of Tokyo and Stanford University as a part of the MARGINS program (US-JAPAN COLLABORATIVE RESEARCH: MULTI-SCALE SEISMIC IMAGING OF THE MARIANA SUBDUCTION FACTORY). To understand nature of the seismic structure of the Mariana arc - back arc system, we shot an airgun array along a main line which runs from the serpentinite seamount on the forearc to the Parece Vela backarc basin though the Mariana arc, the Mariana trough and the west Mariana ridge. A length of the main line was about 700 km. In this paper, we summarize information of the seismic experiments and introduce the seismic data, OBS data and reflection data.

Keyword : Crustal structure, seismic, wide-angle data, OBS, Mariana, granitic layer

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1. Introduction

An oceanic island arc is one of the best examples to study a process of the crustal growth. Because the island arc's crustal growth had been started by a subduction of an oceanic crust beneath another oceanic crust, the tectonics is simpler than that of a continental arc, which had been separated from the continental margin with complex structure. The Izu-Ogasawara arc is one of the island ares and has boninitic middle crust with P-wave velocity (Vp) of 6 km/s (e.g., Suyehiro et al., 1996). A subduction of the oceanic crust for the arc has occurred since Eocene time (e.g., Karig and Moore, 1975) and the boninitic crust has been generated at almost same time with basalt-style magmatism and high heat flow (Macpherson and Hall, 2001). After the Shikoku and the Parece Vela basins were spread in 30-15 Ma (e.g., Okino et al., 1998), newly volcanism had started near current position of the arc. We believe that these crustal structures have information related such history of the crustal growth. Northern Izu-Ogasawara arc has granitic layer with Vp of 6 km/s as the middle crust, the lower crust with Vp of over 7 km/s and crustal thickness of about 20 km (Suyehiro et al., 1996, Takahashi et al., 1998). On the other hand, the Aleutian arc does not have the granitic layer with Vp of 6 km/s despite of almost same crustal thickness and a lower crust with similar Vp (e.g., Fliedner and Klemperer, 1999). What does indicate the difference between the Izu-Ogasawara arc and the Aleutian arc? What are roles of the granitic layer for the crustal growth? It is important to understand common characteristics of the island arc structure and differences between them.

Despite the Mariana arc is also typical oceanic arc and seismic experiments were carried out before (e.g., Murauchi et al., 1968; Ambos and Hussong, 1982), the details of the seismic structure of entire of Mariana arc - backarc system has been poorly understood. A rough structure including the crustal thickness was obtained by the gravity analysis (e.g., Yang et al., 1992), however, the result is too rough to study the process of the crustal growth of the Mariana arc - backarc system. A main purpose of this seismic profiling is to clarify the struc-

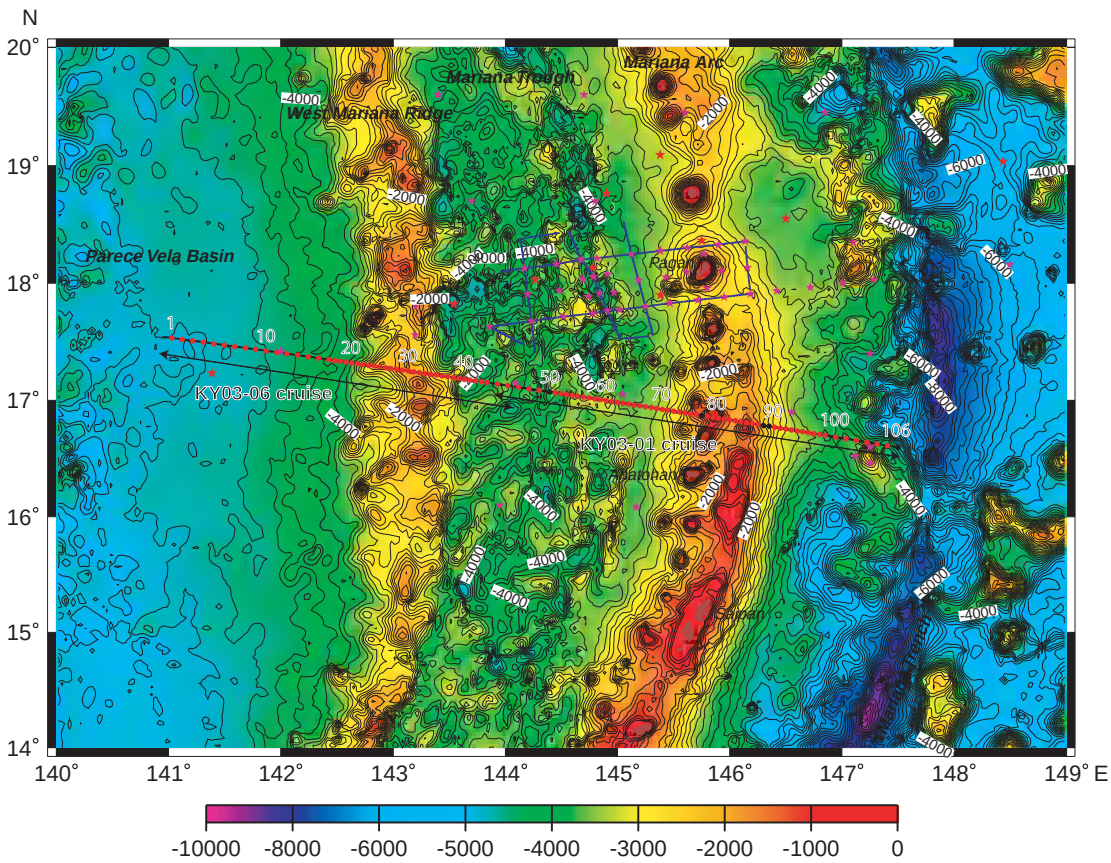

Fig. 1 Map of the experimental area. Solid circles indicate OBSs and available OBSs are shown by red circles. We shot an airgun array on a thick black line. Red and purple stars indicate the long term OBSs for natural earthquake observations. Blue lines indicate airgun shooting lines for the long term OBSs.

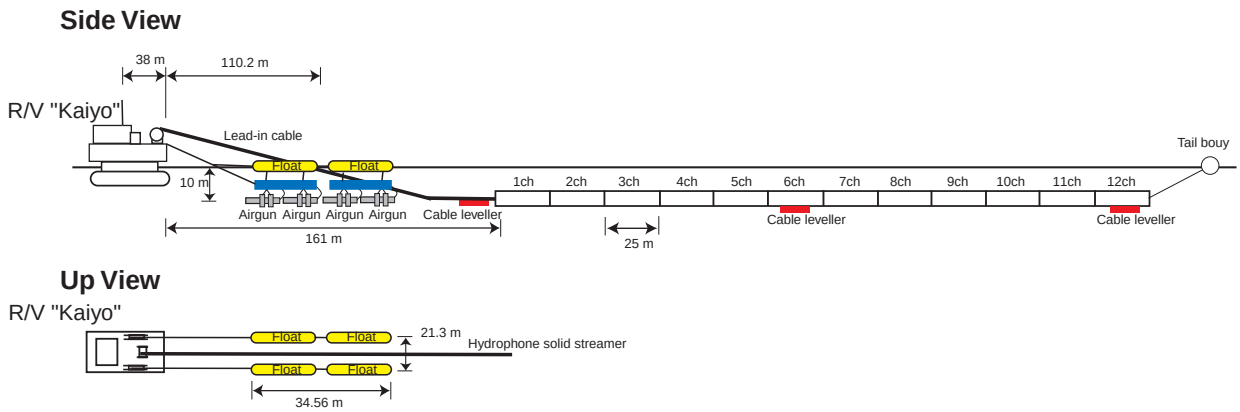

Fig. 2 Geometry of seismic experiment.

tural variation across the entire Mariana arc - backarc system. It is expected to understand the crustal variation related to developmental process of the Mariana arc, the distribution of the granitic layer with P-wave velocity of 6 km/s found by Kerr et al. (2002) across this arc-backarc system and finally common structural characteristics of general island arc including Izu-Ogasawara-Mariana arc.

2. Experiment

A seismic experiment using total 152 Ocean Bottom Seismographs (OBSs) and an airgun array was performed around the middle Mariana area by R/V Kaiyo (Figure 1). We had to spend two cruises (KY03-01 and KY03-06 cruises were carried out in Jan.-Feb. and Jun.-Jul., 2003, respectively) to complete the airgun shooting because of the bad weather and bad sea status due to strong wind from Siberian high pressure and unexpected typhoon attack to experimental area during first KY03-01 cruise. The areas of the airgun shooting during two cruises were eastern half of main line from eastern end of the forearc to the western Mariana trough and the western Mariana trough to the Parece Vela basin, respectively. The specifications of this seismic experiment were almost same to those of KY03-01 cruise except used OBS number. During the airgun shooting, we towed a 12-channel hydrophone streamer to understand the shallow structural nature. The specific contents of the airgun shooting, OBSs and Multichannel Seismics (MCS) are described below.

2.1. Airgun shooting

The length of the seismic line named by MR101 was about 700 km. The eastern and western ends were located on the serpentine seamount of eastern forearc region and on the Parece Vela basin, respectively (Table 1). To understand the crustal variation of transition zone between the arc and the backarc basin, we set the west-

Table 1 Shat locations along MR101

Shot No.	Latitude	Longitude	Depth (m)
1	16_35.5643N	147_31.1758E	4889
101	16_37.3997N	147_20.0931E	3684
201	16_39.1879N	147_ 8.9971E	3897
301	16_40.9478N	146_57.8788E	3850
401	16_42.7181N	146_46.7683E	3690
501	16_44.4590N	146_35.6659E	3450
601	16_46.1971N	146_24.5586E	2861
701	16_47.9142N	146_13.4452E	1782
801	16_49.6324N	146_ 2.3290E	1883
901	16_51.3375N	145_51.2080E	586
1001	16_53.0389N	145_40.0850E	1371
1101	16_54.7276N	145_28.9602E	2968
1201	16_56.3985N	145_17.8296E	3485
1301	16_58.0643N	145_ 6.6932E	3701
1401	16_59.7333N	144_55.5633E	3092
1501	17_ 1.3659N	144_44.4278E	3438
1601	17_ 3.0126N	144_33.2831E	3730
1701	17_ 4.6379N	144_22.1366E	4107
1801	17_ 6.2345N	144_10.9847E	4039
1901	17_ 7.8485N	143_59.8352E	3645
2001	17_ 9.4644N	143_48.6577E	4263
2101	17_11.0546N	143_37.5024E	3662
2201	17_12.6257N	143_26.3381E	2431
2301	17_14.2004N	143_15.1712E	1905
2401	17_15.7237N	143_ 4.0012E	1993
2501	17_17.3021N	142_52.8347E	2498
2601	17_18.8246N	142_41.6601E	3450
2701	17_20.3465N	142_30.4835E	4097
2801	17_21.8674N	142_19.3073E	4251
2901	17_23.3620N	142_ 8.1234E	4429
3001	17_24.8632N	141_56.9399E	4540
3101	17_26.3386N	141_45.7509E	4668
3201	17_27.7976N	141_34.5579E	4685
3301	17_29.2790N	141_23.3616E	4738
3401	17_30.7142N	141_12.1624E	4725
3501	17_32.1841N	141_ 0.9653E	4771
3539	17_32.7115N	140_56.7050E	4818

Table 2a　OBS information of KY03-01 cruise. Asterisks indicate that the locations were estimated by SSBL of R/V Kaiyo.

Site	Deployment time (local)		Deployment position		Depth (m)	Retrieval time (local)		Retrieval position		Estimated position at sea bottom		Est. depth	Hyd. Type	Rec. type	remarks
1	1/13	7:05	17_32.0464N	141_01.6585E	4773	2/3	20:52	17_31.8671N	141_01.4418E	17_31.9098N	141_01.5101E	4741	BENTHOS	DAT	*
2	1/13	7:59	17_31.3419N	141_07.2669E	4835	2/3	22:32	17_31.3538N	141_07.2560E	17_31.4489N	141_07.2571E	4823	BENTHOS	HDD	*
3	1/13	8:53	17_30.6235N	141_12.8791E	4746	2/4	0:07	17_30.5644N	141_12.9059E	17_30.6857N	141_12.8444E	4833	BENTHOS	DAT	*
4	1/13	9:50	17_29.9157N	141_18.4748E	4751	2/4	1:48	17_29.7801N	141_18.4874E	17_29.9114N	141_18.4869E	4691	BENTHOS	HDD	*
5	1/13	10:45	17_29.1781N	141_24.0916E	4731	2/4	3:22	17_29.0542N	141_24.0091E	No data			BENTHOS	DAT	*
6	1/13	11:39	17_28.4454N	141_29.6935E	4712	2/4	4:57	17_28.3051N	141_29.5043E	No data			BENTHOS	DAT	*
7	1/13	12:32	17_27.7150N	141_35.3040E	4686	2/4	6:32	17_27.5533N	141_35.0751E	No data			BENTHOS	DAT	*
8	1/13	13:37	17_26.9577N	141_40.8963E	4702	2/4	8:09	17_26.8919N	141_40.6924E	17_27.0011N	141_40.8345E	4700	BENTHOS	DAT	*
9	1/13	14:29	17_26.2378N	141_46.5148E	4667	2/4	9:49	17_26.2110N	141_46.3557E	17_26.2956N	141_46.4636E	4624	BENTHOS	DAT	*
10	1/13	15:20	17_25.4930N	141_52.1123E	4586	2/4	11:26	17_25.4662N	141_52.0010E	17_25.5176N	141_52.0588E	4584	BENTHOS	DAT	*
11	1/13	16:09	17_24.7604N	141_57.7114E	4519	2/4	13:02	17_24.7375N	141_57.6388E	17_24.7814N	141_57.6978E	4483	BENTHOS	DAT	*
12	1/13	17:00	17_24.0131N	142_03.2874E	4476	2/4	14:32	17_23.9407N	142_03.2214E	17_24.0449N	142_03.3162E	4435	BENTHOS	DAT	*
13	1/13	17:50	17_23.2701N	142_08.9092E	4391	1/30	5:56	17_23.1637N	142_08.5563E	17_23.1776N	142_08.8106E	4400	BENTHOS	DAT	*
14	1/13	18:39	17_22.5192N	142_14.5137E	4342	1/30	4:11	17_22.6198N	142_14.2731E	17_22.6320N	142_14.4843E	4350	BENTHOS	DAT	*
15	1/13	19:28	17_21.7485N	142_20.1116E	4201	1/30	2:31	17_21.6953N	142_19.9102E	17_21.6516N	142_20.0574E	4250	BENTHOS	DAT	*
16	1/13	20:17	17_21.0152N	142_25.7029E	4168	1/30	0:49	17_20.9796N	142_25.5799E	17_20.9588N	142_25.6216E	4175	BENTHOS	DAT	*
17	1/13	20:55	17_20.5813N	142_28.7381E	4120	1/29	23:25	17_20.5479N	142_28.6617E	17_20.5177N	142_28.6643E	4108	BENTHOS	DAT	*
18	1/13	21:31	17_20.1943N	142_31.7402E	4093	1/29	22:05	17_20.1181N	142_31.7292E	17_20.1227N	142_31.6777E	3983	BENTHOS	DAT	*
19	1/13	22:09	17_19.7610N	142_34.7715E	4070	1/29	20:44	17_19.6844N	142_34.7498E	17_19.6518N	142_34.6548E	4020	BENTHOS	HDD	*
20	1/13	22:46	17_19.3524N	142_37.7918E	3873	1/29	19:23	17_19.3043N	142_37.7597E	17_19.2584N	142_37.7075E	3861	HIGH TECH	HDD	*
21	1/13	23:27	17_18.9492N	142_40.8095E	3544	1/29	18:07	17_18.9293N	142_40.7290E	17_18.8798N	142_40.7147E	3587	BENTHOS	DAT	*
22	1/14	0:05	17_18.5274N	142_43.8343E	3411	1/29	16:39	17_18.4993N	142_43.7072E	17_18.4558N	142_43.7380E	3360	BENTHOS	DAT	*
23	1/14	0:41	17_18.1159N	142_46.8853E	3216	1/29	15:28	17_18.0724N	142_46.6698E	17_18.0769N	142_46.7687E	3280	BENTHOS	HDD	* No data
24	1/14	1:16	17_17.7005N	142_49.8717E	2653	1/29	14:17	17_17.6526N	142_49.7268E	17_17.6665N	142_49.7746E	2640	BENTHOS	DAT	*
25	1/14	1:52	17_17.2871N	142_52.8973E	2496	1/29	13:12	17_17.2315N	142_52.7134E	17_17.2423N	142_52.8198E	2455	BENTHOS	DAT	*
26	1/14	2:28	17_16.8653N	142_55.9082E	2654	1/29	12:01	17_16.7727N	142_55.7719E	17_16.8111N	142_55.8036E	2630	BENTHOS	DAT	*
27	1/14	3:02	17_16.4457N	142_58.9329E	2766	1/29	10:55	17_16.3544N	142_58.8235E	17_16.3929N	142_58.8550E	2720	BENTHOS	HDD	*
28	1/14	3:36	17_16.0237N	143_01.9466E	1886	1/29	9:42	17_15.9781N	143_01.8522E	17_16.0201N	143_01.9007E	1915	BENTHOS	HDD	*
29	1/14	4:10	17_15.6164N	143_04.9819E	1846	1/29	8:19	17_15.5884N	143_04.8991E	17_15.5709N	143_04.9179E	1842	BENTHOS	HDD	*
30	1/14	4:43	17_15.1938N	143_07.9888E	2037	1/29	7:21	17_15.1392N	143_07.8820E	17_15.1157N	143_07.9083E	1940	HIGH TECH	DAT	*
31	1/14	5:16	17_14.7677N	143_11.0125E	1905	1/29	6:27	17_14.7764N	143_10.9178E	17_14.7243N	143_10.9561E	1917	BENTHOS	HDD	*
32	1/14	5:51	17_14.3501N	143_14.0262E	1924	1/29	5:27	17_14.3692N	143_13.9360E	17_14.3212N	143_13.9510E	1973	BENTHOS	DAT	*
33	1/14	6:27	17_13.9325N	143_17_0550E	1995	1/29	4:35	17_13.9617N	143_16.9802E	17_13.9094N	143_17.0279E	2000	BENTHOS	HDD	*
34	1/14	7:04	17_13.5027N	143_20.0601E	2582	1/29	3:40	17_13.4983N	143_10.9510E	17_13.4398N	143_20.0120E	2580	HIGH TECH	DAT	*
35	1/14	7:41	17_13.0867N	143_23.0848E	2651	1/29	2:40	17_13.0220N	143_22.9864E	17_12.9920N	143_23.0600E	2640	BENTHOS	DAT	*
36	1/14	8:18	17_12.6534N	143_26.1090E	2449	1/29	1:38	17_12.5815N	143_25.9861E	17_12.5659N	143_26.0601E	2478	BENTHOS	HDD	*
37	1/14	8:55	17_12.2312N	143_29.1290E	2804	1/29	0:39	17_12.1457N	143_29.0008E	17_12.1430N	143_29.0726E	2814	BENTHOS	DAT	*
38	1/14	9:32	17_11.8106N	143_32.1523E	2672	1/28	23:41	17_11.7305N	143_32.0066E	17_11.7463N	143_32.0876E	2684	BENTHOS	DAT	*
39	1/14	10:09	17_11.3737N	143_35.1640E	3157	1/28	22:39	17_11.2911N	143_35.0446E	17_11.3000N	143_35.0865E	3127	BENTHOS	DAT	*
40	1/14	10:47	17_10.9416N	143_38.1860E	3835	1/28	21:34	17_10.9766N	143_38.1011E	17_10.9597N	143_38.0927E	3710	BENTHOS	DAT	*
41	1/14	11:22	17_10.5223N	143_41.1991E	4241	1/28	20:14	17_10.4980N	143_41.0399E	17_10.4486N	143_41.0840E	4261	BENTHOS	DAT	*
42	1/14	11:58	17_10.0963N	143_44.2000E	4231	1/28	18:53	17_10.1220N	143_44.0022E	17_10.0565N	143_44.0549E	4211	BENTHOS	DAT	*
43	1/14	12:34	17_09.6654N	143_47.2098E	4113	1/28	17:22	17_09.6697N	143_46.9765E	17_09.6213N	143_47.0579E	3921	BENTHOS	DAT	*
44	1/14	13:09	17_09.2329N	143_50.2385E	4231	1/28	15:58	17_09.2633N	143_49.9218E	17_09.1830N	143_50.1152E	4240	BENTHOS	DAT	*
45	1/14	13:57	17_08.4334N	143_55.8215E	3764	1/28	14:29	17_08.5769N	143_55.5597E	17_08.3650N	143_55.7440E	3730	BENTHOS	DAT	
46	1/14	14:45	17_07.6385N	144_01.4022E	3511	1/28	13:06	17_07.8229N	144_01.1434E	17_07.6053N	144_01.2972E	3534	BENTHOS	DAT	
47	1/14	15:32	17_06.8294N	144_06.9883E	4310	1/28	11:44	17_07.0377N	144_06.7596E	17_06.9216N	144_06.9113E	4301	BENTHOS	HDD	
48	1/14	16:20	17_06.0244N	144_12.5708E	3834	1/28	10:14	17_06.1430N	144_12.3964E	17_06.0152N	144_12.4844E	3789	BENTHOS	DAT	
49	1/14	17:08	17_05.2110N	144_18.1538E	4098	1/28	8:51	17_05.3786N	144_18.6245E	17_05.1843N	144_18.0832E	4014	BENTHOS	HDD	
50	1/14	17:55	17_04.4064N	144_23.7393E	3992	1/28	7:21	17_04.4459N	144_23.6155E	17_04.4078N	144_23.6844E	3997	BENTHOS	DAT	*No data
51	1/14	18:33	17_03.9704N	144_26.7521E	3747	1/28	5:50	17_03.9652N	144_26.7009E	17_03.9971N	144_26.7733E	3716	BENTHOS	DAT	
52	1/14	19:08	17_03.5323N	144_29.7701E	3806	1/28	4:24	17_03.5331N	144_29.6577E	17_03.5649N	144_29.7519E	3753	BENTHOS	DAT	
53	1/14	19:44	17_03.0859N	144_32.7860E	3831	1/25	20:19	17_03.1569N	144_32.6482E	17_03.0784N	144_32.7953E	3825	BENTHOS	DAT	
54	1/14	20:22	17_02.6357N	144_35.7985E	3225	1/25	18:37	17_02.6605N	144_35.6907E	17_02.5743N	144_35.7881E	3213	BENTHOS	DAT	
55	1/14	20:58	17_02.2068N	144_38.8071E	3532	1/25	17:17	17_02.2335N	144_38.7475E	17_02.1780N	144_38.7901E	3516	BENTHOS	DAT	
56	1/14	21:38	17_01.7529N	144_41.8205E	3563	1/25	16:00	17_01.7810N	144_41.7954E	17_01.7573N	144_41.8112E	3550	BENTHOS	DAT	
57	1/14	22:17	17_01.3152N	144_44.8264E	3427	1/25	14:42	17_01.3227N	144_44.7512E	17_01.2717N	144_44.7566E	3414	BENTHOS	DAT	
58	1/14	22:57	17_00.8736N	144_47.8508E	3237	1/25	13:23	17_00.8319N	144_47.8006E	17_00.8095N	144_47.8144E	3216	BENTHOS	DAT	
59	1/14	23:37	17_00.4464N	144_50.8613E	3436	1/25	11:48	17_00.4170N	144_50.7596E	17_00.4293N	144_50.8049E	3455	BENTHOS	DAT	
60	1/15	0:13	16_59.9855N	144_53.8559E	3211	1/25	10:25	16_59.9070N	144_53.7499E	17_00.0132N	144_53.8219E	3196	HIGH TECH	DAT	
61	1/15	0:49	16_59.5345N	144_56.8709E	3202	1/25	9:08	16_59.4889N	144_56.7149E	16_59.5077N	144_56.7839E	3179	BENTHOS	DAT	
62	1/15	1:24	16_59.0886N	144_59.8783E	3455	1/25	7:55	16_59.0412N	144_59.7905E	16_59.1009N	144_59.8227E	3398	BENTHOS	DAT	
63	1/15	1:59	16_58.6384N	145_02.8872E	3719	1/25	6:34	16_58.5707N	145_02.8751E	16_58.5951N	145_02.8283E	3703	BENTHOS	DAT	
64	1/15	2:33	16_58.1929N	145_05.9022E	3689	1/25	5:14	16_58.1852N	145_05.9117E	16_58.1653N	145_05.8341E	3681	BENTHOS	DAT	
65	1/15	3:07	16_57.7425N	145_08.9116E	3602	1/25	3:53	16_57.7829N	145_08.9129E	16_57.7044N	145_08.8189E	3587	BENTHOS	DAT	
66	1/15	3:41	16_57.2882N	145_11.9157E	3552	1/25	2:30	16_57.3217N	145_11.8564E	16_57.2827N	145_11.8302E	3529	BENTHOS	DAT	
67	1/15	4:17	16_56.8414N	145_14.9239E	3552	1/25	1:05	16_56.8751N	145_14.8065E	16_56.8337N	145_14.8567E	3535	BENTHOS	DAT	
68	1/15	4:51	16_56.3901N	145_17.9378E	3486	1/24	23:30	16_56.3016N	145_17.7669E	16_56.3367N	145_17.8710E	3462	BENTHOS	DAT	
69	1/15	5:25	16_55.9408N	145_20.9466E	3418	1/24	22:08	16_55.8306N	145_20.7695E	16_55.9208N	145_20.9113E	3401	HIGH TECH	DAT	
70	1/15	6:00	16_55.4778N	145_23.9693E	3341	1/24	20:33	16_55.2220N	145_23.6274E	16_55.2722N	145_23.6948E	3340	BENTHOS	DAT	
71	1/15	6:37	16_55.0368N	145_26.9781E	3247	1/24	19:14	16_55.0416N	145_26.9195E	16_55.0687N	145_26.9174E	3233	BENTHOS	HDD	
72	1/15	7:16	16_54.5777N	145_29.9952E	2960	1/24	17:58	16_54.5876N	145_29.9904E	16_54.5758N	145_29.9610E	2938	BENTHOS	DAT	
73	1/15	7:52	16_54.1160N	145_32.9995E	2805	1/24	16:35	16_54.1979N	145_32.0087E	16_54.1419N	145_32.9717E	2767	HIGH TECH	HDD	
74	1/15	8:26	16_53.6685N	145_35.9985E	2380	1/24	15:22	16_53.6508N	145_36.0960E	16_53.6249N	145_36.0740E	2352	HIGH TECH	HDD	
75	1/15	9:01	16_53.1950N	145_39.0084E	1752	1/24	14:12	16_53.2213N	145_38.9517E	16_53.2200N	145_38.9552E	1754	BENTHOS	DAT	
76	1/15	9:39	16_52.7541N	145_42.0101E	1130	1/24	12:56	16_52.7464N	145_41.9238E	16_52.7726N	145_41.9396E	1093	BENTHOS	HDD	
77	1/15	10:16	16_52.2977N	145_45.0165E	1182	1/24	11:55	16_52.2442N	145_44.9374E	16_52.2616N	145_44.9714E	1147	HIGH TECH	DAT	*No data
78	1/15	10:54	16_51.8328N	145_48.0173E	828	1/24	10:52	16_51.7593N	145_47.9016E	16_51.8508N	145_47.9577E	799	HIGH TECH	HDD	
79	1/15	11:31	16_51.3697N	145_51.0312E	608	1/24	9:54	16_51.2904N	145_50.9554E	16_51.3595N	145_50.9739E	590	HIGH TECH	HDD	
80	1/15	12:21	16_50.9137N	145_54.0237E	1064	1/24	8:50	16_50.8277N	145_53.9469E	16_50.8476N	145_54.0179E	1039	HIGH TECH	HDD	
81	1/15	12:57	16_50.4481N	145_57.0402E	1654	1/24	7:51	16_50.4376N	145_56.9557E	16_50.4433N	145_57.0148E	1624	HIGH TECH	HDD	
82	1/15	13:34	16_49.9883N	146_00.0419E	1850	1/24	6:42	16_50.0267N	145_59.9106E	16_49.9946N	145_59.9733E	1822	HIGH TECH	HDD	
83	1/15	14:11	16_49.5293N	146_03.0485E	1874	1/24	5:31	16_49.5766N	146_02.9939E	16_49.5646N	146_02.9977E	1857	BENTHOS	DAT	
84	1/15	14:51	16_49.0653N	146_06.0521E	1561	1/24	4:26	16_49.1147N	146_06.0113E	16_49.0684N	146_05.9770E	1563	BENTHOS	HDD	
85	1/15	15:30	16_48.5971N	146_09.0550E	945	1/24	3:12	16_48.6056N	146_09.0067E	16_48.5912N	146_08.9703E	918	BENTHOS	DAT	
86	1/15	16:10	16_48.1376N	146_12.0585E	1582	1/24	2:06	16_48.0749N	146_12.1157E	16_48.1309N	146_12.0400E	1571	BENTHOS	DAT	
87	1/15	16:51	16_47.6663N	146_15.0699E	1882	1/24	0:46	16_47.6478N	146_14.9924E	16_47.6502N	146_15.0141E	1856	BENTHOS	HDD	
88	1/15	17:30	16_47.2027N	146_18.0677E	2377	1/23	23:36	16_47.1651N	146_17.8988E	16_47.1709N	146_17.9761E	2367	HIGH TECH	HDD	*No data
89	1/15	18:10	16_46.7375N	146_21.0863E	2624	1/23	22:26	16_46.7132N	146_20.9390E	16_46.6609N	146_21.0345E	2624	BENTHOS	HDD	*No data
90	1/15	18:52	16_46.2764N	146_24.0740E	2825	1/23	21:21	16_46.2327N	146_23.8622E	16_46.2158N	146_24.0311E	2806	BENTHOS	HDD	
91	1/15	19:32	16_45.8104N	146_27.0814E	2986	1/23	20:08	16_45.7163N	146_26.9234E	16_45.7279N	146_27.0500E	2969	BENTHOS	HDD	
92	1/15	20:12	16_45.3409N	146_30.0885E	3237	1/23	18:54	16_45.2039N	146_29.9672E	16_45.2734N	146_30.0911E	3221	BENTHOS	HDD	
93	1/15	20:49	16_44.8667N	146_33.1067E	3358	1/23	17:38	16_44.7804N	146_33.0265E	16_44.8448N	146_33.0988E	3345	HIGH TECH	HDD	
94	1/15	21:25	16_44.3996N	146_36.1038E	3462	1/23	16:14	16_44.3308N	146_36.1366E	16_44.3614N	146_36.1404E	3439	BENTHOS	HDD	
95	1/15	22:03	16_43.9302N	146_39.0985E	3479	1/23	14:51	16_43.8974N	146_39.0752E	16_43.8572N	146_39.0914E	3470	BENTHOS	HDD	
96	1/15	22:43	16_43.4561N	146_42.1042E	3626	1/23	13:27	16_43.4386N	146_42.0601E	16_43.4076N	146_42.0906E	3603	BENTHOS	HDD	
97	1/15	23:21	16_42.9759N	146_45.1086E	3673	1/23	12:02	16_42.9741N	146_44.9955E	16_42.9127N	146_45.0789E	3658	BENTHOS	HDD	
98	1/16	0:01	16_42.5120N	146_48.1148E	3704	1/23	10:40	16_42.4703N	146_47.9112E	16_42.4684N	146_48.0787E	3686	BENTHOS	HDD	
99	1/16	0:36	16_42.0333N	146_51.0921E	3823	1/23	9:16	16_42.0446N	146_50.9215E	16_41.9751N	146_51.0675E	3888	BENTHOS	DAT	
100	1/16	1:29	16_41.1575N	146_56.6576E	3940	1/23	7:27	16_41.1992N	146_56.5950E	16_41.1614N	146_56.6551E	3925	HIGH TECH	HDD	
101	1/16	2:16	16_40.2706N	147_02.2170E	3689	1/22	18:08	16_40.2276N	147_01.9634E	16_40.2931N	147_02.1861E	3688	BENTHOS	HDD	
102	1/16	3:33	16_39.3854N	147_07.7787E	3878	1/22	20:15	16_39.3804N	147_07.6282E	16_39.4274N	147_07.7708E	3867	BENTHOS	HDD	
103	1/16	3:51	16_38.5053N	147_13.3282E	4085	1/22	22:14	16_38.3986N	147_13.1848E	16_38.3856N	147_13.3006E	4028	BENTHOS	HDD	
104	1/16	4:39	16_37.6075N	147_18.8830E	3713	1/23	0:08	16_37.6766N	147_18.7218E	16_37.6089N	147_18.8603E	3675	BENTHOS	HDD	
105	1/16	5:28	16_36.7181N	147_24.4362E	4099	1/23	1:21	16_36.4558N	147_23.0552E	16_36.7092N	147_24.4691E	4087	BENTHOS	HDD	
106	1/16	6:17	16_35.8259N	147_30.0085E	4599	1/23	3:37	16_35.8971N	147_29.8595E	16_35.8490N	147_30.0205E	4575	BENTHOS	HDD	*No data

Table 2b OBS information of KY03-06 cruise. An asterisk indicates that the locations were estimated by SSBL of R/V Kaiyo.

Site	Deployment time (local)		Deployment position		Depth (m)	Retrieval time (local)		Retrieval position		Estimated position at sea bottom		Est. depth	Hyd. Type	Rec. type	remarks
1	6/23	6:48	17_32.0679N	141_01.6542E	4774	7/2	7:42	17_32.0185N	141_01.6971E	17_31.8600N	141_01.8799E	4751	BENTHOS	HDD	
2	6/23	8:55	17_31.3588N	141_07.2696E	4833	7/2	10:00	17_31.4442N	141_07.1597E	17_31.3512N	141_07.2376E	4832	BENTHOS	DAT	
3	6/23	8:58	17_30.6160N	141_12.8679E	4742	7/2	11:52	17_30.6928N	141_12.8033E	17_30.6416N	141_12.8388E	4732	BENTHOS	HDD	
4	6/23	10:03	17_29.8835N	141_18.4630E	4758	7/2	13:01	17_29.9005N	141_18.4490E	17_29.8722N	141_18.4374E	4739	BENTHOS	DAT	
5	6/23	11:06	17_29.1634N	141_24.0632E	4729	7/2	16:04	17_29.1715N	141_23.9075E	17_29.1618N	141_24.0101E	4716	BENTHOS	DAT	
6	6/23	12:16	17_28.4422N	141_29.6662E	4715	7/2	17:45	17_28.4849N	141_29.4544E	17_28.4889N	141_29.5837E	4705	BENTHOS	DAT	
7	6/23	13:31	17_27.7096N	141_35.2567E	4696	7/2	19:37	17_27.7860N	141_34.9759E	17_27.7388N	141_35.1999E	4677	BENTHOS	HDD	
8	6/23	14:40	17_26.9747N	141_40.8681E	4699	7/2	21:27	17_26.9658N	141_40.6604E	17_26.9550N	141_40.8122E	4683	BENTHOS	DAT	
9	6/23	15:50	17_26.2347N	141_46.4769E	4664	7/2	23:20	17_26.1670N	141_46.2225E	17_26.2455N	141_46.4392E	4650	BENTHOS	DAT	
10	6/24	6:41	17_25.4826N	141_52.0804E	4591	7/3	2:32	17_25.4103N	141_51.9169E	17_25.4797N	141_52.0673E	4576	BENTHOS	DAT	
11	6/24	7:55	17_24.7343N	141_57.6710E	4526	7/3	5:05	17_24.3851N	141_57.3318E	17_24.6707N	141_57.5270E	4544	BENTHOS	DAT	
12	6/24	9:07	17_23.9846N	142_03.2753E	4485	7/3	7:20	17_23.8828N	142_03.0725E	17_23.9832N	142_03.2452E	4474	HIGH TECH	DAT	
13	6/24	10:20	17_23.2454N	142_08.8880E	4401	7/3	9:30	17_23.1569N	142_08.6478E	17_23.2665N	142_08.8292E	4389	BENTHOS	DAT	
14	6/24	11:29	17_22.4923N	142_14.4898E	4341	7/3	11:41	17_22.5069N	142_14.3249E	17_22.5004N	142_14.4181E	4326	BENTHOS	DAT	
15	6/24	12:37	17_21.7390N	142_20.0924E	4181	7/3	13:56	17_21.8782N	142_20.0642E	17_21.7563N	142_20.0305E	4177	BENTHOS	DAT	
16	6/24	13:43	17_20.9818N	142_25.6929E	4174	7/3	16:06	17_21.0587N	142_25.6962E	17_21.0327N	142_25.6260E	4145	BENTHOS	DAT	
17	6/24	14:19	17_20.5812N	142_28.7161E	4124	7/3	17:45	17_20.6386N	142_28.6695E	17_20.6414N	142_28.6570E	4103	BENTHOS	DAT	
18	6/24	14:56	17_20.1718N	142_31.7290E	4093	7/3	19:18	17_20.2763N	142_31.6942E	17_20.1713N	142_31.7066E	4083	BENTHOS	DAT	
19	6/25	6:33	17_19.7433N	142_34.7459E	4077			not retrieval		no response			BENTHOS	DAT	
20	6/25	7:13	17_19.3531N	142_37.7493E	3882			not retrieval		17_19.3986	142_37.8137	3883	BENTHOS	DAT	*
21	6/25	7:49	17_18.9337N	142_40.8014E	3539	7/4	2:39	17_19.0226N	142_40.9381E	17_18.9281N	142_40.7958E	3528	BENTHOS	DAT	
22	6/29	3:49	17_18.5173N	142_43.8142E	3405	7/4	3:57	17_18.5544N	142_43.9094E	17_18.5321N	142_43.7296E	3402	HIGH TECH	HDD	
23	6/29	4:23	17_18.1048N	142_46.8439E	3240	7/4	5:26	17_18.1325N	142_46.8118E	17_18.1350N	142_46.7054E	3289	BENTHOS	DAT	
24	6/29	4:57	17_17.7061N	142_49.8563E	2642	7/4	6:45	17_17.7044N	142_49.9212E	17_17.6860N	142_49.9071E	2611	BENTHOS	DAT	
25	6/29	5:31	17_17.2864N	142_52.8834E	2473	7/4	8:02	17_17.3455N	142_52.8811E	17_17.3000N	142_52.8245E	2435	BENTHOS	DAT	
26	6/29	6:04	17_16.8628N	142_55.8992E	2680	7/4	9:03	17_16.9328N	142_55.8629E	17_16.9210N	142_55.8396E	2662	BENTHOS	DAT	
27	6/29	6:37	17_16.4607N	142_58.9137E	2769	7/4	10:24	17_16.6007N	142_58.9613E	17_16.5846N	142_58.8931E	2758	BENTHOS	HDD	
28	6/29	7:09	17_16.0307N	143_01.9392E	1881	7/4	12:21	17_16.1322N	143_02.0532E	No data			HIGH TECH	DAT	No data
29	6/29	7:42	17_15.6174N	143_04.9543E	1843	7/4	13:27	17_15.7437N	143_05.0768E	17_15.6824N	143_04.9124E	1810	HIGH TECH	HDD	
30	6/29	8:15	17_15.1756N	143_07.9737E	2037	7/4	14:28	17_15.2562N	143_08.1053E	17_15.2234N	143_07.9561E	2007	BENTHOS	DAT	
31	6/29	8:47	17_14.7501N	143_10.9892E	1901	7/4	15:35	17_14.7931N	143_11.1301E	17_14.7252N	143_10.9965E	1879	BENTHOS	DAT	
32	6/29	9:21	17_14.3314N	143_13.9993E	1931	7/4	16:51	17_14.3983N	143_14.1067E	17_14.4371N	143_14.0605E	1885	BENTHOS	DAT	
33	6/29	9:56	17_13.9259N	143_17.0109E	1999	7/4	17:50	17_13.9202N	143_17.0354E	17_14.0301N	143_17.0222E	1979	BENTHOS	HDD	
34	6/29	10:31	17_13.4967N	143_20.0369E	2564	7/4	19:07	17_13.4893N	143_20.0285E	17_13.5224N	143_20.0691E	2581	BENTHOS	HDD	
35	6/29	11:06	17_13.0711N	143_23.0615E	2643	7/4	20:23	17_13.0747N	143_23.0329E	17_13.1236N	143_23.1070E	2627	BENTHOS	DAT	
36	6/29	11:41	17_12.6535N	143_26.0765E	2438	7/5	17:54	17_12.6316N	143_26.1702E	17_12.7027N	143_26.1117E	2430	BENTHOS	DAT	
37	6/29	12:18	17_12.2327N	143_29.0977E	2448	7/5	16:45	17_12.2415N	143_29.2064E	17_12.2336N	143_29.1283E	2624	BENTHOS	DAT	
38	6/29	12:55	17_11.8005N	143_32.1189E	2673	7/5	15:30	17_11.7905N	143_32.1922E	17_11.8088N	143_32.1260E	2660	BENTHOS	HDD	
39	6/29	13:33	17_11.3701N	143_35.1338E	3145	7/5	14:23	17_11.3142N	143_35.1484E	17_11.3764N	143_35.0875E	3125	BENTHOS	DAT	
40	6/29	14:09	17_10.9318N	143_38.1560E	3833	7/5	13:09	17_10.9006N	143_38.1497E	17_10.9369N	143_38.1507E	3835	BENTHOS	DAT	
41	6/29	14:47	17_10.4961N	143_41.1841E	4240	7/5	11:48	17_10.3635N	143_41.1054E	17_10.3059N	143_41.1265E	4200	BENTHOS	DAT	
42	6/29	15:25	17_10.0789N	143_44.1904E	4230	7/5	10:14	17_09.9541N	143_44.0136E	17_10.0944N	143_44.1490E	4211	BENTHOS	DAT	
43	6/29	16:02	17_09.6570N	143_47.1911E	4109	7/5	8:34	17_09.3919N	143_46.9528E	17_09.5916N	143_47.1316E	4061	BENTHOS	DAT	
44	6/29	16:39	17_09.2372N	145_50.2100E	4232	7/5	6:58	17_09.0183N	143_50.0378E	17_09.1863N	143_50.1416E	4215	BENTHOS	DAT	
45	6/29	17:50	17_08.4375N	143_55.7961E	3764	7/5	4:14	17_08.3377N	143_55.6408E	17_08.4138N	143_55.7224E	3760	BENTHOS	HDD	
46	6/29	18:58	17_07.6282N	144_01.3798E	3518	7/5	2:09	17_07.5437N	144_01.2904E	17_07.5570N	144_01.3251E	3504	BENTHOS	DAT	

ern end to where has the normal oceanic crust.

We shot an airgun array from an eastern end of the line to OBS#45 during KY03-01 cruise and from OBS#47 to a western end of the line during KY03-06 cruise. Each specification of the airgun shooting geometry was right same. The airgun array with total capacity of 12,000 cubic inches consists of eight airguns with 1500 cubic inches capacity each. The air pressure sent to chambers was 2000 psi. The shot interval was 200 m (about 70-100 sec depending on the ship speed) to reduce noise by previous shot. The geometry of the seismic experiment is shown in Figure 2. The two floats with two airguns each were deployed from port and starboard sides, respectively. The airgun array's size is 34.56 m length x 21.3 m width. Airgun's position was located 148.2 m behind the ship position (distances from ship antenna to tail of ship, and from tail of ship to center of the airgun array, are 38 m and 110.2 m, respectively).

The differential global positioning system (DGPS) was used as the navigation system by Skyfix system. We adopted a nearest station, Manila, as the reference station, because Guam was unavailable. The accuracy of ship positioning was about 10 m.

2.2. Ocean Bottom Seismographs

We deployed 106 OBSs on the seismic line during KY03-01 cruise and 46 OBSs during KY03-06 cruise (Figure 1, Table 2). As above, because we did not complete airgun shooting of only KY03-01 cruise and the shooting area was limited from OBS#45 to eastern end of the line, 46 OBSs from OBS#1 to OBS#46 were deployed on same line again during KY03-06 cruise. Only two OBSs for KY03-06 cruise were not retrieved due to troubles of each release system. The interval of each OBS is 5.4 km for the strong crustal variation or 10 km for the relative homogeneous area. These intervals were decided by 2-D ray tracing using expected velocity model referring to that of Izu-Ogasawara arc (Suyehiro et al., 1996; Takahashi et al., 1998).

The specifications of OBSs were also right same between above two cruises. The OBSs were equipped with a hydrophone sensor and three-component geophones (vertical and two horizontal components perpendicular each other) using gimbal-leveling mechanisms; natural frequency of the geophones was 4.5 Hz. The sensitivities of a geophone and hydrophone sensors are shown in Table 3. Our OBSs and the digital recorder system were originally designed by Kanazawa and

Table 3　Sensitivities of geophone and hydrophone sensors.

Sensor type	Sensor name	Maker	Sensitivity	Frequency
Geophone (three components)	L-28LB.H.V	Mark Products	0.69 V/in/sec	4.5Hz (natural freq.)
Hydrophone	AQ-18	Benthos, inc.	-169 dB	1Hz - 12kHz
Hydrophone	HTI-99DY	HIGH TECH, inc	-165dB	2Hz - 20kHz

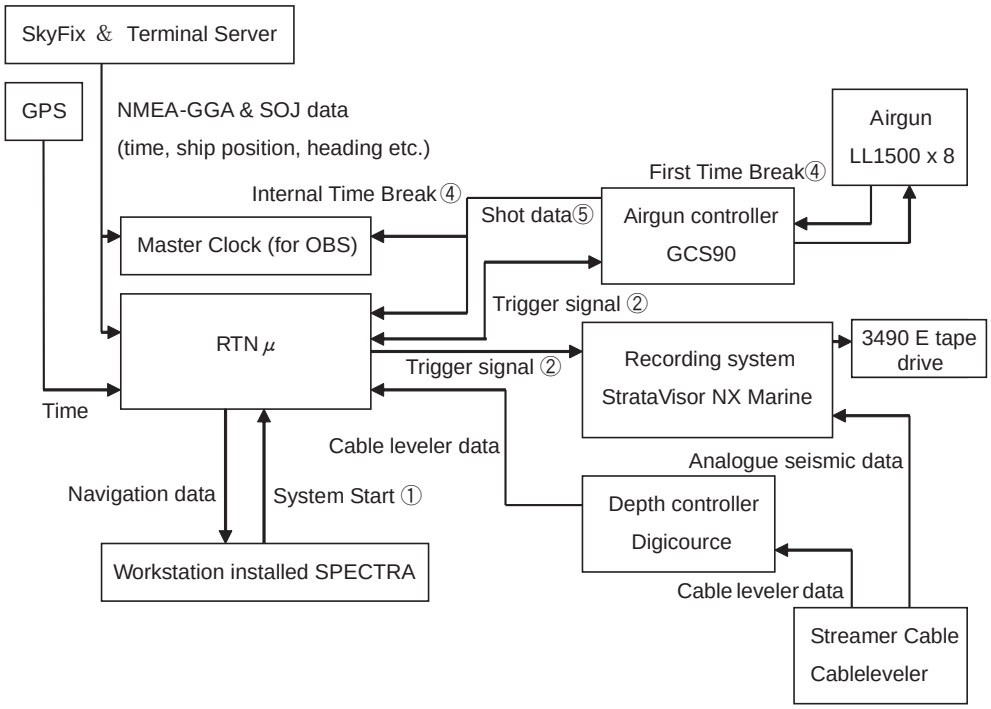

Fig. 3　Flow chart of the MCS recording system. Circled numerals show the timing flow of this seismic system.

Shiobara (1994) and Shinohara et al. (1993). The digital recorder used a 16-bit A/D converter and stored data on digital audiotape or a hard disk sampling continuously for 17 days with original format (Shinohara et al., 1993). The power for the recorder system of OBS is supplied by rechargeable lithium-ion or alkali batteries. Above geophone sensors with gimbal-leveling mechanism, batteries and a recorder system are installed in 17 inch glass sphere by Benthos, Inc. The glass sphere is stored in the yellow hard hat. To enable easy OBS retrieval after arriving at sea surface, all OBSs are attached to a flash light and a beacon with coded signals.

All OBSs are deployed by free fall and retrieved by melting releaser composed of stainless steel plates connecting the OBS with a weight after a transponder system, which receives acoustic signal sent from a vessel. This acoustic communications between the OBS and the vessel were performed using transducers installed on the vessel. Positions of OBSs on sea bottom are estimated by the vessel's positioning system and the direct arrivals of airgun shooting within 10 km from the each OBS. The accuracy of the positioning seems to be less than 100 m.

2.3. Multichannel hydrophone streamer

During airgun shooting, we towed a 12-channel hydrophone streamer to know the distribution of sediments with low P-wave velocity. The hydrophne streamer cable is solid type made by Sercel. The interval of each channel was 25m. Hydrophone sensors (TYPE Bruel & Kjaer Free-field 1/2 Microphone) with sensitivity of -25.9dB re1V/Pa (50.4mV/Pa) were used and these analog signals form five sensors in same channel were stacked before A/D conversion. The A/D conversion kit was attached in the recording system, the StrataVisor NX Marine made by Geometrics Inc, and digitized data was recorded on 3490E tapes with SEG-D format. No recording delay was set. The sampling rate was 4 msec and the record length was 13.5 sec or 12.0 sec.

The flow chart of this seismic experiment is shown in Figure 3. Navigation data collected by the ship's navigation system is sent to the RTNμ and the master clock via the terminal server connecting the LAN of the ship with this MCS system. The RTNμ obtains time signals of GPS from original antenna and the signals are used for the confirmation of navigation data sent from the ship's system. Then, the navigation data is sent to the Sun workstation installed SPECTRA software and monitored on the display. Timing of the system start, shot number and so on are set using the SPECTRA software. The system start signal generated from the SPECTRA is sent to the gun controller, GCS90 and the recording system, StrataVisor NX Marine, as trigger signal via the RTNμ. The gun controller sends back the internal time break signal to the master clock and RTNμ just after getting trigger signals, the shot signal is sent to eight airguns, and the recording system starts to record digitized seismic data from a hydrophone streamer. The first break signal is sent to the gun controller from the airguns at same timing with the shot, then the gun controller sends the shot data to RTNμ.

3. Data

In this chapter, we introduce examples of the seismic data obtained by OBSs and a multichannel streamer. Each three components of OBS#1 on the Parece Vela basin, OBS#30 on the west Mariana ridge, OBS#61 on the Mariana trough, OBS#86 on the Mariana arc and OBS#104 on the forearc, the serpentinite seamount and the MCS data are indicated in following subsections.

3.1. OBS

We retrieved almost OBSs data except five OBSs with recorder troubles (shown by black circles in Figure 1). The recorder troubles of five OBSs seemed to be mainly caused by much consumption of the power for the hard disk recorder system. Data quality of available OBSs is basically good and we can trace the first phases on vertical records until 200-250 km distance from each OBS. Horizontal records also show good quality despite of poorer S/N ratio than the vertical, and we can see converted S arrivals until about 100 km from the OBS. We describe characteristics of OBS data using vertical record sections of OBS#1 (Figure 4), OBS#30 (Figure 5), OBS#60 (Figure 6), OBS#86 (Figure 7) and OBS#104 (Figure 8) as follows.

Figure 4a shows a vertical record section of OBS#1 deployed on the Parece Vela basin. First arrivals can be identified to an offset of 280 km. Apparent velocities at offsets of 5-12 km, 25-100 km, 100-210 km and 210-280 km are 4.2 km/s, 7.6 km/s, 7.0 km/s and 8.2 km/s, respectively. The region of slow apparent velocity of 7.0 km/s seems to correspond to a transition zone between the Parece Vela basin and the west Mariana ridge and the topographic and crustal changes probably result in such variation of the apparent velocities.

Figure 5a shows a vertical record section of OBS#30 deployed on the west Mariana ridge. First arrivals can be identified to an offset of about 180 km. A remarkable characteristic of a record section of OBS#30 is a first phase with apparent velocity of about 6 km/s, which is not identified on record sections deployed on the Parece Vela basin (Figure 4). Apparent velocities at offsets of 3-20 km, 20-70 km and 70-180 km in the western side are 4.1 km/s, 5.8 km/s and over 8 km/s, respectively. Those of 5-65 km and 65-105 km in the eastern side are 5.6 km/s and over 8 km/s, respectively. Areas we can identify the apparent velocity of about 6 km/s seems to be limited within the west Mariana ridge region.

Figure 6a shows a vertical record section of OBS#60 deployed on the Mariana trough. The main characteristics of this record section are variation of the amplitudes. In the western part, the amplitude of first phases abruptly becomes small at an offset of 50 km. Apparent velocities at offsets of 3-8 km, 8-25 km, 25-40 km and 40-80 km in the western side are 4.2 km/s, 6.4 km/s, 6.8 km/s and 7.7 km/s, respectively. Those of 3-9 km, 9-25 km, 25-60 km and 170-230 km in eastern side are 4.0 km/s, 6.2 km/s, 7.2 km/s and 8.2 km/s, respectively. At an offset of 110-170 km, the apparent velocity becomes slow due to the topography and probably crustal structure.

Figure 7a shows a vertical record section of OBS#86 deployed on the Mariana arc. This record section has a strong variation of apparent velocities in the western side. Apparent velocities of 5-15 km, 15-25 km, 25-55 km and 70-150 km in the western side are 4.2 km/s, 4.8 km/s, 7.6 km/2 and 8.2 km/s, respectively. Those of 2-8 km, 8-14 km, 14-36 km, 36-50 km and 50-80 km in the eastern side are 3.0 km/s, 4.0 km/s, 5.0 km/s, 6.6 km/s and 7.8 km/s, respectively. Those in the western and eastern sides become slow at an offset of 55-70 km and

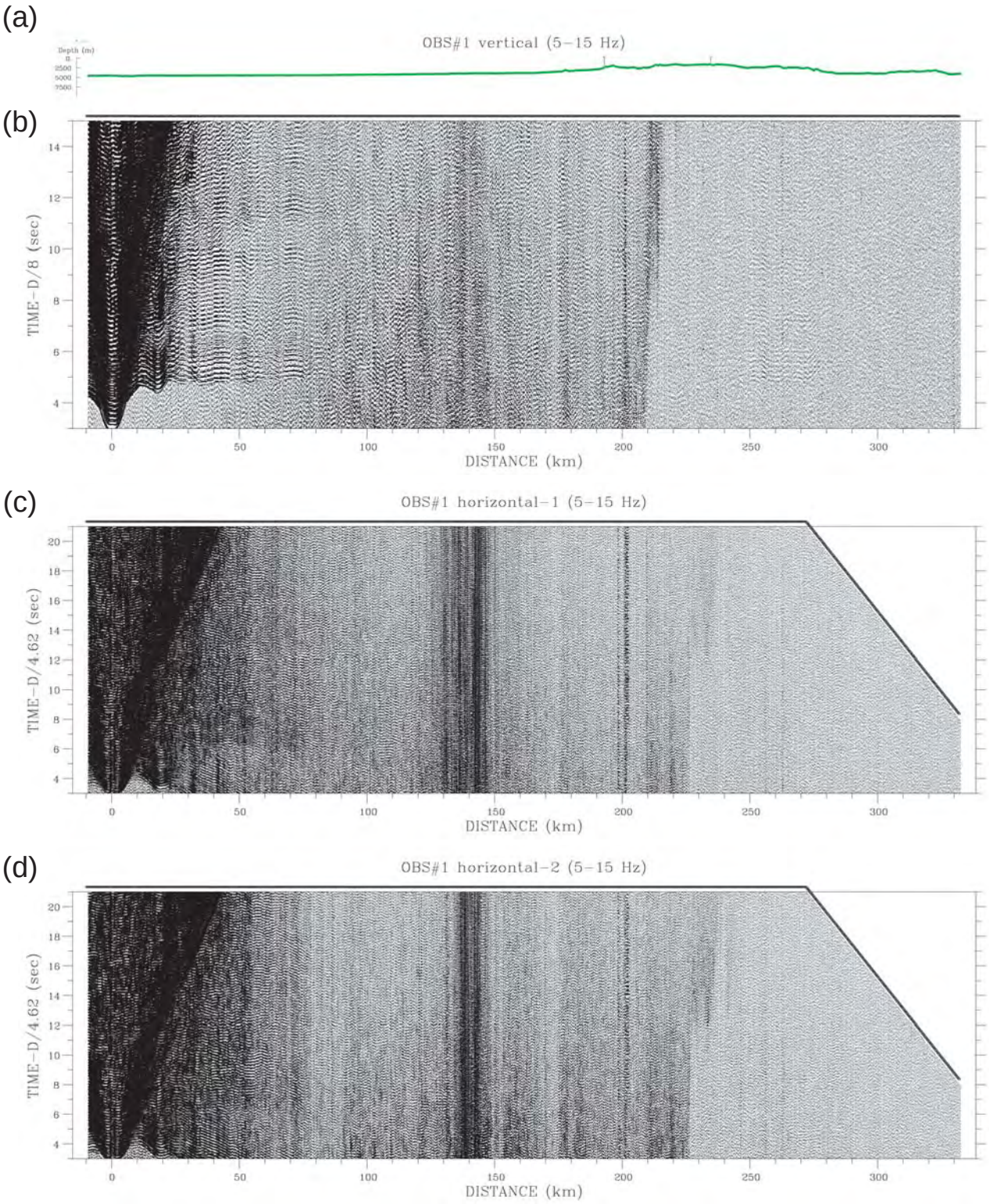

Fig. 4 Record sections of OBS#1. All traces are filtered by 5-15 Hz. Horizontal and vertical axes are offsets from OBS and reduced traveltimes by 8 km/s for vertical component or 4.62 km/s for horizontal components. (a) Topography. (b) Vertical component. (c) Horizontal-1 component. (d) Horizontal-2 component.

80-120 km, respectively due to the topography and probably variations of the crustal structure as OBS#60.

Figure 8a shows a vertical record section of OBS#104 deployed on a serpentinite seamount in the forearc region. The area we can identify first arrivals is narrower than other area. Apparent velocity at offsets of 10-60

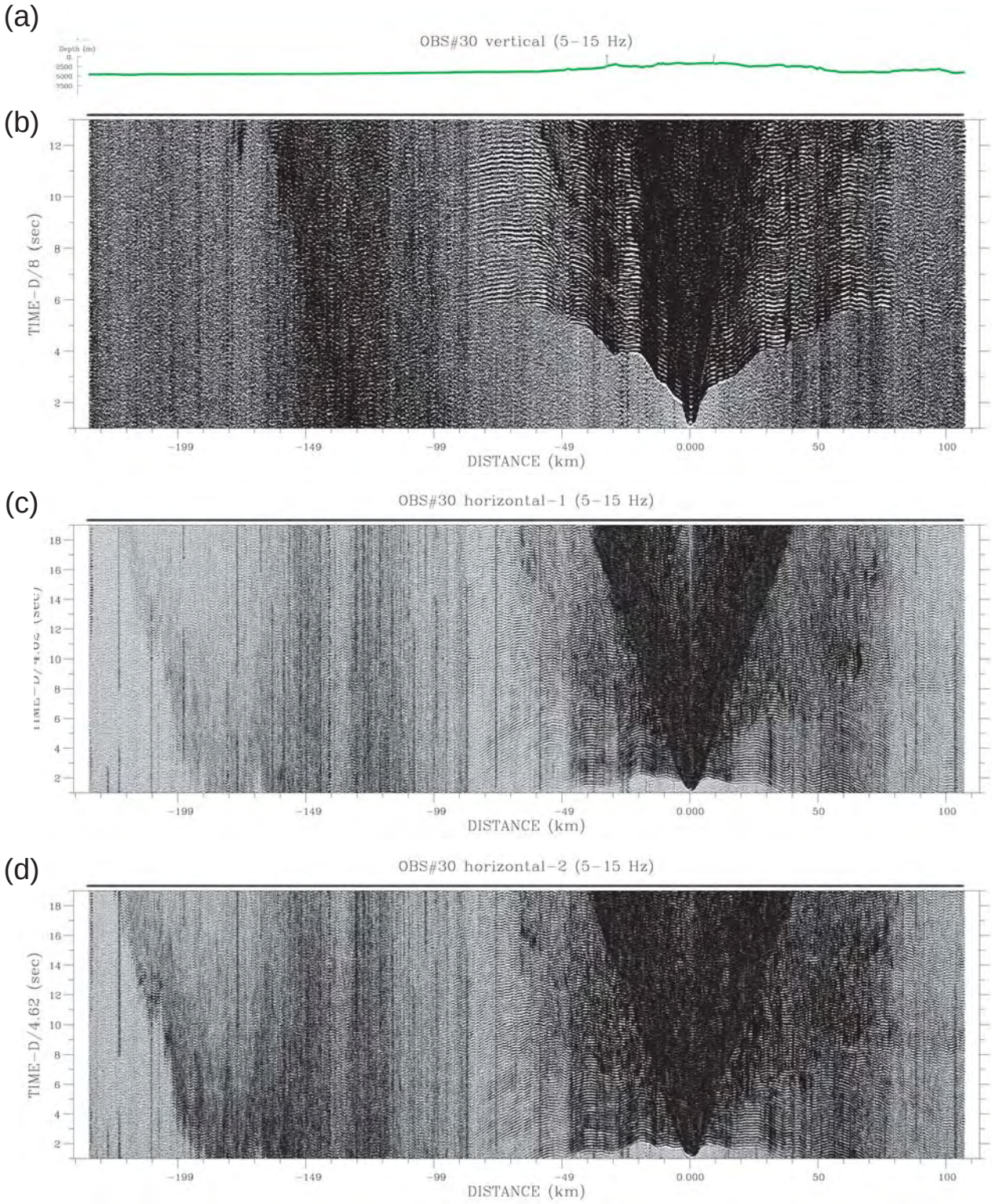

Fig. 5 Record sections of OBS#30. The details are same as for Figure 4. (a) Topography. (b) Vertical component. (b) Horizontal-1 component. (c) Horizontal-2 component.

km, 60-80 km and 80-100 km are 6.2 km/s, 7.4 km/s and over 8 km/s, respectively.

3.2. MCS

The reflection data recorded by 12-channel hydrophone streamer has also enough quality to pick the acoustic basement except one or two channels. Applied

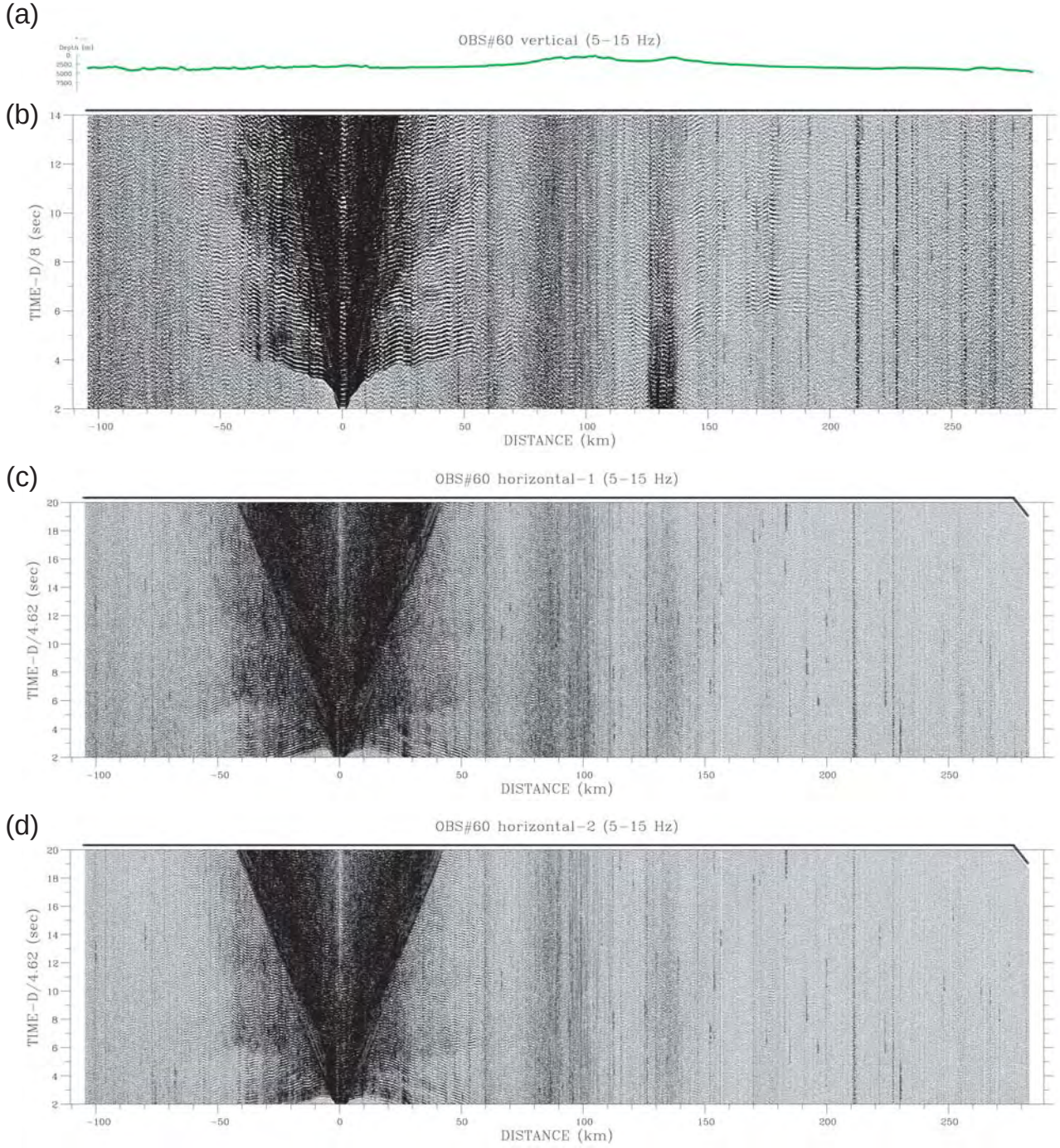

Fig. 6 Record sections of OBS#60. The details are same as for Figure 4. (a) Topography. (b) Vertical component. (b) Horizontal-1 component. (c) Horizontal-2 component.

flows were corrections of spherical divergence, editing bad quality traces, sorting by CDPs, the NMO corrections with water velocity of 1500 m/s, stacking, the deconvolution filtering, the bandpass filtering of 8-45 Hz, the time migration using water velocity and the auto gain control. Because of the channel interval of 25m and the shot interval of 200 m, the fold number was 1 or 0.

We showed all processed reflection profiles using above flows (Figure 9) and describe the rough characteristics. Thick sediments with thickness of 700-1500 msec were accumulated on the entire of forearc region except the serpentinite diapir area. The sediments with acoustic transparency also cover on eastern ridge of the Mariana arc, however, a western ridge of the Mariana

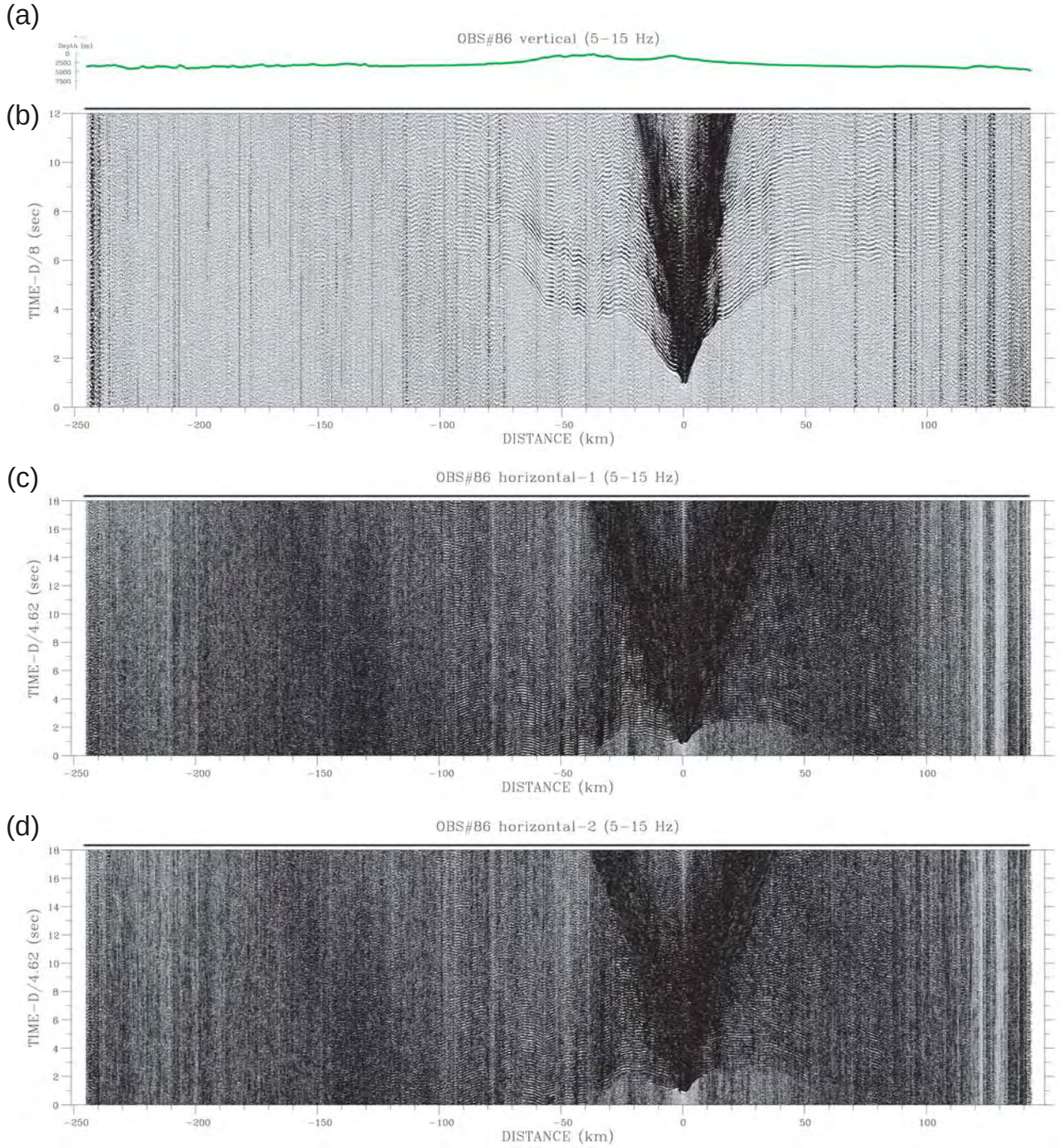

Fig. 7 Record sections of OBS#86. The details are same as for Figure 4. (a) Topography. (b) Vertical component. (b) Horizontal-1 component. (c) Horizontal-2 component.

arc does not have them. A western ridge of the arc has complex topography and we can identified intrusive materials right beneath the topographic low (CDP 15200). Sediments with acoustic transparency and with thickness of 500 msec cover the basement between the Mariana arc and the Mariana trough (CDPs 18000-20000). We can see diffractions at depths of 6-8 sec in the western Mariana trough (CDPs 20000-26000) and this might indicate many intrusive materials because these have faster apparent velocity than 1500 m/s. The west Mariana ridge also has complex topography and we can identify diffractions at CDPs 33500-36000 and 39000-41000. At the western side from CDP 42000, the sea floor topography becomes gentle and we can see

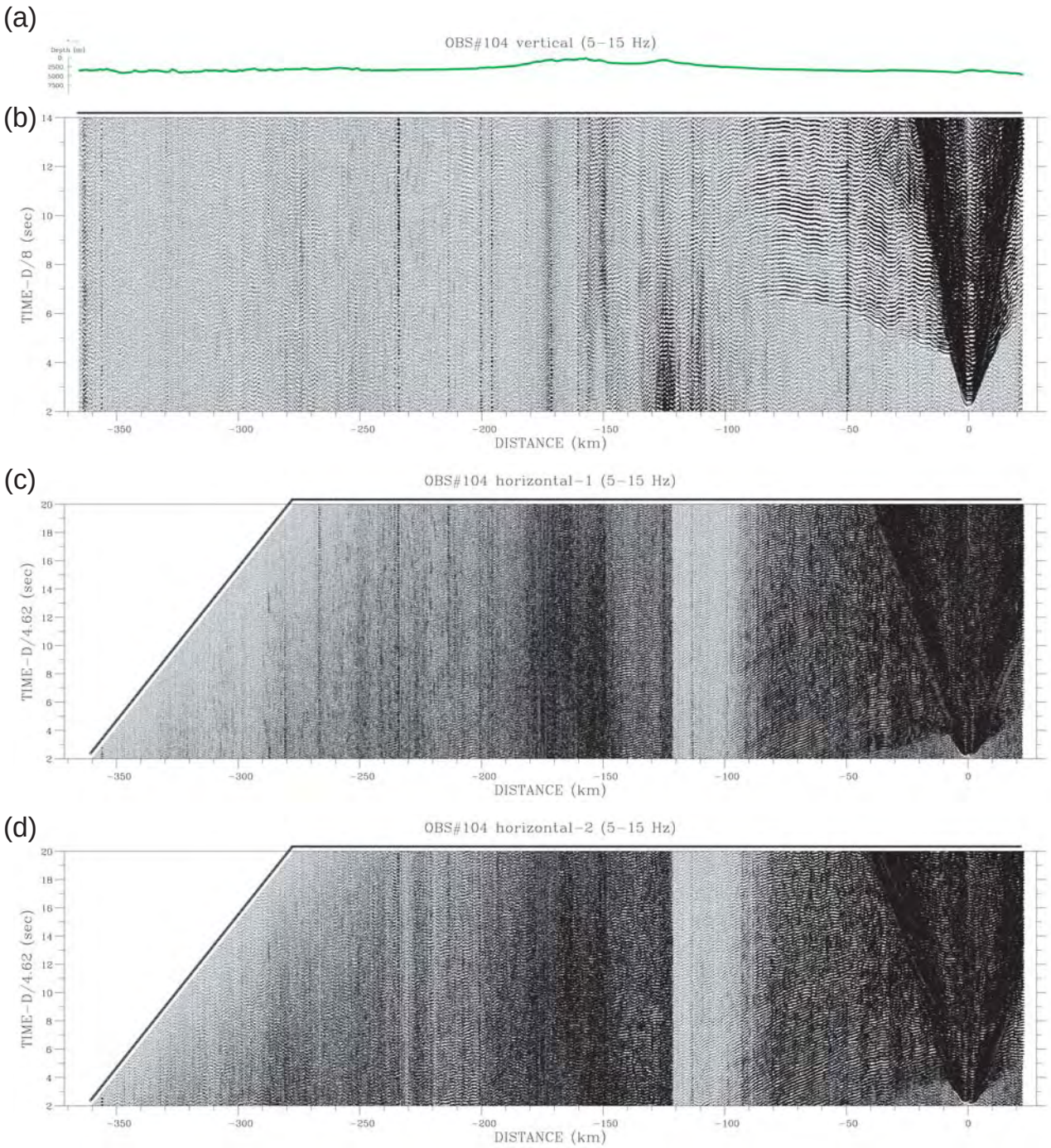

Fig. 8 Record sections of OBS#104. The details are same as for Figure 4. (a) Topography. (b) Vertical component. (b) Horizontal-1 component. (c) Horizontal-2 component.

thick sediments like turbidites at CDPs 42000-45000 and hemiperagic sediments at CDPs 48000-56500. At the Parece Vela basion region, we can also trace weak interfaces at 8-9 sec, which might be oceanic Moho.

4. Summary

In this paper, we summarize the specification and the arrangement of the seismic experiments across the Mariana arc - backarc system and introduce the seismic data. Due to good data quality of the OBSs, we can trace the first P-arrivals to the offsets of 200-250 km from each OBS and also S-arrivals to that of 100 km. We will estimate the velocity structural variation across entire of the Mariana arc - backarc system, and believe that we can understand distribution of the granitic layer and that know common and difference characteristics

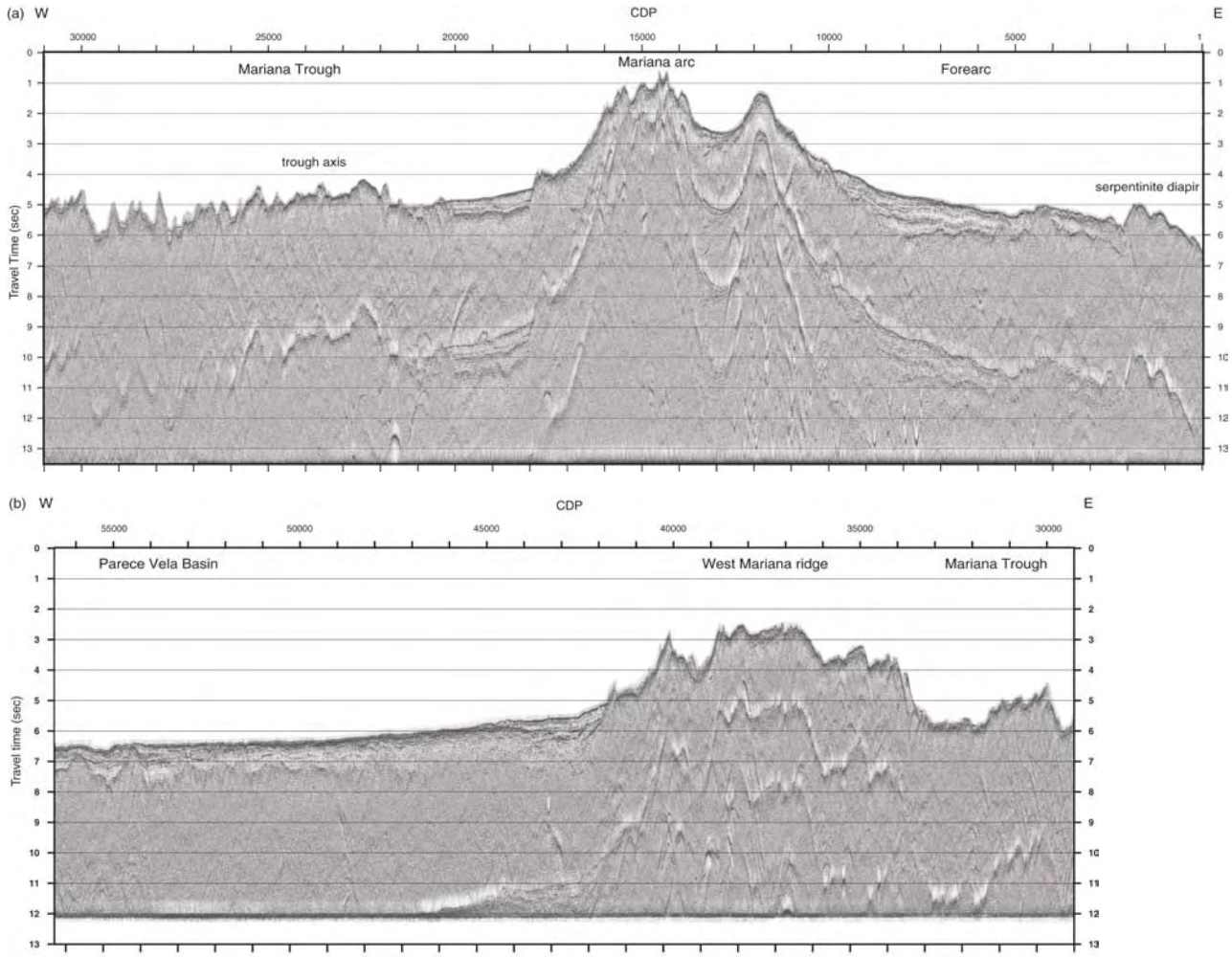

Fig. 9 MCS profile. (a) Eastern half obtained by KY03-01 cruise. (b) Western half obtained by KY03-06 cruise.

between the Mariana arc and the northern Izu arc by Suyehiro et al. (1996).

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