revision date: 26 July 87

FM35-06
CRUISE SUMMARY
FOR THE
JAPAN-UNITED STATES COOPERATIVE STUDY
EXPANDING SPREAD SEISMIC PR0FILING, PHYSICAL PROPERTIES AND SUBDUCTION PROCESSES IN THE NANKAI TROUGH
JULY 13-JULY 27, 1987

	United States	Japan
Ships:	Fred H. Moore	Tansei-Maru
Chief Scientists:	Thomas H. Shipley Paul Stoffa	Asahiko Taira
Captains:	Captain Perkins	Hiroshi Igarashi

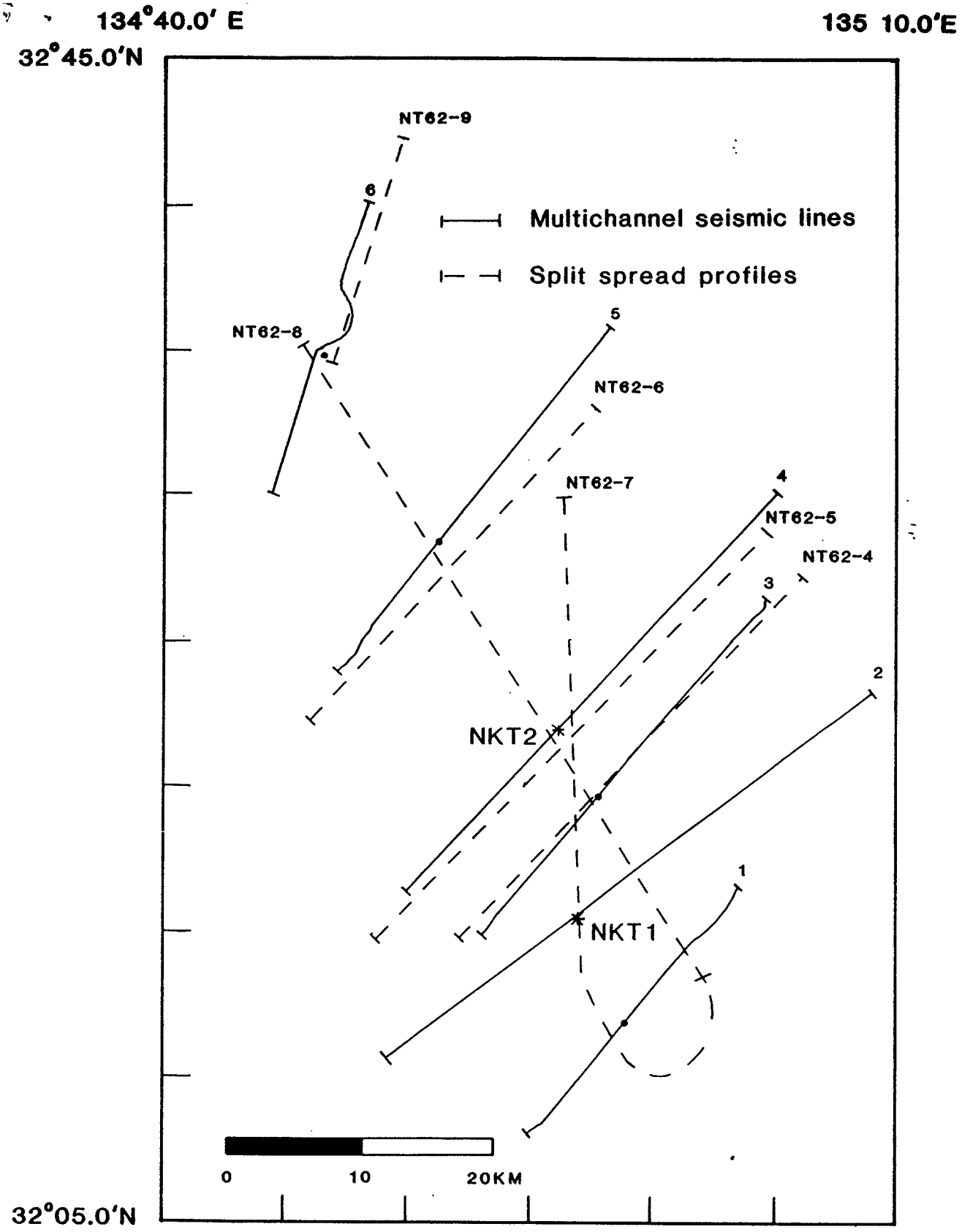

Figure 1. Sketch map of the northeastern Nankai Trough area. Proposed ODP sites are NKT-1 and NKT-2. Offset between split spread profiles (SSP) and the multichannel lines (MCS) is due to different navigation datums. After final navigation reduction, the two will be nearly coincident. SSP's used two 400 cubic inch water guns, 96 trace 16.66m group streamer. MCS used 1065 cubic inch air gun array, 69 trace 33.33m group streamer.

AREA 1
NORTHEASTERN NANKAI TROUGH
PROPOSED ODP SITE AREA

SSP *LINE*	REFLECTION PROFILE DESCRIPTION	LOCATION	
1	Pelagic Section	N55-1, SP 130	
	Proposed:	A. 32 15.938(56.3)	135 03.087(05.2)
		C. 32 11.803(48.2)	134 58.988(59.3)
		E. 32 07.667(40.0)	134 54.896(53.8)
	Actual:	A. 32 07.425(25.5)	134 54.116(07.0)
		C. 32 11.571(34.3)	134 58.760(45.6)
		E. 32 17.795(47.7)	135 04.900(54.0)

	DAY	TIME(z)	REEL	REC	MINI RANGE(m)
A.	J199	21:48:21	356064	0007	11381, 11376
C.	J199	22:39:01	356066	0167	179, 180
E.	J199	23:48:03	356069	0385	14461, 14462

COMMENTS:
Split spread with Moore going with the current from SW to NE. Data acquired with offsets of -9km to +16km. Minor track deviation of Moore to avoid ship from offsets of 7-10km. Current somewhat diminished compared to other area 1 profiles.

AREA 1
NORTHEASTERN NANKAI TROUGH
PROPOSED ODP SITE AREA

SSP *LINE*	REFLECTION PROFILE DESCRIPTION	LOCATION	
2	Undeformed Trench Wedge	N55-1, SP 290	
	Proposed:	A. 32 18.685(41.1)	135 02.118(07.1)
		C. 32 15.463(27.8)	134 56.998(59.9)
		E. 32 12.238(14.3)	134 51.885(53.1)
	Actual:	A. 32 23.237(14.2)	135 09.235(14.1)
		C. 32 15.748(44.9)	134 57.368(22.1)
		E. 32 10.601(36.1)	134 49.273(16.4)

	DAY	TIME(z)	REEL	REC	MINI RANGE(m)
A.	J199	14:13:04	356044	0001	22998, 22995 (REC29)
C.	J199	17:50:43	356055	0688	418, 417
E.	J199	20:30:39	356063	1193	16004, 15994

COMMENTS:
No reel 356046 because of reject on MT3.

Split spread with Moore going against the current from NE to SW. 6 hours of shooting because of current. Offsets of -22km to +15km.

AREA 1
NORTHEASTERN NANKAI TROUGH
PROPOSED ODP SITE AREA

SSP *LINE*	REFLECTION PROFILE DESCRIPTION	LOCATION	
3	Proto-Thrust Zone	55-2, CDP 190, SP 71	
	Proposed:	A. 32 23.691(41.4)	135 02.038(02.3)
		C. 32 19.603(36.2)	134 57.868(52.1)
		E. 32 15.514(30.8)	134 53.705(42.3)
	Actual:	A. 32 14.970(58.2)	134 53.167(10.0)
		C. 32 19.637(38.2)	134 57.903(54.2)
		E. 32 26.363(21.8)	135 04.733(44.0)

	DAY	TIME(z)	REEL	REC	MINI RANGE(m)
A.	J199	10:19:00	356037	0001	11022, 11013 (REC 5)
C.	J199	11:16:16	356039	0181	252, 256
E.	J199	12:43:02	356043	0455	16355, 16360

COMMENTS:
Split spread profile with Moore going with the current. Good signal to noise. Good crossing. Offsets of -10km to +17km.

AREA 1
NORTHEASTERN NANKAI TROUGH
PROPOSED ODP SITE AREA

SSP LINE	REFLECTION PROFILE DESCRIPTION	LOCATION	
4	Proposed ODP Site "NKT-2"		
	Basin	55-2, CDP 368, SP 160	
	Proposed:	A. 32 25.899(54.0)	135 00.597(35.8)
		C. 32 21.953(57.2)	134 56.238(14.3)
		E. 32 18.005(00.3)	134 51.886(53.2)
	Actual:	A. 32 30.523(31.4)	135 05.243(14.6)
		C. 32 21.785(47.1)	134 56.052(03.1)
		E. 32 16.117(07.0)	134 49.917(55.0)

	DAY	TIME(z)	REEL	REC	MINI RANGE(m)
A.	J199	03:15:00	356022	0001	20598, 20597 (REC 16)
C.	J199	06:29:17	356031	0610	105
E.	J199	08:14:25	356036	0943	14171, 14169 (REC 931)

COMMENTS:
Both ships came on line quickly and shot this profile as a split spread from -18km to +15km. Moore went into the current so its ground speed was about 3.5 knots. Coverage is very high about 45 fold per offset increment of 50m.

AREA 1
NORTHEASTERN NANKAI TROUGH
PROPOSED ODP SITE AREA

SSP LINE	REFLECTION PROFILE DESCRIPTION	LOCATION	
5A	Lowermost Bench	55-2, CDP 968, SP 460	
	Proposed:	A. 32 32.566(34.0)	134 55.281(16.9)
		C. 32 28.323(19.4)	134 51.328(19.7)
		E. 32 24.079(04.7)	134 47.382(22.9)
	Actual:	A. 32 22.663(39.8)	134 46.575(34.5)
		C. 32 28.278(16.7)	134 51.328(19.7)
		E. 32 35.761(45.7)	134 58.235(14.1)

	DAY	TIME(z)	REEL	REC	MINI RANGE(m)
A.	J198	23:05:00	356015	0002	12899, 12889
C.	J199	00:04:13	356017	0189	142, 143
E.	J199	01:24:39	356021	0443	17390, 17390

COMMENTS:
SSP-5 was started, but the other ship got off course so we started over with SSP-5A. On 5A, closest point of approach on shot 189 at mini-ranger readings of A-142m, and B-143m.

Current srong again so another split spread. This mode is not our preference, but the ships cannot make the proper speed over the ground with the strong current in this study area. Also, the Tansei can keep station well so in some ways this is preferrable logistically because of difficulties coordinating ESP maneuvers for the first time.

Moore had to circle twice before starting this line taking 7 hours. Moore went from SW to NE, with the current. Offsets of -10 to +17km were obtained. Signal to noise good to excellent when running with the current.

AREA 1
NORTHEASTERN NANKAI TROUGH
PROPOSED ODP SITE AREA

SSP *LINE*	REFLECTION PROFILE DESCRIPTION	LOCATION

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6 Slope Basin — 55-2, CDP 1498, SP 725

Proposed:	A. 32 39.971(58.2)	134 48.580(34.8)
	C. 32 34.853(51.2)	134 46.548(32.9)
	E. 32 29.736(44.1)	134 44.521(31.2)
Actual:	A. 32 42.067(04.0)	134 49.893(53.6)
	C. 32 34.853(51.2)	134 46.548(32.9)
	E. 32 26.055(03.3)	134 43.033(02.0)

	DAY	TIME(z)	REEL	REC	MINI RANGE(m)
A.	J198	10:46:55	356001	0001	14152, 14155
C.	J198	12:39:02	356006	0356	523, 521
E.	J198	14:32:55	356011	0714	16659, 16657 (REC 707)

COMMENTS:
First profile was shot as a split spread because of high currents (2+ knts) from SW to NE in study area 1. Tansei maintained position at the midpoint and Moore steamed from -14km to +16km. Moore steamed from NE to SW. Large excursion as ships passed is unacceptable. Next time will be better. Signal/noise fair to poor because of towing noise.

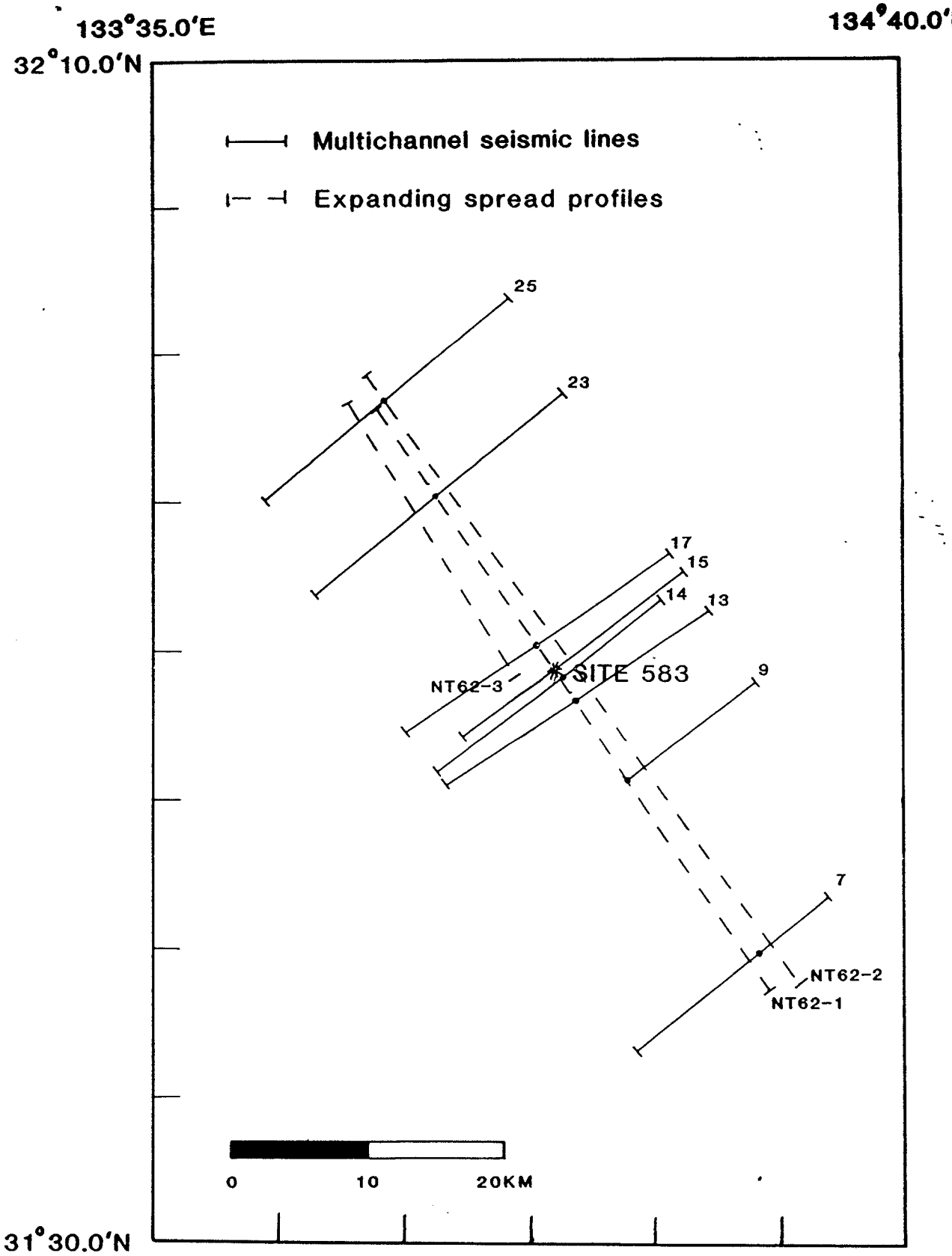

Figure 2. Sketch map of the southwestern Nankai Trough area. DSDP site 583 vicinity. Shown are 8 expanding spread profiles (ESP) and 3 multichannel dip lines. The ESP's were collected with a 96 trace, 16.66m streamer and with two 400 cubic inch water guns (except 25, which used one water gun). The MCS used a 1065 cubic inch air gun array, 96 trace, 16.66m group streamer.

AREA 2
SOUTHWESTERN NANKAI TROUGH
DSDP LEG 87 AREA

ESP LINE	REFLECTION PROFILE DESCRIPTION	LOCATION	
7	Pelagic Section	55-3, SP "2200" extrapolated	
	Proposed:	A. 31 43.163(09.8)	134 04.270(16.2)
		C. 31 39.793(47.6)	133 59.318(19.1)
		E. 31 36.420(25.2)	133 54.867(52.0)
	Actual:	A. 31 41.635(38.1)	134 02.107(06.4)
		C. 31 39.808(48.5)	133 59.348(20.9)
		E. 31 36.225(13.5)	133 54.070(04.2)

	DAY	TIME(z)	REEL	REC	MINI RANGE(m)
A.	J201	05:03:00	356070	0001	11533, 11531
C.	J201	05:38:09	356071	0112	125
E.	J201	06:41:29	356074	0309	21109, 21111

COMMENTS:
On reel 356073, record 210, the deep water delay was changed to 4.0s (at 10km mini range). The 4.0s was taken back out and put at 0.0s again at approximately record 214.

Both ships came onto line and sychronized up quickly considering this was the first time for both ships to do an ESP. Ranges were read from SYLEDIS and radioed between ships, as was the speed over the ground. Data was acquired with two water guns from -5km to +11km from the midpoint. A good midpoint was maintained throughout. Maximum source-receiver offset is approximately 22km.

AREA 2
SOUTHWESTERN NANKAI TROUGH
DSDP LEG 87 AREA

ESP LINE	REFLECTION PROFILE DESCRIPTION	LOCATION	
9	Site 582, Undeformed Trench Wedge	N55-3, SP 1932	
	Proposed:	A. 31 48.900(54.0)	133 59.051(03.1)
		C. 31 45.623(37.4)	133 54.008(00.5)
		E. 31 42.343(20.6)	133 48.972(58.3)
	Actual:	A. 31 45.178(10.7)	133 53.643(38.6)
		C. 31 45.655(39.3)	133 54.132(07.9)
		E. 31 49.258(15.5)	133 59.590(35.4)

	DAY	TIME(z)	REEL	REC	MINI RANGE(m)
A.	J201	10:28:00	356075	0004	2551, 2552 (REC 4)
C.	J201	10:36:46	356075	0028	38,43
E.	J201	11:45:49	356078	0246	21762, 21764

COMMENTS:
The time for start (10:28:00) is for record 4 because the logger had crashed at the start of the line and then the GUS was reset and restarted at record 9. (We appear to have lost record 7.)

Both ships moved to this line immediately after completing ESP 7. Moore came onto the line at the -5km point but had to circle because Tansei-Maru was not ready. Two hours were lost and Moore came onto the line just at the midpoint. Data were acquired using two water guns out to 11km from the midpoint. A good midpoint was maintained, but the current of 1+ kt made maneuvering more difficult than doing ESP 7. Moore travelled with the current at slow on one engine. Tansei was against the current and was barely able to make good 5 knots over the ground.

AREA 2
SOUTHWESTERN NANKAI TROUGH
DSDP LEG 87 AREA

ESP LINE	REFLECTION PROFILE DESCRIPTION	LOCATION	
13	Initial Deformation	N55-3, SP 1830	
	Proposed:	A. 31 51.265(15.9)	133 57.215(12.9)
		C. 31 48.263(15.8)	133 51.938(56.3)
		E. 31 45.258(15.5)	133 46.667(40.0)
	Actual:	A. 31 50.355(21.3)	133 55.640(38.4)
		C. 31 48.273(16.4)	133 51.947(56.8)
		E. 31 44.942(56.5)	133 46.118(07.1)

	DAY	TIME(z)	REEL	REC	MINI RANGE(m)
A.	J201	12:48:45	356079	0001	13862, 13867 (REC 2)
C.	J201	13:33:24	356081	0143	91, 92
E.	J201	14:43:04	356084	0363	22079

COMMENTS:
Both ships moved directly to their positions at the 10km mark from the midpoint. This time Moore was going into the current and was able to make 4.5-5 knots over the ground. Tansei had no problem going slow and was able to keep in sync. Data was acquired using 2 water guns from -10 to +11km. A good midpoint was maintained. Complete reversed coverage was obtained. Maximun source-receiver offsets of up to 22km were obtained.

AREA 2
SOUTHWESTERN NANKAI TROUGH
DSDP LEG 87 AREA

ESP LINE	REFLECTION PROFILE DESCRIPTION	LOCATION
14	DSDP Site 583, First Thrust	N55-3, SP 1800
	Proposed:	A. 31 52.342(20.5) 133 56.425(25.5) C. 31 49.043(02.6) 133 51.398(23.9) E. 31 45.742(44.5) 133 46.378(22.7)
	Actual:	A. 31 50.502(30.1) 133 53.628(37.7) C. 31 49.021(01.7) 133 51.367(22.0) E. 31 45.230(13.8) 133 45.625(37.5)

	DAY	TIME(z)	REEL	REC	MINI RANGE(m)
A.	J202	00:33:25	356091	0004	9008,8998
C.	J202	01:06:21	356092	0108	125,129
E.	J202	02:27:25	356097	0362	23006

COMMENTS:
On record 25 the water guns on Tansei went down: the generator ran out of gas. At record 60, the water guns were up and started shooting again.

Moore came on to the line at the -10km mark and proceeded towards the midpoint. Tansei had gun firing problems at the -2km point and Moore was forced to circle. This caused a delay of several hours since 2 circles had to be made. Finally, after Tansei gun problems were solved, data was recorded from the -4km mark to the 11km point.

AREA 2
SOUTHWESTERN NANKAI TROUGH
DSDP LEG 87 AREA

ESP LINE	REFLECTION PROFILE DESCRIPTION	LOCATION	
15	First Thrust	N55-3, SP 1790	
	Proposed:	A. 31 52.569(34.1)	133 56.241(14.5)
		C. 31 49.333(20.0)	133 51.158(09.5)
		E. 31 46.094(05.7)	133 46.081(04.9)
	Actual:	A. 31 47.012(00.7)	133 47.497(29.8)
		C. 31 49.332(19.9)	133 51.182(10.9)
		E. 31 49.913(54.8)	133 52.055(03.3)

	DAY	TIME(z)	REEL	REC	MINI RANGE(m)
A.	J202	03:24:06	356098	0001	14419
C.	J202	04:07:29	356100	0137	97, 102
E.	J202	04:17:56	356100	0170	3417, 3421

COMMENTS:
Reel 356100 goes to record 195, but shooting actually stopped at record 169 or 170.

Turned immediatly to begin ESP 15 after completing ESP 14. Came on line quickly. Data was recorded from the -7km point until the 1km point. Tansei again had water gun firing problems so the line terminated early. Rather than reshoot the line, we continued on the line anticipating a solution to the water gun problem. None appeared. To give Tansei more time, Moore transited to the end of ESP 23.

AREA 2
SOUTHWESTERN NANKAI TROUGH
DSDP LEG 87 AREA

ESP LINE	REFLECTION PROFILE DESCRIPTION	LOCATION	
17	N55A1 2nd Thrust Package	N55-3, SP 1740;	
	Proposed:	A. 31 53.215(12.9)	133 55.649(38.9)
		C. 31 50.203(12.2)	133 50.378(22.7)
		E. 31 47.188(11.3)	133 45.113(06.8)
	Actual:	A. 31 48.437(26.2)	133 47.350(21.0)
		C. 31 50.187(11.2)	133 50.350(21.0)
		E. 31 53.550(33.0)	133 56.218(13.1)

	DAY	TIME(z)	REEL	REC	MINI RANGE(m)
A.	J201	15:51:09	356085	0001	11673, 11670
C.	J201	16:29:47	356086	0123	116, 115
E.	J201	17:44:31	356090	0359	22408, 22410

COMMENTS:
Both ships moved to their end of the line and started recording from the -5.5km point to the +11km point. Moore was with the current, and Tansei started into the current. A good midpoint was maintained but the actual crossing was about 200m beyond that desired. However, it was still on the line.

AREA 2
SOUTHWESTERN NANKAI TROUGH
DSDP LEG 87 AREA

ESP LINE	REFLECTION PROFILE DESCRIPTION	LOCATION
23	Thrust Zone	N55-3, SP 1515
	Proposed:	A. 31 58.499(30.0) 133 51.429(25.7) C. 31 55.113(06.8) 133 46.478(28.7) E. 31 51.724(43.5) 133 41.534(32.0)
	Actual:	A. 31 58.862(51.7) 133 51.975(58.5) C. 31 55.118(07.1) 133 46.492(29.5) E. 31 52.017(01.0) 133 41.910(54.6)

	DAY	TIME(z)	REEL	REC	MINI RANGE(m)
A.	J202	08:00:33	356101	0001	22176 (REC 2)
C.	J202	09:11:49	356104	0227	43, 44
E.	J202	10:15:09	356105	0065	18555

COMMENTS:
Data for this line actually starts on record 4 (the file does start on record 1).

Internal time break (ITB) on reel 356101, records 12,14,22,26,28,29,33,34,44,45,50; ITB on reel 356102, file 101: Tansei Maru not returning our shot signal.

Tansei ceased shooting 2km before the midpoint; Moore quit recording with reel 356104 record 0260 at 09:22:16z. GUS was reset,(09:55:12z) and recording started on reel 356105, record 0001, resulting in duplicate record numbers for the line. (There is a +30 minute data gap between reels 104 and 105 because Tansei was not shooting.)

Tansei ceased shooting again at about 10:13, hence we quit recording with reel 356105 record 0065 at 10:15:09.

Tansei solved the water gun problems during transit to end of ESP 23. Moore came on the line at the -12km mark. Synchronization was achieved immediately. Data was recorded from the -12km mark until -2km. Tansei lost the water guns again, and this profile also ended early. Moore steamed the line anyway hoping that Tansei would restart the waterguns. This worked for about 2km from the 6.5 to 8.5km point before the water guns failed again. We transited to ESP 25 while Tansei worked on the problem again.

AREA 2
SOUTHWESTERN NANKAI TROUGH
DSDP LEG 87 AREA

ESP LINE	REFLECTION PROFILE DESCRIPTION	LOCATION
25	Thrust Zone	N55-3, SP 1400
	Proposed:	A. 32 01.826(49.6) 133 49.258(15.5) C. 31 58.363(21.8) 133 44.378(22.7) E. 31 54.898(53.9) 133 39.505(30.3)
	Actual:	A. 31 57.588(35.3) 133 43.318(19.1) C. 31 58.470(28.2) 133 44.533(32.0) E. 32 01.985(59.1) 133 49.458 (27.5)

	DAY	TIME(z)	REEL	REC	MINI RANGE(m)
A.	J202	13:20:46	356106	0001	4869, 4866 (REC 3)
C.	J202	13:37:52	356106	0056	128, 129
E.	J202	14:42:28	356109	0260	15930, 15931 (REC 221)

COMMENTS:
ITB on reel 356109, records 58 and 60.

Tansei can only fire one water gun for the rest of the program because of a hydraulic pump failure. Ships moved quickly into position and data was acquired from the -1km to the +11km mark. We missed the midpoint by 400m but we were on the line. At the end of this profile Tansei departed for Kochi because of a sick crew member, Moore proceded to shoot single ship MCS line NT62-line 1.

MCS LINE SUMMARY

AREA 2 SW NANKAI TROUGH

All lines used a 1065 ci, 6-gun source array. Receiving array was 96-channels, 16 2/3m groups.

NT62-1	Dip line through ESP 25, 23, 17, 15, 14, 13, 9, 7 Syledis navigation
NT62-2	Dip line offset 1000m northeast of NT62-1 Loran-C navigation (with GPS and Transit).
NT62-3	Dip line offset 1000m southwest of NT62-1 Terminated after crossing ESP 25, 23, 17. Moore departed to Kochi to get medical attention for technician on the Moore. Loran-C navigation (with GPS and Transit).

AREA 1 NE NANKAI TROUGH

All lines used a 1065 ci, 6-gun source array. Receiving array was 69 channels 33 1/3m groups. Loran-C navigation (with GPS and Transit).

NT62-4	Strike line along SSP-3.
NT62-5	Strike line along SSP-4.
NT62-6	Strike line along SSP-5A.
NT62-7	Dip line connecting midpoints SSP-4, SSP-2, SSP-1.
NT62-8	Dip line connecting midpoints SSP-3, SSP-4, SSP-5, SSP-6.
NT62-9	Strike line along SSP-6.

Line	JD	z	Latitude N	Longitude E	Rec No.	Tape No.
NT62-1						
Begin:	202	20:38:27	31 58.25	133 43.85	0004	356110
End:	203	00:33:39	31 38.48	133 59.67	0840	356119
NT62-2						
Begin:	203	02:22:50	31 38.28	134 01.21	0001	356120
End:	203	06:52:30	31 59.29	133 43.43	1144	356132
NT62-3						
Begin:	203	08:06:00	31 57.36	133 43.40	0001	356133
End:	203	09:51:14	31 49.09	133 49.42	0452	356137
NT62-4						
Begin:	205	19:17:27	32 14.70	134 52.10	0001	356138
End:	205	22:23:53	32 27.00	135 06.10	0800	356146
NT62-5						
Begin:	206	00:24:45	32 28.57	135 04.59	0001	356147
End:	206	05:47:41	32 14.67	134 48.68	1384	356161
NT62-6						
Begin:	206	07:47:51	32 22.15	134 46.07	0001	356162
End:	206	10:21:09	32 32.88	134 57.59	0658	356168
NT62-7						
Begin:	206	14:30:21	32 29.82	134 56.34	0001	356169
End:	206	18:53:19	32 13.43	135 02.03	1128	356180
NT62-8						
Begin:	206	18:53:33	32 13.43	135 02.03	1129	356181
End:	207	03:40:53	32 35.15	134 45.59	3387	356207
NT62-9						
Begin:	207	05:24:15	32 34.42	134 46.75	0001	356208
End:	207	07:13:41	32 42.12	134 49.74	0470	356212

Figure 1. Sketch map of the northeastern Nankai Trough area. Proposed ODP sites are NKT-1 and NKT-2. Offset between split spread profiles (SSP) and the multichannel lines (MCS) is due to different navigation datums. After final navigation reduction, the two will be nearly coincident. SSP's used two 400 cubic inch water guns, 96 trace 16.66m group streamer. MCS used 1065 cubic inch air gun array, 68 trace 33.33m group streamer.

Figure 2. Sketch map of the southeastern Nankai Trough area. DSDP site 583 vicinity. Shown are 8 expanding spread profiles (ESP) and 3 multichannel dip lines. The ESP's were collected with a 96 trace, 16.66m streamer and with two 400 cubic inch water guns (except 25, which used one water gun). The MCS used a 1065 cubic inch air gun array, 96 trace, 16.66m group streamer.