FINAL REPORT
FOR
STUDY ON MEASURES TO PREVENT OIL POLLUTION
OF
THERMAL ELECTRIC POWER STATIONS
AND
SEA WATER DESALINATION PLANTS
IN
UMM AL NAR, ABU DHABI
THE UNITED ARAB EMIRATES
SUPPLEMENT
(DATA BOOK)

OCTOBER 1989

JAPAN INTERNATIONAL COOPERATION AGENCY

FINAL REPORT
FOR
STUDY ON MEASURES TO PREVENT OIL POLLUTION
OF
THERMAL ELECTRIC POWER STATIONS
AND
SEA WATER DESALINATION PLANTS
IN
UMM AL NAR, ABU DHABI
THE UNITED ARAB EMIRATES
SUPPLEMENT
(DATA BOOK)

OCTOBER 1989

JAPAN INTERNATIONAL COOPERATION AGENCY

Table of Contents

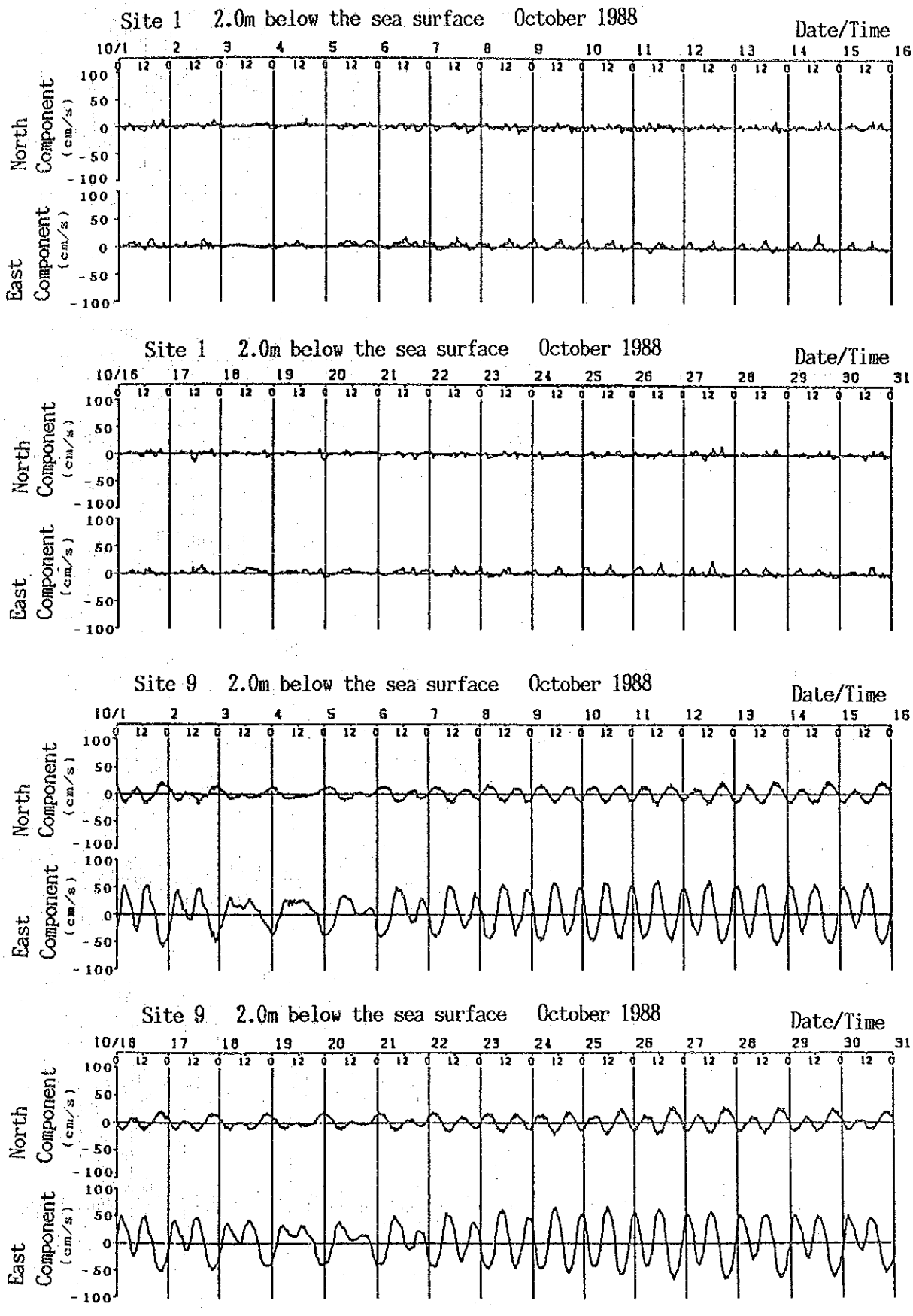


Fig. 3.10.1(1) Consecutive Anchored Observations of Tidal Currents in the Second Field Survey

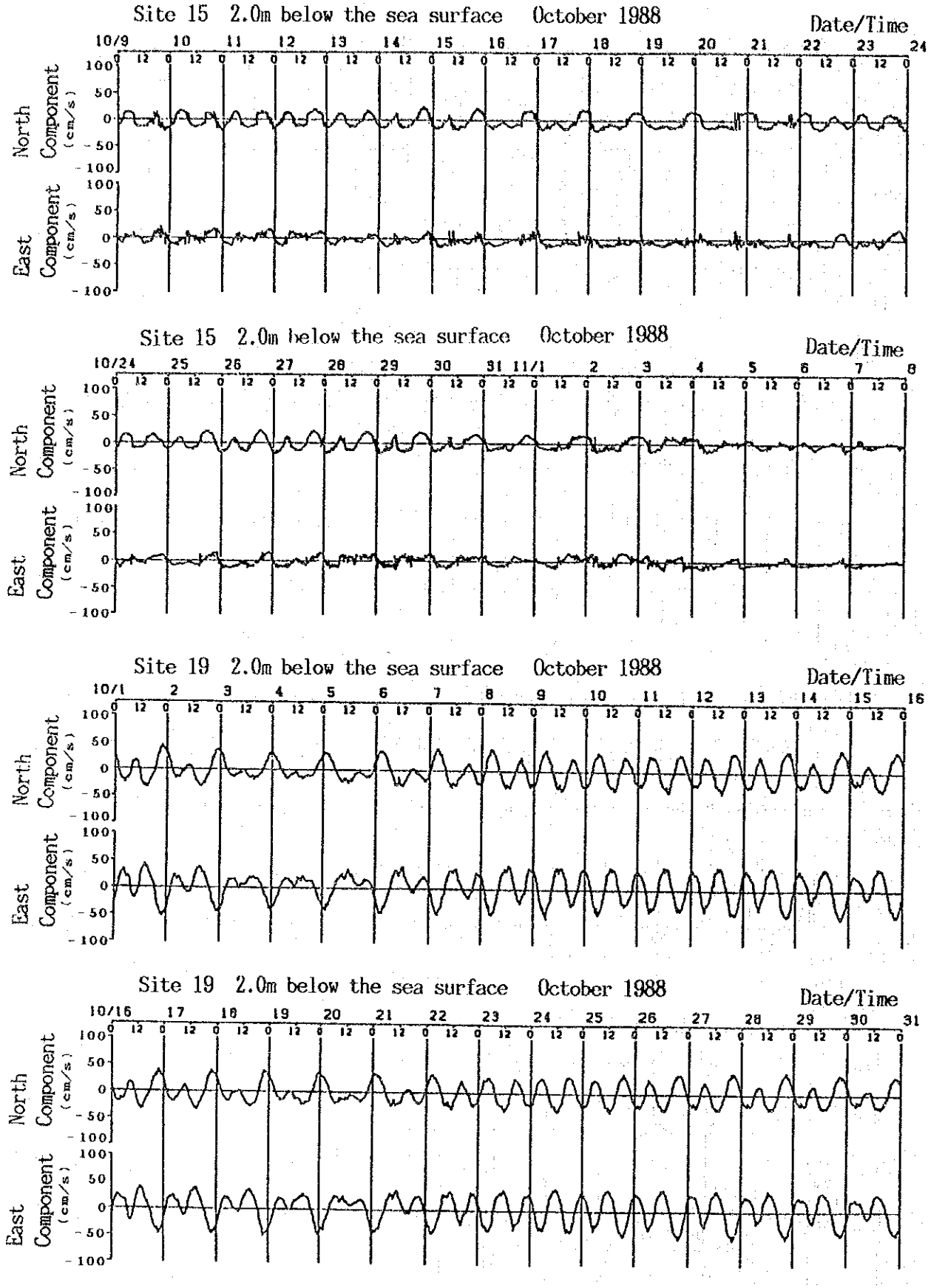


Fig. 3.10.1(2) Consecutive Anchored Observations of Tidal Currents in the Second Field Survey

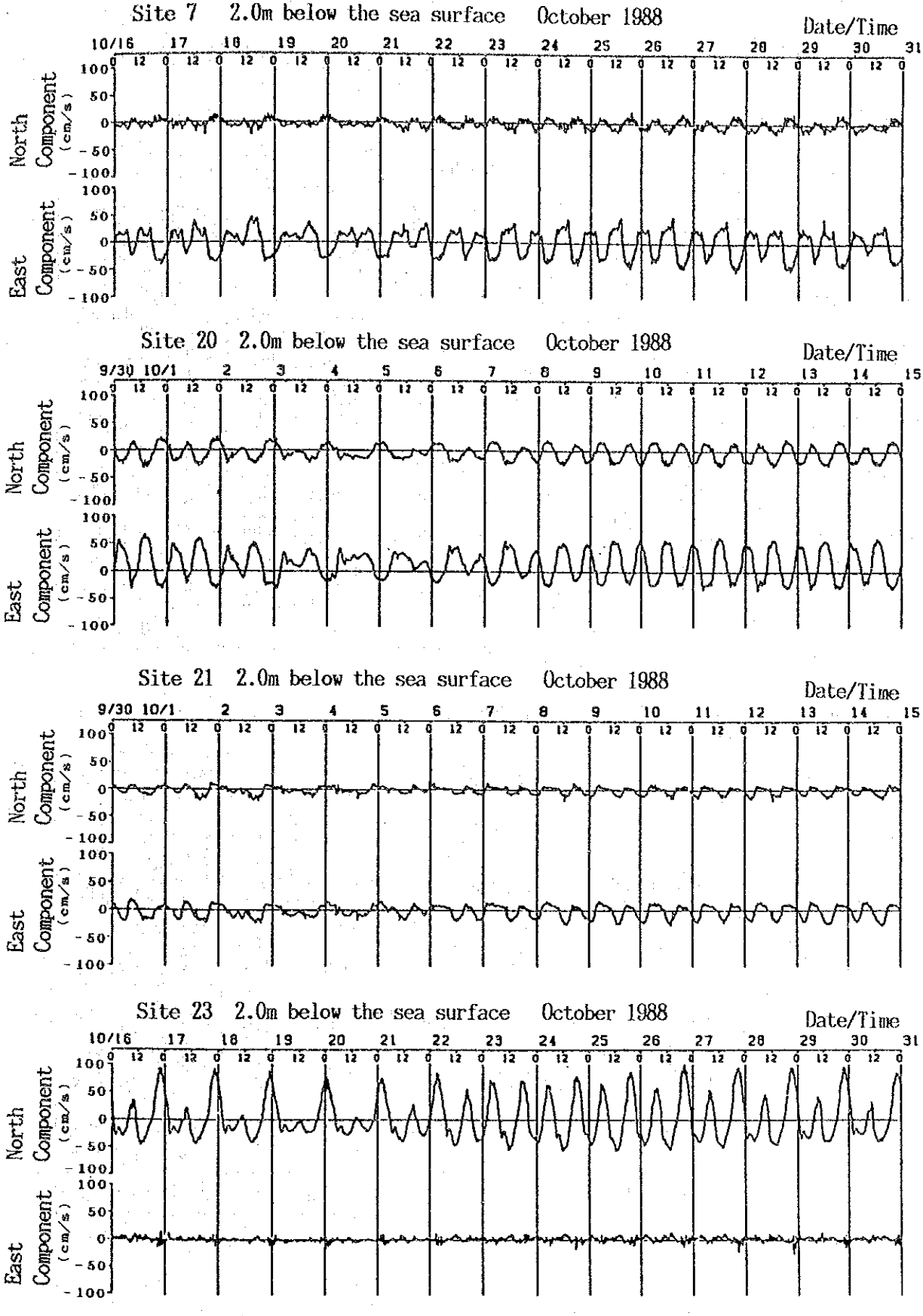


Fig. 3.10.1(3) Consecutive Anchored Observations of Tidal Currents in the Second Field Survey

Table 3.10.1(1) Harmonic Analysis Results of Tidal Currents in the Second Field Survey

Observation Location : Site 1 2.0m below the sea surface
Duration of Observation : 1st-30th October 1988

Component Current	Elliptic Element						Main Current Direction 74 deg	
	Long Axis Component			Short Axis Component				
	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Speed (cm/s)	Ph. (deg)
M_2	61	3.1	25	151	0.6	295	3.1	23
S_2	271	1.6	227	1	0.6	137	1.6	54
K_2	271	0.4	227	1	0.2	137	0.4	54
N_2	60	0.6	1	150	0.0	91	0.6	2
K_1	60	2.4	132	150	0.7	42	2.4	128
O_1	285	1.6	253	15	0.0	163	1.4	74
P_1	60	0.8	132	150	0.2	42	0.8	128
Q_1	278	0.3	231	8	0.1	321	0.3	45
M_4	271	0.2	262	1	0.1	352	0.2	75
MS_4	320	1.0	232	50	0.8	322	0.9	352
U_0	1.9 cm/s			95 deg			1.8 cm/s	

Observation Location : Site 7 2.0m below the sea surface
Duration of Observation : 16th-30th October 1988

Component Current	Elliptic Element						Main Current Direction 285 deg	
	Long Axis Component			Short Axis Component				
	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Speed (cm/s)	Ph. (deg)
M_2	286	22.9	147	16	1.0	237	22.9	147
S_2	285	10.2	224	15	0.3	134	10.2	224
K_2	285	2.8	224	15	0.1	134	2.8	224
N_2	74	4.4	118	164	0.1	28	3.8	297
K_1	284	17.3	300	14	1.0	210	17.3	300
O_1	287	8.5	236	17	0.0	326	8.5	236
P_1	284	5.7	300	14	0.3	210	5.7	300
Q_1	287	1.7	205	17	0.1	295	1.7	205
M_4	280	2.8	292	10	0.2	202	2.8	292
MS_4	279	3.6	285	9	0.2	15	3.6	285
U_0	1.9 cm/s			182 deg			-0.4 cm/s	

Table 3.10.1(2) Harmonic Analysis Results of Tidal Currents in the Second Field Survey

Observation Location : Site 9 2.0m below the sea surface
Duration of Observation : 1st-30th October 1988

Component Current	Elliptic Element						Main Current Direction 287 deg	
	Long Axis Component			Short Axis Component				
	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Speed (cm/s)	Ph. (deg)
M_2	287	34.5	141	17	0.3	231	34.5	141
S_2	286	16.0	186	16	0.3	276	16.0	186
K_2	286	4.4	186	16	0.1	276	4.4	186
N_2	74	6.7	128	164	0.4	218	5.6	310
K_1	288	28.1	274	18	0.5	184	28.1	274
O_1	287	13.0	233	17	0.7	323	13.0	233
P_1	288	9.4	274	18	0.2	184	9.4	274
Q_1	287	2.5	212	17	0.2	302	2.5	212
M_4	299	1.0	132	29	0.1	42	1.0	134
MS_4	289	1.0	73	19	0.1	343	1.0	73
U_0	3.1 cm/s			71 deg			-2.5 cm/s	

Observation Location : Site 15 2.0m below the sea surface
Duration of Observation : 9th October-7th November 1988

Component Current	Elliptic Element						Main Current Direction 18 deg	
	Long Axis Component			Short Axis Component				
	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Speed (cm/s)	Ph. (deg)
M_2	349	8.8	126	79	4.0	216	7.9	140
S_2	15	4.0	205	105	1.6	295	4.0	206
K_2	15	1.1	205	105	0.4	295	1.1	206
N_2	339	1.8	88	69	0.6	178	1.4	103
K_1	35	13.2	256	125	2.2	166	12.6	259
O_1	13	6.2	221	103	1.2	311	6.2	222
P_1	35	4.4	256	125	0.7	166	4.2	259
Q_1	6	1.2	199	96	0.3	289	1.2	202
M_4	14	0.8	290	104	0.6	200	0.8	286
MS_4	45	0.7	237	135	0.3	147	0.6	251
U_0	2.3 cm/s			238 deg			-1.8 cm/s	

Table 3.10.1(3) Harmonic Analysis Results of Tidal Currents in the Second Field Survey

Observation Location : Site 19 2.0m below the sea surface
Duration of Observation : 1st-30th October 1988

Component Current	Elliptic Element						Main Current Direction 308 deg	
	Long Axis Component			Short Axis Component				
	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Speed (cm/s)	Ph. (deg)
M_2	308	32.0	162	38	0.7	252	32.0	162
S_2	308	13.7	217	38	0.5	307	13.7	217
K_2	308	3.7	217	38	0.1	307	3.7	217
N_2	52	6.2	141	142	0.6	231	1.5	343
K_1	309	28.9	297	39	0.7	27	28.9	297
O_1	307	14.6	248	37	0.3	338	14.6	248
P_1	309	9.6	297	39	0.2	27	9.6	297
Q_1	307	2.8	224	37	0.1	314	2.8	224
M_4	308	1.4	323	38	0.3	233	1.4	323
MS_4	306	1.7	341	36	0.3	251	1.7	341
U_0	1.8 cm/s			118 deg			-1.7 cm/s	

Observation Location : Site 20 2.0m below the sea surface
Duration of Observation : 30th September-14th October 1988

Component Current	Elliptic Element						Main Current Direction 297 deg	
	Long Axis Component			Short Axis Component				
	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Speed (cm/s)	Ph. (deg)
M_2	296	30.6	162	26	0.5	252	30.6	162
S_2	294	14.4	207	24	0.3	297	14.4	207
K_2	294	3.9	207	24	0.1	297	3.9	207
N_2	65	5.9	148	155	0.5	238	3.6	334
K_1	298	21.4	295	28	0.4	205	21.4	295
O_1	302	8.7	246	32	0.2	336	8.7	246
P_1	298	7.1	295	28	0.1	205	7.1	295
Q_1	301	1.7	221	31	0.1	311	1.7	221
M_4	275	1.2	122	5	0.1	212	1.1	123
MS_4	51	0.6	332	141	0.3	242	0.4	108
U_0	13.2 cm/s			109 deg			-13.1 cm/s	

Table 3.10.1(4) Harmonic Analysis Results of Tidal Currents in the Second Field Survey

Observation Location : Site 21 2.0m below the sea surface
Duration of Observation : 30th September-14th October 1988

Component Current	Elliptic Element						Main Current Direction 61 deg	
	Long Axis Component			Short Axis Component				
	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Speed (cm/s)	Ph. (deg)
M_2	63	11.6	200	153	0.9	290	11.6	200
S_2	60	5.6	243	150	0.3	153	5.6	243
K_2	60	1.5	243	150	0.1	153	1.5	243
N_2	64	2.2	178	154	0.3	268	2.2	177
K_1	60	9.5	332	150	0.2	62	9.5	332
O_1	60	4.4	269	150	0.9	179	4.4	269
P_1	60	3.2	332	150	0.1	62	3.2	332
Q_1	62	0.8	237	152	0.3	147	0.8	237
M_4	64	2.7	275	154	0.3	5	2.7	275
MS_4	57	2.4	271	147	0.1	1	2.4	271
U_0	2.7 cm/s			244 deg			-2.7 cm/s	

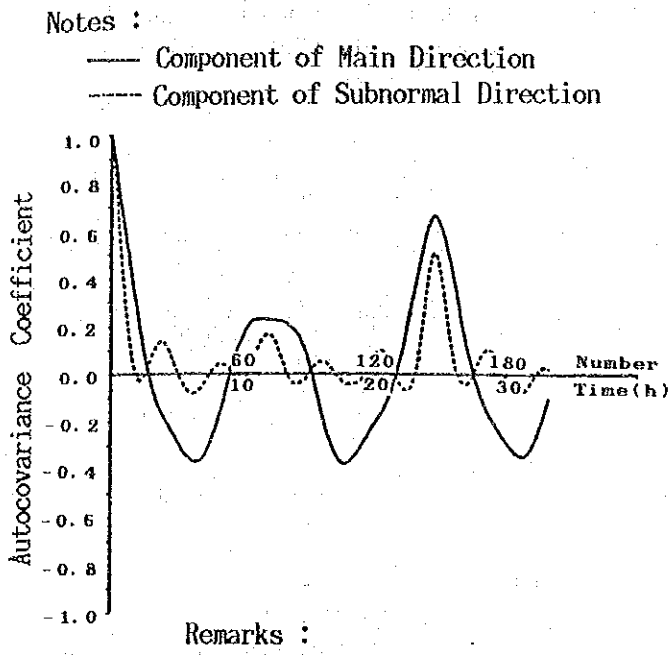
Observation Location : Site 23 2.0m below the sea surface
Duration of Observation : 16th-30th October 1988

Component Current	Elliptic Element						Main Current Direction 357 deg	
	Long Axis Component			Short Axis Component				
	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Speed (cm/s)	Ph. (deg)
M_2	357	37.5	175	87	0.0	265	37.5	175
S_2	355	15.3	248	85	0.4	338	15.3	248
K_2	355	4.2	248	85	0.1	338	4.2	248
N_2	3	7.3	135	93	0.2	225	7.2	135
K_1	358	30.2	304	88	0.0	34	30.2	304
O_1	358	14.5	255	88	0.3	165	14.5	255
P_1	358	10.1	304	88	0.0	34	10.1	304
Q_1	358	2.8	231	88	0.1	141	2.8	231
M_4	357	7.2	357	87	0.6	87	7.2	357
MS_4	6	5.5	35	96	0.3	125	5.5	35
U_0	3.2 cm/s			21 deg			-2.9 cm/s	

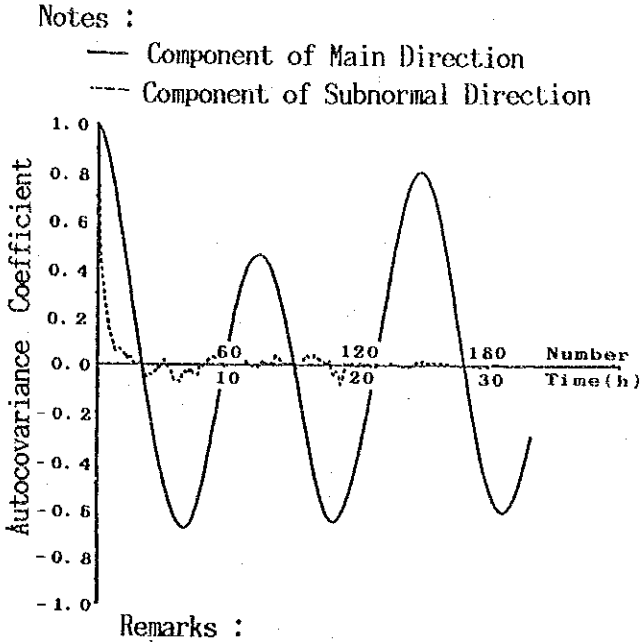
Table 3.10.2 Predicted Hydrographic Conditions for Spring Tide Period in the Second Field Survey

Site	1		7		9		15		19		20		21		23	
Parameter Time(h)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)
0	67.4	7.2	108.6	31.0	105.0	36.1	210.1	3.0	129.3	51.4	114.1	59.4	237.9	25.7	174.8	60.4
1	59.5	7.1	115.4	13.3	97.8	6.9	339.9	6.2	130.8	30.0	113.3	41.4	239.3	24.4	173.9	42.6
2	49.7	5.8	269.5	9.7	289.2	27.4	355.0	15.3	233.2	1.6	108.7	14.7	240.6	18.2	166.8	12.5
3	30.0	3.7	280.6	31.7	288.1	59.3	1.6	23.1	305.8	33.7	303.0	15.3	243.3	8.0	1.5	24.6
4	332.7	2.4	282.7	48.8	288.0	81.5	7.4	27.8	307.3	62.9	298.8	41.4	54.7	4.2	358.5	60.3
5	280.2	3.9	283.6	57.3	288.2	89.1	13.8	28.6	308.0	81.9	298.3	57.9	59.8	15.7	357.9	87.1
6	262.4	5.7	284.0	55.2	288.6	80.4	22.4	25.4	308.6	86.5	298.6	61.2	61.0	24.2	357.7	99.2
7	253.0	6.4	284.1	43.4	289.8	57.5	35.6	19.2	309.2	76.2	299.6	50.5	61.8	27.7	357.7	94.2
8	244.7	5.8	283.2	24.8	294.0	25.9	61.8	12.3	310.1	53.5	303.1	28.9	62.5	25.8	358.0	73.7
9	231.5	4.0	268.8	4.3	83.4	8.3	115.3	9.3	313.0	24.1	9.8	3.8	63.0	19.0	359.0	42.8
10	187.4	2.0	112.6	14.2	101.7	35.3	160.9	12.6	108.9	5.9	108.2	26.0	63.3	9.1	7.8	9.0
11	113.8	3.0	110.9	26.1	103.7	51.7	184.4	16.8	125.0	29.1	112.2	45.9	250.9	1.4	172.1	20.6
12	94.4	5.1	111.6	29.7	104.3	54.6	200.9	19.4	126.7	42.0	113.6	55.2	246.8	10.2	174.6	39.4
13	88.7	6.5	113.7	25.3	104.4	45.5	215.6	20.1	127.4	43.3	114.4	52.8	247.8	15.4	175.2	44.8
14	87.8	6.7	119.4	15.7	103.8	28.7	229.2	19.6	127.8	34.7	115.2	40.9	249.5	16.4	175.4	37.7
15	91.0	5.9	147.5	5.2	100.5	10.6	240.6	18.2	128.1	20.8	116.3	24.3	252.3	13.5	175.4	22.2
16	100.5	4.5	254.9	5.6	306.4	3.0	247.2	16.1	127.5	7.3	119.6	8.6	257.9	8.4	174.0	4.6
17	120.8	3.2	271.1	8.0	295.0	7.0	245.5	13.4	329.6	0.8	263.9	1.2	276.4	3.1	357.0	8.4
18	145.9	2.8	268.4	3.7	4.7	1.1	231.1	11.2	41.3	0.5	276.4	1.1	22.0	1.4	356.8	12.2
19	155.0	2.8	108.6	6.9	102.3	15.2	207.7	11.3	123.9	9.9	115.2	8.7	67.6	1.4	358.8	4.8
20	142.1	2.9	105.4	20.6	104.6	34.5	191.0	13.5	126.5	26.1	114.4	25.5	212.2	2.3	174.5	12.1
21	113.9	3.3	105.4	33.4	105.3	51.2	184.0	15.2	127.5	43.8	114.3	44.4	229.1	8.5	175.2	33.5
22	90.3	4.7	106.0	41.2	105.5	59.2	182.9	14.4	128.0	57.0	114.3	59.5	233.8	16.0	175.3	52.8
23	76.4	6.2	106.9	40.8	105.5	54.4	186.7	10.5	128.6	60.5	114.3	65.5	236.3	22.5	175.2	63.3

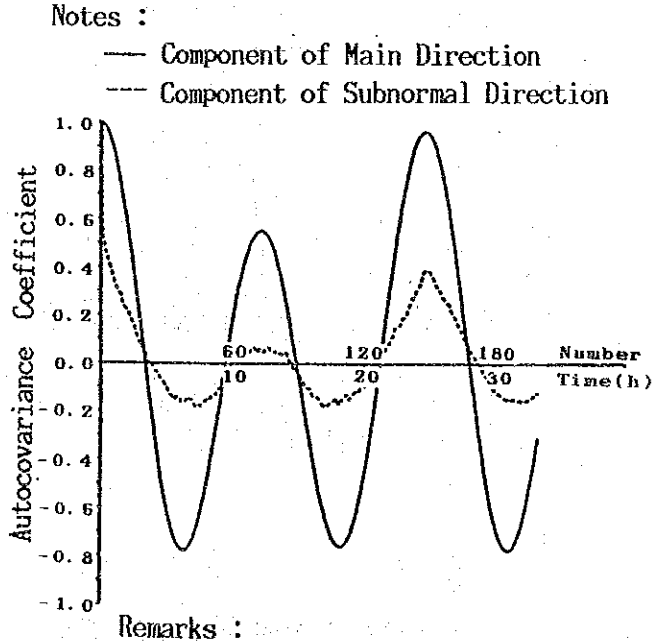
Site	1		7		9		15		19		20		21		23	
Parameter Time(h)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)
0	73.1	6.6	115.0	18.1	103.3	24.2	236.1	8.5	128.9	35.2	113.9	45.7	242.7	19.8	174.5	42.5
1	69.9	5.8	170.4	3.6	325.8	2.1	282.3	8.3	130.7	15.2	113.4	25.9	245.0	16.8	173.0	23.0
2	67.8	4.0	274.0	15.4	289.5	26.3	314.8	10.6	303.7	8.4	97.7	2.7	249.5	10.0	16.4	3.8
3	68.6	1.5	280.1	27.7	288.6	43.2	333.4	12.1	307.4	29.3	298.4	17.9	292.3	1.8	358.7	29.9
4	229.8	0.9	282.1	32.6	288.7	47.9	347.6	11.2	308.3	41.9	297.7	30.1	52.9	7.3	357.8	49.0
5	232.6	2.7	283.1	28.7	289.5	39.1	5.2	7.9	309.0	42.8	298.3	30.7	59.3	13.0	357.6	55.7
6	227.4	3.3	283.2	17.0	293.1	19.2	54.1	3.9	310.1	31.8	301.0	19.6	62.3	14.5	357.8	48.3
7	214.8	2.9	250.2	0.8	87.8	7.0	135.6	6.0	314.5	11.8	35.1	2.2	65.6	11.5	358.9	28.8
8	175.5	1.9	107.7	16.0	102.6	31.3	160.3	10.6	122.0	11.9	109.9	23.8	75.8	4.8	26.6	2.6
9	110.8	2.6	107.7	28.5	104.2	48.2	173.7	13.4	126.4	32.8	112.6	44.2	225.3	4.3	173.1	24.1
10	87.1	4.5	108.5	33.5	104.6	52.9	186.5	13.6	127.5	45.4	113.5	56.3	237.5	12.6	174.5	43.2
11	78.0	6.1	110.3	29.7	104.5	44.1	204.3	11.3	128.2	46.3	113.9	56.9	240.6	18.3	174.7	49.9



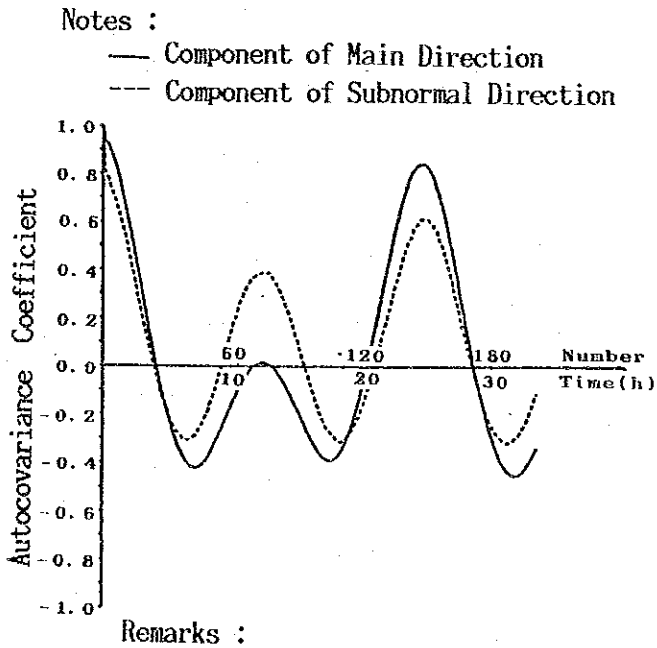
Remarks :
Location---Site 1
2.0m below the sea surface
Duration---October 1988



Remarks :
Location---Site 7
2.0m below the sea surface
Duration---October 1988

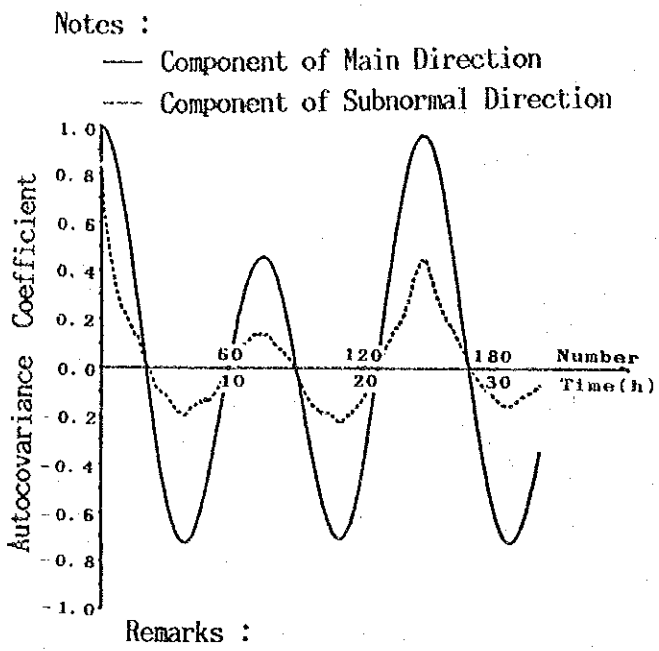


Remarks :
Location---Site 9
2.0m below the sea surface
Duration---October 1988

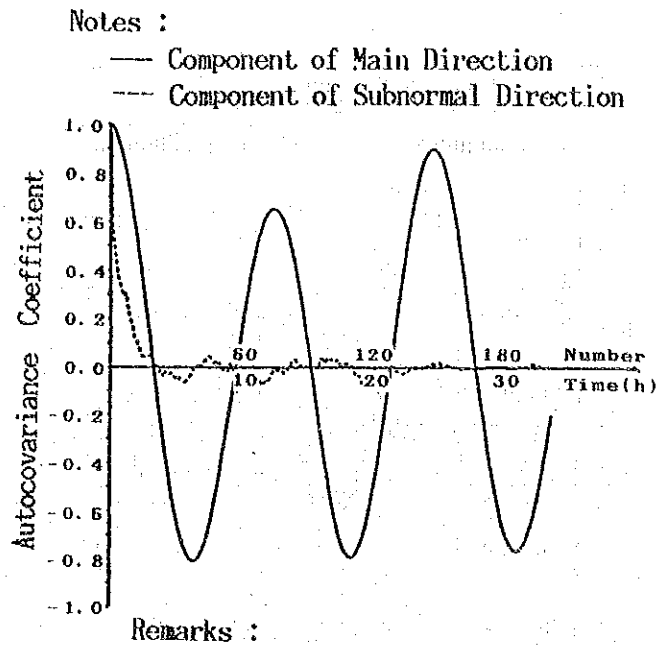


Remarks :
Location---Site 15
2.0m below the sea surface
Duration---October 1988

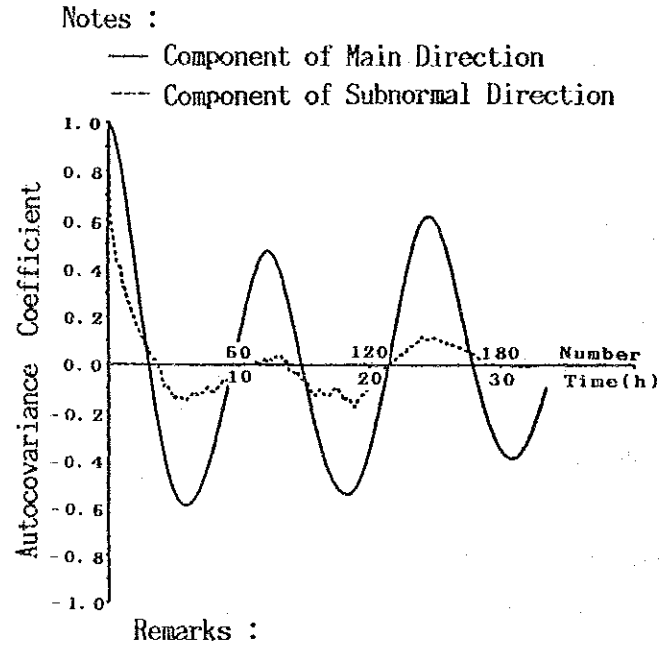
Fig. 3.10.2(1) Auto-covariance Curve of Tidal Currents in the Second Field Survey



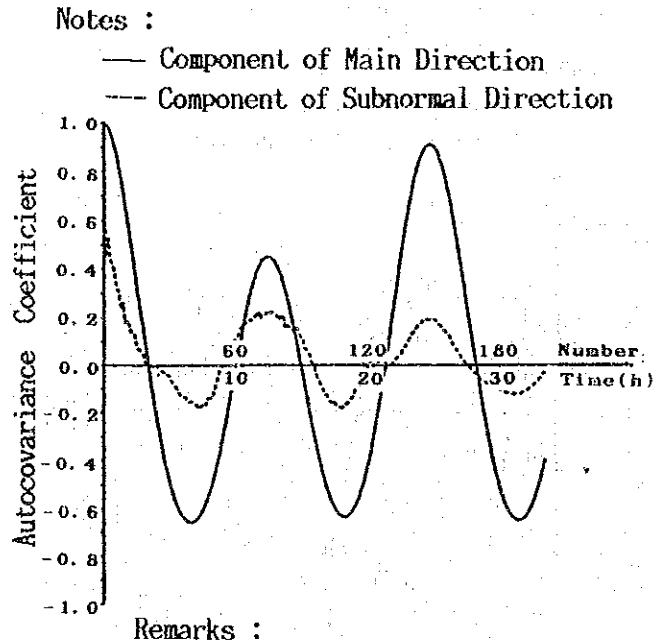
Remarks :
Location---Site 19
2.0m below the sea surface
Duration---October 1988



Remarks :
Location---Site 20
2.0m below the sea surface
Duration---October 1988

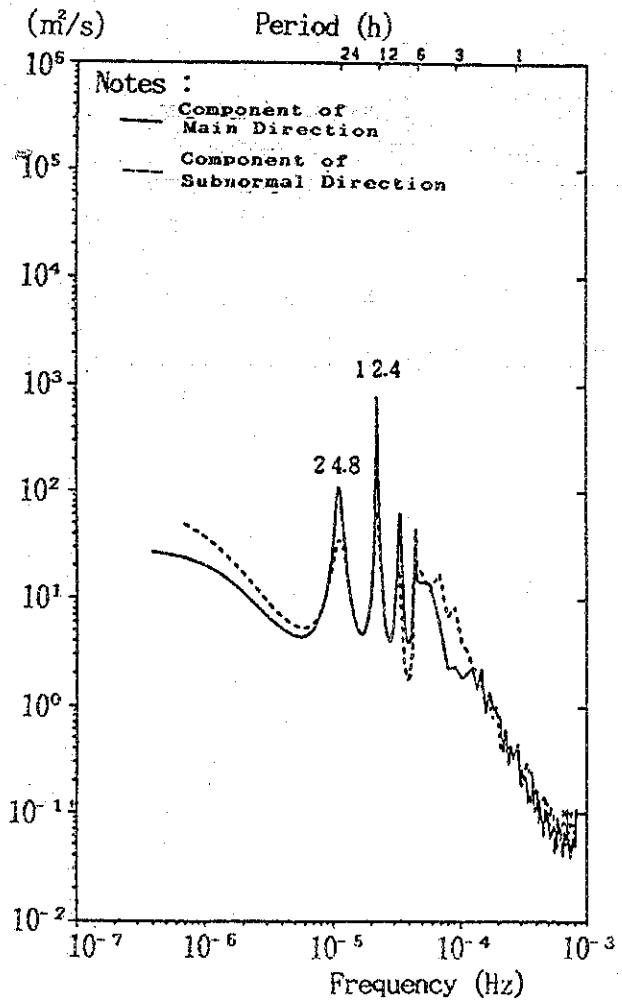


Remarks :
Location---Site 21
2.0m below the sea surface
Duration---October 1988

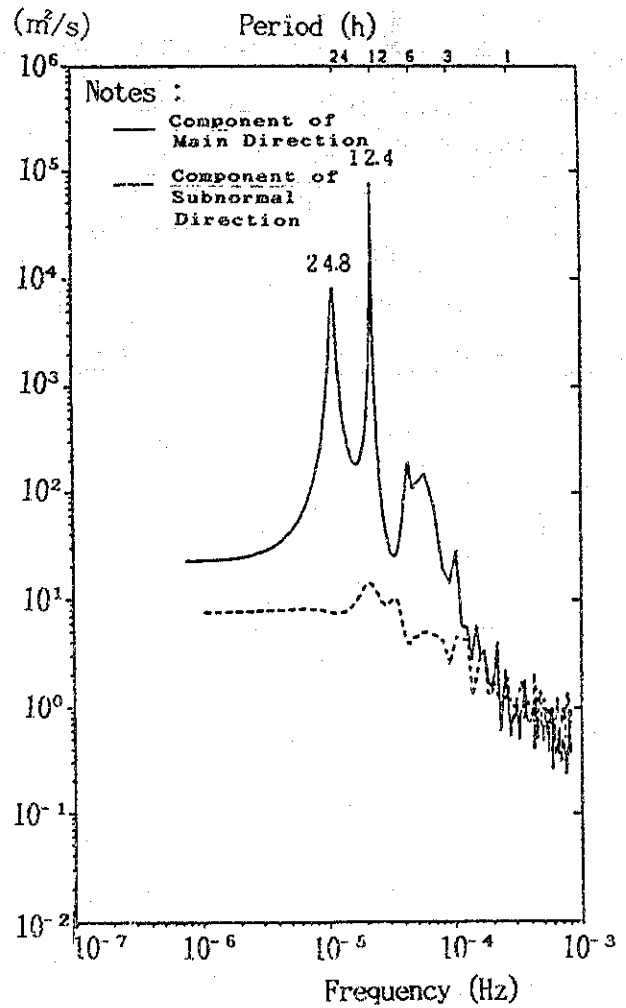


Remarks :
Location---Site 23
2.0m below the sea surface
Duration---October 1988

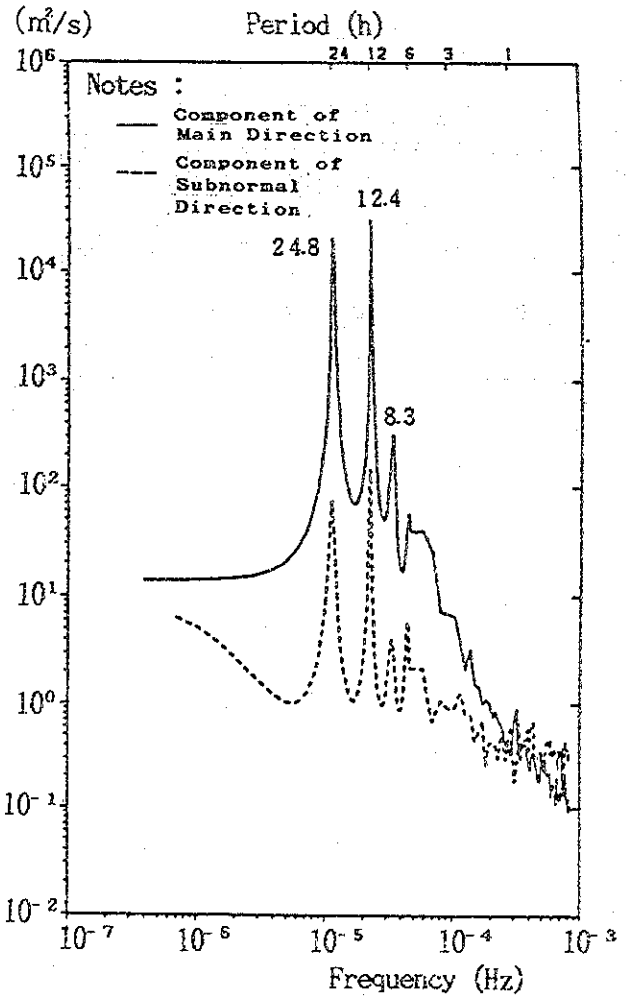
Fig. 3.10.2(2) Auto-covariance Curve of Tidal Currents in the Second Field Survey



Remarks :
Location---Site 1
2.0m below the sea surface
Duration---October 1988

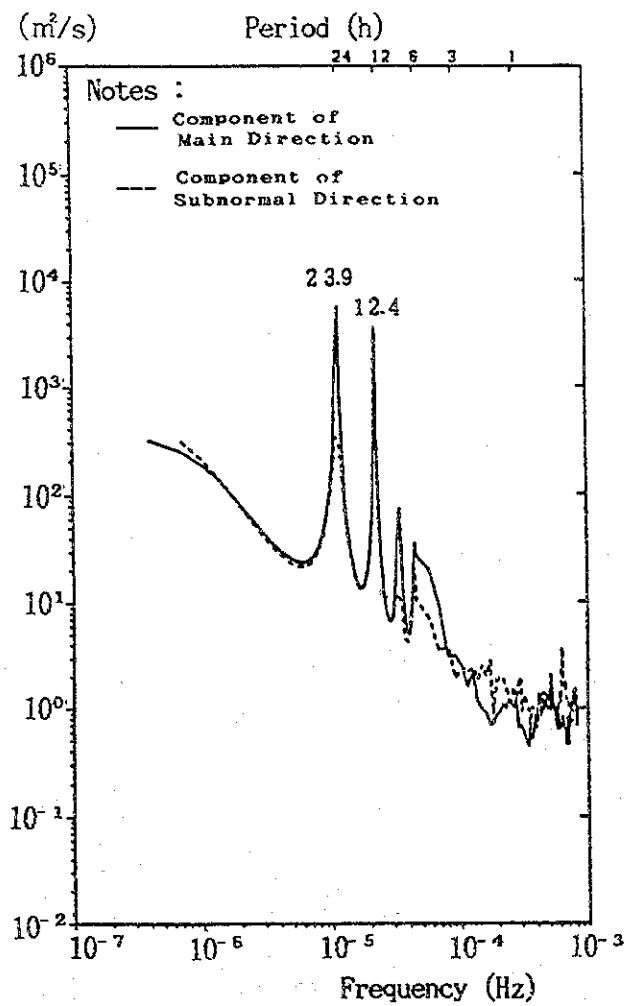


Remarks :
Location---Site 7
2.0m below the sea surface
Duration---October 1988

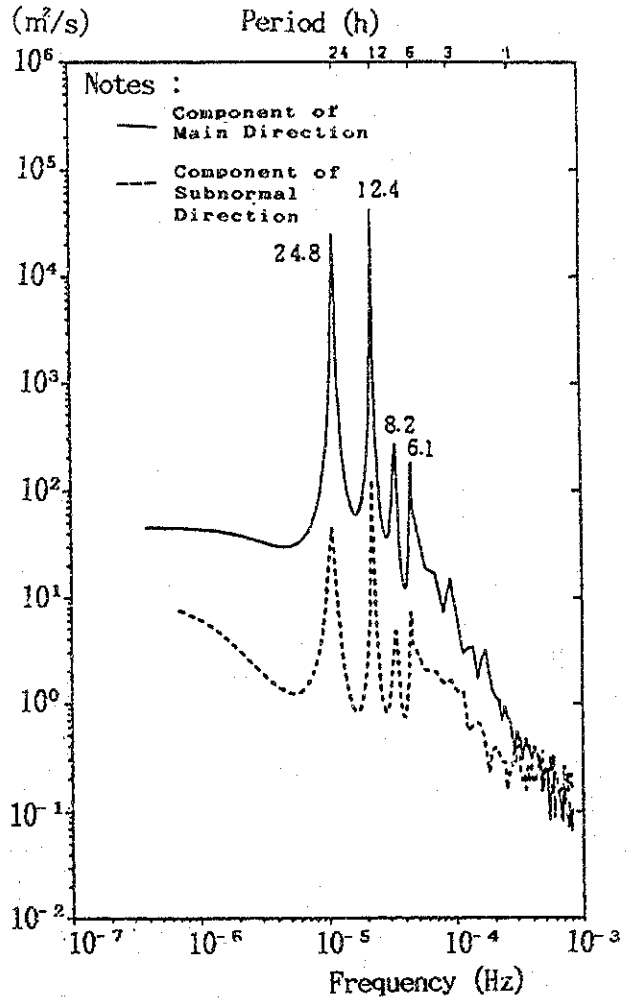


Remarks :
Location---Site 9
2.0m below the sea surface
Duration---October 1988

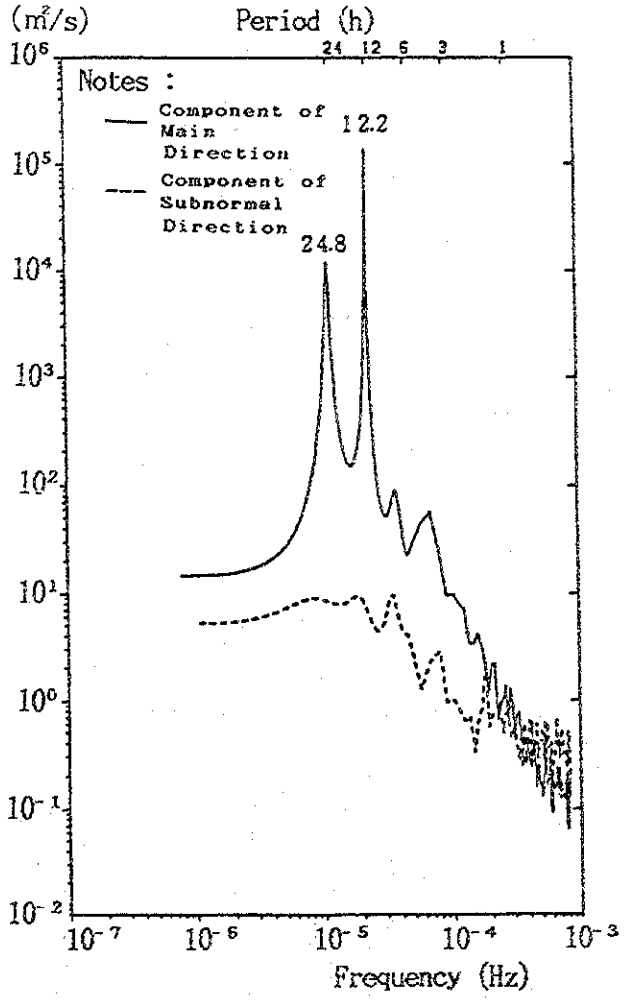
Fig. 3.10.3(1) Power Spectrum Density Curve of Tidal Currents in the Second Field Survey



Remarks :
Location---Site 15
2.0m below the sea surface
Duration---October 1988

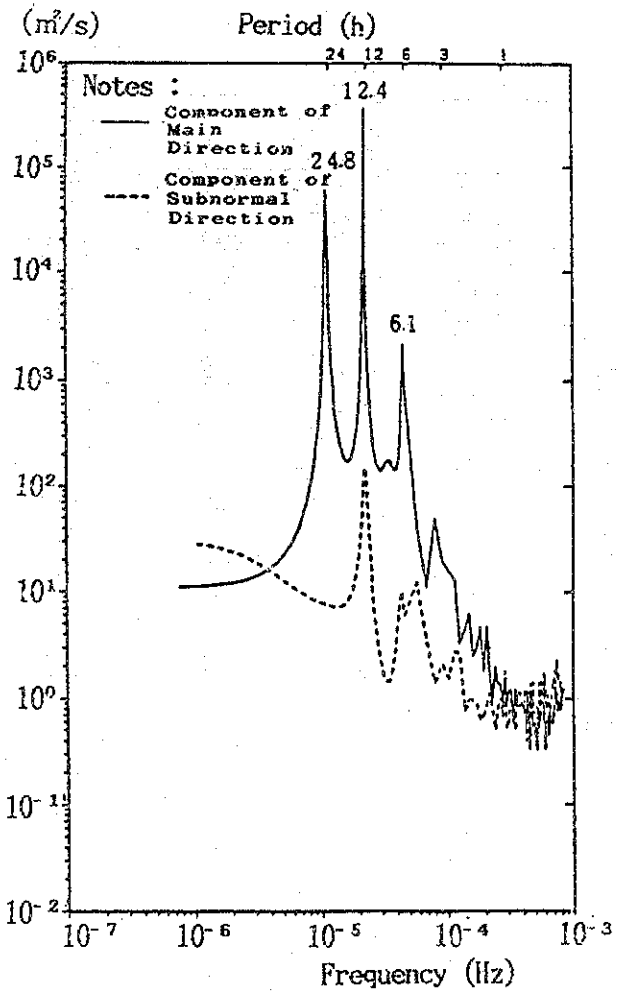


Remarks :
Location---Site 19
2.0m below the sea surface
Duration---October 1988

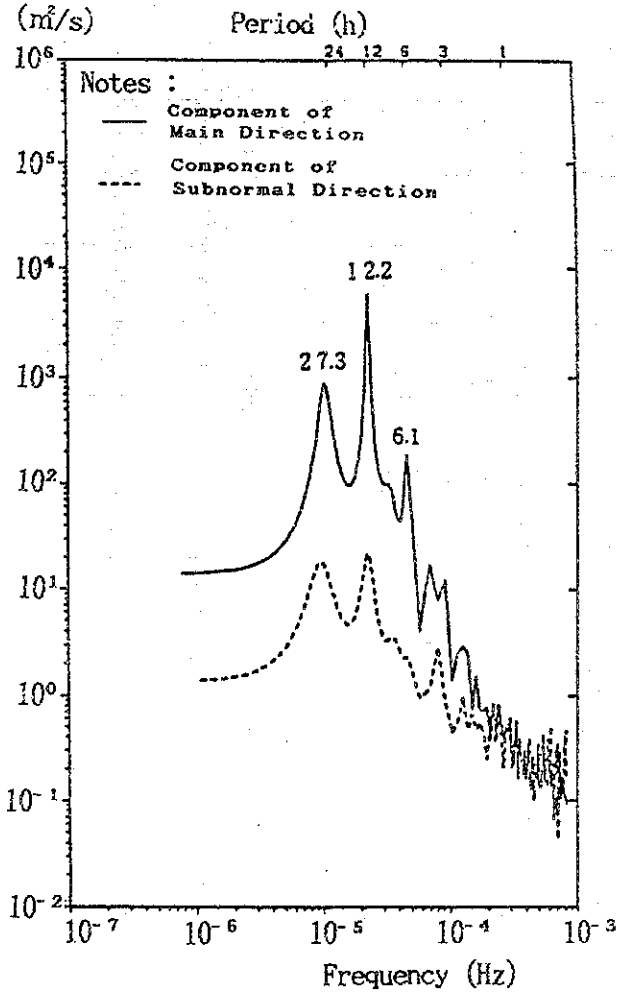


Remarks :
Location---Site 20
2.0m below the sea surface
Duration---October 1988

Fig. 3.10.3(2) Power Spectrum Density Curve of Tidal Currents in the Second Field Survey



Remarks :
Location---Site 23
2.0m below the sea surface
Duration---October 1988



Remarks :
Location---Site 21
2.0m below the sea surface
Duration---October 1988

Fig. 3.10.3(3) Power Spectrum Density Curve of Tidal Currents in the Second Field Survey

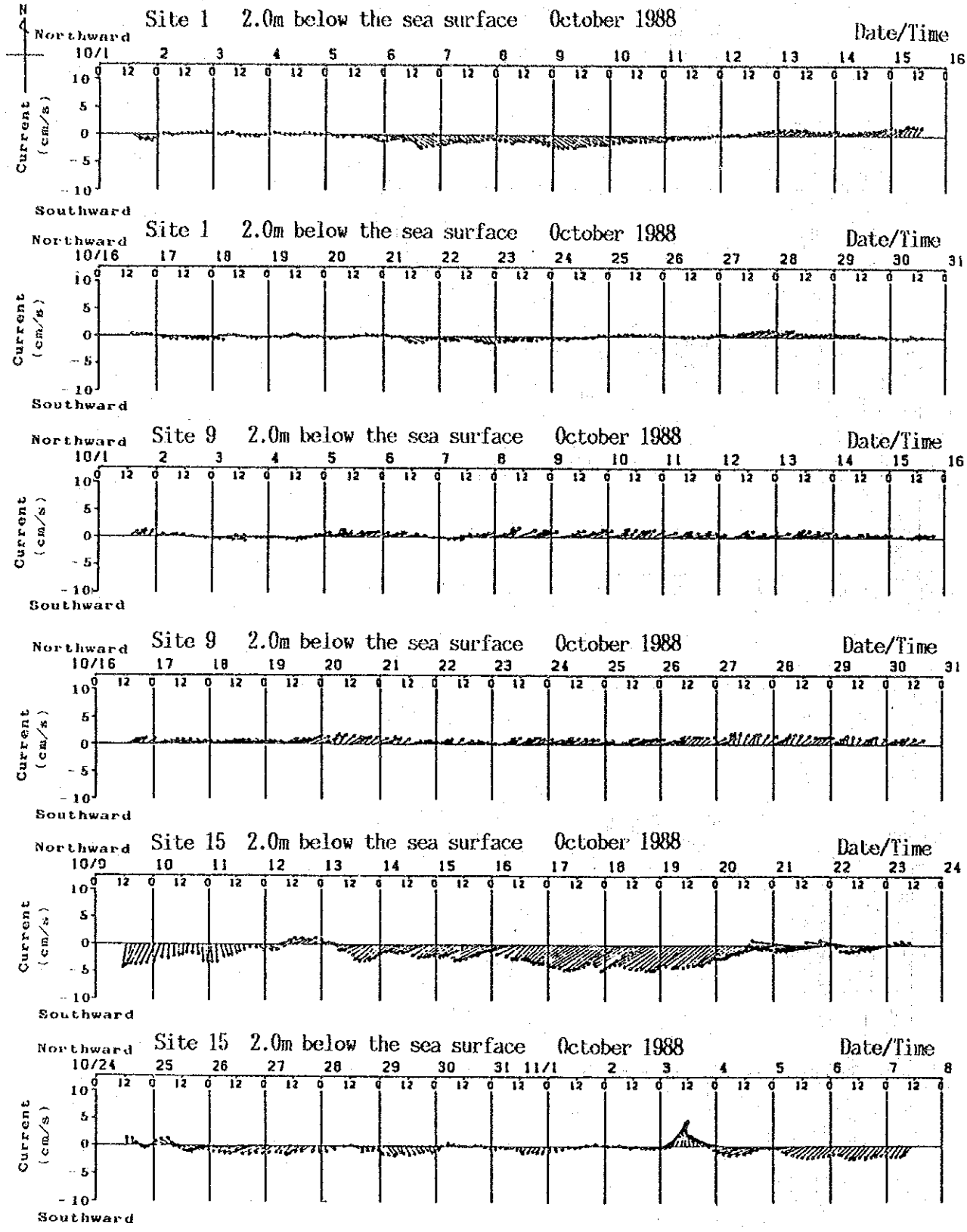


Fig. 3.10.4(1) Average Movement of Tidal Currents over a Twenty-Five Hour Period in the Second Field Survey

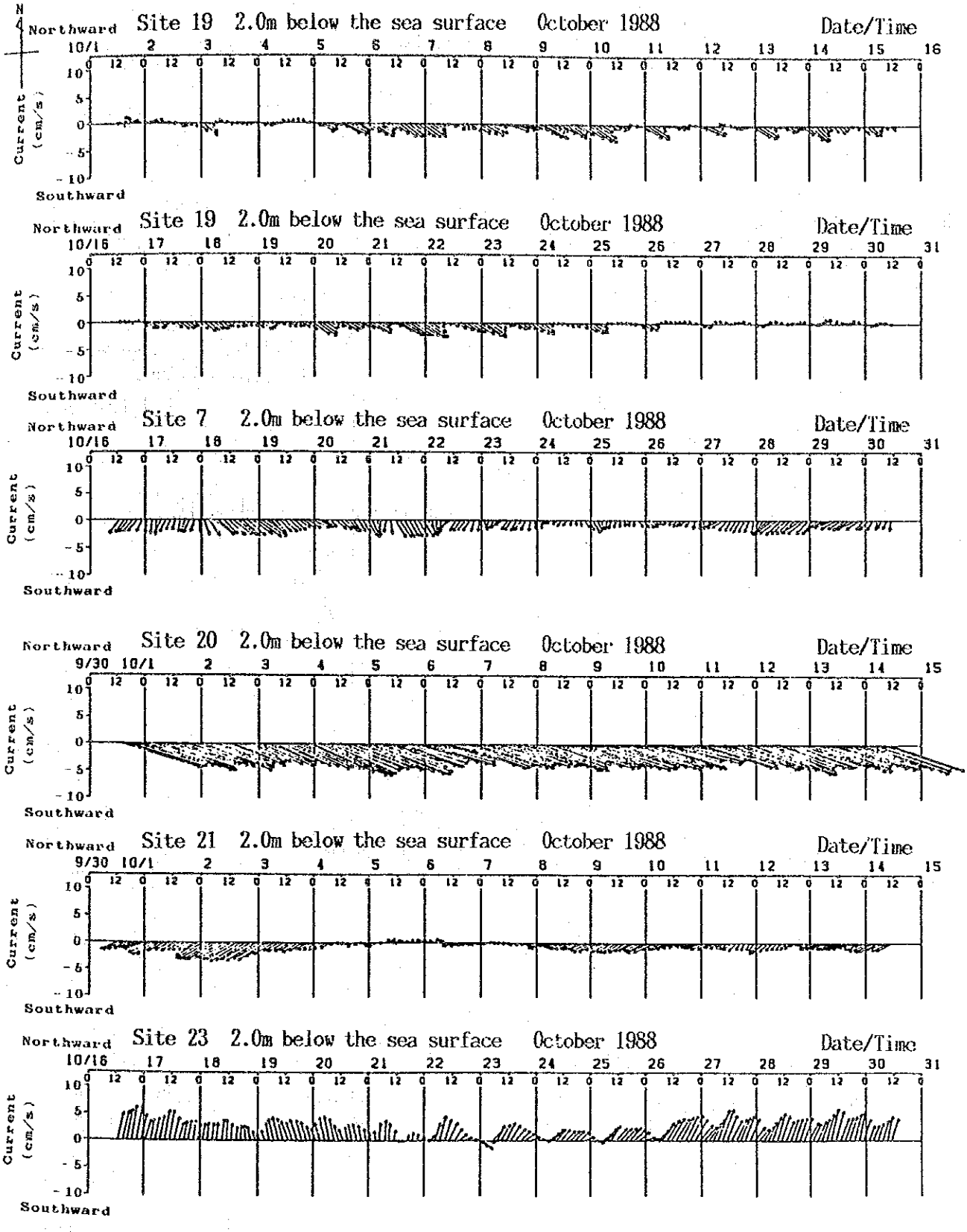


Fig. 3.10.4(2) Average Movement of Tidal Currents over a Twenty-Five Hour Period in the Second Field Survey

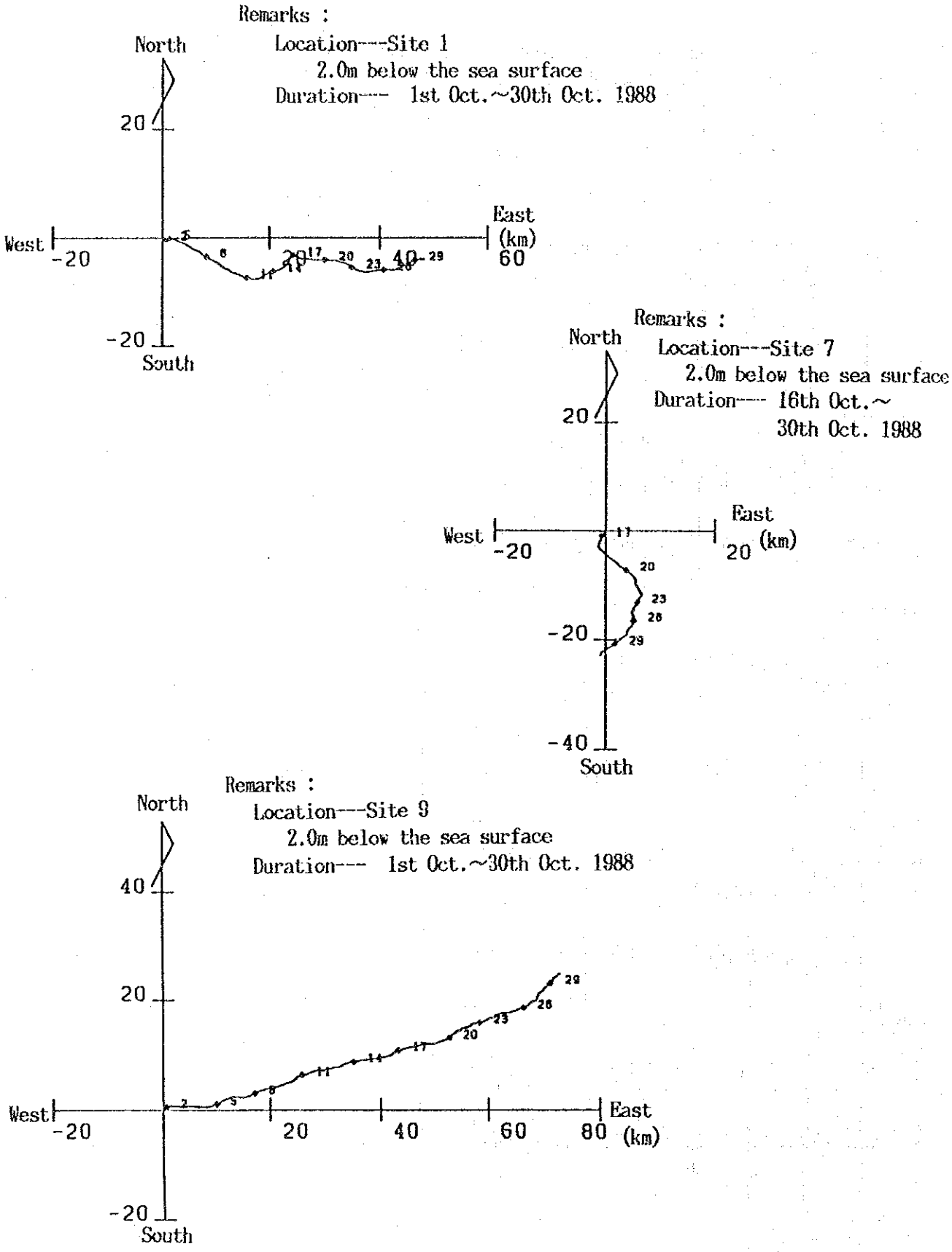
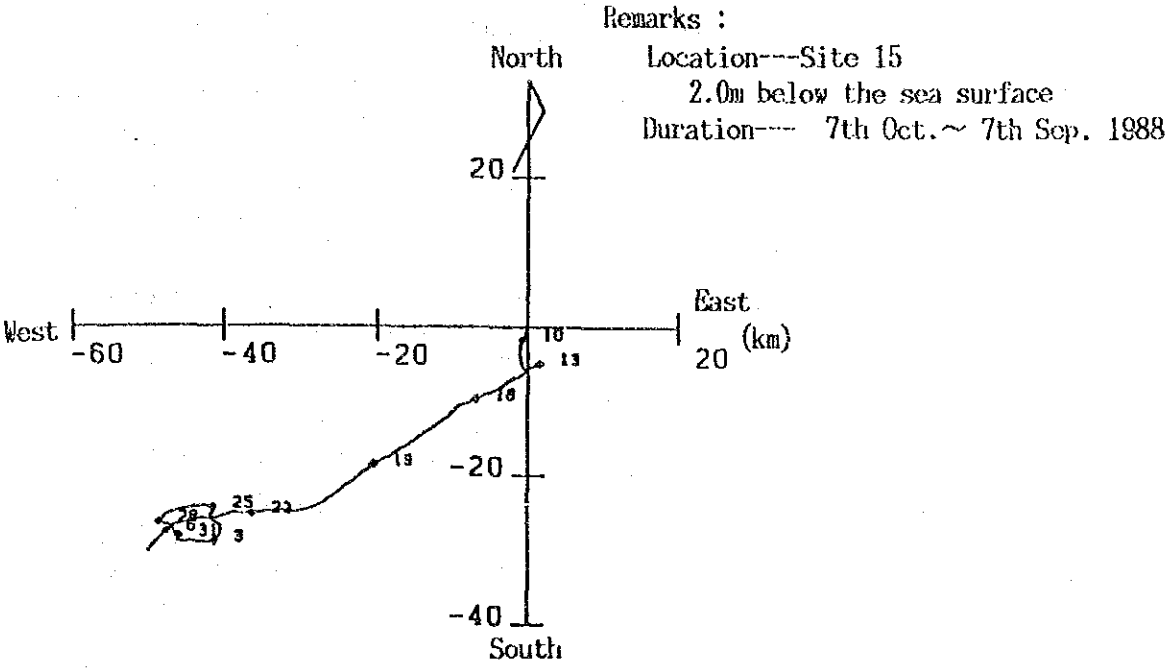


Fig. 3.10.5(1) Advance Vector of Tidal Currents in the Second Field Survey



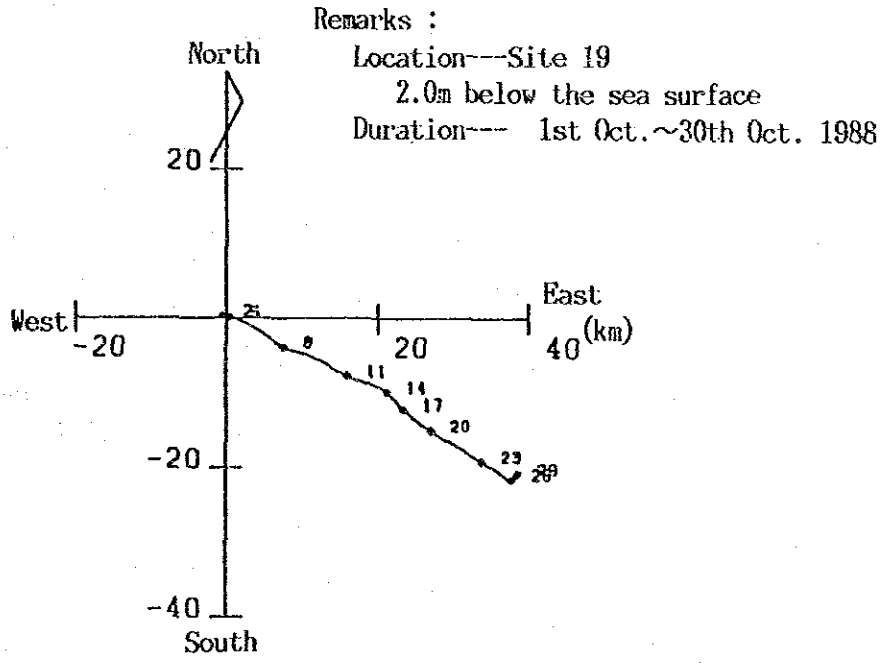
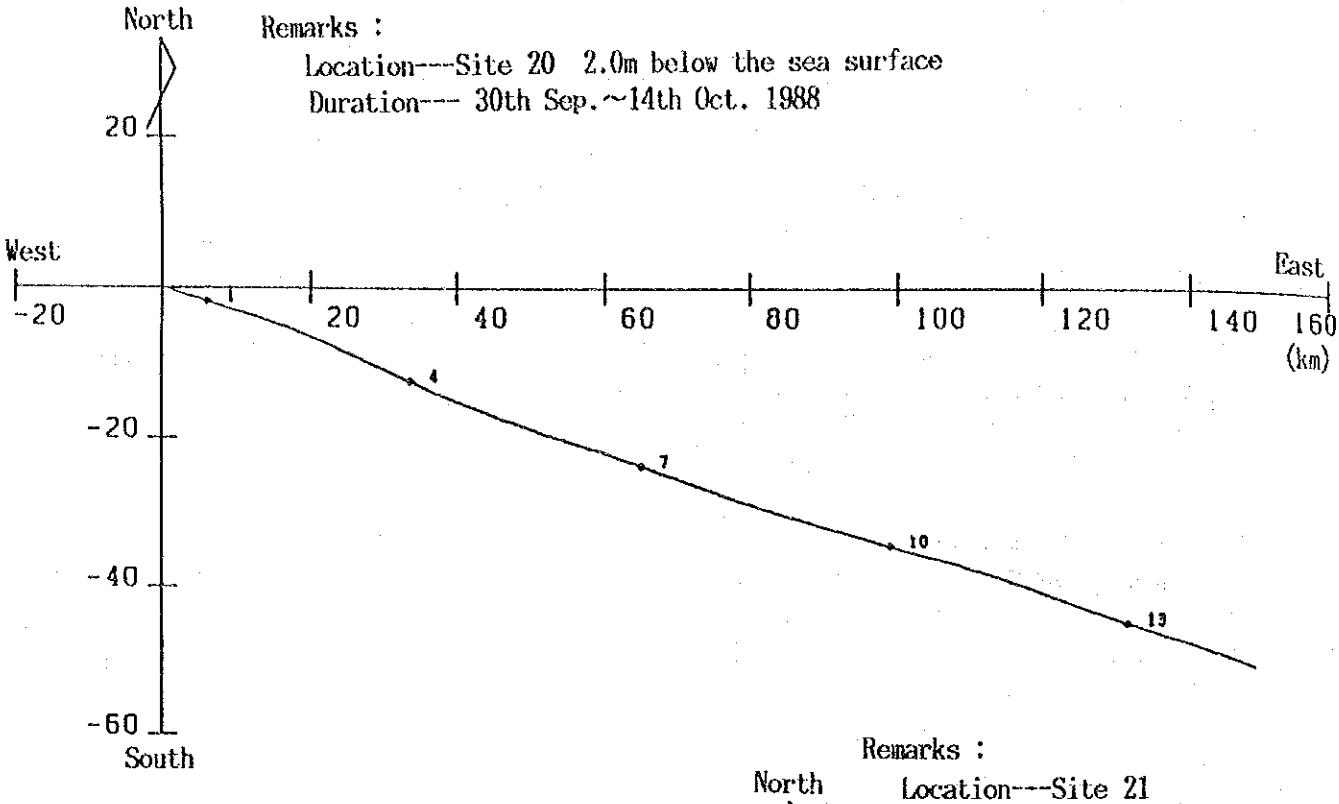
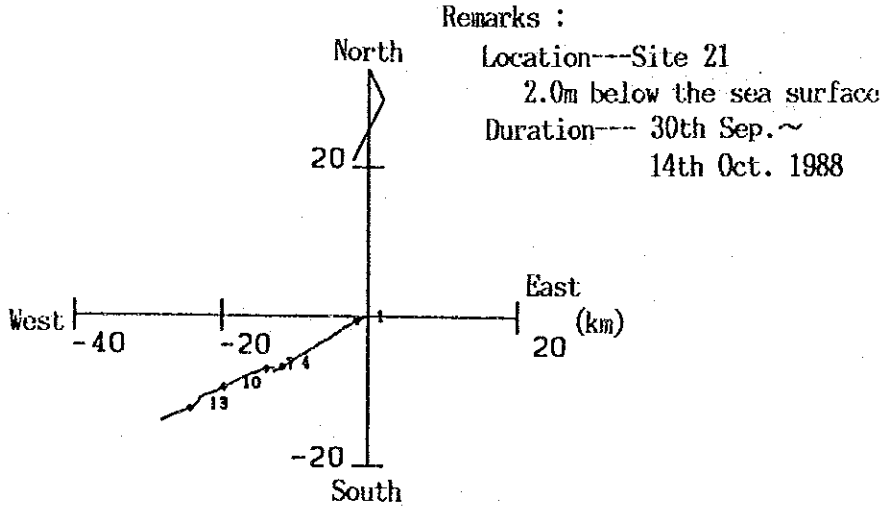


Fig. 3.10.5(2) Advance Vector of Tidal Currents in the Second Field Survey





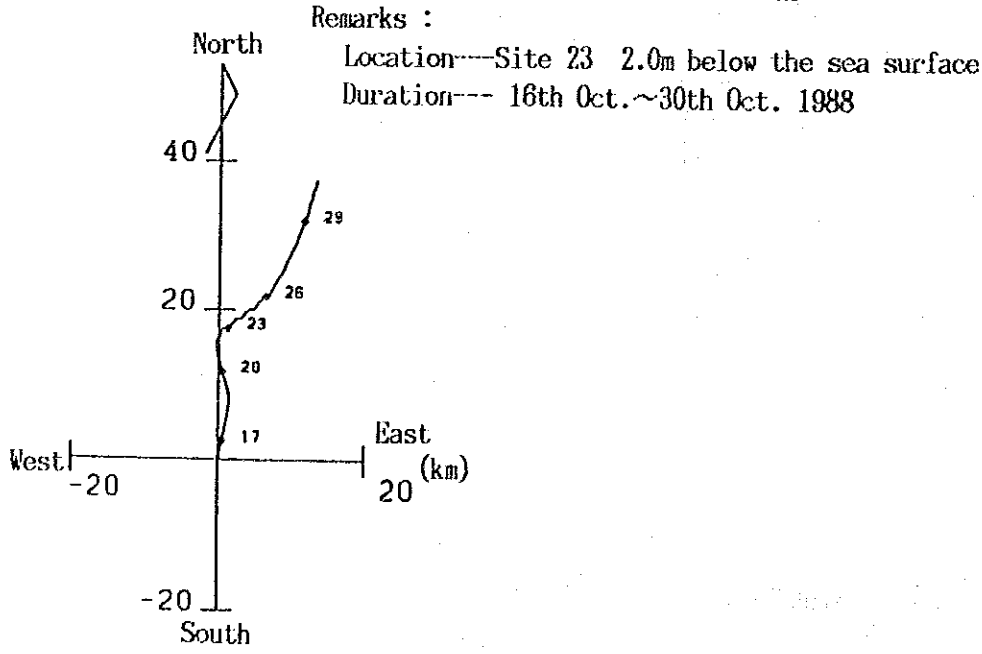


Fig. 3.10.5(3) Advance Vector of Tidal Currents in the Second Field Survey

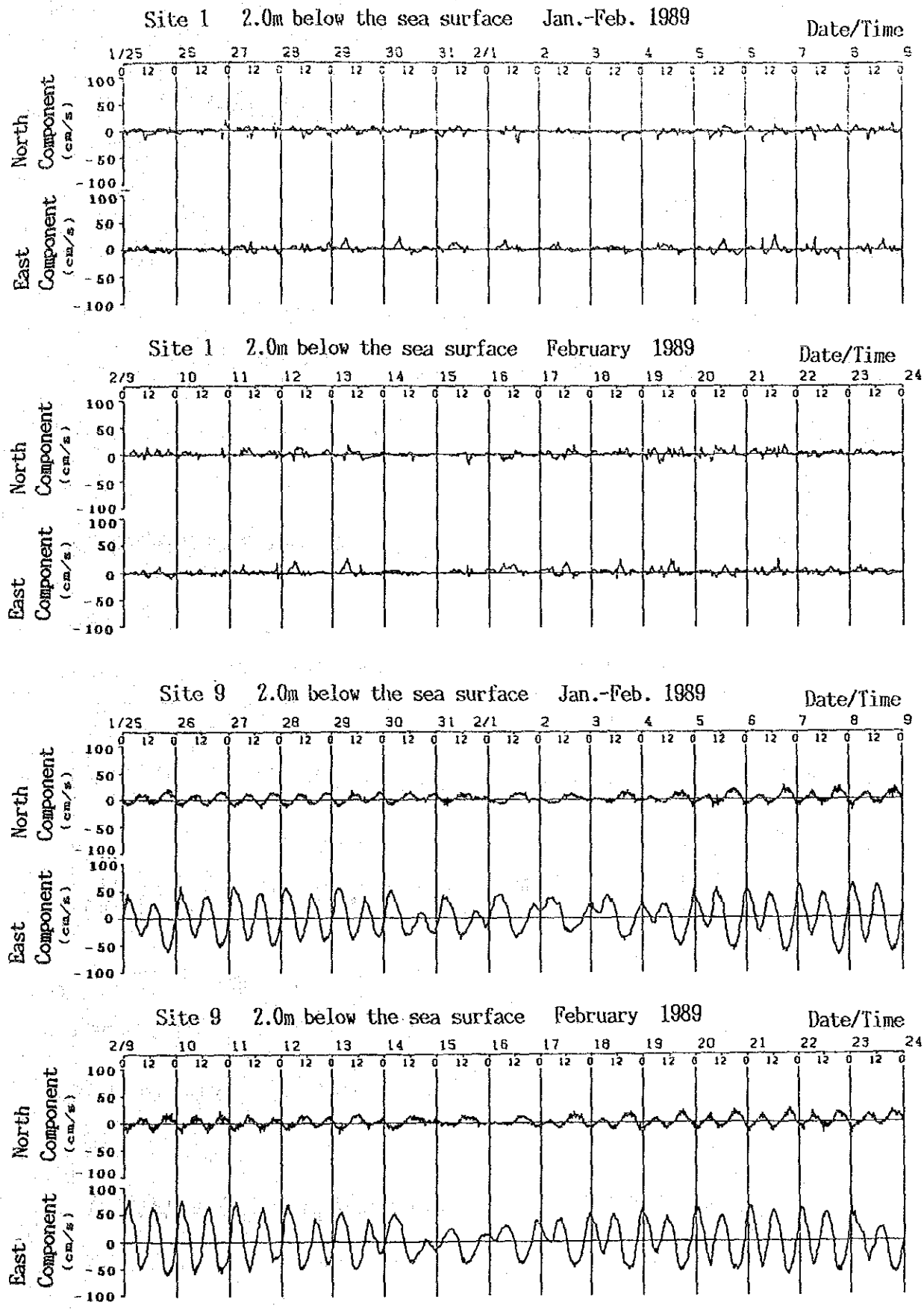


Fig. 3.10.6(1) Consecutive Anchorted Observations of Tidal Currents in the Third Field Survey

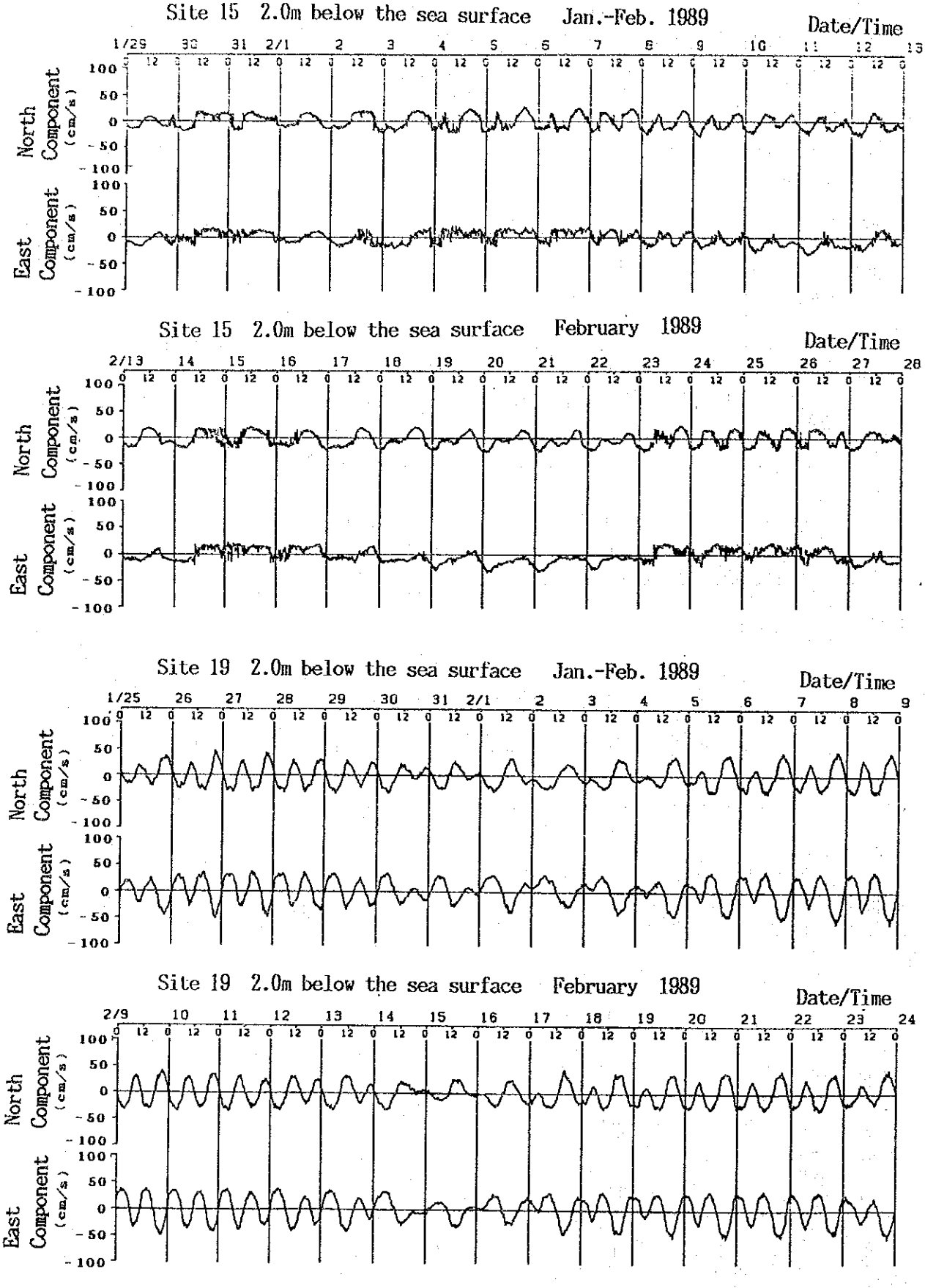


Fig. 3.10.6(2) Consecutive Anchorted Observations of Tidal Currents in the Third Field Survey

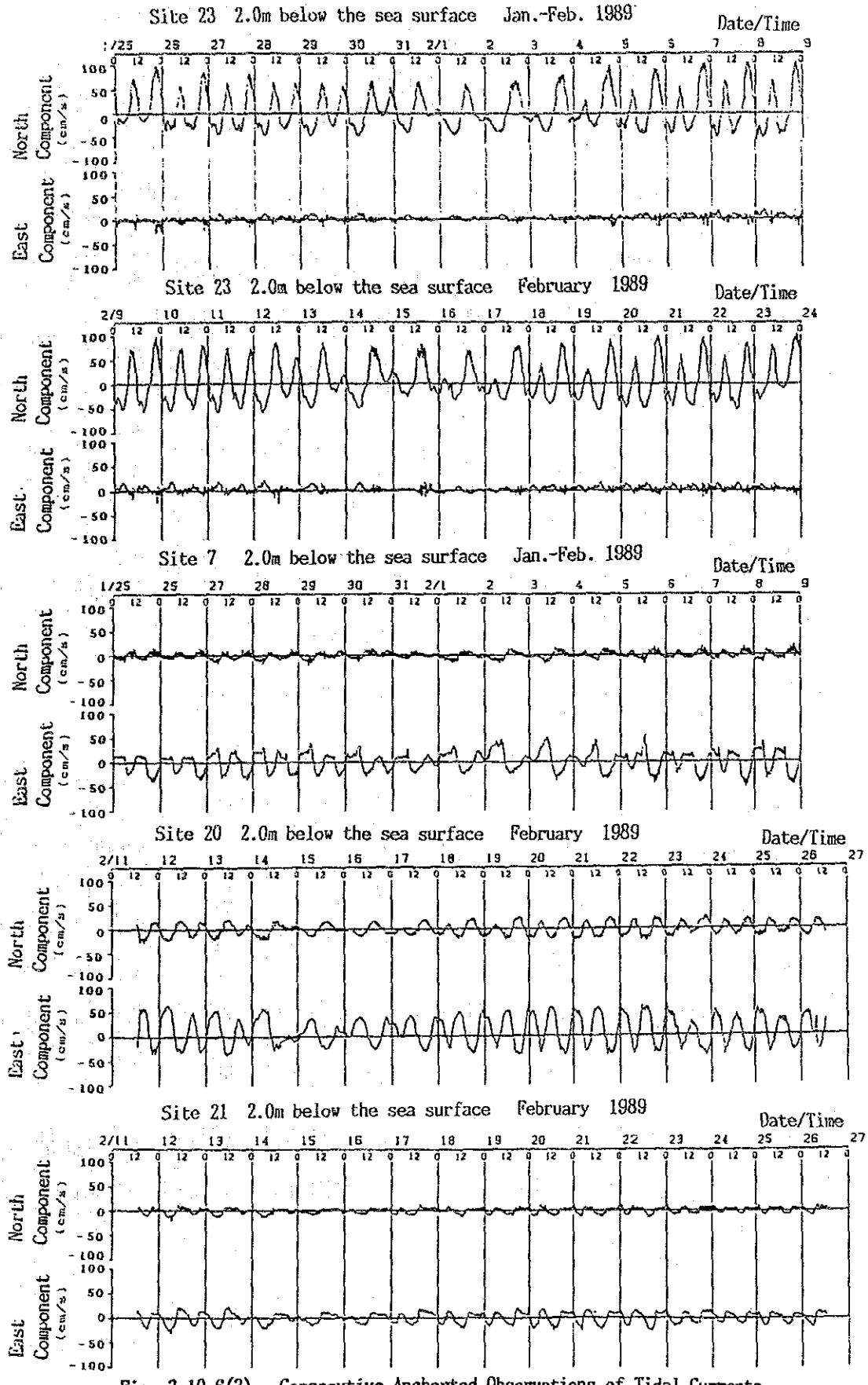


Fig. 3.10.6(3) Consecutive Anchorted Observations of Tidal Currents in the Third Field Survey

Table 3.10.3(1) Harmonic Analysis Results of Tidal Currents in the Third Field Survey

Observation Location : Site 1 2.0m below the sea surface
Duration of Observation : 25th January-23th February 1989

Component Current	Elliptic Element						Main Current Direction 62 deg	
	Long Axis Component			Short Axis Component				
	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Speed (cm/s)	Ph. (deg)
M_2	44	2.7	31	134	1.2	301	2.6	23
S_2	44	1.0	115	134	0.4	25	1.0	108
K_2	44	0.3	115	134	0.1	25	0.3	108
N_2	43	0.5	346	133	0.2	256	0.5	338
K_1	271	1.8	325	1	0.0	55	1.6	145
O_1	64	1.6	159	154	0.1	69	1.6	159
P_1	271	0.6	325	1	0.0	55	0.5	145
Q_1	83	0.3	160	173	0.1	250	0.3	150
M_4	282	0.6	163	12	0.1	253	0.5	334
MS_4	282	1.0	234	12	0.3	324	0.8	42
U_0	1.3 cm/s			82 deg			1.2 cm/s	

Observation Location : Site 7 2.0m below the sea surface
Duration of Observation : 25th January-8th February 1989

Component Current	Elliptic Element						Main Current Direction 285 deg	
	Long Axis Component			Short Axis Component				
	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Speed (cm/s)	Ph. (deg)
M_2	285	20.1	116	15	0.9	206	20.1	116
S_2	283	8.6	224	13	0.2	314	8.6	224
K_2	283	2.3	224	13	0.1	314	2.3	224
N_2	74	3.9	70	164	0.0	160	3.3	250
K_1	288	11.4	291	18	0.1	201	11.4	291
O_1	283	6.2	248	13	0.8	338	6.2	248
P_1	288	3.8	291	18	0.0	201	3.8	291
Q_1	280	1.2	226	10	0.2	316	1.2	227
M_4	280	2.3	179	10	0.1	89	2.3	179
MS_4	278	3.9	323	8	0.1	233	3.9	323
U_0	0.5 cm/s			159 deg			-0.3 cm/s	

Table 3.10.3(2) Harmonic Analysis Results of Tidal Currents in the Third Field Survey

Observation Location : Site 9 2.0m below the sea surface
Duration of Observation : 25th January-23th February 1989

Component Current	Elliptic Element						Main Current Direction 282 deg	
	Long Axis Component			Short Axis Component				
	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Speed (cm/s)	Ph. (deg)
M_2	282	34.6	125	12	0.3	215	34.6	125
S_2	281	21.4	219	11	0.2	129	21.3	219
K_2	281	5.8	219	11	0.1	129	5.8	219
N_2	78	6.7	86	168	0.2	176	6.1	267
K_1	283	17.0	283	13	0.2	13	17.0	283
O_1	285	9.8	238	15	0.0	148	9.8	238
P_1	283	5.6	283	13	0.1	13	5.6	283
Q_1	285	1.9	215	15	0.0	125	1.9	215
M_4	80	0.4	287	170	0.2	197	0.4	98
MS_4	295	1.2	76	25	0.2	346	1.1	78
U_0	2.5 cm/s			39 deg			-1.1 cm/s	

Observation Location : Site 15 2.0m below the sea surface
Duration of Observation : 29th January-27th February 1989

Component Current	Elliptic Element						Main Current Direction 17 deg	
	Long Axis Component			Short Axis Component				
	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Speed (cm/s)	Ph. (deg)
M_2	356	9.1	118	86	4.8	208	8.6	130
S_2	10	5.8	218	100	2.2	308	5.8	221
K_2	10	1.6	218	100	0.6	308	1.6	221
N_2	347	1.8	64	77	0.9	154	1.6	79
K_1	35	12.5	265	125	0.9	355	11.8	263
O_1	6	6.0	226	96	0.7	316	5.9	227
P_1	35	4.1	265	125	0.3	355	3.9	263
Q_1	3	1.2	207	93	0.2	297	1.1	210
M_4	273	0.5	74	3	0.4	164	0.4	184
MS_4	28	0.8	266	118	0.4	176	0.7	273
U_0	2.4 cm/s			230 deg			-2.0 cm/s	

Table 3.10.3(3) Harmonic Analysis Results of Tidal Currents in the Third Field Survey

Observation Location : Site 19 2.0m below the sea surface
Duration of Observation : 25th January-23th February

Component Current	Elliptic Element						Main Current Direction 310 deg	
	Long Axis Component			Short Axis Component				
	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Speed (cm/s)	Ph. (deg)
M_2	310	31.7	136	40	1.0	226	31.7	136
S_2	310	15.8	230	40	0.7	320	15.8	230
K_2	310	4.3	230	40	0.2	320	4.3	230
N_2	50	6.1	92	140	0.5	182	1.2	299
K_1	310	17.3	297	40	0.5	27	17.3	297
O_1	309	11.2	246	39	0.5	336	11.2	246
P_1	310	5.8	297	40	0.2	27	5.8	297
Q_1	309	2.2	221	39	0.1	311	2.2	221
M_4	309	1.5	286	39	0.3	196	1.5	286
MS_4	308	2.7	350	38	0.1	260	2.7	350
U_0	0.8 cm/s			117 deg			-0.7 cm/s	

Observation Location : Site 20 2.0m below the sea surface
Duration of Observation : 11th-26th February 1989

Component Current	Elliptic Element						Main Current Direction 293 deg	
	Long Axis Component			Short Axis Component				
	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Speed (cm/s)	Ph. (deg)
M_2	292	33.0	142	22	1.0	232	32.9	142
S_2	292	15.5	218	22	0.5	308	15.5	218
K_2	292	4.2	218	22	0.1	308	4.2	218
N_2	68	6.4	112	158	0.3	202	4.5	295
K_1	294	15.6	295	24	0.4	25	15.5	295
O_1	300	7.3	268	30	0.7	178	7.3	269
P_1	294	5.2	295	24	0.1	25	5.2	295
Q_1	300	1.4	255	30	0.2	165	1.4	256
M_4	84	1.1	268	174	0.2	178	0.9	84
MS_4	293	3.0	339	23	0.2	249	3.0	339
U_0	9.9 cm/s			96 deg			-9.5 cm/s	

Table 3.10.3(4) Harmonic Analysis Results of Tidal Currents in the Third Field Survey

Observation Location : Site 21 2.0m below the sea surface
Duration of Observation : 11th-26th February 1989

Component Current	Elliptic Element						Main Current Direction 65 deg	
	Long Axis Component			Short Axis Component				
	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Speed (cm/s)	Ph. (deg)
M_2	67	11.4	181	157	0.1	271	11.4	181
S_2	67	5.0	270	157	0.3	180	5.0	270
K_2	67	1.4	270	157	0.1	180	1.4	270
N_2	67	2.2	133	157	0.1	223	2.2	133
K_1	63	4.7	332	153	0.4	242	4.7	331
O_1	61	5.5	297	151	0.2	207	5.5	297
P_1	63	1.6	332	153	0.1	242	1.6	331
Q_1	61	1.1	280	151	0.0	190	1.1	279
M_4	61	1.5	224	151	0.6	314	1.5	225
MS_4	60	3.2	280	150	0.4	10	3.2	281
U_0	0.4 cm/s			223 deg			-0.3 cm/s	

Observation Location : Site 23 2.0m below the sea surface
Duration of Observation : 25th January-23rd February 1989

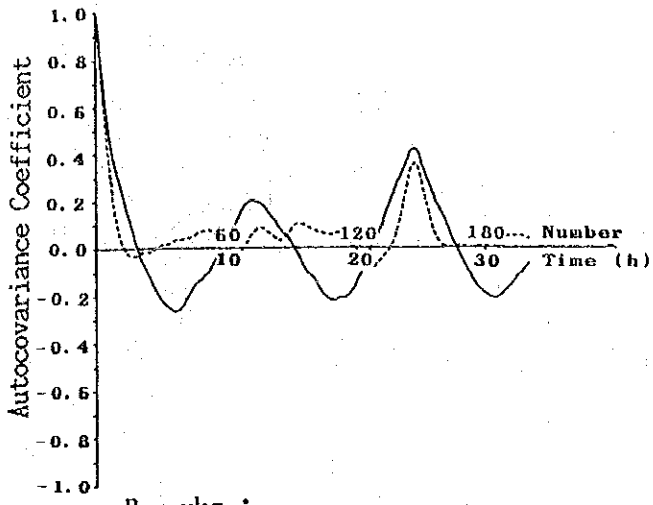
Component Current	Elliptic Element						Main Current Direction 356 deg	
	Long Axis Component			Short Axis Component				
	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Dir. (deg)	Speed (cm/s)	Ph. (deg)	Speed (cm/s)	Ph. (deg)
M_2	355	38.4	157	85	0.5	247	38.4	157
S_2	355	20.1	248	85	0.3	158	20.1	248
K_2	355	5.5	248	85	0.1	158	5.5	248
N_2	5	7.5	108	95	0.1	18	7.4	108
K_1	355	21.0	302	85	0.3	212	21.0	302
O_1	0	13.6	259	90	0.6	169	13.5	259
P_1	355	7.0	302	85	0.1	212	7.0	302
Q_1	2	2.6	238	92	0.1	148	2.6	238
M_4	3	5.4	323	93	0.5	53	5.3	322
MS_4	358	8.0	17	88	0.8	107	8.0	17
U_0	5.4 cm/s			24 deg			-4.8 cm/s	

Table 3.10.4 Predicted Hydrographic Conditions for Spring Tide Period in the Third Field Survey

Site	1		7		9		15		19		20		21		23	
Parameter / Time(h)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)
0	75.2	7.1	113.8	17.2	99.1	35.7	241.7	9.1	132.6	41.2	109.8	57.5	244.0	24.1	171.2	60.4
1	64.4	7.1	226.9	3.2	71.7	3.5	309.8	10.0	139.1	14.6	108.3	33.6	244.0	21.1	168.5	36.0
2	54.3	6.2	278.2	20.7	285.4	32.0	342.1	17.8	302.3	17.2	76.1	4.1	243.3	13.6	90.7	4.2
3	42.1	4.5	282.1	35.5	284.0	61.3	356.2	25.1	307.7	46.2	298.4	26.5	235.3	3.2	1.3	38.4
4	17.7	2.5	283.8	43.1	283.8	78.1	6.0	29.3	309.1	66.4	296.4	48.4	70.0	7.9	358.5	71.4
5	305.1	1.6	285.1	42.0	284.1	78.5	15.6	29.2	310.0	73.2	296.5	58.7	67.8	17.2	357.8	91.6
6	259.0	2.9	286.6	33.0	284.9	62.9	27.2	25.1	310.8	65.6	297.6	54.3	66.9	22.7	357.8	94.5
7	244.3	3.9	289.7	18.6	287.5	35.5	45.2	18.7	312.1	45.9	300.8	37.4	66.4	23.4	358.3	80.1
8	236.5	4.0	319.9	3.0	329.7	4.7	78.4	12.8	315.9	19.4	317.5	13.2	65.6	19.5	359.6	52.5
9	231.1	3.2	97.2	11.3	94.8	26.1	127.1	11.9	115.9	7.8	92.5	15.8	64.0	12.1	6.3	18.9
10	227.0	1.7	101.8	19.3	98.3	45.0	161.8	14.9	127.0	28.2	105.3	35.8	54.1	3.6	162.4	13.3
11	32.3	0.2	103.7	20.4	99.2	50.1	183.1	17.4	128.7	38.2	108.4	46.5	259.2	4.3	171.8	35.0
12	37.0	1.7	105.4	15.0	99.2	41.3	200.1	17.9	129.6	36.2	109.8	45.1	253.1	9.1	173.6	42.9
13	33.1	2.7	110.1	5.5	97.9	22.3	216.9	16.8	130.4	24.2	110.0	32.9	252.3	10.4	174.7	36.3
14	28.5	2.9	277.4	4.8	349.4	1.5	233.9	14.9	132.5	7.0	111.6	14.5	253.3	7.5	176.1	18.8
15	22.8	2.2	282.5	12.1	285.6	19.8	248.1	12.8	309.4	9.6	291.2	4.1	262.6	2.3	344.9	3.3
16	13.9	1.0	283.9	13.7	284.6	29.2	253.9	10.9	311.1	19.7	292.8	16.9	61.6	3.6	353.9	22.1
17	198.9	0.6	285.1	8.7	285.4	25.7	242.5	8.4	312.6	19.7	294.5	19.4	67.0	7.9	355.1	31.5
18	183.0	2.0	99.6	2.1	292.2	9.8	213.0	8.8	318.6	9.0	300.7	10.3	69.3	9.1	356.6	27.6
19	168.3	3.0	104.5	15.9	94.4	14.7	193.7	12.7	121.6	10.3	97.6	8.9	73.4	6.4	3.2	11.1
20	149.5	3.8	105.4	28.9	99.0	40.2	188.5	17.1	127.7	32.4	107.3	32.4	149.4	1.0	165.5	14.4
21	127.3	4.5	106.2	37.4	100.0	59.6	189.9	19.6	129.2	51.2	109.0	54.3	238.5	8.2	170.8	41.1
22	105.9	5.4	107.2	38.6	100.3	66.7	195.7	18.9	130.1	60.9	109.7	68.2	242.3	16.4	171.7	61.5
23	88.5	6.4	108.9	31.5	100.1	58.5	208.1	14.8	131.0	57.7	110.0	69.7	243.6	22.3	171.8	69.1

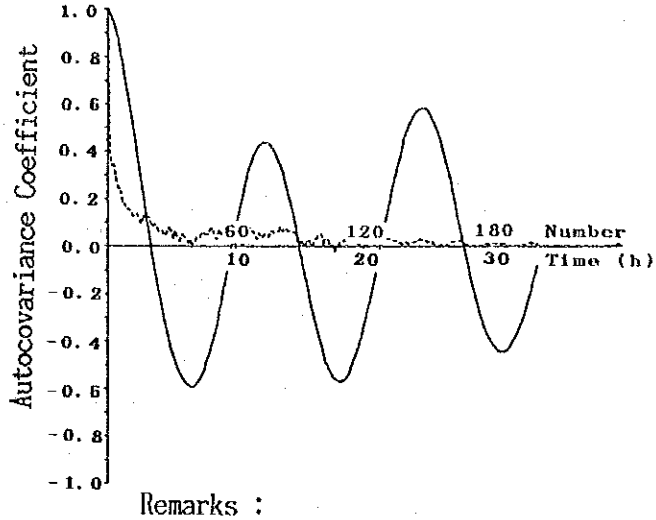
Site	1		7		9		15		19		20		21		23	
Parameter / Time(h)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)
0	54.9	4.8	174.6	1.7	92.6	10.3	252.2	9.4	134.2	17.4	109.4	31.4	246.7	15.3	171.5	34.2
1	45.4	4.4	278.7	13.9	287.0	18.7	298.4	9.8	299.8	7.3	101.5	6.9	246.8	9.9	160.1	7.3
2	34.7	3.2	282.4	24.4	284.3	42.2	328.1	12.4	308.2	29.6	296.9	17.1	246.5	2.0	359.5	23.3
3	13.7	1.6	283.9	28.4	284.0	54.1	346.3	13.5	309.6	43.8	295.5	33.8	67.4	6.4	357.4	48.5
4	274.6	0.8	285.2	24.7	284.5	51.3	2.4	11.9	310.6	46.1	296.1	39.0	67.4	13.0	357.2	62.1
5	227.6	2.0	287.4	14.4	286.2	34.4	27.2	7.8	311.9	35.9	298.4	31.2	67.6	16.0	357.6	60.3
6	210.8	2.8	12.2	0.8	300.7	8.4	92.7	5.2	315.8	15.9	310.1	12.9	67.9	14.6	359.1	43.7
7	193.1	2.8	102.1	14.4	94.5	21.0	147.8	9.2	119.3	8.8	93.4	13.0	68.7	9.2	6.4	16.9
8	164.0	2.4	104.2	25.0	98.6	44.4	168.4	13.9	127.7	31.1	105.8	36.4	79.7	1.3	161.2	14.1
9	119.4	2.4	105.5	29.0	99.5	56.3	181.9	16.3	129.2	45.3	108.4	53.0	244.9	7.1	170.3	39.1
10	85.2	3.3	107.0	25.3	99.7	53.5	195.9	15.5	130.2	47.6	109.4	58.0	246.1	13.7	171.9	52.6
11	66.7	4.3	110.3	15.0	99.1	36.6	216.1	12.4	131.3	37.4	109.8	50.1	246.5	16.6	172.2	50.8

Notes :
Component of Main Direction
Component of Subnormal Direction



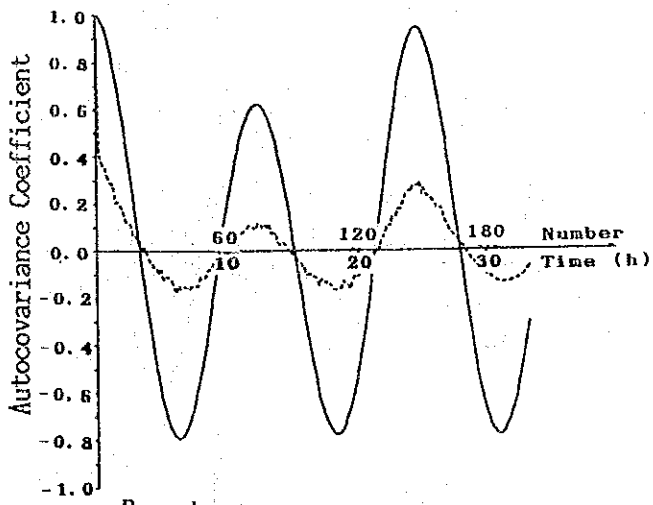
Remarks :
Location---Site 1
2.0m below the sea surface
Duration---Jan.-Feb. 1989

Notes :
Component of Main Direction
Component of Subnormal Direction



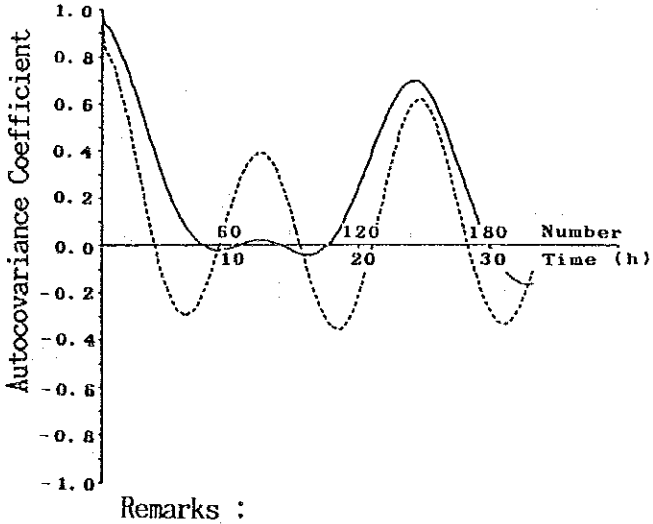
Remarks :
Location---Site 7
2.0m below the sea surface
Duration---Jan.-Feb. 1989

Notes :
Component of Main Direction
Component of Subnormal Direction



Remarks :
Location---Site 9
2.0m below the sea surface
Duration---Jan.-Feb. 1989

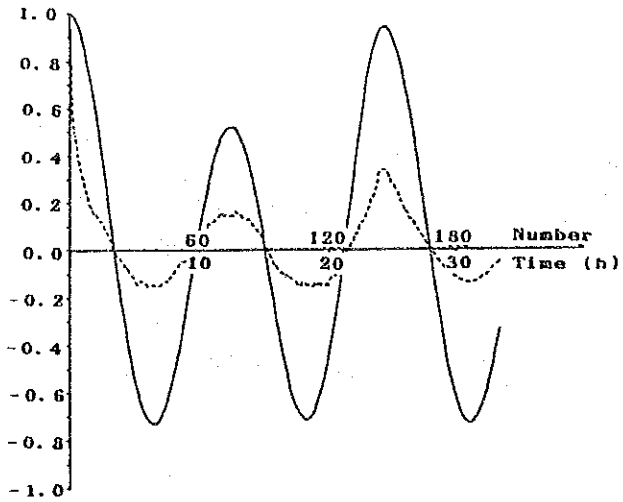
Notes :
Component of Main Direction
Component of Subnormal Direction



Remarks :
Location---Site 15
2.0m below the sea surface
Duration---Jan.-Feb. 1989

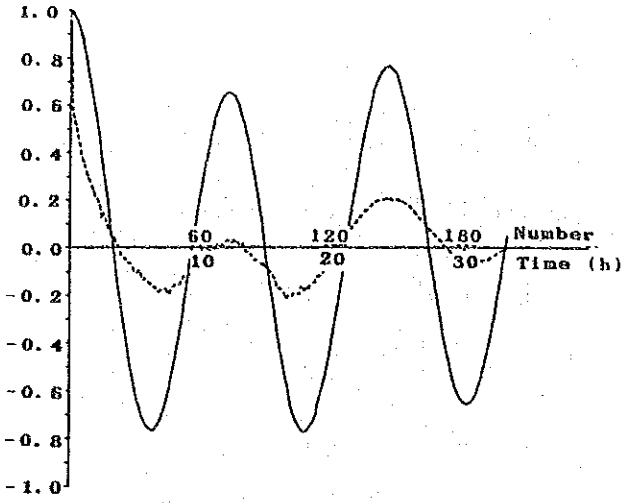
Fig. 3.10.7(1) Auto-covariance Curve of Tidal Currents in the Third Field Survey

Notes :
Component of Main Direction
Component of Subnormal Direction



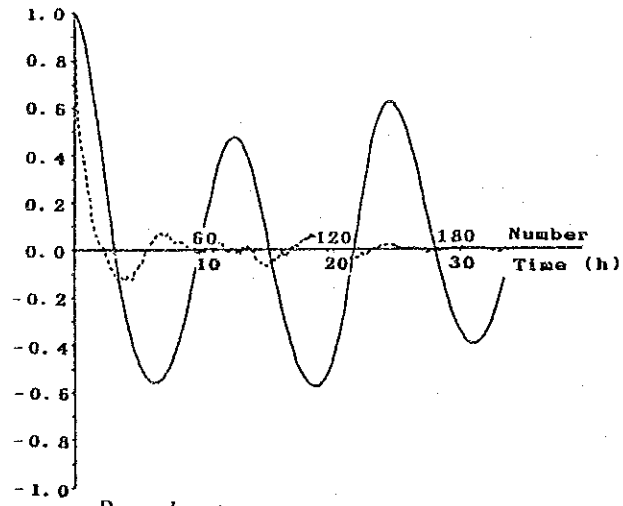
Remarks :
Location---Site 19
2.0m below the sea surface
Duration---Jan.-Feb. 1989

Notes :
Component of Main Direction
Component of Subnormal Direction



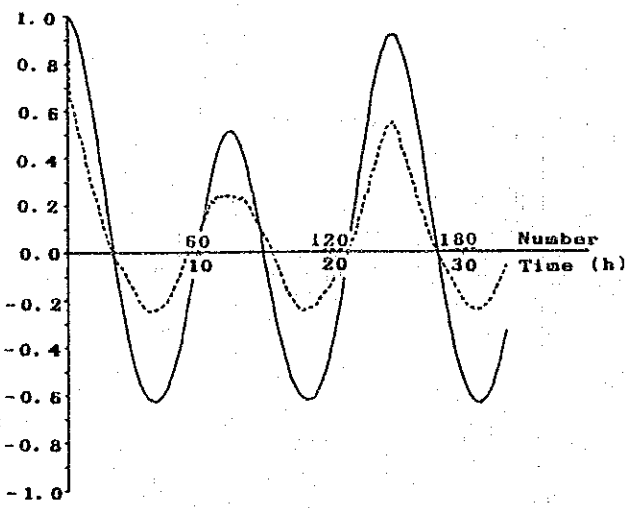
Remarks :
Location---Site 20
2.0m below the sea surface
Duration---February

Notes :
Component of Main Direction
Component of Subnormal Direction



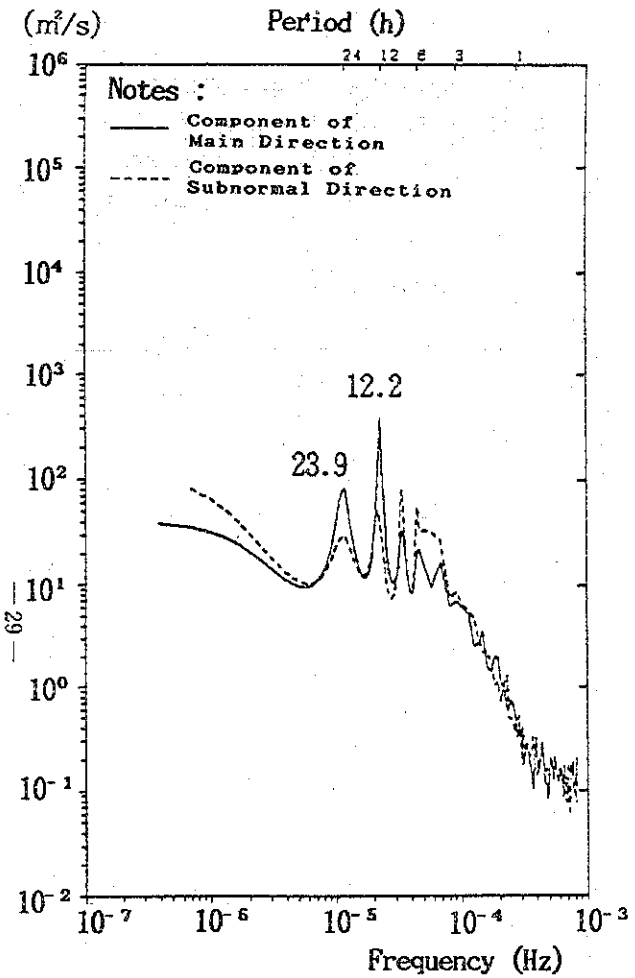
Remarks :
Location---Site 21
2.0m below the sea surface
Duration---February. 1989

Notes :
Component of Main Direction
Component of Subnormal Direction

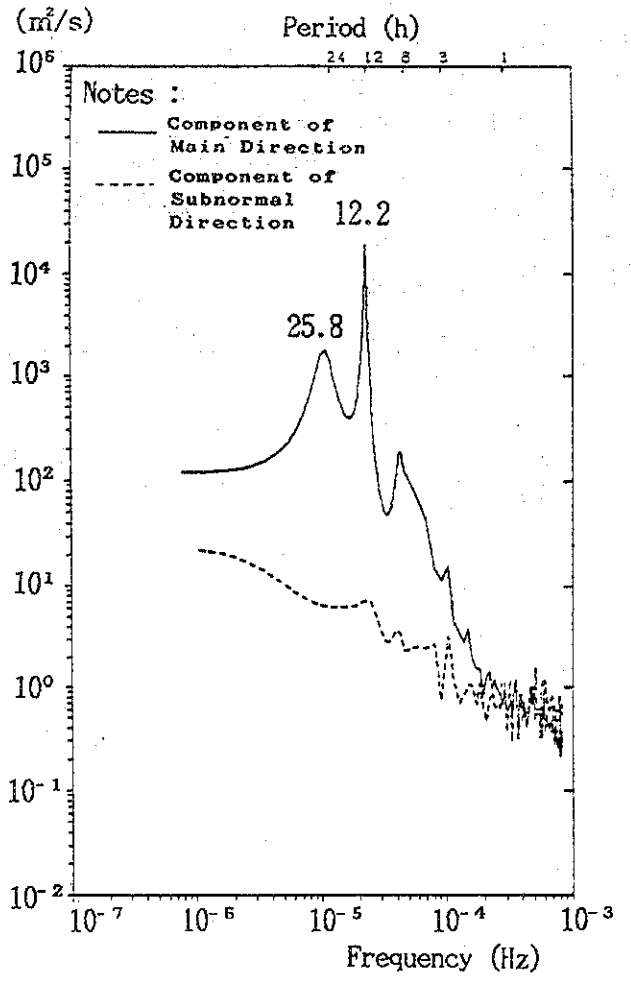


Remarks :
Location---Site 23
2.0m below the sea surface
Duration---Jan.-Feb. 1989

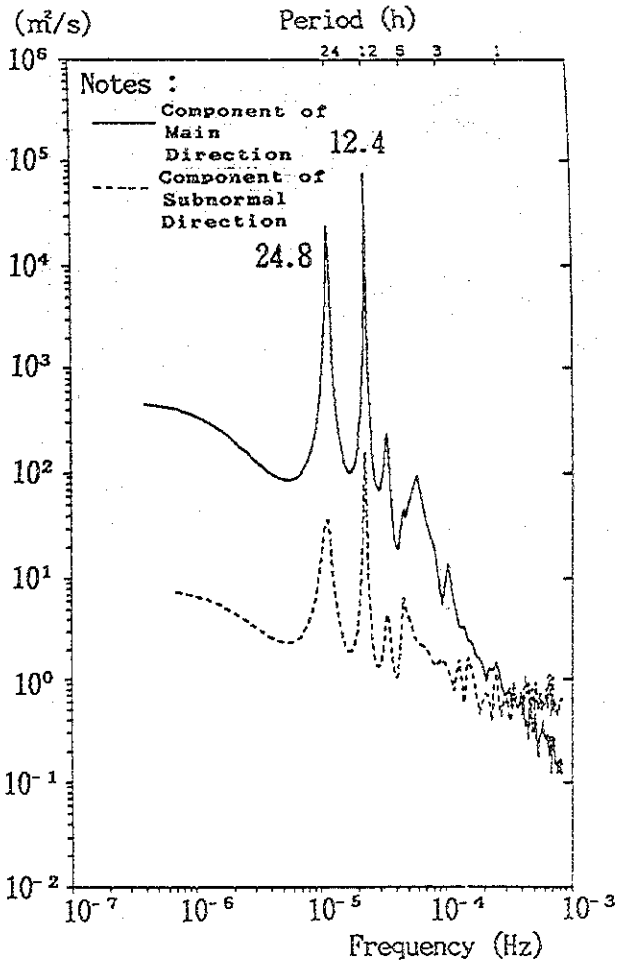
Fig. 3.10.7(2) Auto-covariance Curve of Tidal Currents in the Third Field Survey



Remarks :
Location---Site 1
2.0m below the sea surface
Duration---Jan.-Feb. 1989

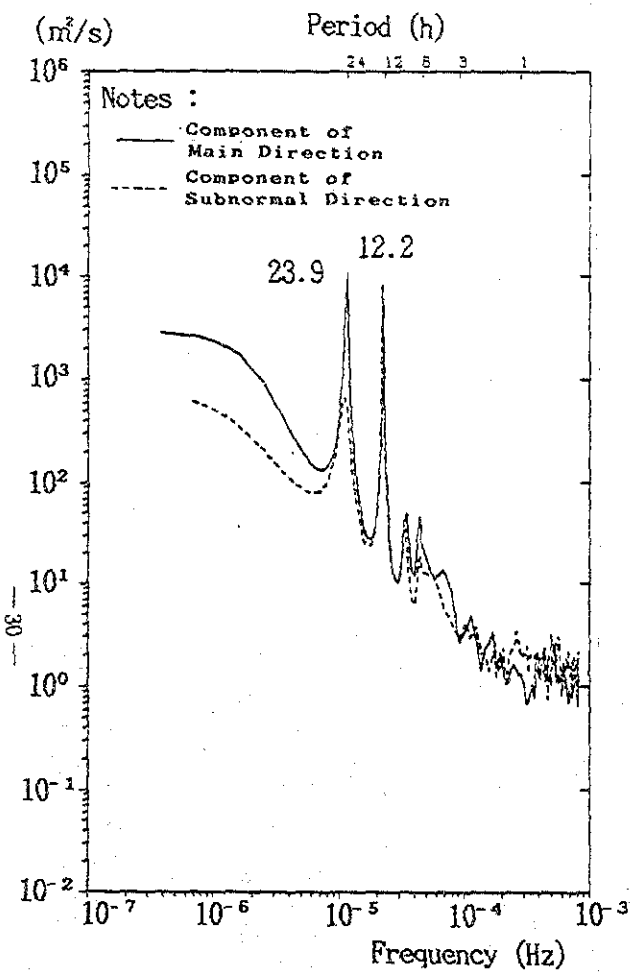


Remarks :
Location---Site 7
2.0m below the sea surface
Duration---Jan.-Feb. 1989

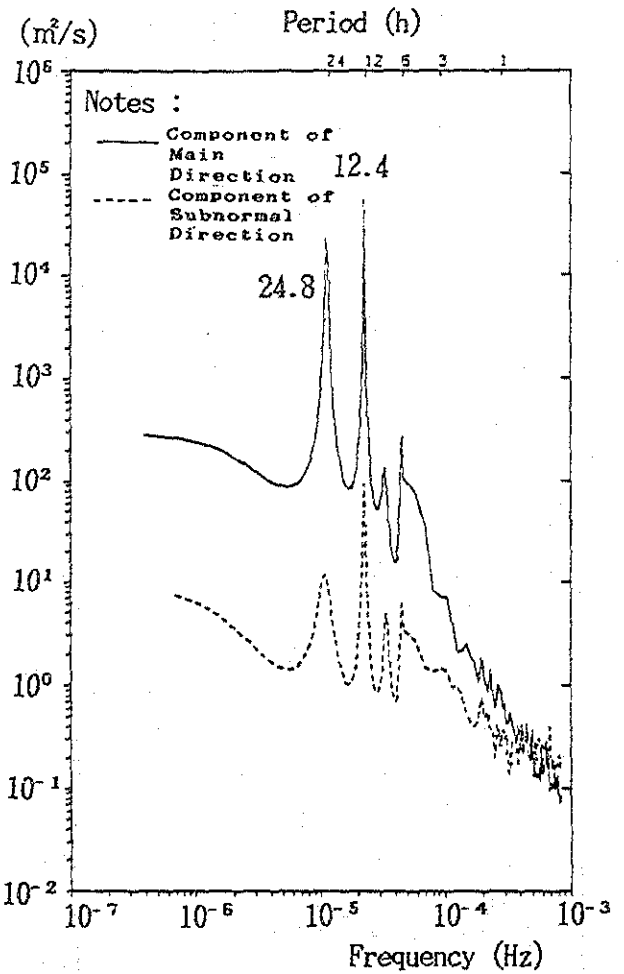


Remarks :
Location---Site 9
2.0m below the sea surface
Duration---Jan.-Feb. 1989

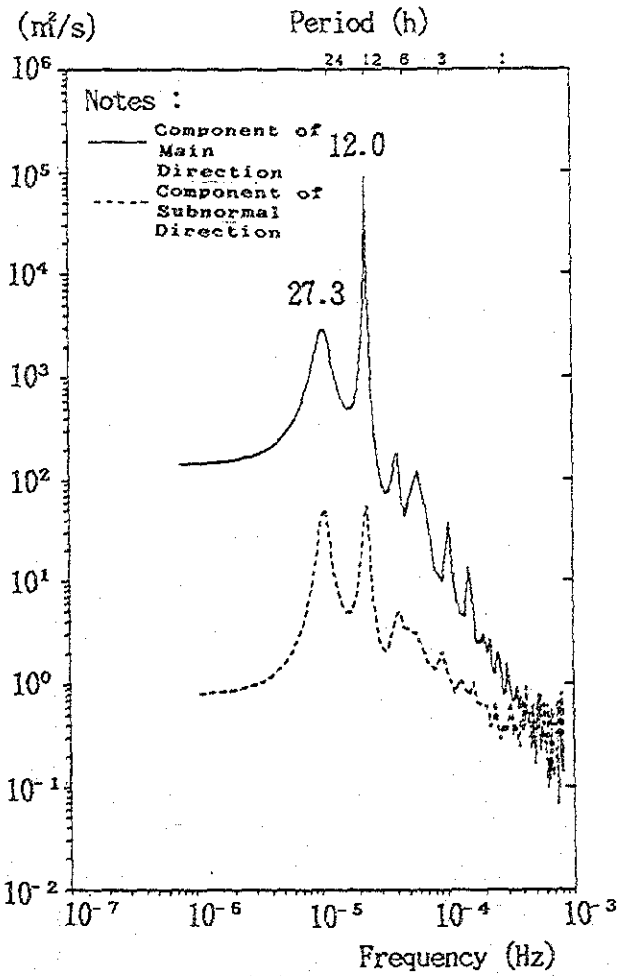
Fig. 3.10.8(1) Power Spectrum Density Curve of Tidal Currents in the Third Field Survey



Remarks :
Location---Site 15
2.0m below the sea surface
Duration---Jan.-Feb. 1989

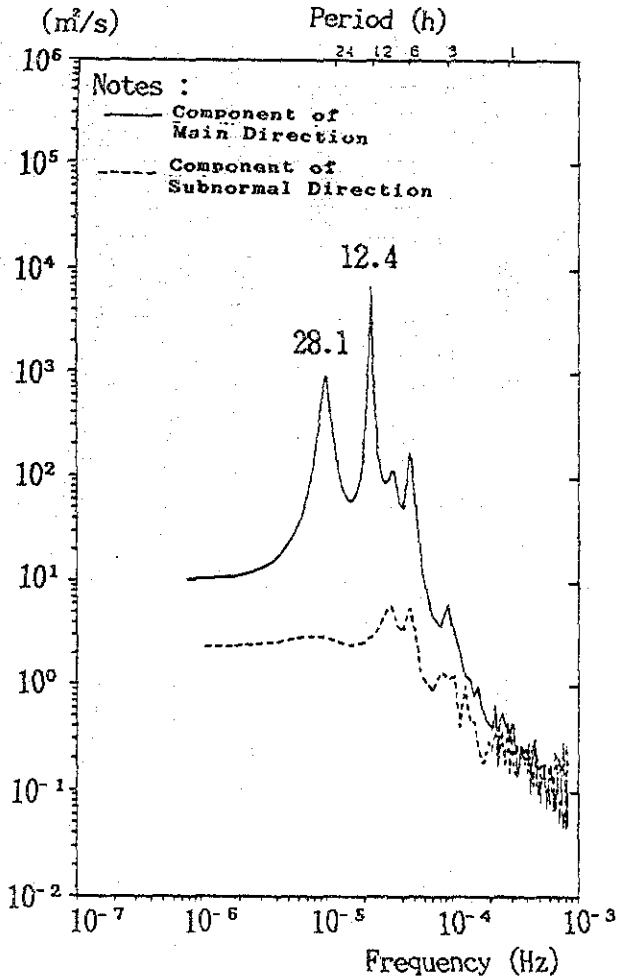


Remarks :
Location---Site 19
2.0m below the sea surface
Duration---Jan.-Feb. 1989

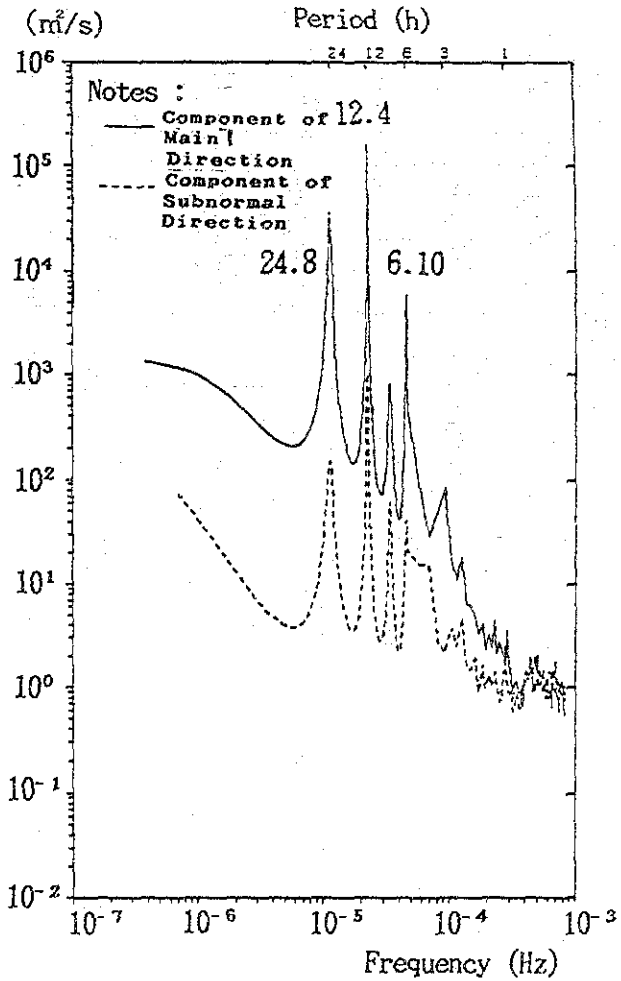


Remarks :
Location---Site 20
2.0m below the sea surface
Duration---February 1989

Fig. 3.10.8(2) Power Spectrum Density Curve of Tidal Currents in the Third Field Survey



Remarks :
Location---Site 21
2.0m below the sea surface
Duration---February. 1989



Remarks :
Location---Site 23
2.0m below the sea surface
Duration---Jan.-Feb. 1989

Fig. 3.10.8(3) Power Spectrum Density Curve of Tidal Currents in the Third Field Survey

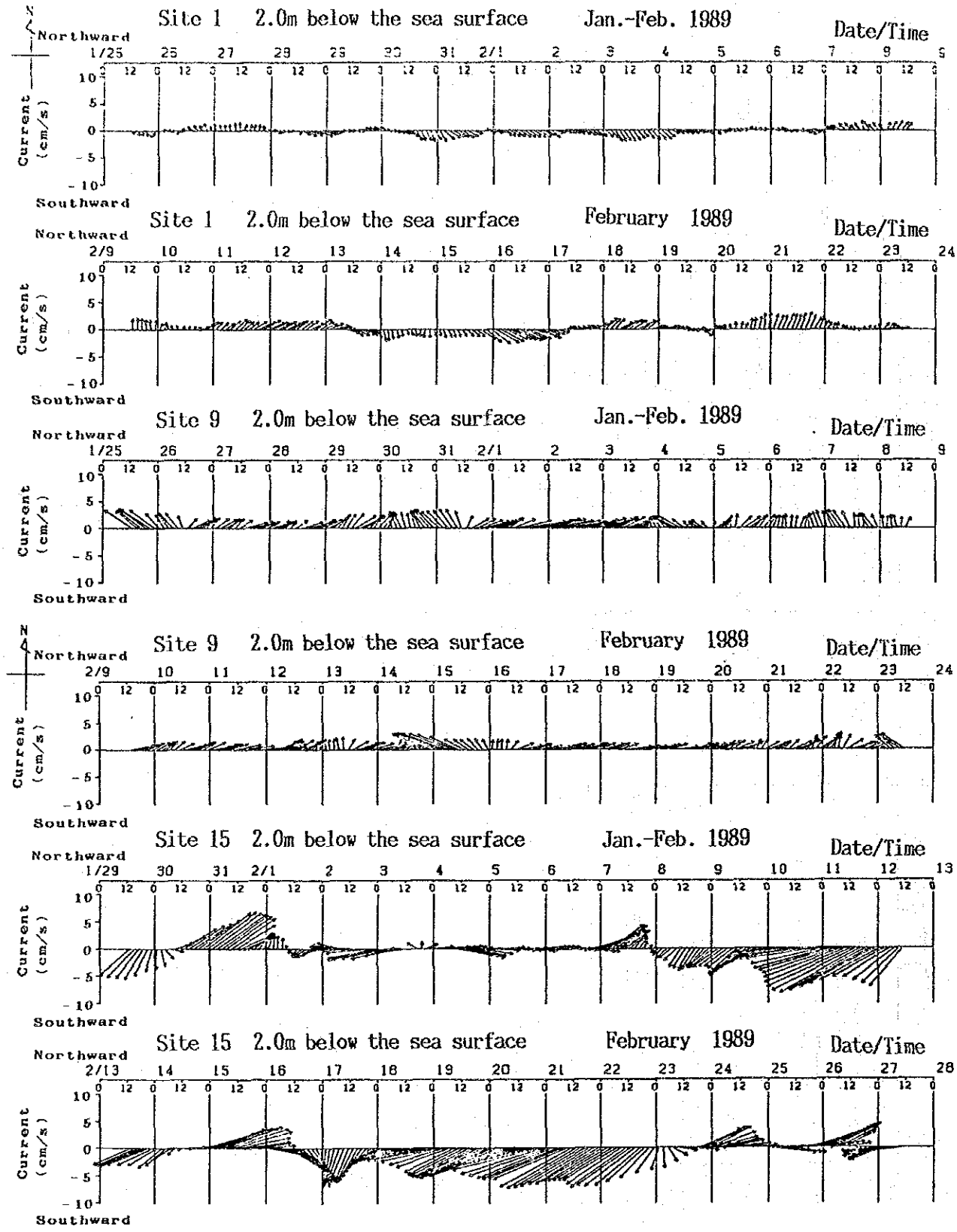


Fig. 3.10.9(1) Average Movement of Tidal Currents over a Twenty-Five Hour Period in the Third Field Survey

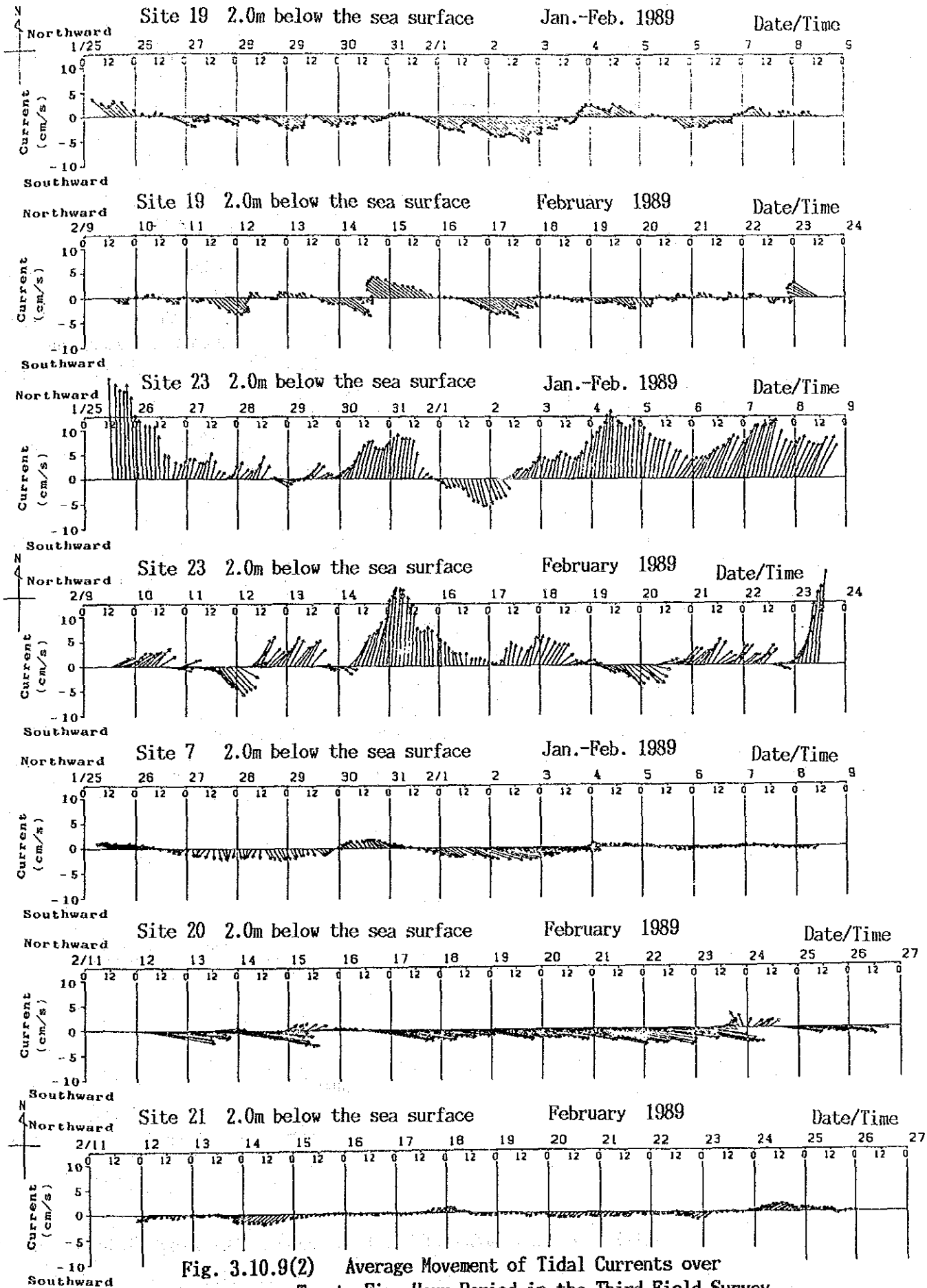


Fig. 3.10.9(2) Average Movement of Tidal Currents over a Twenty-Five Hour Period in the Third Field Survey

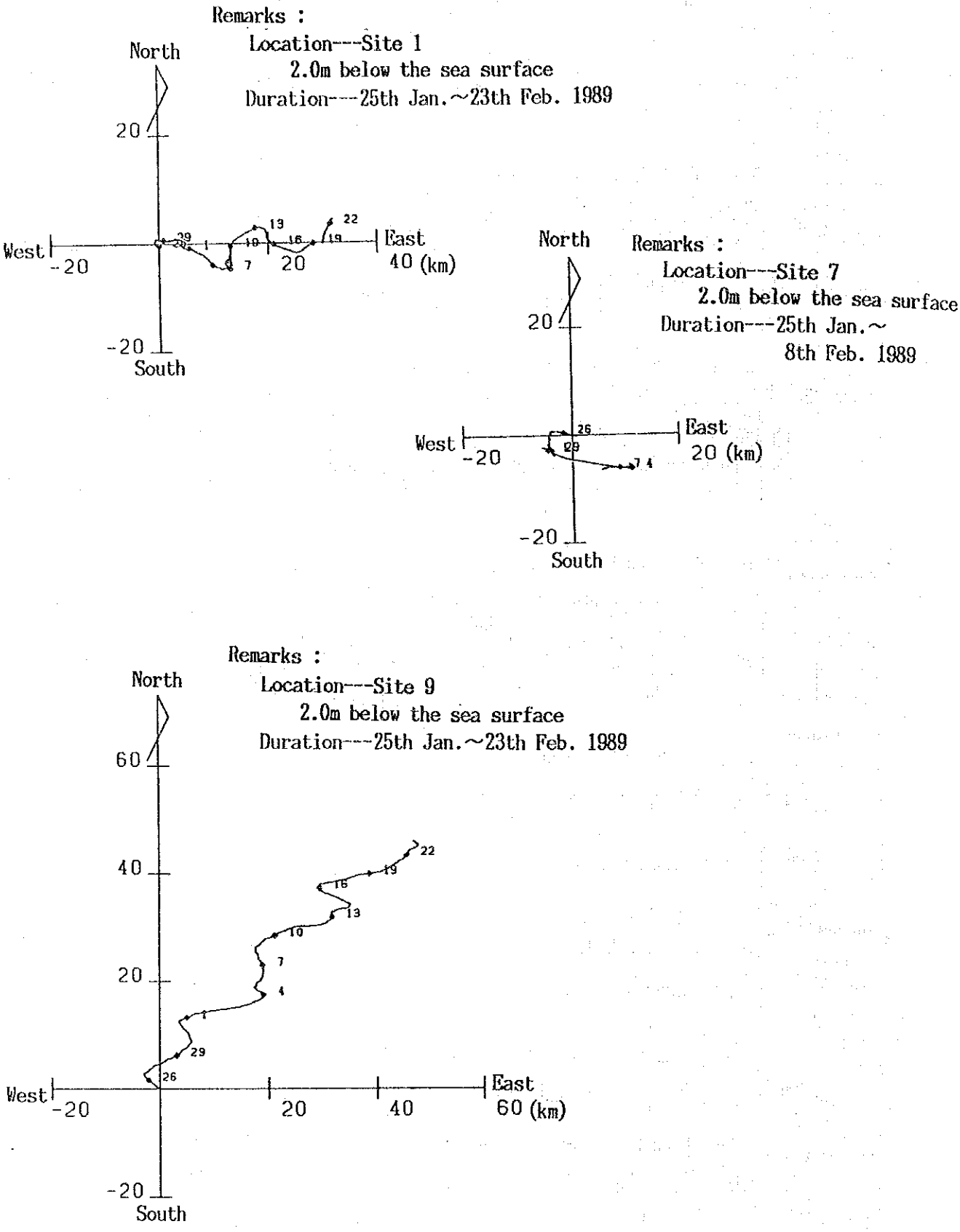
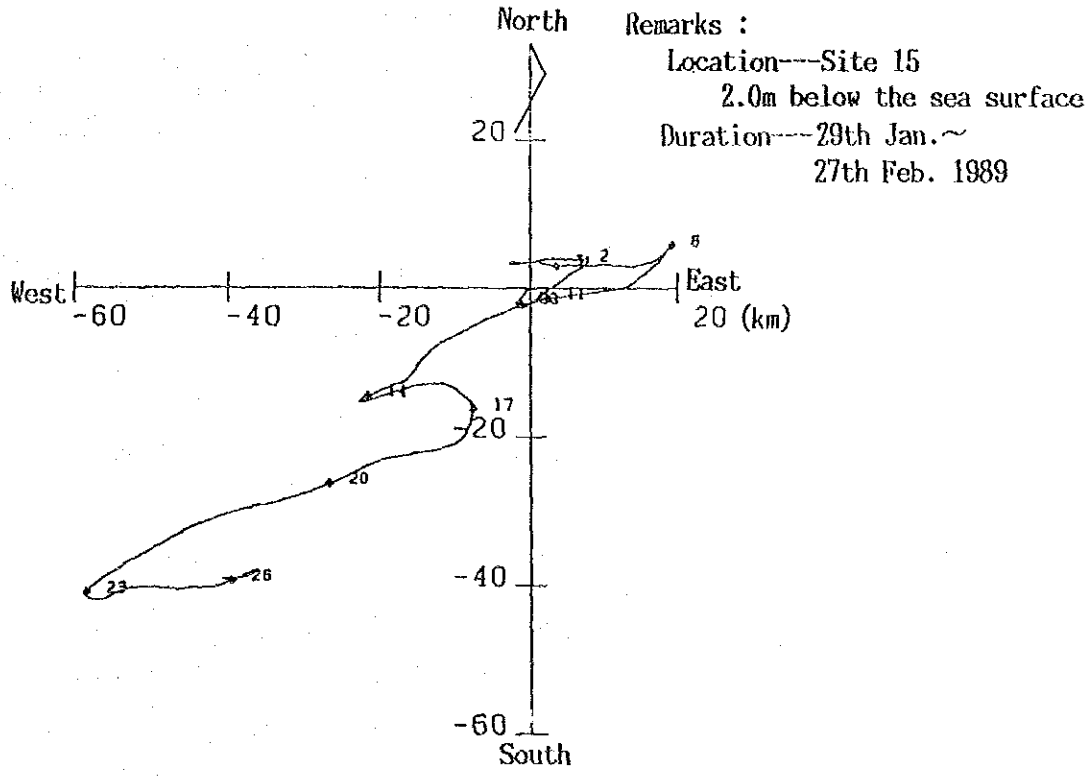
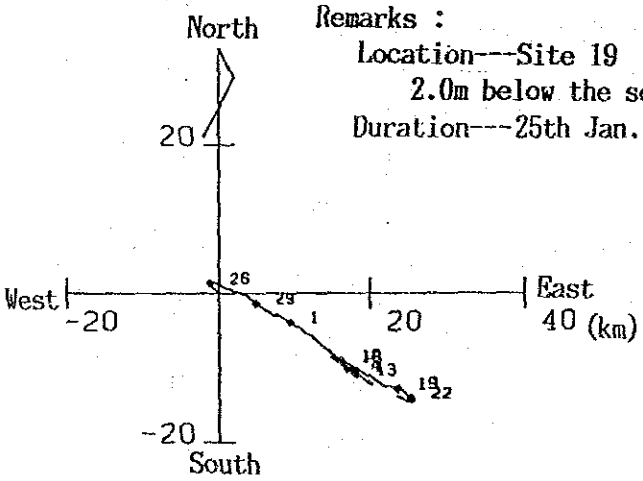


Fig. 3.10.10(1) Advance Vector of Tidal Currents in the Third Field Survey





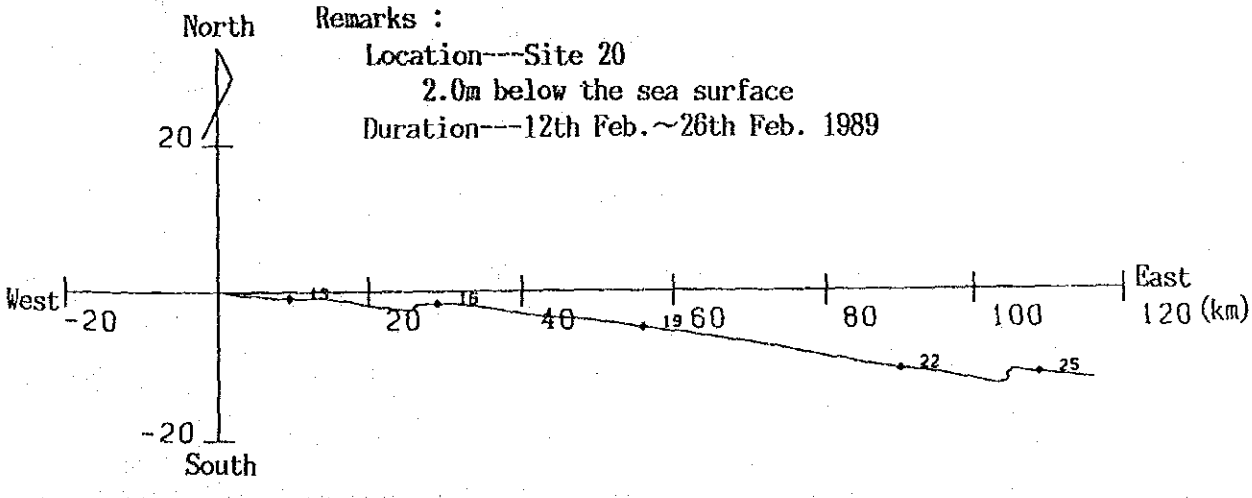
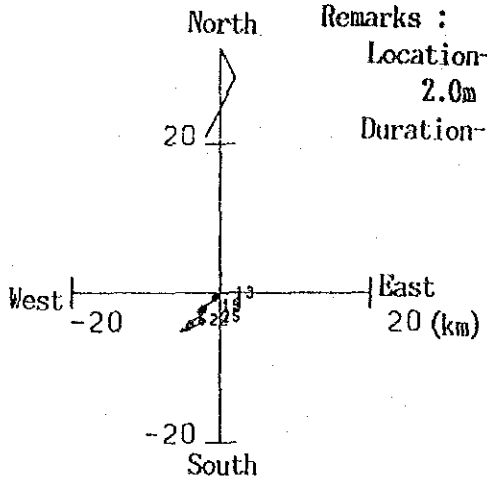


Fig. 3.10.10(2) Advance Vector of Tidal Currents in the Third Field Survey



Remarks :
Location---Site 21
2.0m below the sea surface
Duration---12th Feb.~26th Feb. 1989

Remarks :
Location---Site 23
2.0m below the sea surface
Duration---25th Jan.~23th Feb. 1989

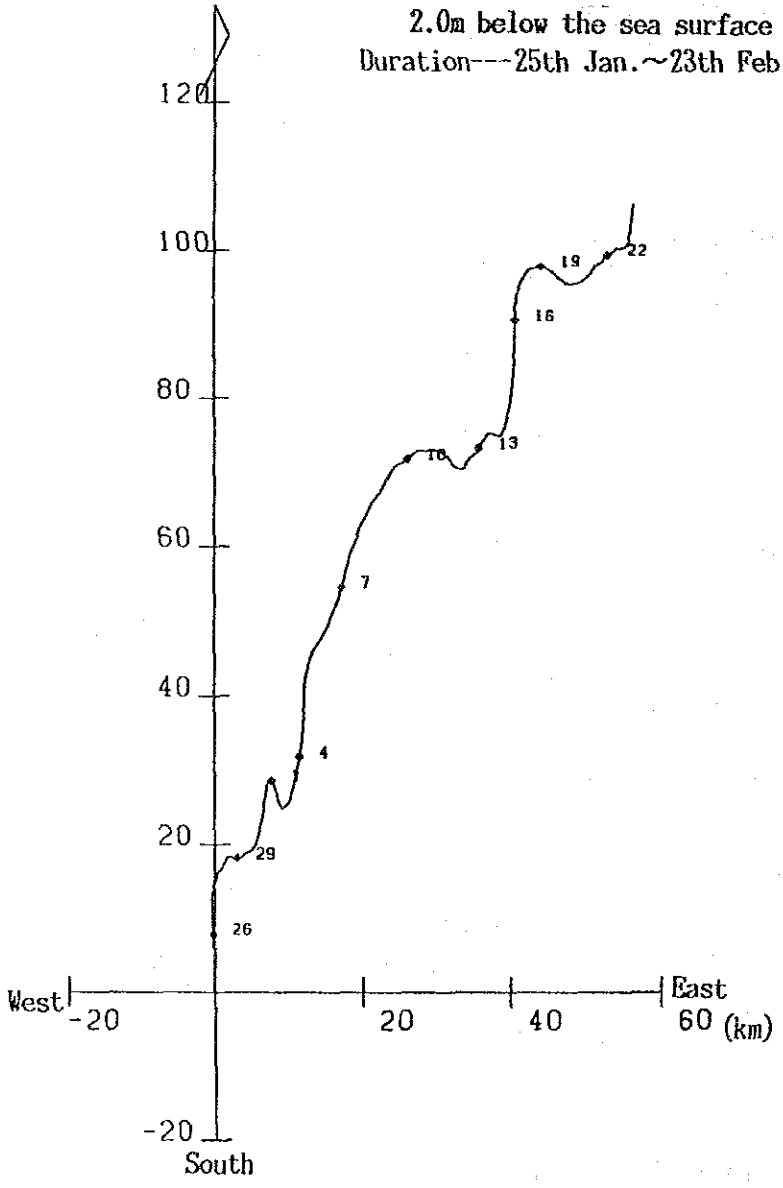


Fig. 3.10.10(3) Advance Vector of Tidal Currents in the Third Field Survey

Table 3.10.5(1) Results of Current Drag in the Second Field Survey (Flood Tide Period on 10th October 1988)

Observation Layer : 2.0m below the sea surface

Location	Time	Interval (s)	Distance (m)	Speed (m/s)
1-1	09h 06min			
		1,860	925	0.50
1-2	09h 37min			
		1,980	875	0.44
1-3	10h 10min			
2-1	09h 17min			
		2,160	1,025	0.47
2-2	09h 53min			
		1,920	1,300	0.68
2-3	10h 25min			
3-1	10h 30min			
		1,620	850	0.52
3-2	10h 57min			
		8,400	2,075	0.25
3-3	13h 17min			
4-1	10h 43min			
		1,620	200	0.12
4-2	11h 10min			
		1,620	225	0.14
4-3	11h 37min			
5-1	13h 23min			
		7,860	2,275	0.29
5-2	15h 34min			
6-1	12h 35min			
		1,320	600	0.45
6-2	12h 57min			
		540	350	0.65
6-3	13h 06min			
7-1	10h 05min			
		4,380	2,125	0.49
7-2	11h 18min			
8-1	09h 00min			
		3,060	825	0.27
8-2	09h 51min			

Table 3.10.5(2) Results of Current Drag in the Second Field Survey (Flood Tide Period on 10th October 1988)

Observation Layer : 7.0m below the sea surface

Location	Time	Interval (s)	Distance (m)	Speed (m/s)
1-1	09h 06min	1,920	1,050	0.55
1-2	09h 38min	2,220	1,525	0.69
1-3	10h 15min			
2-1	09h 17min	2,220	700	0.32
2-2	09h 54min	1,680	1,075	0.64
2-3	10h 22min			
3-1	10h 30min	1,740	725	0.42
3-2	10h 59min			
6-1	12h 35min	1,200	325	0.27
6-2	12h 55min			
6-3	12h 57min	660	350	0.53
6-4	13h 08min			
7-1	10h 06min	5,760	2,075	0.36
7-2	11h 42min			
8-1	09h 00min	2,580	650	0.25
8-2	09h 43min			

Table 3.10.5(3) Results of Current Drag in the Second Field Survey
(Ebb Tide Period on 11th October 1988)

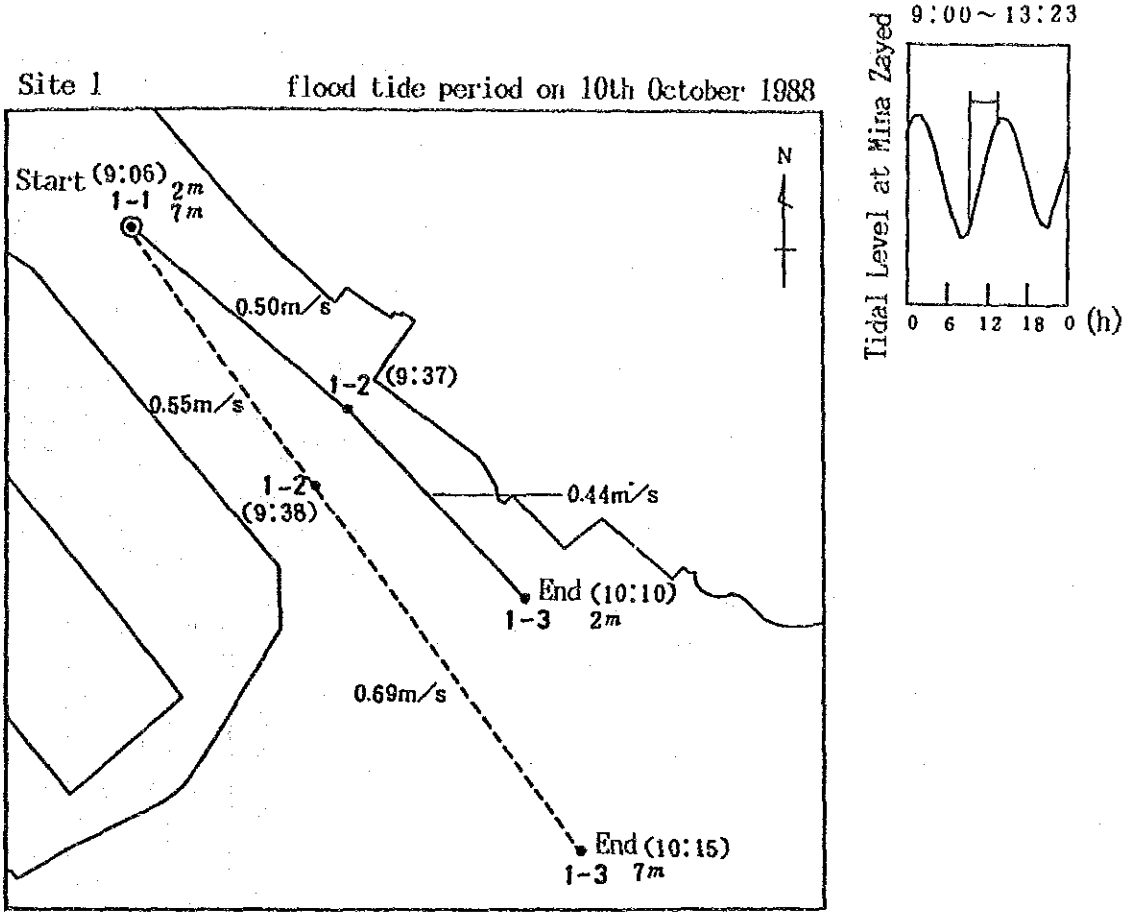
Observation Layer : 2.0m below the sea surface

Location	Time	Interval (s)	Distance (m)	Speed (m/s)
1-1	15h 08min	2,520	150	0.06
1-2	15h 50min			
2-1	14h 53min	1,920	275	0.14
2-2	15h 25min			
3-1	13h 31min	4,200	2,000	0.48
3-2	14h 41min			
4-1	13h 35min	3,360	450	0.13
4-2	14h 31min			
5-1	13h 40min	2,640	1,050	0.40
5-2	14h 24min			
6-1	13h 42min	2,160	400	0.19
6-2	14h 18min			
7-1	12h 57min	4,920	875	0.18
7-2	14h 19min			
8-1	12h 48min	6,240	1,550	0.25
8-2	14h 32min	1,980	525	0.27
8-3	15h 05min			
9-1	14h 37min	2,880	700	0.24
9-2	15h 25min			
10-1	15h 58min	1,320	100	0.08
10-2	16h 20min	3,000	1,225	0.41
10-3	17h 10min			

Table 3.10.5(4) Results of Current Drag in the Second Field Survey
(Ebb Tide Period on 11th October 1988)

Observation Layer : 7.0m below the sea surface

Location	Time	Interval (s)	Distance (m)	Speed (m/s)
1-1 1-2	15h 08min 15h 51min	2,520	150	0.06
2-1 2-2	14h 53min 15h 32min	1,920	275	0.14
9-1 9-2	14h 37min 15h 40min	3,780	700	0.19
10-1 10-2	15h 58min 17h 16min	4,680	1,375	0.29



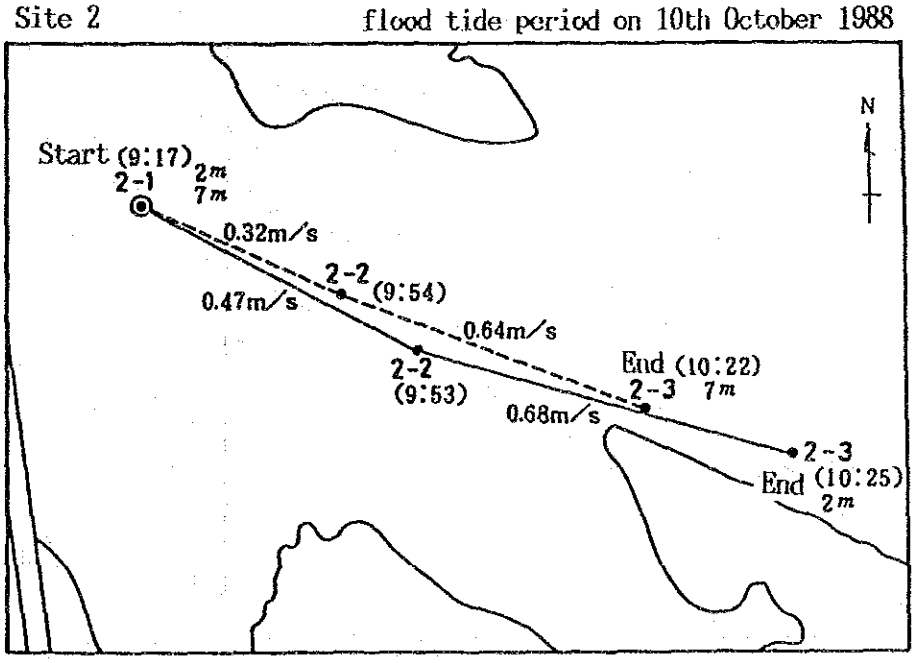
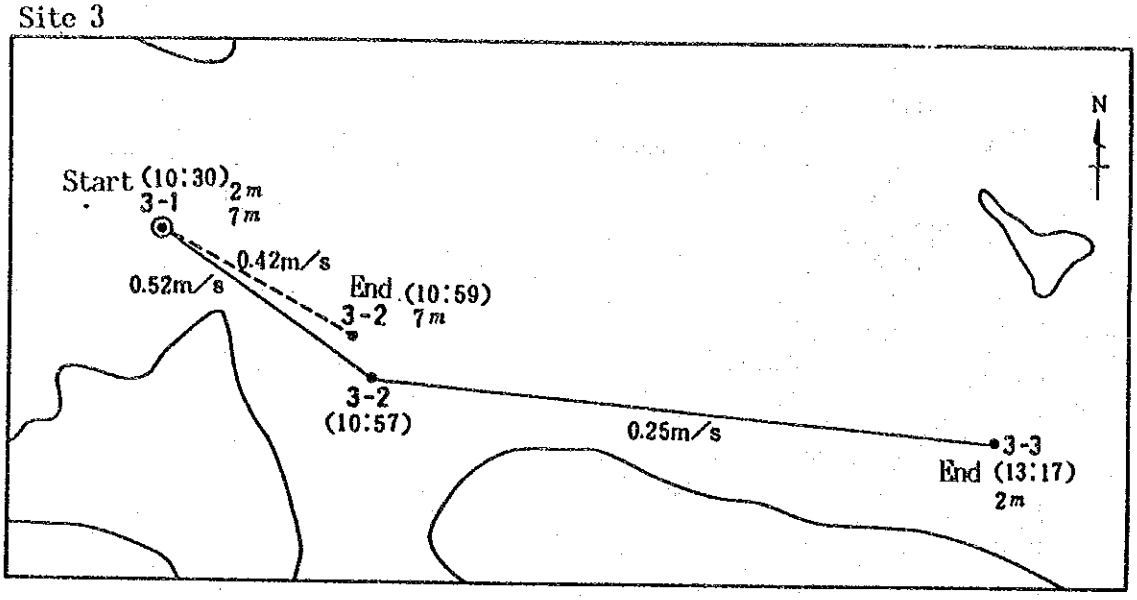
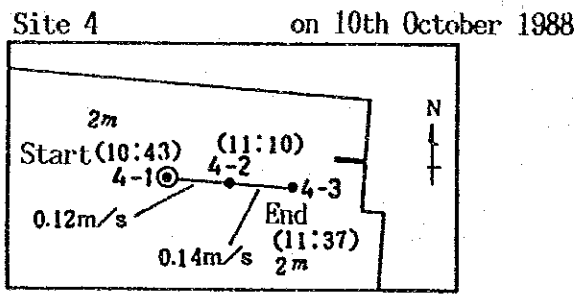
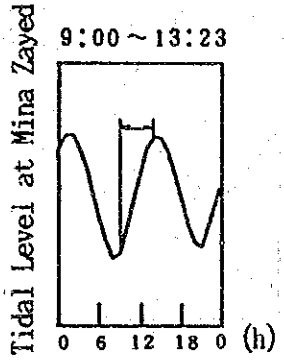


Fig. 3.10.11(1) Stream Trace of Current Drag in the Second Field Survey
(Flood Tide Period on 10th October 1988)







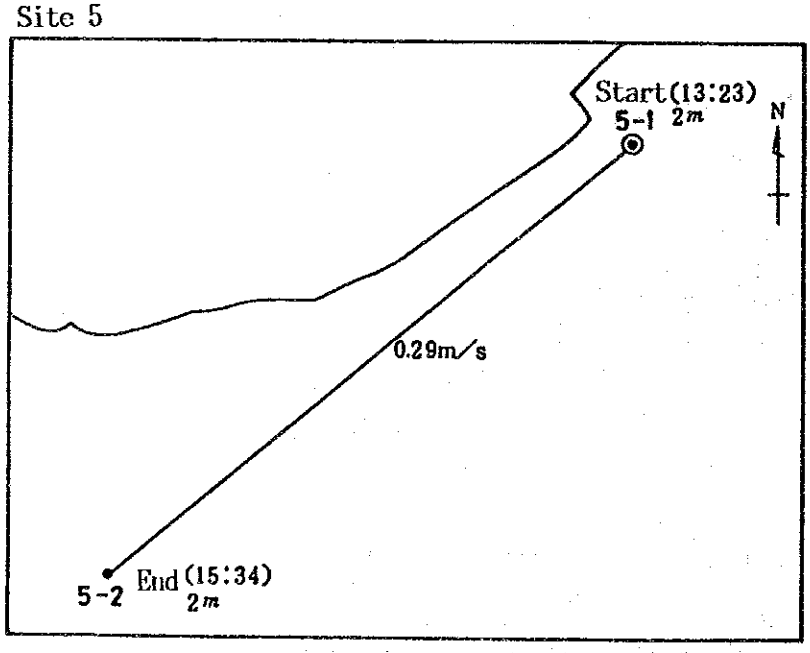
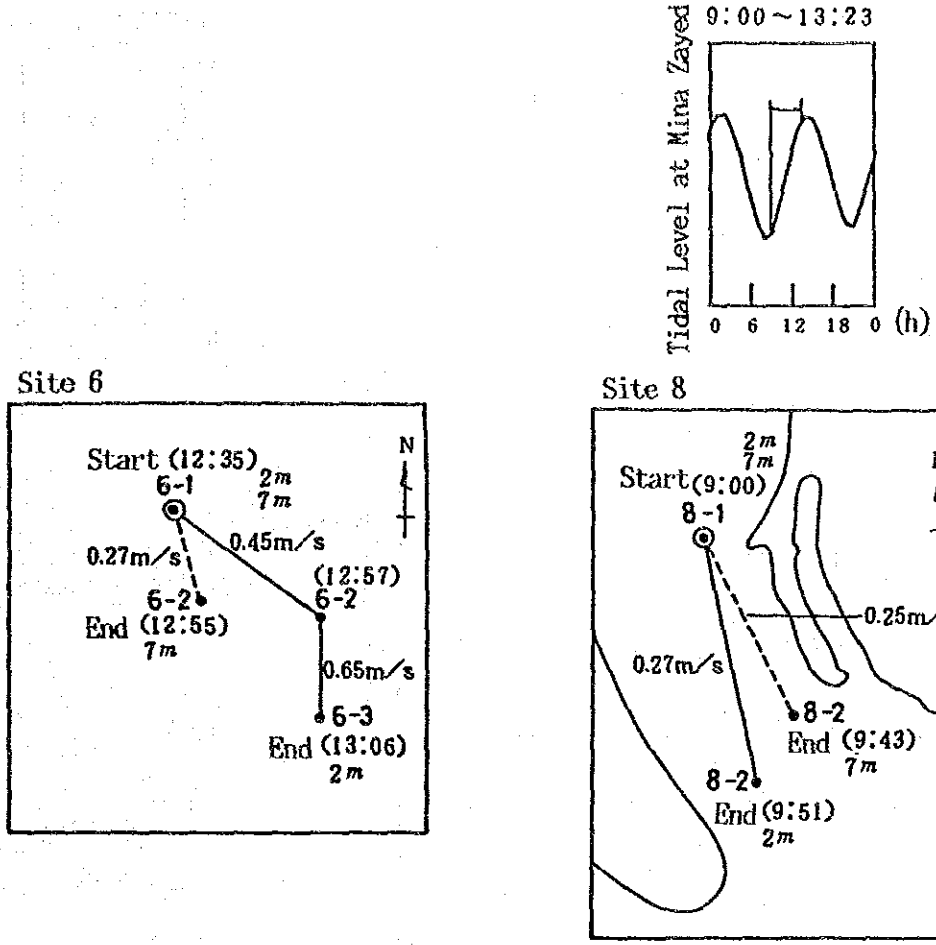


Fig. 3.10.11(2) Stream Trace of Current Drag in the Second Field Survey (Flood Tide Period on 10th October 1988)



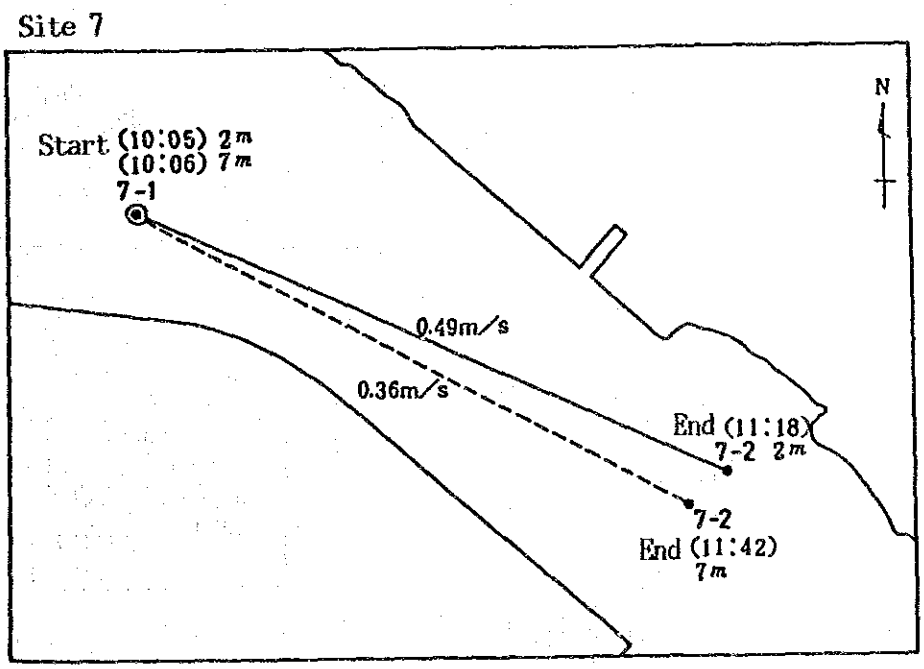


Fig. 3.10.11(3) Stream Trace of Current Drag in the Second Field Survey (Flood Tide Period on 10th October 1988)

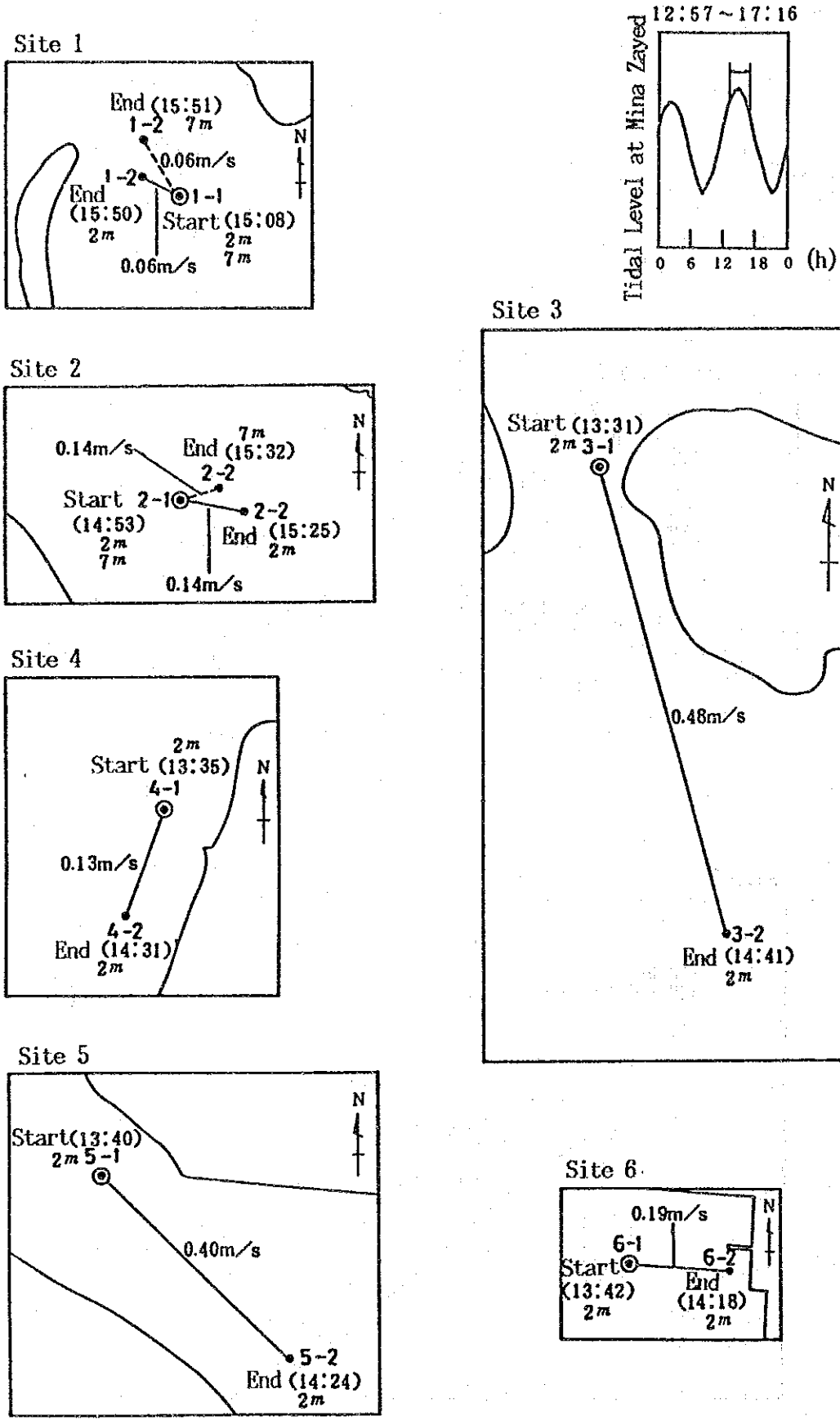


Fig. 3.10.11(4) Stream Trace of Current Drag in the Second Field Survey (Ebb Tide Period on 11th October 1988)

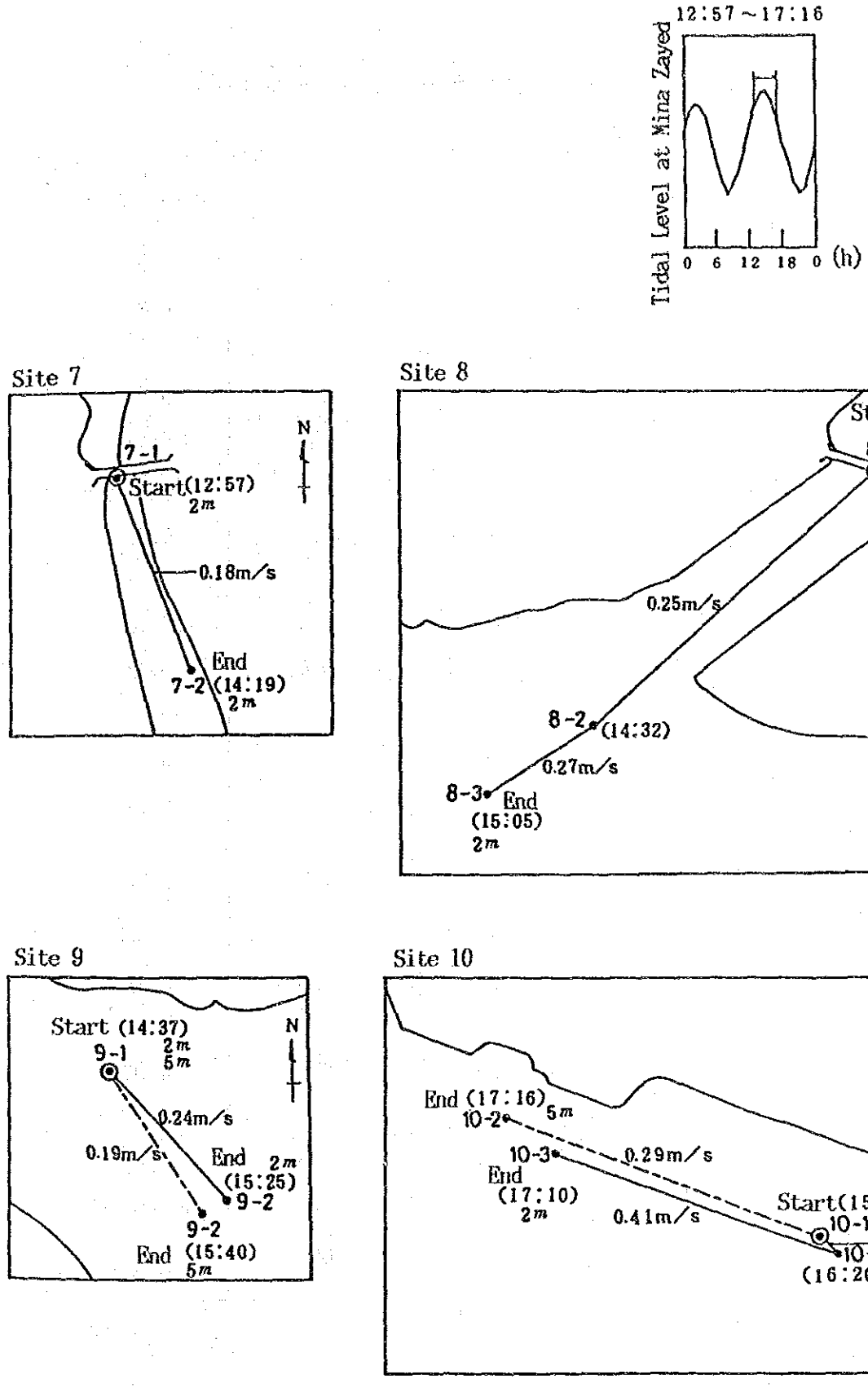


Fig. 3.10.11(5) Stream Trace of Current Drag in the Second Field Survey (Ebb Tide Period on 11th October 1988)

Table 3.10.6(1) Results of Current Drag in the Third Field Survey
(Ebb Tide Period on 1st February 1989)

Observation Layer : 2.0m below the sea surface

Location	Time	Interval (s)	Distance (m)	Speed (m/s)
1-1	12h 46min	2,400	1,500	0.63
1-2	13h 26min	1,680	1.050	0.63
1-3	13h 54min			
2-1	12h 38min	1,740	425	0.24
2-2	13h 07min	1,980	950	0.48
2-3	13h 40min			
3-1	11h 07min	4,860	300	0.06
3-2	12h 28min			
4-1	10h 46min	2,880	300	0.10
4-2	11h 34min	2,280	950	0.42
4-3	12h 12min			
5-1	09h 00min	1,800	200	0.11
5-2	09h 30min	1,500	300	0.20
5-3	09h 55min			
6-1	09h 10min	3,300	950	0.29
6-2	10h 05min			
7-1	10h 40min	720	50	0.07
7-2	10h 52min			
8-1	10h 27min	4,140	800	0.19
8-2	11h 36min			
9-1	11h 18min	2,220	500	0.23
9-2	11h 55min			
10-1	12h 07min	1,440	800	0.56
10-2	12h 31min			

Table 3.10.6(2) Results of Current Drag in the Third Field Survey
(Ebb Tide Period on 1st February 1989)

Observation Layer : 7.0m below the sea surface

Location	Time	Interval (s)	Distance (m)	Speed (m/s)
1-1	12h 46min			
		2,460	1,500	0.61
1-2	13h 27min			
		1,680	1,050	0.63
1-3	13h 55min			
2-1	12h 38min			
		1,320	425	0.32
2-2	13h 00min			
		2,160	950	0.44
2-3	13h 36min			
4-1	10h 46min			
		2,820	400	0.14
4-2	11h 33min			
		2,100	850	0.41
4-3	12h 08min			
5-1	09h 00min			
		1,800	200	0.11
5-2	09h 30min			
		1,500	300	0.20
5-3	09h 55min			
8-1	10h 27min			
		2,100	150	0.07
8-2	11h 02min			
		2,220	75	0.03
8-3	11h 39min			
9-1	11h 18min			
		2,280	600	0.26
9-2	11h 56min			
10-1	12h 07min			
		1,620	750	0.46
10-2	12h 34min			

Table 3.10.6(3) Results of Current Drag in the Third Field Survey
(Flood Tide Period on 7th February 1989)

Observation Layer : 2.0m below the sea surface

Location	Time	Interval (s)	Distance (m)	Speed (m/s)
1-1	09h 36min	1,560	550	0.35
1-2	10h 02min			
2-1	09h 51min	1,560	575	0.37
2-2	10h 17min	1,320	525	0.40
2-3	10h 39min			
3-1	10h 56min	600	400	0.67
3-2	11h 06min	660	425	0.64
3-3	11h 17min			
4-1	11h 01min	600	350	0.58
4-2	11h 11min	1,740	950	0.55
4-3	11h 40min			
5-1	11h 25min	1,800	800	0.44
5-2	11h 55min			
6-1	12h 12min	2,760	1,275	0.46
6-2	12h 58min			
7-1	12h 22min	2,460	1,025	0.42
7-2	13h 03min			
8-1	12h 26min	2,460	425	0.17
8-2	13h 06min			
9-1	11h 54min	2,400	900	0.38
9-2	12h 34min			
10-1	11h 43min	1,200	425	0.35
10-2	12h 02min	1,260	450	0.36
10-3	12h 24min			
11-1	10h 25min	2,520	1,000	0.40
11-2	11h 07min			
12-1	08h 33min	1,020	525	0.51
12-2	08h 50min			

Table 3.10.6(4) Results of Current Drag in the Third Field Survey
(Flood Tide Period on 7th February 1989)

Observation Layer : 7.0m below the sea surface

Location	Time	Interval (s)	Distance (m)	Speed (m/s)
1-1	09h 08min	1,680	575	0.34
1-2	09h 36min	1,560	550	0.35
1-3	10h 02min			
2-1	09h 19min	1,920	575	0.30
2-2	09h 51min	1,560	575	0.37
2-3	10h 17min	1,440	525	0.35
2-4	10h 41min			
3-1	10h 56min	600	400	0.67
3-2	11h 06min	720	425	0.59
3-3	11h 18min			
4-1	11h 01min	660	350	0.53
4-2	11h 12min	1,680	900	0.54
4-3	11h 40min			
5-1	11h 25min	1,980	800	0.40
5-2	11h 58min			
6-1	12h 12min	2,580	1,250	0.49
6-2	12h 55min			
10-1	11h 43min	1,260	425	0.34
10-2	12h 04min	1,260	325	0.26
10-3	12h 25min			
11-1	10h 25min	3,000	1,080	0.36
11-2	11h 15min			
12-1	08h 33min	1,080	500	0.46
12-2	08h 51min			

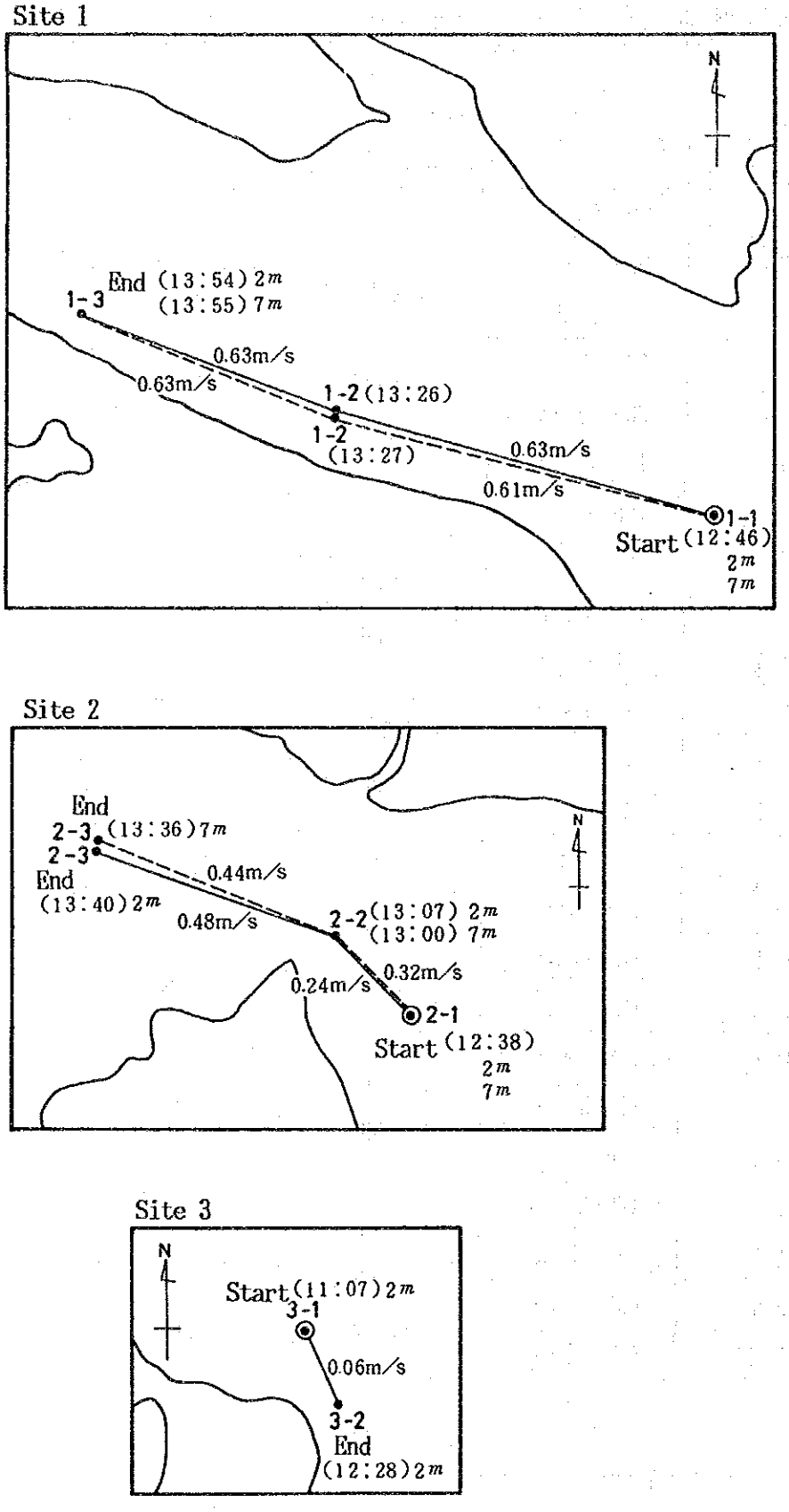


Fig. 3.10.12(1) Stream Trace of Current Drag in the Third Field Survey (Ebb Tide Period on 1st February 1989)

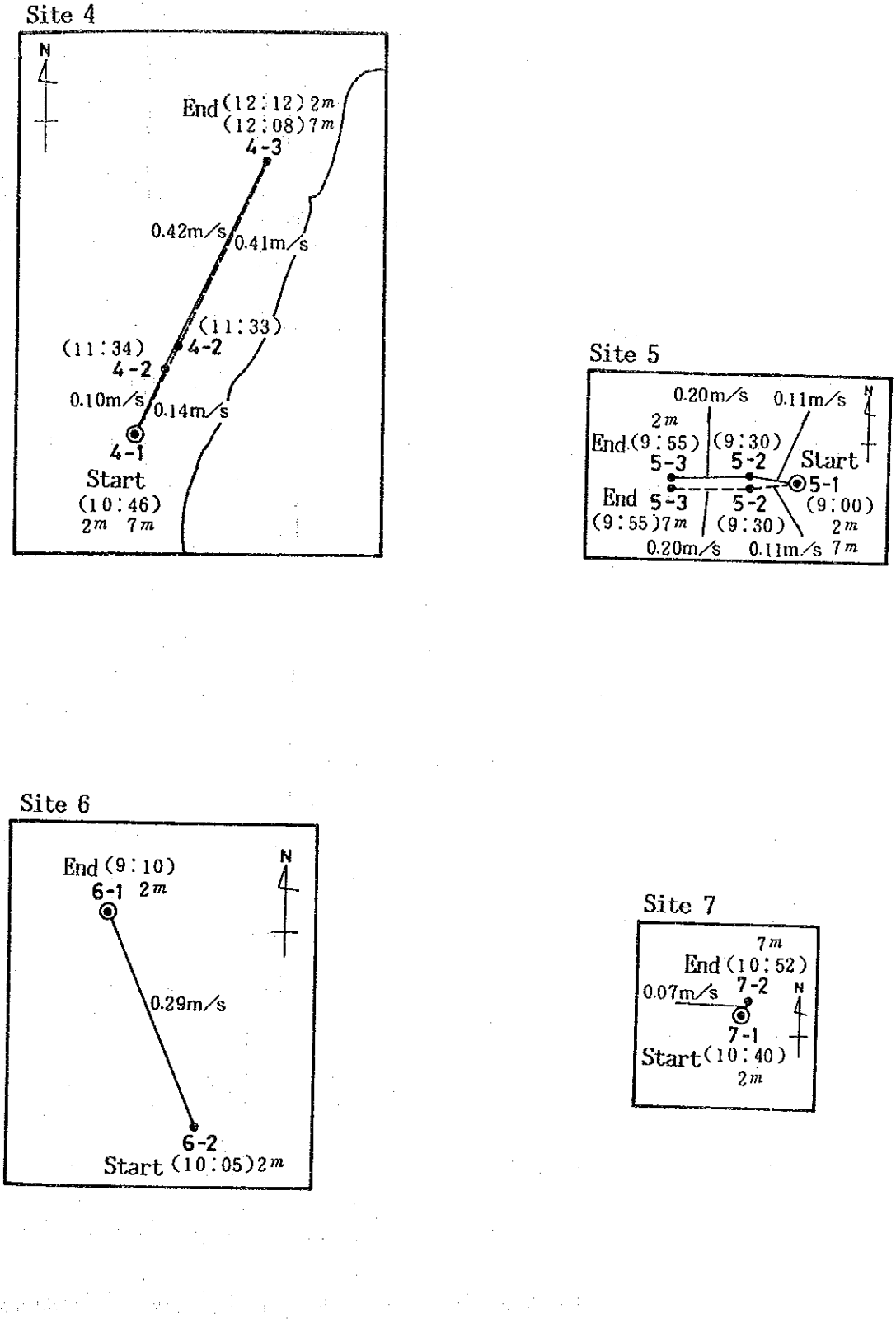


Fig. 3.10.12(2) Stream Trace of Current Drag in the Third Field Survey (Ebb Tide Period on 1st February 1989)

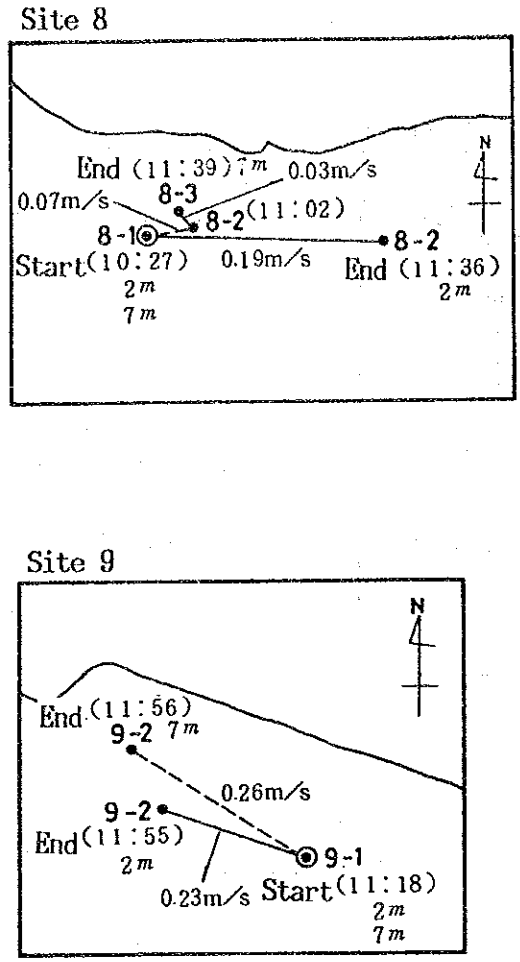


Fig. 3.10.12(3) Stream Trace of Current Drag in the Third Field Survey (Ebb Tide Period on 1st February 1989)

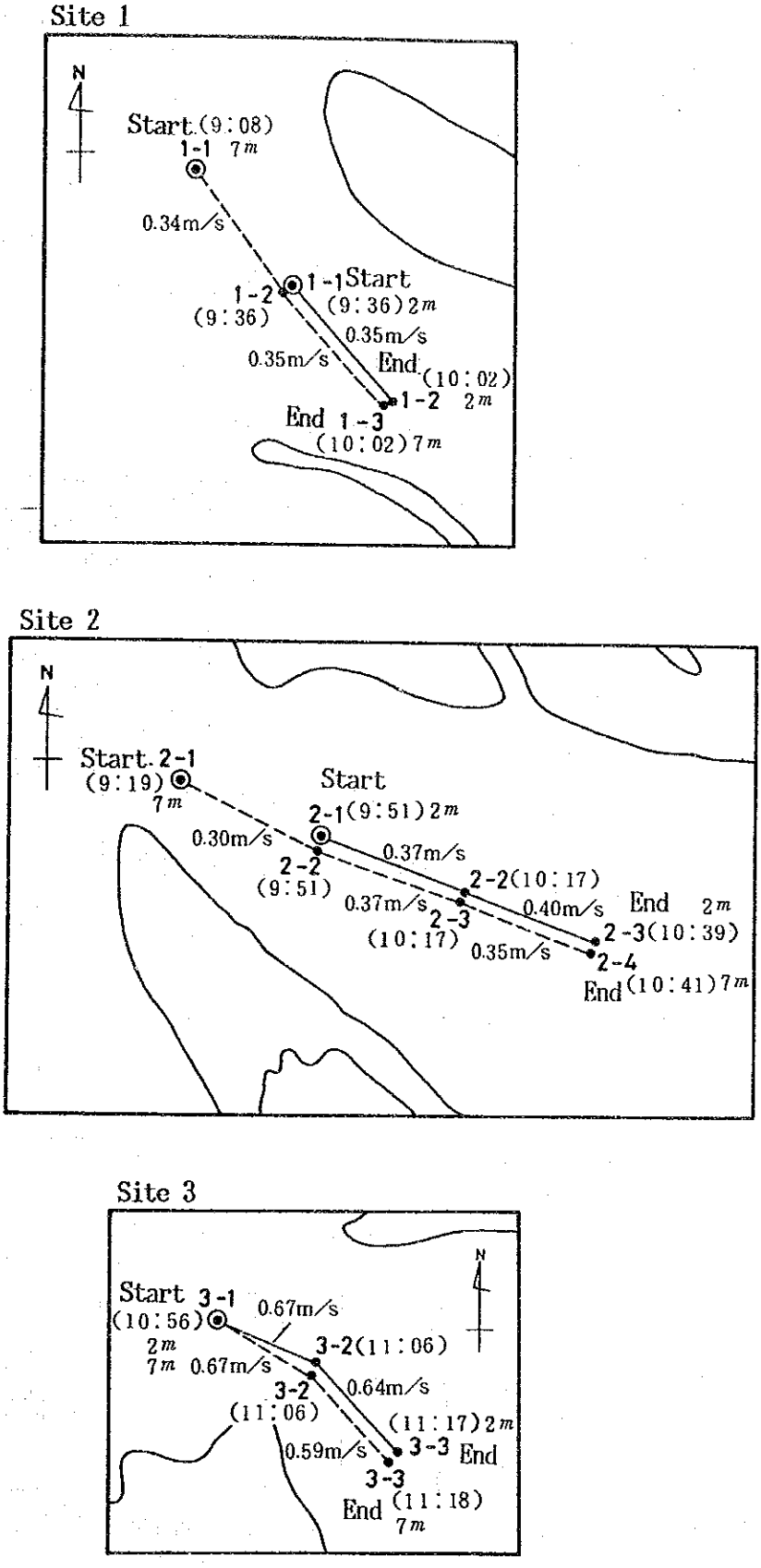


Fig. 3.10.12(4) Stream Trace of Current Drag in the Third Field Survey (Flood Tide Period on 7st February 1989)

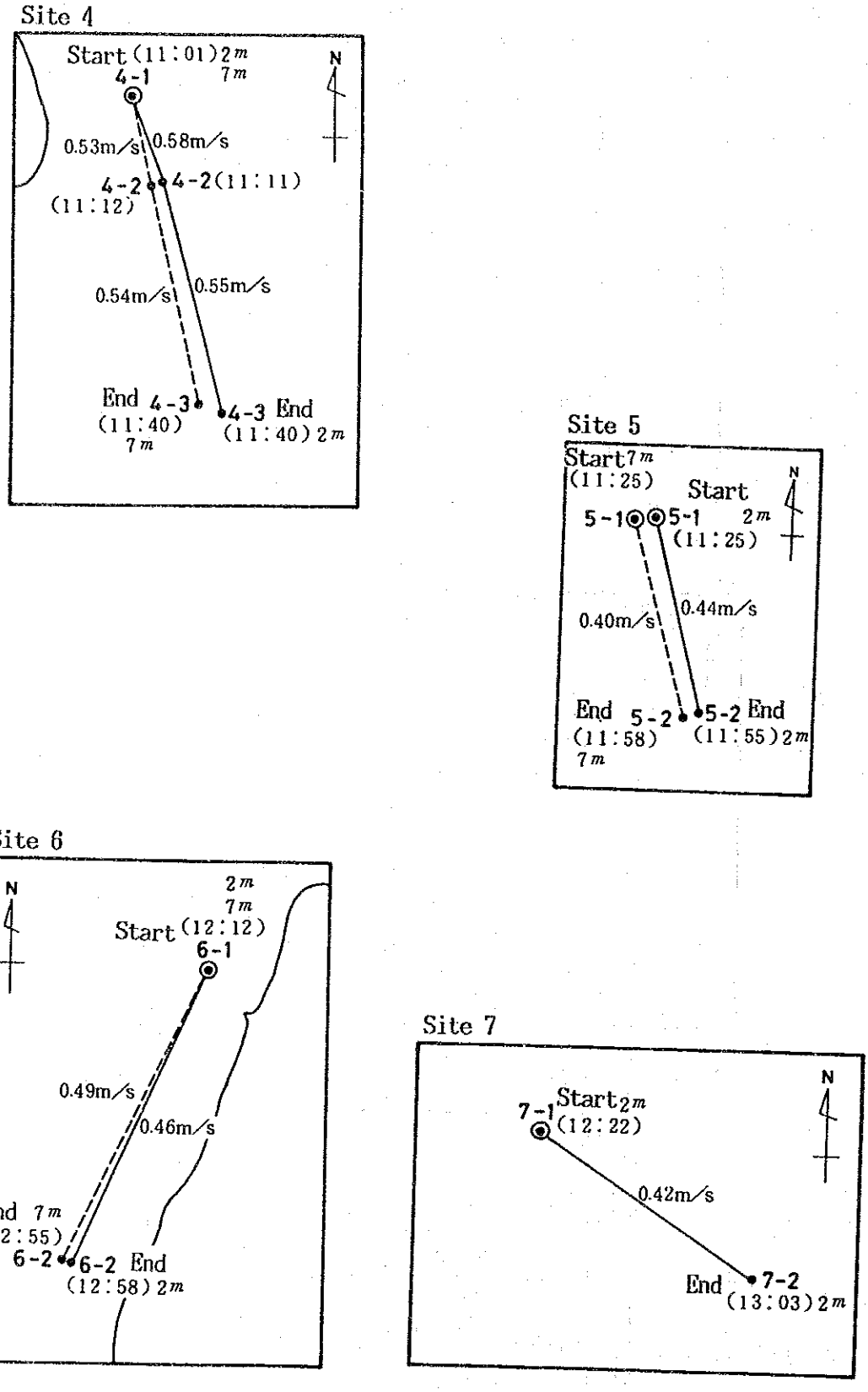
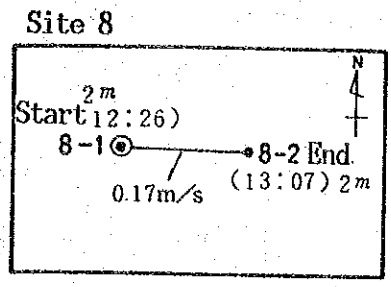
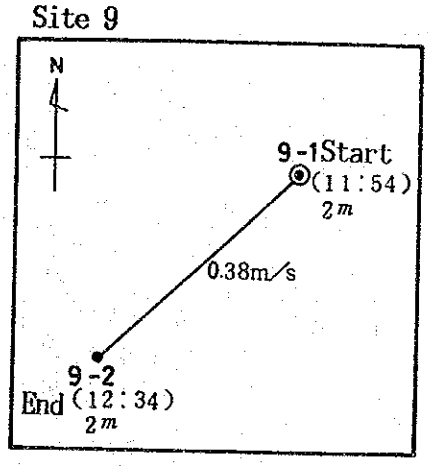
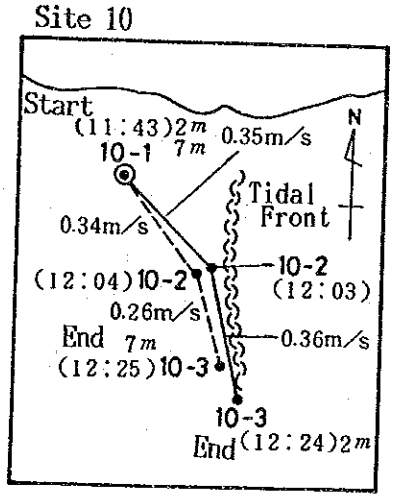
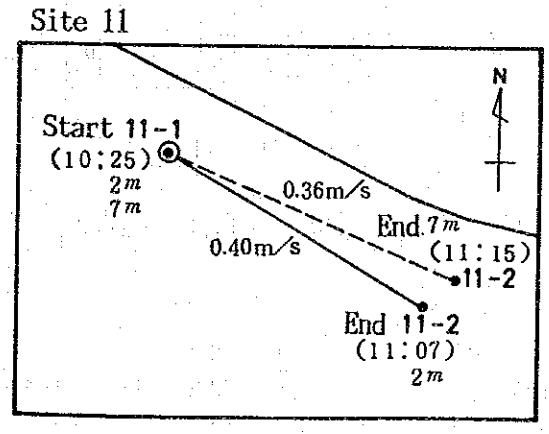


Fig. 3.10.12(5) Stream Trace of Current Drag in the Third Field Survey (Flood Tide Period on 7st February 1989)









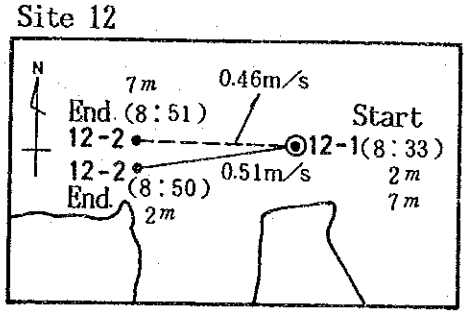


Fig. 3.10.12(6) Stream Trace of Current Drag in the Third Field Survey (Flood Tide Period on 7st February 1989)

Table 3.10.7(1) Observations of Vertical Current Profile in the Second Field Survey (Ebb Tide Period on 25th October 1988)

Site	I-A		I-B		I-C		I-D		I-E		I-F		I-G		I-H	
Depth(m)	6.0		6.8		6.7		8.0		7.7		8.5		9.3		9.5	
Parameter / Layer(m)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)
0.3	310	8	320	14	330	15	270	8	260	19	220	11	200	21	250	23
1.0	0	18	30	16	340	10	260	12	255	22	250	23	250	17	250	15
2.0	360	19	5	25	340	14	255	27	270	27	255	25	240	25	270	16
3.0	350	18	10	29	340	9	265	30	270	26	270	20	260	20	270	14
4.0	355	20	0	38	340	7	280	15	260	28	270	22	240	20	275	13
5.0	0	22	0	44	0	4	275	20	260	27	260	29	240	28	270	21
6.0			0	38	320	3	260	18	270	23	260	26	260	23	270	22
7.0									270	15	250	24	260	24	260	30
8.0											250	4	260	18	260	27
9.0													260	25	260	13
10.0																
11.0																
12.0																
13.0																
Max.	0	22	30	44	0	15	280	30	270	28	270	29	260	28	275	30
Min.	310	8	320	14	320	3	255	8	255	15	220	4	200	17	250	13

Site	1-1		3		4		5		6		7		9		12	
Depth&m&	9.6		14.0		1.5		9.0		12.0		9.0		11.0		14.0	
Parameter / Layer(m)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)
0.3	60	25	70	4	350	8	48	20	18	45	279	55	290	90	110	30
1.0	250	15	85	4	340	10	41	25	0	63	279	65	302	93	125	33
2.0	250	17	67	3			32	32	351	75	285	65	300	96	155	40
3.0	280	12	325	12			32	37	355	75	285	73	300	94	156	35
4.0	270	23	329	18			25	41	359	83	281	76	290	92	123	38
5.0	270	18	340	17			22	45	1	76	283	74	290	91	150	37
6.0	280	15	340	18			22	35	2	75	290	66	310	82	150	35
7.0	250	15	340	20			22	34	0	72	318	55	302	85	150	35
8.0	280	5	346	16			22	33	2	67	280	53	300	80	132	35
9.0	280	5	329	19					2	59			305	80	135	40
10.0			329	20					351	65					132	40
11.0			340	20					340	67					131	32
12.0			334	19											125	43
13.0			334	15											128	33
Max.	60	25	85	20	350	10	48	45	18	83	318	76	310	96	156	40
Min.	250	5	325	3	340	8	22	20	340	45	279	53	290	80	110	30

Site	15		16		19		20		24		25					
Depth&m&	14.0		9.0		9.0		8.0		6.0		8.0					
Parameter / Layer(m)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)
0.3	325	14	175	10	340	20	280	18	188	5	52	7				
1.0	341	12	175	12	286	12	270	25	222	5	52	5				
2.0	310	14	200	12	300	6	280	20	270	3	-	0				
3.0	298	15	210	9	288	8	292	25	-	0	333	6				
4.0	305	13	260	5	325	13	298	27	-	0	310	15				
5.0	12	7	260	8	318	12	290	35	-	0	295	23				
6.0	8	7	280	5	340	16	298	32			300	25				
7.0	-	0	289	5	352	15	285	25			300	23				
8.0	-	0	300	6	338	17										
9.0	-	0														
10.0	-	0														
11.0	-	0														
12.0	-	0														
13.0																
Max.	12	15	300	12	352	20	298	35	270	5	52	25				
Min.	298	0	175	5	286	6	270	18	188	0	295	0				

Table 3.10.7(2) Observations of Vertical Current Profile in the Second Field Survey (Flood Tide Period on 26th October 1988)

Site	I-A		I-B		I-C		I-D		I-E		I-F		I-G		I-H	
Depth(m)	5.1		6.5		5.5		6.8		6.8		7.9		6.0		8.5	
Parameter / Layer(m)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)
0.3	35	5	20	10	340	7	140	8	70	16	120	15	120	2	80	18
1.0	15	22	35	12	10	8	120	5	95	11	130	10	150	3	80	17
2.0	10	22	10	20	10	11	110	3	95	14	140	13	200	3	80	18
3.0	30	22	350	24	35	14	85	5	110	10	140	13	170	5	70	16
4.0	30	25	350	28	30	15	80	9	80	10	130	17	160	5	40	10
5.0	0	28	5	35	340	15	80	5	80	10	110	17	-	0	30	9
6.0			340	25			80	5	110	11	110	15			25	8
7.0											85	15			30	9
8.0															40	7
9.0																
10.0																
11.0																
12.0																
13.0																
Max.	35	28	35	35	35	15	140	9	110	16	140	17	200	5	80	18
Min.	0	5	340	10	340	7	80	3	70	10	85	10	150	0	25	7

Site	1-1		3		4		5		6		7		9		12	
Depth(m)	9.5		14.0		1.5		9.0		13.0		11.0		11.0		13.0	
Parameter / Layer(m)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)
0.3	120	14	140	32	126	17	255	15	188	52	85	96	107	42	162	27
1.0	130	13			129	14										
2.0	130	13	133	32			225	17	180	52	90	95	110	64	151	45
3.0	170	4	140	17			222	20	172	46	95	85	123	65	140	49
4.0	210	5														
5.0	220	8	148	10			208	18	172	52	107	88	120	72	140	47
6.0	240	10														
7.0	-	0	350	5			205	17	172	51	108	78	120	55	140	48
8.0	-	0					220	12								
9.0	-	0														
10.0			350	5					172	48	98	57	120	48	140	54
11.0																
12.0									182	38					132	41
13.0			350	5												
Max.	240	14	148	32	129	17	255	20	188	52	108	96	123	72	162	54
Min.	120	0	350	5	126	14	205	12	172	38	85	57	107	42	132	27

Site	15		16		19		20		24		25					
Depth(m)	13.0		8.0		8.0		8.0		5.5		8.0					
Parameter / Layer(m)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)
0.3	208	18	170	45	130	45	112	46	220	20	154	49				
1.0																
2.0	193	15	203	55	128	43	108	60	220	22	135	52				
3.0	210	12	200	57	130	39	108	56	220	26	130	64				
4.0																
5.0	206	13	220	60	127	32	108	45	218	18	121	52				
6.0																
7.0	194	14	220	54	130	23	98	37			118	39				
8.0																
9.0																
10.0	174	16														
11.0																
12.0	175	15														
13.0																
Max.	210	18	220	60	130	45	112	60	220	26	154	64				
Min.	174	12	170	45	127	23	98	37	216	18	118	39				

Table 3.10.8(1) Observatipns of Vertical Current Profile in the Third Field Survey (Ebb Tide Period on 2nd February 1989)

Site	1-A		1-B		1-C		1-D		1-E		1-F		1-G		1-H	
Depth(m)	5.5		6.0		6.5		7.0		8.5		8.5		7.0		7.5	
Parameter / Layer(m)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)
0.3	280	7	30	8	355	3	270	7	260	7	280	15	280	22	290	15
1.0																
2.0	350	17	30	15	8	7	275	6	275	15	265	25	280	20	280	17
3.0	350	19	30	18	9	5	285	6	285	12	285	25	290	17	315	15
4.0																
5.0	0	18	20	23	9	7	290	6	290	17	262	24	295	17	305	15
6.0					13	7	295	5					295	12		
7.0									290	18	288	15			305	15
8.0									295	23	255	5				
9.0																
10.0																
11.0																
12.0																
13.0																
Max.	0	19	30	23	13	3	295	7	295	23	288	25	295	22	315	17
Min.	280	7	20	8	355	7	270	5	260	7	255	5	280	12	280	15

Site	1-I		3		5		6		7		9		12		15	
Depth(m)	10.0		13.0		10.0		13.5		14.0		14.0		15.0		15.0	
Parameter / Layer(m)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)
0.3	280	12	278	55	75	60	82	24	271	28	273	21	122	15	22	15
1.0																
2.0	275	15	272	46	78	66	29	48	272	30	274	27	62	20	340	13
3.0	282	15	300	55	80	66	10	50	282	26	331	12	70	18	314	20
4.0																
5.0	315	25	322	60	78	60	32	50	298	17	282	24	98	16	30	10
6.0																
7.0	318	25	322	70	76	56	22	48	300	40	288	15	75	17	357	13
8.0																
9.0	318	25			49	45										
10.0			330	70			20	48	299	26	319	15	80	16	88	24
12.0			310	60												
13.0							342	77	292	27	310	14				
14.0													87	16	276	13
Max.	318	25	330	70	80	66	82	77	300	40	319	27	122	20	88	24
Min.	275	12	272	46	49	45	342	24	271	17	273	12	62	15	276	10

Site	16		19		20		24		25							
Depth(m)	8.5		8.5		9.5		5.0		10.0							
Parameter / Layer(m)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)
0.3	200	45	128	45	100	27	130	15	70	70						
1.0																
2.0	220	44	128	43	110	31	220	27	60	65						
3.0	220	43	110	48	175	12	230	25	91	45						
4.0							175	10								
5.0	222	40	135	35	220	5			0	70						
6.0																
7.0	222	38	155	26	270	15			342	50						
8.0	220	30	145	24												
9.0					270	5			70	70						
10.0																
11.0																
12.0																
13.0																
Max.	222	45	155	48	270	31	230	27	91	70						
Min.	200	30	110	24	100	5	130	10	342	45						

Table 3.10.8(2) Observations of Vertical Current Profile in the Third Field Survey (Flood Tide Period on 8th February 1989)

Site	1-A		1-B		1-C		1-D		1-E		1-F		1-G		1-H	
Depth(m)	6.5		6.0		6.0		8.0		8.0		9.0		9.0		9.0	
Parameter / Layer(m)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)
0.3	330	15	52	16	70	5	130	4	70	15	150	14	100	15	45	20
1.0																
2.0	0	15	2	19	50	10	90	10	60	25	90	22	100	10	75	15
3.0	0	17	358	25	30	10	60	15	60	15	90	20	90	10	70	12
4.0																
5.0	5	20	0	35	355	12	45	10	80	7	110	15	110	10	50	10
6.0	20	17														
7.0							60	15	80	7	90	5	100	15	90	5
8.0											115	10	90	10	90	2
9.0																
10.0																
11.0																
12.0																
13.0																
Max.	20	20	52	35	70	12	130	15	80	25	150	22	110	15	90	20
Min.	330	15	358	16	355	5	45	4	60	7	90	10	90	10	45	2

Site	1-I		3		4		5		6		7		9		12	
Depth(m)	9.5		13.0		5.0		9.5		12.0		13.5		13.0		14.0	
Parameter / Layer(m)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)
0.3	120	20	125	33	138	35	224	33	195	52	109	67	104	67	190	33
1.0																
2.0	90	20	115	47	110	47	222	32	168	46	107	64	109	72	173	29
3.0	110	21	123	32	113	35	232	36	173	47	107	68	110	53	190	28
4.0					102	47										
5.0	110	5	271	30			236	27	156	47	107	61	106	43	178	32
6.0																
7.0	120	5	281	5			220	23	171	38	102	48	102	33	175	26
8.0																
9.0		0					260	23								
10.0			262	2					169	35	109	36	102	22	153	26
11.0									221	16						
12.0			125	17									98	21		
13.0											109	42			133	27
Max.	120	21	281	47	138	47	260	36	221	47	109	68	110	72	190	33
Min.	90	0	115	2	102	35	220	23	168	16	102	36	98	21	133	26

Site	15		16		19		20		24		25					
Depth(m)	14.0		7.0		8.0		9.0		4.5		11.0					
Parameter / Layer(m)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)	Dir. (deg)	Sp. (cm/s)
0.3	172	15	20	30	340	17	105	45	115	25	190	58				
1.0																
2.0	171	18	12	32	265	5	110	45	115	10	228	67				
3.0	158	17	20	26	22	4	100	42	170	15	200	61				
4.0									170	20						
5.0	158	11	30	25	110	4	108	38			190	49				
6.0			20	25												
7.0	99	6				0	98	34			200	44				
8.0							110	23								
9.0																
10.0	134	7									196	26				
11.0																
12.0																
13.0	88	10														
Max.	172	18	30	32	265	17	110	45	170	25	228	67				
Min.	88	6	12	25	110	0	98	23	115	10	190	26				

Table 3.10.9(1) Observations of Tidal Elevation at Typical Sites

Sito 1-1 (Umm Al Nar Station) Duration---3rd Oct.~27th Nov. 1988

D/H	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1003	***	***	***	***	***	***	***	***	***	***	***	***	132	137	150	164	177	184	189	187	177	161	142	121
1004	102	82	65	55	54	70	90	104	115	123	129	135	139	144	151	160	168	173	175	175	173	166	154	138
1005	120	101	81	65	52	48	60	81	100	117	132	144	154	158	157	154	152	153	156	161	166	170	171	164
1006	149	131	111	90	70	54	47	58	82	106	126	143	157	163	162	154	146	138	139	146	157	167	176	181
1007	177	165	145	123	101	78	61	54	68	95	122	144	161	172	174	166	152	136	124	122	131	144	160	172
1008	179	175	161	139	116	92	70	54	58	81	109	134	155	168	173	167	151	131	114	105	111	125	144	162
1009	177	183	176	160	136	112	88	69	66	73	101	130	154	172	181	176	161	141	120	103	97	109	129	149
1010	169	181	182	170	149	126	100	77	63	69	95	123	149	169	180	178	164	143	119	95	78	75	93	117
1011	140	160	169	166	152	129	104	80	62	73	86	115	142	166	182	185	173	151	125	101	77	63	70	94
1012	120	143	160	162	159	139	118	95	75	69	88	116	143	169	187	194	184	165	138	111	84	61	50	68
1013	100	128	149	162	163	150	130	108	87	79	95	121	145	170	190	200	197	178	153	124	95	67	47	46
1014	72	104	130	149	158	154	140	120	101	87	94	118	142	166	188	201	203	189	168	139	111	82	58	40
1015	50	79	109	131	144	147	139	124	105	91	88	109	133	157	180	197	203	195	176	152	123	94	67	45
1016	38	56	85	110	127	136	137	128	115	103	96	109	128	152	173	190	200	201	187	168	143	116	88	64
1017	45	42	61	89	110	123	129	127	120	109	101	105	120	140	160	177	190	195	189	175	154	128	101	77
1018	56	42	47	67	91	108	118	123	122	119	113	113	121	136	154	170	181	189	190	181	163	141	119	96
1019	73	54	40	42	60	85	100	112	119	122	123	123	124	130	142	156	168	176	181	183	176	161	141	121
1020	100	77	57	41	37	50	76	96	112	123	133	137	138	138	138	143	151	161	169	176	180	178	169	151
1021	132	112	87	66	45	35	47	74	101	123	140	153	160	159	150	139	131	132	140	151	164	174	180	178
1022	167	155	126	98	74	52	38	51	81	111	136	156	168	171	160	143	125	111	106	114	128	146	163	176
1023	178	167	147	123	98	72	48	41	64	98	128	156	176	186	183	166	143	120	99	87	93	112	134	155
1024	171	176	165	146	122	96	71	49	52	81	116	148	174	190	194	180	156	130	103	80	65	72	97	125
1025	151	168	173	162	143	121	96	73	60	78	110	142	172	195	205	201	180	153	126	95	70	55	65	93
1026	124	150	168	172	162	143	121	98	80	83	110	139	168	194	212	216	202	177	149	118	88	62	45	60
1027	92	124	149	164	168	156	137	115	95	83	102	130	158	185	206	216	212	191	165	135	105	74	45	37
1028	60	94	123	144	157	159	147	129	111	96	101	125	149	174	195	211	216	205	181	155	125	93	65	40
1029	39	65	98	124	143	153	153	140	125	111	105	119	140	163	184	201	210	209	192	170	142	113	83	57
1030	38	44	73	104	125	139	144	142	130	117	107	114	132	154	174	190	202	207	199	177	155	125	99	73
1031	52	42	56	82	107	124	134	137	136	132	123	123	133	154	172	188	199	204	204	189	168	144	120	96
1101	75	59	53	67	91	110	123	132	137	140	138	137	140	150	164	176	186	191	192	186	172	154	134	113
1102	92	75	63	62	74	94	110	123	131	138	142	142	143	143	147	155	163	168	171	171	167	156	141	124
1103	106	89	73	63	63	76	96	113	126	139	149	154	152	147	141	137	137	141	146	150	155	156	150	138
1104	122	105	87	70	61	62	77	97	117	135	151	162	167	165	157	145	136	132	132	136	142	151	157	155
1105	143	127	109	91	75	65	70	88	112	134	154	169	177	177	166	150	133	120	111	111	121	134	145	153
1106	153	141	126	106	87	72	66	77	99	124	146	165	179	182	173	156	135	116	100	92	97	113	131	147
1107	157	156	144	126	107	89	76	77	96	123	147	169	186	193	189	173	151	126	105	87	81	91	113	133
1108	150	160	158	144	126	107	90	82	95	119	143	166	186	197	196	181	159	134	109	85	68	68	87	115
1109	136	152	159	155	140	121	104	91	95	117	141	164	186	201	207	196	175	150	123	95	72	57	63	88
1110	118	140	156	161	154	138	119	104	98	114	137	161	184	201	211	208	189	165	136	108	80	57	47	67
1111	97	124	145	157	158	147	131	113	102	109	129	153	176	196	210	213	203	180	154	124	95	69	48	49
1112	75	107	131	149	159	159	146	130	116	113	128	150	173	195	211	219	216	196	171	142	112	83	58	43
1113	50	79	110	132	146	152	147	135	121	113	119	132	159	180	199	211	214	204	182	156	127	98	71	49
1114	42	61	91	118	136	148	153	148	138	127	125	138	159	179	199	214	223	224	211	188	163	135	109	88
1115	75	73	87	114	137	154	167	170	162	152	143	139	146	162	179	193	205	209	206	191	170	146	119	95
1116	73	59	58	74	100	120	134	142	145	139	130	123	124	136	154	170	183	192	194	187	173	153	130	109
1117	88	71	64	68	86	109	127	143	153	159	158	153	145	143	149	163	175	184	191	194	189	176	159	138
1118	116	98	83	76	83	102	123	141	158	169	174	170	160	146	139	140	147	157	166	174	178	177	166	148
1119	129	109	90	74	67	79	101	125	146	166	179	184	177	162	143	129	121	120	126	138	151	162	165	159
1120	144	125	105	85	70	67	84	111	131	160	178	190	193	186	167	145	126	112	106	110	120	139	154	165
1121	162	151	134	116	98	85	86	108	134	160	185	204	213	212	206	173	149	125	107	96	96	107	129	149
1122	164	172	168	157	138	121	111	116	137	160	182	202	216	222	216	199	175	147	120	96	78	72	85	111
1123	133	151	161	160	146	128	114	106	116	138	162	184	203	215	216	201	179	159	122	95	69	52	50	75
1124	107	130	147	156	152	140	122	109	109	128	151	174	196	214	223	220	202	177	147	116	87	64	51	62
1125	92	124	147	164	171	164	150	132	121	129	148	170	192	211	224	228	216	194	161	135	105	77	54	44
1126	65	98	128	148	162	165	155	139	122	114	124	143	166	187	204	214	212	194	169	139	108	78	50	30
1127	35	67	101	126	142	150	149	139	125	115	116	***	***	***	***	***	***	***	***	***	***	***	***	***

Remarks : Average Water Level = ACD+132cm

Table 3.10.9(2) Observations of Tidal Elevation at Typical Sites

Site 1-2 (Umm Al Nar Station) Duration---25th Dec. 1988~28th Feb. 1989

D/H	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1225	***	***	***	***	***	***	***	***	***	***	127	147	168	188	205	214	211	192	168	137	107	77	49	33
1226	47	81	113	135	150	155	148	134	119	110	113	129	152	176	196	212	218	211	189	164	135	108	83	68
1227	72	95	124	145	163	173	173	163	146	131	121	130	148	168	187	203	212	214	202	180	156	130	108	90
1228	88	108	130	153	174	190	202	201	190	177	163	155	159	167	179	190	200	203	193	174	151	125	101	78
1229	65	71	96	124	147	167	181	184	176	164	150	139	135	138	149	163	174	178	173	160	140	117	94	72
1230	54	53	72	99	121	140	154	160	157	144	126	112	106	108	121	137	151	161	166	158	144	124	105	86
1231	72	70	89	112	132	149	163	175	182	179	171	159	150	140	142	149	156	166	172	169	161	146	132	115
101	101	94	96	112	131	150	166	179	187	188	180	167	150	136	127	120	119	122	126	127	122	115	104	91
102	79	72	74	85	101	118	136	148	160	166	164	155	139	123	109	96	87	83	85	91	99	101	97	93
103	83	77	74	82	96	117	132	144	161	176	187	190	186	173	155	138	124	113	111	116	126	132	139	140
104	142	140	135	130	128	138	153	167	179	190	200	204	200	186	166	145	124	105	88	78	76	88	106	121
105	132	140	144	143	143	141	145	155	173	188	206	216	218	214	199	179	154	129	107	86	68	56	61	81
106	103	120	128	132	126	121	117	124	140	157	173	186	196	199	192	177	157	132	107	82	62	48	55	78
107	106	127	142	149	152	140	129	124	135	153	171	187	202	211	211	200	179	154	126	99	73	50	40	59
108	91	119	138	150	154	145	131	117	115	130	148	168	187	201	208	205	187	162	132	101	70	41	21	27
109	59	95	122	141	151	147	133	117	106	108	125	147	172	192	206	211	201	178	151	120	89	58	28	16
110	40	78	111	134	150	155	146	129	112	101	109	130	154	176	195	208	210	194	168	139	108	77	45	20
111	20	54	94	123	144	156	155	141	123	106	95	105	127	152	174	193	204	202	181	155	126	95	65	36
112	23	45	83	117	145	166	179	184	183	170	158	154	171	187	199	212	222	226	215	196	170	141	112	86
113	64	56	69	100	132	156	170	176	166	152	131	114	104	108	124	141	157	169	171	159	138	113	87	61
114	36	26	48	82	112	136	157	168	167	154	134	114	97	89	99	116	136	151	162	161	150	132	112	93
115	76	67	77	105	132	157	178	192	199	198	182	163	144	127	117	116	120	129	137	141	138	128	113	97
116	82	73	78	95	117	135	153	168	177	176	165	146	126	106	87	72	66	71	87	99	108	112	110	105
117	97	89	87	94	112	130	148	166	183	195	199	194	178	159	140	122	108	98	92	93	102	115	126	137
118	143	144	142	138	139	150	167	183	199	214	223	229	223	211	192	171	150	129	109	91	80	79	87	102
119	118	124	125	118	107	98	96	104	119	137	153	164	167	159	141	119	96	70	42	18	7	20	48	76
120	97	113	125	127	120	112	107	112	127	146	167	184	196	201	194	175	152	125	99	73	49	36	54	84
121	112	133	150	158	155	144	132	122	126	143	164	182	198	209	211	197	175	149	120	92	63	36	28	50
122	86	115	135	148	151	141	128	111	102	111	130	152	172	188	197	197	181	157	128	98	67	37	17	27
123	60	96	122	139	149	147	134	117	102	99	117	140	164	186	202	209	205	185	159	131	102	74	52	44
124	67	101	129	150	166	174	167	154	136	125	127	143	162	179	194	205	208	198	177	152	124	96	72	54
125	56	81	113	136	156	169	170	156	141	124	114	116	130	148	166	182	189	184	167	142	116	88	61	35
126	28	52	85	112	131	142	144	131	116	97	81	79	96	119	140	160	174	176	165	145	119	93	68	46
127	43	68	99	124	144	158	163	155	137	117	99	88	92	109	129	147	164	172	165	147	123	99	74	52
128	48	61	93	119	141	157	164	158	142	122	103	87	82	93	115	135	150	158	156	142	123	102	81	62
129	54	72	98	122	143	162	172	174	164	144	120	115	109	100	106	114	130	144	150	141	130	116	98	79
130	65	73	95	121	140	162	176	182	180	170	154	137	123	112	109	110	118	127	135	134	128	116	102	87
131	75	73	87	106	124	140	155	165	169	162	149	130	113	97	84	75	76	82	89	93	89	88	80	73
201	69	77	89	102	121	136	152	164	172	173	167	156	140	124	109	96	83	78	81	86	95	103	108	109
202	110	114	119	126	137	152	166	179	188	198	203	200	188	170	154	137	120	103	89	78	75	84	96	110
203	121	127	126	126	127	131	140	154	170	183	192	197	195	183	165	144	123	104	84	68	62	72	91	110
204	125	135	140	139	133	127	127	136	151	166	179	190	194	192	178	157	133	107	80	55	32	24	44	75
205	102	120	132	133	127	116	103	97	108	130	151	170	185	194	192	176	152	126	98	70	40	23	32	63
206	97	122	141	151	151	140	123	109	105	121	142	164	185	200	208	205	187	163	134	105	77	51	37	52
207	85	118	145	162	170	163	146	125	108	106	124	146	169	190	206	211	200	175	148	118	86	57	31	30
208	63	102	133	156	168	168	152	129	105	87	87	110	134	159	181	198	200	184	159	131	100	68	37	20
209	40	80	117	145	165	172	163	141	117	92	74	77	101	130	155	177	191	188	167	141	112	81	52	27
210	37	73	111	140	164	178	176	160	136	110	85	71	78	103	129	152	172	179	171	149	122	95	66	40
211	33	59	95	125	153	174	180	168	145	120	92	67	55	70	98	125	148	165	174	162	144	123	101	78
212	68	84	111	137	164	186	199	201	188	167	143	118	98	86	89	106	126	143	152	150	138	120	101	81
213	68	76	99	122	145	165	180	185	179	162	138	115	91	71	57	58	73	93	108	111	107	99	87	75
214	67	75	91	113	132	153	171	186	197	206	197	179	160	140	124	115	111	106	111	116	118	118	114	109
215	106	107	110	118	130	144	160	173	183	190	189	178	160	140	119	100	81	68	60	63	74	84	91	94
216	94	94	92	90	94	104	118	130	144	157	165	167	158	144	125	106	86	67	50	42	50	70	90	104
217	117	125	130	126	122	119	123	135	148	164	177	187	190	183	166	144	120	97	75	55	43	52	75	98
218	117	130	138	137	129	117	105	102	114	132	150	167	180	184	174	155	130	105	77	48	25	23	48	81
219	106	124	137	141	131	116	102	94	95	111	132	151	169	185	190	180	160	134	107	80	55	38	47	77
220	107	131	149	160	158	146	128	110	100	111	130	150	171	190	198	197	180	155	128	99	70	42	30	50
221	85	116	138	153	157	145	128	108	90	85	102	127	149	170	185	192	183	161	135	107	78	49	27	35
222	70	104	130	145	152	143	129	106	83	71	73	101	128	150	172	184	183	163	139	111	82	54	37	38
223	76	111	141	163	179	187	191	178	162	143	135	146	162	179	197	208	213	205	185	160	131	105	79	61
224	60	83	115	137	148	157	145	128	107	88	76	77	95	117	138	156	167	166	152	129	104	76	49	32
225	42	71	102	127	144	152	147	133	111	89	70	62	76	101	125	147	165	173	169	153	129	105	84	70
226	75	99	125	145	163	172	169	154	132	108	84	66	56	69	95	119	138	149	147	134	116	94	72	59
227	66	90	118	141	161	175	179	164	146	122	102	84	73	78	98	119	135	146	151	143	129	110	93	80
228	83	103	126	147	165	179	182	175	160	138	117	***	***	***	***	***	***	***	***	***	***	***	***	***

Remarks : Average Water Level = ACD+127cm

Table 3.10.9(3) Observations of Tidal Elevation at Typical Sites

Site 10 (Mina Zayed) Duration---1st Oct. 1988 ~27th Feb. 1989

D/H	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1001	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	218	199	170	134	97	70	55
1002	52	59	75	95	117	130	136	136	128	120	115	120	134	154	175	190	201	203	198	180	153	123	94	72
1003	56	52	60	74	90	108	123	130	133	134	135	137	143	153	166	180	188	193	194	188	169	146	120	94
1004	76	63	59	59	68	84	99	113	123	130	135	140	145	151	159	166	172	176	177	176	172	162	146	127
1005	104	84	70	61	59	65	80	98	118	134	148	156	160	159	158	157	157	160	164	169	174	175	171	158
1006	138	116	92	73	62	59	66	82	105	131	151	164	170	168	162	155	148	146	152	160	169	179	185	183
1007	172	150	124	97	76	64	63	74	94	122	148	167	177	178	170	156	141	132	130	136	147	161	174	181
1008	180	166	143	113	85	67	59	65	83	109	140	163	177	180	172	155	133	115	110	117	129	148	166	184
1009	189	183	164	136	104	80	66	66	80	103	135	163	183	188	182	165	141	116	100	101	113	131	153	177
1010	190	190	177	153	123	91	72	66	76	97	125	155	179	188	183	167	140	111	86	76	80	95	118	145
1011	168	179	174	157	131	100	75	65	70	89	118	151	179	194	193	178	151	118	86	67	63	74	93	124
1012	152	170	175	168	147	120	92	77	78	94	119	149	179	200	205	193	166	130	92	65	52	55	70	96
1013	129	155	170	169	158	135	110	90	88	102	126	154	183	205	212	202	180	146	106	71	48	44	54	76
1014	105	137	158	167	163	148	127	104	97	105	126	151	178	202	217	213	194	164	125	87	57	44	46	59
1015	82	112	137	153	156	150	134	115	100	101	117	140	167	193	213	215	203	178	144	104	70	48	41	47
1016	62	85	113	134	145	145	138	125	113	108	119	136	159	183	202	211	208	193	168	135	98	70	52	47
1017	52	67	89	111	128	136	136	130	120	114	116	127	146	167	187	199	203	196	178	152	119	87	65	52
1018	47	54	68	88	106	120	127	129	127	122	122	127	139	155	174	187	194	195	188	170	144	115	88	68
1019	55	50	53	65	82	99	115	124	128	129	130	130	135	145	157	170	180	186	187	182	168	148	124	98
1020	76	59	51	50	59	75	95	115	129	140	144	145	143	143	147	154	163	171	179	184	183	176	160	138
1021	111	86	65	52	49	57	74	100	127	148	162	166	165	157	147	141	141	147	157	169	181	188	186	173
1022	151	122	92	68	52	49	60	83	113	143	166	178	178	168	150	131	118	115	121	136	152	170	184	187
1023	176	153	122	89	64	50	52	69	98	135	168	192	199	192	173	144	115	95	91	100	118	139	164	183
1024	187	177	154	122	89	64	54	63	87	121	160	192	208	208	191	161	123	88	70	67	80	101	130	161
1025	182	186	175	152	122	91	71	71	87	117	153	189	217	225	212	185	146	104	69	54	55	71	96	130
1026	161	181	184	173	152	124	97	85	93	116	146	181	214	235	231	212	177	131	86	55	42	46	66	92
1027	127	157	174	178	167	148	120	99	95	112	138	168	200	227	235	223	196	157	109	68	40	33	42	61
1028	92	128	153	166	168	158	140	120	106	113	133	158	186	211	229	229	213	182	140	96	60	38	33	46
1029	67	98	130	152	163	164	154	137	122	118	127	147	171	195	216	224	219	198	164	124	83	55	40	41
1030	53	75	104	130	147	153	153	141	130	122	125	139	158	181	200	213	216	206	181	150	115	80	58	50
1031	52	63	83	107	128	141	146	146	141	136	136	145	161	180	196	207	212	208	195	173	144	114	87	71
1101	64	66	76	92	112	128	140	146	148	148	147	149	156	167	180	190	196	197	193	181	162	139	113	92
1102	78	72	74	81	95	111	126	137	144	149	150	150	154	159	166	172	175	177	175	167	154	135	114
1103	96	83	76	76	83	97	115	131	143	153	161	161	157	153	148	148	150	153	157	161	163	160	151	134
1104	116	98	83	76	75	84	100	121	142	160	171	176	175	167	157	148	143	143	146	151	158	164	164	156
1105	140	120	100	85	79	82	93	114	140	163	179	187	185	176	159	142	128	121	122	129	139	151	159	161
1106	153	136	117	97	84	80	86	102	128	153	176	189	192	184	165	141	120	105	101	106	119	135	154	163
1107	165	156	139	118	99	88	89	102	126	154	180	199	205	199	181	155	125	102	90	90	99	117	139	158
1108	168	167	156	138	118	100	95	103	124	150	176	199	211	207	191	164	131	100	79	71	77	92	117	142
1109	161	169	167	154	134	115	103	106	119	148	174	200	217	220	205	180	145	108	78	62	60	72	94	123
1110	150	167	172	165	148	130	114	111	124	145	171	196	218	226	218	196	162	122	84	59	51	55	72	98
1111	129	153	166	168	159	142	125	115	120	131	160	186	211	226	225	210	182	142	102	71	53	49	59	79
1112	108	138	156	169	169	159	144	129	127	138	158	189	207	227	234	225	203	168	127	86	59	45	47	59
1113	71	111	138	156	161	159	148	135	128	130	144	166	190	211	225	225	212	186	150	109	75	53	45	51
1114	67	91	120	142	156	162	159	151	141	139	147	163	186	210	227	236	233	219	190	156	120	92	78	75
1115	79	92	116	139	160	172	176	168	158	151	146	152	165	182	197	210	214	209	195	167	136	102	79	62
1116	58	63	76	96	117	134	144	148	143	137	132	133	140	154	171	185	195	198	191	178	155	127	102	81
1117	70	69	74	87	106	127	145	156	162	162	158	153	151	155	164	175	185	193	197	193	183	162	138	115
1118	95	85	83	90	105	125	145	163	175	180	176	167	155	148	147	152	159	168	176	181	181	172	156	136
1119	114	93	80	76	85	102	127	152	175	187	191	184	169	151	135	128	127	132	142	153	164	169	165	154
1120	133	110	89	77	77	87	109	138	166	191	203	203	194	174	150	127	116	113	117	125	142	157	169	168
1121	160	145	125	104	94	95	112	137	168	197	219	226	220	202	173	142	117	101	95	99	108	127	149	165
1122	174	172	161	142	122	113	118	134	158	185	207	232	230	218	196	163	125	93	73	65	62	71	103	128
1123	148	161	163	151	135	117	109	117	135	158	183	206	222	222	207	178	140	97	65	45	41	49	67	94
1124	124	145	157	157	148	130	117	115	127	148	173	199	222	233	227	206	174	134	91	69	45	45	58	83
1125	116	147	167	175	171	157	140	129	132	148	170	193	217	233	236	221	193	156	108	70	45	36	43	60
1126	89	122	148	165	170	162	146	130	122	127	143	165	189	210	222	218	199	167	126	82	48	29	26	37
1127	56	87	119	141	154	156	149	137	128	125	132	149	171	194	209	217	207	189	159	121	80	49	33	35
1128	49	71	101	129	148	157	156	148	138	131	133	145	163	182	198	211	211	199	178	147	110	76	50	38
1129	43	59	83	108	135	151	155	153	146	139	137	144	157	173	188	200	205	201	186	160	124	90	66	55
1130	56	66	80	104	130	148	158	161	160	155	148	145	149	159	171	182	189	190	182	164	138	108	82	65
1201	57	59	69	88	110	130	145	154	157	155	148	143	141	145	151	158	165	169	166	160	143	122	101	83
1202	72	69	73	84	103	125	144	159	168	171	168	163	157	154	152	155	156	159	160	159	153	141	126	106
1203	93	83	80	84	96	114	135	153	166	175	176	170	159	146	137	133	132	133	135	138	140	135	127	116
1204	103	92	85	83	90	102	119	138	157	171	176	173	164	150	134	121	112	108	108	114	121	127	131	129
1205	122	112	101	93	93	101	116	135	157	176	187	188	182	167	145	124	104	94	91	96	106	120	132	138
1206	140	133	122	112	105	108	119	137	160	183	200	206	200	186	162	133	105	84	72	72	80	96	117	132
1207	142	142	136	127	118	114	120	136	157	179	199	211	212	201	180	150	116	85	61	51	56	71	91	116
1208	137	147	148	142	131	123	123	132	148	171	195	213	222	219	202	175	139	100	68	49	45	53	71	97
1209	124	143	153	153	143	132	124	126	140	161	184	206	221	225	212	189	156	119	81	52	36	39	53	77
1210	108	136	154	160	157	146	133	127	136	154	176	199	220	231	227	212	183	146	104	68	43	35	43	60
1211	84	111	138	156	164	159	145	133	132	144	163	184	207	226	233	225	204	172	131	88	55	35	34	47
1212	69	98	127	149	162	162	152	139	129	130	143	164	187	210	225	227	215	190	155	114	75	46	35	40
1213	57	84	116	145	164	171	167	154	142	136	142	158	178	200	220	233	232	216	189	153	112	75	53	47
1214	56	74	102	134	158	172	176	169	157	144	139	147	161	180	197	215	222	216	196	168	131	94	64	48
1215	48	60	80	106	133	155	170	173	166	154	140	135	142	153	170	187	202	209	202	186	163	134	103	78
1216	63	61	72	91	118	143	165	180	184	177	165	152	145	147	155	165	177	187	192	186	172	150	126	101
1217	82	71	74	85	105	133	159	181	193	193	183	167	149	138	135	139	147	156	164	166	161	146	129	110
1218	91	80	75	82	97	118	145	152	195	207	206	196	177	159	142	133	131	133	140	148	152	152	144	134
1219	122	110	100	100	108	125	146	170	195	214	222	215	200	180	155	133	117	107	107	113	122	132	140	143
1220	140	133	124	117	116	123	136	154	174	196	211	217	210	195	176	145	116	93	81	81	88	103	122	142
1221	157	163	161	152	144	142	150	165	187	210	231	242	239	225	200	168	135	104	82	70	72	83	100	123
1222	165	162	171	168	159	148	144	151	167	185	204	217	231	227	210	183	148	113	82	60	52	56	71	92
1223	114	136	152	160	156	147	137	134	145	163	183	204	221	228	223	203	174	140	104	74	55	47	56	75
1224	99	126	148	164	167	160	148	139	139	151	169	193	215	232	238	226	202	167	129	92	63	50	52	69
1225	93	121	145	164	171	166	154	139	131	135	149	167	189	210	224	223	207	179	143	102	68	44	38	49
1226	69	95	125	149	162	162	152	139	128	126	134	152	175	200	220	231	226	208	180	147	114	86	74	78
1227	92	116	142	164	180	185	179	166	152	140	143	154	170	189	208	221	224	216	196	169	139	113	95	92
1228	105	125	148	173	194	209	218	204	188	172	164	165	170	183	191	203	211	202	184	157	125	95	73	66
1229	73	89	112	131	150	176	190	187	175	161	149	142	143	151	163	175	182	181	172	153	125	96	74	61
1230	63	74	92	117	140	158	167	169	161	145	129	120	119	126	139	153	166	172	170	158	139	117	97	84
1231	83	92	108	130	149	168	182	191	191	185	176	165	156	153	155	161	169	175	177	172	162	148	129	114

Remarks : Average Water Level = ACD+135cm

Table 3.10.9(4) Observations of Tidal Elevation at Typical Sites

Site 10 (Mina Zayed) Duration---1st Oct. 1988 ~27th Feb. 1989

D/H	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
101	105	105	115	130	147	165	182	192	196	192	181	166	153	141	133	130	131	133	135	134	129	121	110	97
102	89	87	91	100	116	134	151	165	173	175	169	157	140	124	110	101	97	96	99	104	109	108	106	100
103	95	91	92	101	115	130	149	165	182	194	201	197	189	176	158	142	128	124	126	132	138	144	147	149
104	151	148	144	142	145	156	168	182	195	205	213	210	199	180	157	131	108	93	85	85	92	104	120	132
105	143	148	149	148	147	150	157	169	182	198	208	213	216	200	170	140	106	86	68	58	54	59	66	75
106	86	98	109	117	121	123	125	129	138	152	164	177	186	191	189	180	165	147	127	106	92	83	80	84
107	94	108	122	133	138	139	137	138	143	152	165	179	194	202	204	199	185	166	143	121	101	87	80	81
108	90	104	120	132	140	142	140	137	136	140	149	161	176	189	197	198	190	173	151	126	101	83	71	67
109	71	84	101	119	131	136	135	132	129	128	134	145	161	177	191	197	195	184	164	140	115	92	76	67
110	66	76	93	111	127	137	139	136	131	127	128	135	147	164	180	192	197	192	177	156	131	105	85	71
111	65	70	83	102	121	134	141	141	135	128	124	125	132	146	162	178	189	191	183	167	144	120	97	80
112	71	71	82	100	123	143	159	169	173	171	169	168	174	187	199	209	216	223	219	200	185	175	160	133
113	114	101	97	106	118	135	148	156	158	153	143	132	126	124	127	135	146	155	159	156	144	127	107	88
114	75	67	67	77	94	115	134	147	152	150	142	131	121	116	114	118	127	138	147	150	148	141	130	117
115	105	98	98	105	122	141	160	176	189	190	184	174	161	149	140	135	132	132	135	137	137	134	127	117
116	107	100	98	101	111	124	139	153	163	168	166	157	144	129	116	103	96	93	93	96	101	105	107	107
117	106	104	102	104	112	123	138	154	170	182	189	189	183	172	160	146	134	125	118	114	114	117	123	129
118	134	138	139	140	143	149	160	173	194	212	223	224	214	203	185	163	143	127	100	70	72	77	84	93
119	103	112	116	116	113	110	108	112	120	132	144	154	158	156	146	130	111	90	71	57	48	46	51	63
120	79	95	107	115	117	117	117	121	129	142	158	173	185	191	188	178	161	139	117	95	80	73	74	83
121	98	117	133	143	146	146	142	140	141	148	160	175	188	198	200	194	179	157	131	105	84	70	64	67
122	80	98	116	130	137	138	136	128	124	126	134	147	162	176	185	187	179	162	138	110	86	68	57	55
123	64	82	101	119	131	136	136	129	123	122	127	139	155	173	188	196	195	185	166	142	118	96	83	77
124	81	94	113	131	147	156	157	153	146	141	141	146	156	170	185	197	200	194	179	158	133	110	99	79
125	77	85	100	120	142	158	161	156	146	136	130	129	134	146	166	200	197	190	175	155	130	103	83	70
126	64	66	78	95	113	126	132	130	123	113	104	101	105	117	131	147	160	165	161	150	132	111	92	86
127	76	80	93	112	130	144	151	151	144	133	123	116	114	118	128	140	153	160	160	151	131	117	98	85
128	78	80	91	109	128	143	152	153	147	137	125	116	111	111	113	129	140	147	149	145	135	122	106	94
129	89	90	98	114	132	149	160	165	164	157	146	135	127	122	121	125	131	137	140	139	133	123	110	90
130	93	93	100	115	132	148	162	171	174	171	163	153	142	133	128	125	125	128	131	132	130	125	118	108
131	101	98	99	104	119	132	150	161	167	167	158	140	120	105	95	90	89	87	96	97	97	92	87	83
201	83	90	100	115	130	145	156	166	173	174	167	155	142	130	118	104	95	93	92	96	102	110	113	116
202	120	123	128	138	148	160	172	183	191	199	201	199	183	166	150	135	120	107	97	90	90	97	109	119
203	126	130	131	132	136	142	152	164	179	189	197	198	194	182	163	144	125	106	91	84	82	89	103	118
204	130	138	140	140	138	136	140	150	162	173	185	191	194	186	171	152	127	102	80	61	49	48	66	90
205	109	127	134	134	128	119	112	113	128	149	171	189	200	198	182	153	116	78	47	28	27	37	57	86
206	118	143	156	158	148	131	117	113	123	140	161	182	200	212	213	203	182	154	122	90	67	54	53	70
207	94	122	146	164	170	161	145	128	118	125	141	161	188	198	206	203	187	135	90	51	28	24	29	43
208	63	88	115	138	153	159	141	115	94	93	105	119	136	155	173	186	190	178	158	133	105	82	67	60
209	65	84	110	137	156	166	160	146	127	110	99	100	113	132	154	175	186	183	167	146	120	93	75	65
210	64	81	106	133	156	169	171	161	144	125	108	99	100	112	129	149	166	173	168	153	132	106	86	72
211	68	76	94	119	144	162	171	166	152	133	112	96	90	93	106	126	147	163	169	164	151	135	117	102
212	96	102	118	137	158	178	192	196	188	172	153	135	121	113	109	117	129	141	148	149	142	130	117	103
213	96	97	106	123	141	159	173	180	179	168	151	132	114	98	89	84	86	93	102	107	108	105	99	92
214	89	90	99	114	131	150	168	184	197	201	195	182	166	151	138	128	121	119	118	121	123	121	118	115
215	114	115	121	130	142	157	173	187	198	197	186	169	145	120	98	82	72	69	71	77	84	91	98	100
216	101	100	99	101	108	120	132	146	159	168	172	167	155	133	110	89	72	61	56	59	70	86	102	118
217	130	136	135	131	129	131	140	151	166	181	193	196	192	177	153	124	95	73	59	54	59	74	93	115
218	133	144	147	141	131	121	117	123	136	152	171	186	193	185	167	141	107	77	51	34	35	48	66	77
219	95	110	123	130	132	121	110	109	118	135	156	177	195	202	193	175	146	112	80	56	48	56	71	88
220	101	118	133	143	149	147	135	123	122	134	150	169	189	203	207	196	176	151	119	87	63	50	55	64
221	79	97	116	131	140	140	124	105	98	108	128	148	168	185	196	194	177	150	117	84	58	41	44	52
222	65	84	104	121	132	136	126	113	101	92	100	116	136	161	179	189	182	162	135	106	83	67	58	62
223	76	96	121	143	160	172	178	172	157	147	147	156	169	183	205	215	213	196	170	139	109	82	62	60
224	75	89	103	120	133	141	139	126	107	94	85	92	107	129	151	166	171	162	140	110	79	52	38	46
225	64	92	123	146	157	156	143	120	93	74	69	78	94	118	142	165	177	175	161	135	104	81	72	79
226	96	121	143	164	177	177	165	142	113	86	70	66	74	90	113	137	152	154	144	124	99	78	69	73
227	89	115	143	167	184	188	175	156	129	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***

Remarks : Average Water Level = ACD + 135cm

Table 3.10.9(5) Observations of Tidal Elevation at Typical Sites

Site 18 (Public Marina) Duration--- 28th Sep. 1988~27th Feb. 1989

D/H	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
928	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	***	187	160	134	108	89	81	83
929	100	124	136	162	168	163	146	125	107	95	97	114	136	161	184	196	201	192	168	143	115	90	73	64
930	67	90	113	134	147	152	149	134	117	106	103	115	135	156	179	195	204	203	189	165	141	113	91	75
1001	68	73	94	114	131	141	144	140	129	118	112	118	133	151	171	185	196	199	193	175	152	128	104	85
1002	70	64	69	87	104	119	128	130	127	120	114	115	125	141	158	172	184	190	190	180	161	141	119	97
1003	79	64	59	68	83	99	112	120	125	128	129	132	137	144	156	166	175	182	186	184	173	158	139	119
1004	100	84	71	64	67	80	94	107	117	125	130	136	140	147	154	161	167	172	173	173	172	163	153	138
1005	119	100	83	67	59	60	74	90	106	124	137	146	152	155	155	154	155	157	162	166	170	172	169	160
1006	146	130	110	89	73	61	61	75	95	116	136	150	158	162	160	153	149	147	149	156	163	170	178	180
1007	173	158	140	121	101	84	73	73	89	111	131	151	163	169	169	161	150	139	135	137	144	155	165	173
1008	176	169	152	134	112	91	76	69	79	102	124	147	162	169	169	160	145	129	119	117	126	141	155	170
1009	179	179	169	150	129	107	89	77	79	98	120	145	164	175	177	169	152	133	119	111	113	125	142	160
1010	174	180	177	162	141	120	98	84	80	92	113	138	159	171	175	169	152	131	112	96	90	94	112	131
1011	151	163	166	160	142	121	100	83	75	84	107	131	156	172	180	176	162	138	115	94	82	79	92	115
1012	137	155	163	163	152	132	114	95	87	91	112	135	160	180	189	188	174	151	126	101	80	69	71	91
1013	116	140	155	160	157	144	125	107	96	99	117	138	162	181	194	195	184	162	137	110	86	69	62	72
1014	97	121	142	153	156	151	136	120	107	105	118	138	159	180	196	202	195	177	152	127	100	79	66	61
1015	76	102	122	140	147	148	139	124	110	103	110	130	150	172	190	199	198	186	161	136	109	86	68	58
1016	61	79	102	121	134	139	137	129	118	111	113	127	145	165	183	194	198	193	178	156	132	107	86	70
1017	61	64	84	103	119	129	132	131	124	115	114	122	137	154	170	184	191	192	182	164	143	120	97	78
1018	64	58	66	84	101	115	124	127	126	124	122	125	135	147	162	175	184	189	187	176	158	139	117	96
1019	77	62	55	61	78	94	108	119	125	128	128	130	134	142	152	164	173	181	184	183	174	159	141	121
1020	100	81	64	54	56	70	88	105	121	131	138	142	143	144	147	153	161	168	175	180	182	178	166	151
1021	131	110	89	69	56	54	68	91	113	135	149	158	160	158	151	144	142	146	154	163	172	179	181	176
1022	160	141	119	96	75	61	60	77	102	127	150	163	169	168	157	142	129	121	121	130	144	158	170	177
1023	175	161	140	118	94	73	61	65	90	118	151	169	181	184	175	156	135	117	106	105	114	131	150	166
1024	175	173	160	138	115	92	73	67	81	109	138	167	185	193	188	169	145	121	99	87	85	99	120	143
1025	163	171	170	158	138	116	95	82	84	106	134	164	189	202	203	190	164	138	111	90	78	77	93	118
1026	142	163	170	170	158	138	118	102	99	112	135	161	188	207	215	209	185	127	112	76	47	32	33	49
1027	75	103	128	144	151	148	140	130	123	123	133	152	175	196	208	208	195	169	136	99	66	42	32	36
1028	52	76	101	121	134	140	139	135	131	131	137	151	169	189	203	209	202	184	157	124	91	63	44	37
1029	42	57	77	97	114	125	132	134	135	137	142	151	165	178	195	207	210	202	183	157	130	103	81	66
1030	61	69	95	116	135	145	149	144	135	126	124	135	149	168	185	197	204	202	190	168	143	119	96	78
1031	67	64	78	89	117	132	139	142	141	138	135	141	153	167	183	196	202	203	198	183	163	142	119	100
1101	85	75	74	87	105	119	132	139	143	145	146	147	153	162	173	183	190	194	194	186	172	155	136	116
1102	99	85	78	79	91	106	119	130	138	144	147	149	150	153	158	164	170	175	176	175	170	160	147	130
1103	113	97	84	77	80	93	108	123	137	147	154	157	157	156	154	149	148	149	152	155	158	160	160	153	140
1104	127	110	94	81	75	81	95	111	130	146	158	166	168	166	160	151	147	143	144	148	153	159	161	157
1105	145	130	113	97	85	80	88	106	126	147	163	173	178	175	164	151	139	129	125	126	134	145	152	156
1106	153	142	126	111	95	84	83	97	117	139	158	173	181	180	170	153	135	120	111	108	114	128	142	154
1107	158	155	144	127	112	97	91	98	117	139	161	179	189	191	183	165	146	126	110	101	101	111	129	145
1108	156	160	156	144	128	113	102	102	117	137	159	179	192	197	190	173	151	129	108	92	86	90	108	127
1109	147	156	159	154	140	124	112	108	118	138	158	180	196	204	201	186	163	139	114	93	80	77	88	113
1110	133	152	160	160	151	137	123	116	120	137	156	178	195	217	219	198	176	152	125	100	81	69	72	92
1111	117	139	153	158	156	147	132	121	119	131	150	171	190	205	211	207	190	166	140	113	92	75	69	77
1112	101	124	144	157	161	157	147	134	129	134	151	169	189	206	216	217	205	183	158	129	104	83	69	65
1113	78	103	126	143	151	153	148	138	129	128	139	156	175	192	205	211	207	192	169	143	116	92	73	64
1114	67	86	110	131	146	153	153	151	143	139	142	156	172	190	205	215	218	212	194	173	148	123	104	85
1115	84	86	104	120	139	151	156	156	150	145	139	144	153	167	178	190	193	196	188	168	152	132	110	93
1116	80	73	75	98	111	127	138	142	140	130	121	119	124	136	146	158	168	172	171	161	146	129	108	89
1117	73	62	58	65	81	97	115	126	133	136	131	131	129	132	142	149	157	166	170	169	162	149	131	113
1118	96	80	71	72	79	98	115	132	145	174	175	170	148	139	136	137	143	151	157	161	163	156	144	134
1119	123	112	96	86	86	98	118	139	159	172	181	181	174	144	127	118	113	113	121	128	138	153	156	147
1120	139	124	106	91	82	85	103	134	150	170	186	192	190	160	139	123	109	101	98	102	115	126	137	140
1121	138	126	121	112	99	93	103	122	146	172	194	206	208	189	164	140	120	103	93	90	91	103	120	134
1122	143	147	143	131	117	106	103	115	132	149	168	185	193	193	182	163	139	117	96	81	72	73	84	104
1123	121	133	137	132	121	109	99	101	114	131	150	168	184	189	184	165	142	118	93	70	55	48	52	72
1124	97	116	128	131	127	116	104	99	106	122	141	162	181	193	195	185	164	140	120	99	85	72	65	76
1125	105	133	153	163	164	157	145	135	133	142	154	165	182	196	204	197	181	156	129	100	76	59	50	53
1126	73	98	121	136	144	142	132	119	110	113	126	144	161	177	188	190	182	162	140	112	83	60	46	40
1127	50	78	102	124	136	140	138	130	118	114	120	135	152	169	183	191	189	173	154	129	101	73	54	42
1128	45	66	90	114	134	146	148	145	137	131	131	142	154	163	176	188	191	185	167	145	120	94	70	52
1129	44	52	76	105	126	140	146	146	143	139	138	144	156	169	173	181	187	186	181	167	147	123	100	81
1130	70	67	78	100	119	137	146	153	155	153	148	147	150	159	168	178	185	187	184	170	153	132	110	90

Remarks : Average Water Level = ACD+135cm

Table 3.10.9(6) Observations of Tidal Elevation at Typical Sites

Site 18 (Public Marina) Duration--- 28th Sep. 1988~27th Feb. 1989

D/H	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1201	75	67	70	88	106	125	139	147	152	153	150	145	143	145	151	154	156	162	168	161	149	133	117	99
1202	84	73	73	84	101	114	134	145	155	164	166	152	146	142	140	142	144	148	148	146	142	134	120	105
1203	91	79	72	73	84	100	117	133	145	154	158	157	150	138	131	125	123	122	123	126	127	123	117	108
1204	96	85	84	72	78	89	104	122	137	150	156	157	152	141	127	117	107	101	99	111	117	123	126	126
1205	120	110	100	92	90	99	114	130	148	163	175	180	170	156	139	122	108	95	87	87	99	115	125	132
1206	134	130	122	111	105	104	114	130	150	169	184	193	184	173	155	135	115	86	81	78	81	95	112	125
1207	135	137	134	127	118	113	117	133	150	168	185	197	201	196	182	159	136	112	90	73	65	70	89	110
1208	129	138	141	137	129	120	118	126	142	161	183	198	208	209	187	166	143	117	96	81	66	61	71	95
1209	116	133	141	143	138	130	121	120	133	151	171	191	205	210	205	190	165	140	112	87	67	57	57	77
1210	103	126	142	148	148	141	130	124	130	147	166	186	203	214	205	197	172	151	130	104	80	63	57	66
1211	93	118	140	152	155	151	142	131	128	139	157	176	194	209	215	210	198	175	148	120	94	72	59	57
1212	75	102	124	144	152	154	147	137	128	129	141	158	178	195	204	201	195	179	163	137	108	85	66	57
1213	61	84	111	135	151	157	158	152	142	135	140	154	168	175	191	202	206	197	179	156	128	102	88	72
1214	68	76	101	123	143	155	161	159	153	144	140	145	158	172	187	200	208	207	195	175	150	121	98	77
1215	66	65	82	106	128	148	158	161	158	151	136	134	141	153	162	171	182	188	181	169	148	128	110	89
1216	74	67	73	94	116	137	153	163	167	164	156	145	134	134	142	153	163	169	174	168	157	139	120	102
1217	85	72	72	81	98	122	145	160	170	170	162	150	138	128	125	127	134	141	149	150	146	142	129	112
1218	93	82	71	77	91	108	134	158	177	186	188	175	160	147	135	126	122	122	128	135	140	145	140	130
1219	118	107	97	94	104	119	141	162	181	197	205	203	192	165	145	129	116	106	101	103	110	118	125	127
1220	126	122	118	113	109	117	130	147	166	184	196	203	198	184	159	131	113	94	82	73	78	95	118	137
1221	141	143	148	147	140	136	144	158	176	196	214	224	227	217	191	165	145	127	107	92	86	88	103	124
1222	142	156	162	162	155	147	144	150	164	178	194	208	217	217	204	185	160	131	110	89	75	67	73	95
1223	118	136	149	153	150	144	134	132	143	158	175	191	205	214	213	199	175	152	127	104	83	68	66	78
1224	103	125	145	155	159	153	145	137	137	148	164	183	200	214	221	216	200	175	150	123	99	81	71	74
1225	92	118	138	153	159	157	149	138	129	132	146	160	179	195	207	208	198	178	151	123	95	72	57	55
1226	69	95	119	139	149	150	142	132	122	119	126	145	166	187	202	205	201	190	171	145	123	101	85	81
1227	87	109	130	153	163	169	167	157	147	138	139	150	164	181	196	207	210	206	188	170	147	127	111	103
1228	109	122	143	160	178	190	191	189	178	164	157	155	156	165	174	184	190	187	174	156	135	110	90	75
1229	71	81	102	124	144	159	165	166	160	150	140	134	133	140	148	158	164	165	158	145	125	104	83	67
1230	58	61	77	99	119	135	143	147	144	134	119	109	105	110	121	132	143	149	151	144	129	111	95	82
1231	72	77	93	110	130	146	159	169	173	174	165	154	143	139	140	144	153	158	161	157	150	140	125	110
101	101	96	102	116	133	150	161	170	175	174	163	153	142	132	123	119	117	118	120	119	115	107	97	85
102	76	71	76	86	99	115	130	144	152	155	152	142	130	116	103	94	88	84	88	93	96	97	94	88
103	82	78	78	87	100	116	130	143	158	170	183	185	181	167	149	133	121	115	115	125	130	136	139	142
104	145	142	139	136	139	146	155	167	178	187	192	191	185	170	154	138	117	106	97	91	92	101	114	125
105	136	142	144	145	145	148	155	167	180	196	206	211	214	202	189	169	147	128	108	93	82	77	82	95
106	113	125	132	132	131	128	128	139	149	165	177	189	196	196	187	171	150	128	106	86	72	67	74	94
107	115	134	146	150	149	143	139	141	151	165	180	195	206	210	206	192	171	147	121	98	79	68	65	82
108	108	129	145	153	154	147	137	131	135	147	163	180	195	205	207	197	176	151	122	92	68	51	44	53
109	82	109	132	148	152	147	135	124	120	126	144	164	182	199	207	204	190	165	137	108	80	57	42	43
110	67	97	123	144	154	153	145	131	119	118	130	148	166	186	200	206	200	182	154	126	96	69	50	41
111	51	80	109	135	151	156	152	140	125	114	113	127	145	165	184	198	201	192	168	142	113	86	63	49
112	49	71	102	132	158	173	182	188	179	170	164	172	184	194	206	216	223	219	205	185	160	132	109	89
113	80	81	95	122	144	163	173	172	165	147	132	121	118	125	137	151	162	169	167	153	132	107	82	60
114	47	49	69	96	123	147	161	166	161	150	130	115	106	106	106	129	143	155	160	158	146	130	113	96
115	85	84	100	121	146	167	184	195	196	190	175	160	144	133	128	127	130	138	143	144	139	131	117	102
116	90	87	95	110	127	145	161	173	176	176	164	146	128	110	94	84	81	87	96	105	112	115	114	109
117	104	100	101	108	124	141	159	175	189	197	197	191	176	159	144	129	117	109	107	107	114	124	133	141
118	144	146	146	147	151	163	175	190	205	216	223	224	214	203	185	163	143	127	110	99	94	95	101	111
119	122	128	127	122	115	110	110	119	133	148	159	166	166	155	136	114	90	66	45	30	27	41	63	85
120	108	122	129	129	125	120	119	128	143	160	176	191	198	198	187	167	144	119	96	76	62	62	79	102
121	125	145	155	158	156	149	138	137	146	161	177	193	204	210	204	187	163	137	110	85	65	53	55	78
122	103	126	144	150	149	142	129	119	119	131	148	165	182	193	197	190	168	143	115	86	71	46	41	55
123	83	110	133	146	150	145	134	120	114	120	137	157	177	194	204	205	193	171	146	120	95	77	68	70
124	92	117	141	159	169	169	163	150	139	136	144	158	173	187	199	206	202	188	166	140	114	92	77	72
125	80	103	125	147	161	167	162	152	140	128	126	132	145	159	174	183	186	176	157	132	106	81	61	51
126	54	74	100	123	139	145	142	130	116	101	94	99	114	132	151	165	173	171	158	136	114	90	70	62
127	69	91	114	137	153	161	161	152	135	120	108	106	112	126	143	157	167	168	160	140	119	96	75	64
128	67	85	109	132	150	160	162	155	139	122	108	100	100	113	128	144	153	157	152	140	122	103	85	73
129	77	92	113	136	156	166	172	171	161	146	130	120	112	113	121	131	141	147	145	138	125	108	92	81
130	80	94	113	136	154	169	179	182	179	167	152	140	129	123	120	122	127	134	137	136	130	120	107	94
131	88	91	103	118	135	149	160	167	167	161	148	133	118	105	95	89	89	93	96	97	97	92	87	82
201	83	90	100	116	131	147	158	168	174	174	168	157	144	130	117	105	96	91	91	97	103	110	113	116
202	120	123	128	138	149	161	174	185	193	201	203	198	185	167	151	135	121	107	97	90	90	97	109	119
203	127	131	133	134	136	143	153	165	180	190	197	199	194	182	164	145	126	107	92	82	81	89	103	118
204	131	139	142	142	138	136	140	150	162	173	185	192	195	187	172	153	128	102	80	60	48	48	65	90
205	110	128	134	134	128	119	112	113	128	145	162	178	190	192	185	166	144	117	91	67	51	46	57	84
206	110	134	147	152	149	138	126	119	124	140	157	176	193	204	205	195	175	150	122	98	77	64	63	79
207	107	135	156	166	167	158	138	127	122	128	144	161	181	198	206	203	187	161	134	105	79	60	53	61
208	90	120	147	163	168	163	147	125	109	103	113	131	151	172	190	197	190	170	144	115	87	63	47	49
209	72	105	135	159	169	169	155	134	111	95	93	105	126	146	168	184	187	177	155	129	100	73	54	50
210	67	97	127	157	172	177	170	151	127	106	93	91	102	124	143	163	175	175	161	137	113	87	64	55
211	60	88	114	144	168	175	175	158	138	111	92	79	81	99	119	143	161	173	170	159	138	120	96	87
212	90	108	130	156	180	195	200	196	179	156	135	119	108	105	111	123	138	148	153	148	136	120	102	88
213	87	98	117	138	158	175	183	184	175	154	133	112	93	80	74	77	89	103	112	113	110	103	93	84
214	84	92	108	126	146	163	182	192	204	198	187	167	151	137	129	124	119	119	120	122	124	122	119	116
215	115	116	122	129	141	154	167	179	187	190	187	174	158	142	124	104	90	81	76	78	84	91	97	100
216	102	101	101	102	107	117	128	140	152	161	167	166	158	143	126	108	91	76	63	61	68	84	97	113
217	124	131	132	131	130	130	138	148	160	173	184	190	190	181	164	144	122	100	82	69	64	71	80	107
218	125	137	141	140	133	124	119	120	131	144	160	174	183	180	167	148	125	100	75	55	44	49	67	93
219	114	133	142	142	135	124	113	108	114	131	148	165	180	190	188	175	151	128	104	80	65	59	73	96
220	121	142	155	161	158	148	131	121	121	133	148	168	185	196	198	189	167	144	118	91	69	57	57	79
221	106	129	149	156	155	145	128	112	103	107	125	143	163	178	188	186	173	149	123	98	72	55	51	64
222	92	119	140	150	151	142	126	107	94	89	103	123	144	165	179	183	173	154	129	104	78	61	54	70
223	99	128	153	169	180	187	181	170	156	149	152	162	175	190	201	209	207	196	175	149	123	100	84	80
224	87	107	129	146	156	154	144	127	110	97	91	98	111	129	147	161	165	161	144	122	96	72	55	53
225	65	90	115	138	149	152	145	129	110	93	82	83	95	115	137	156	167	169	163	146	125	105	91	89
226	99	117	138	155	167	170	166	150	129	110	92	80	79	92	111	130	145	148	146	132	114	95	81	77
227	88	110	133	155	169	177	174	163	141	123	108	***	***	***	***	***	***	***	***	***	***	***	***	***

Remarks : Average Water Level = ACD + 135cm

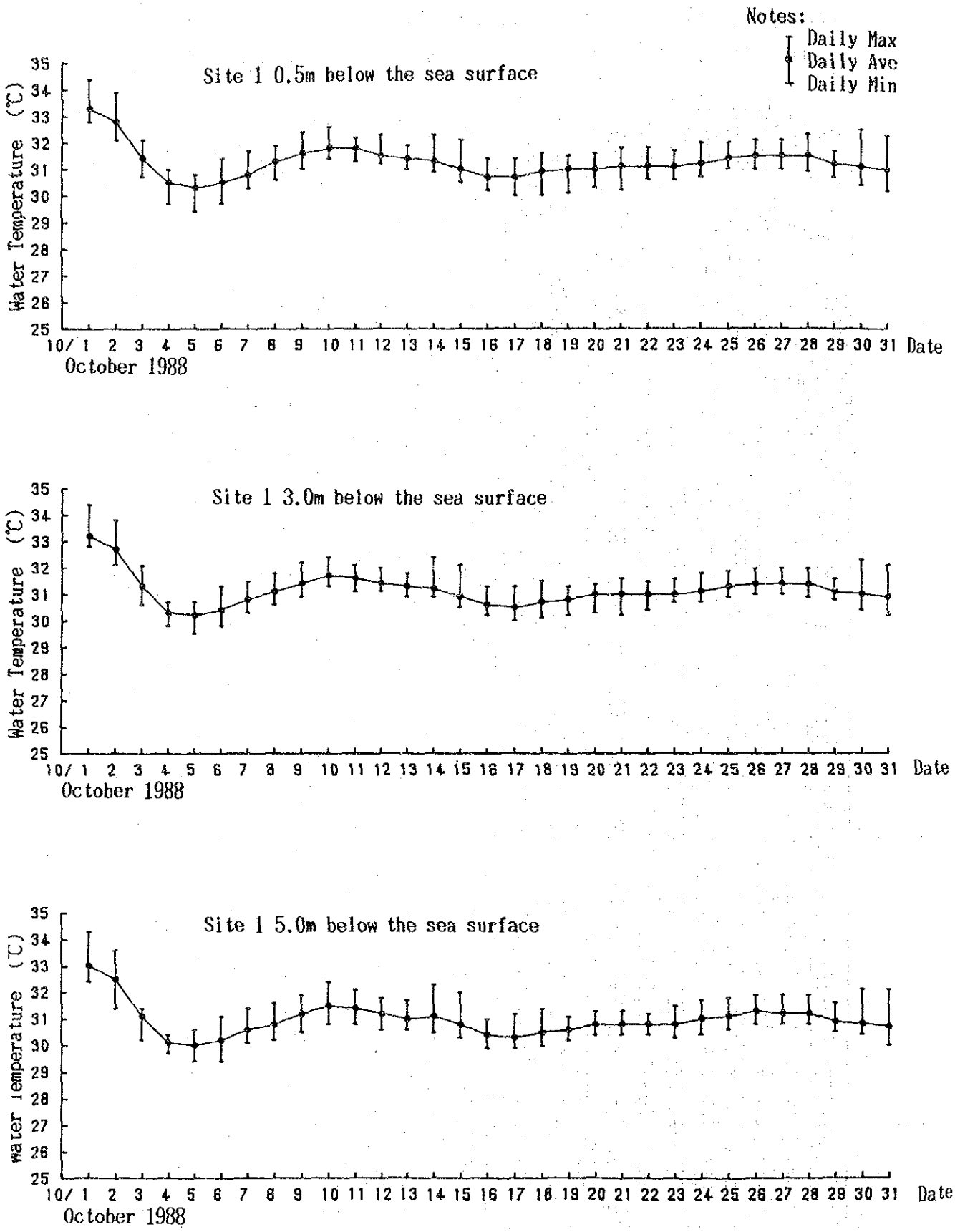
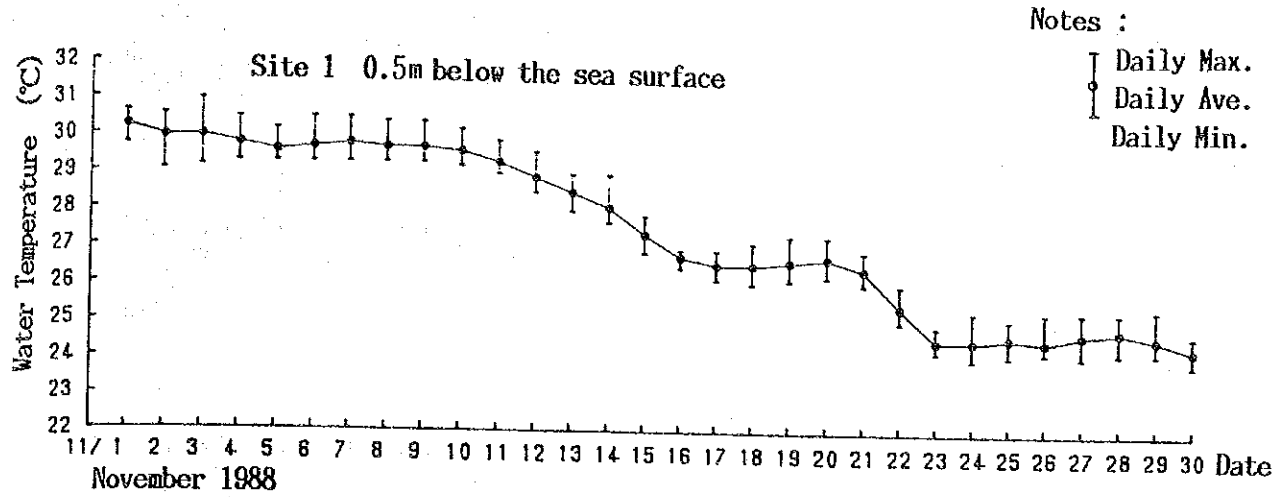
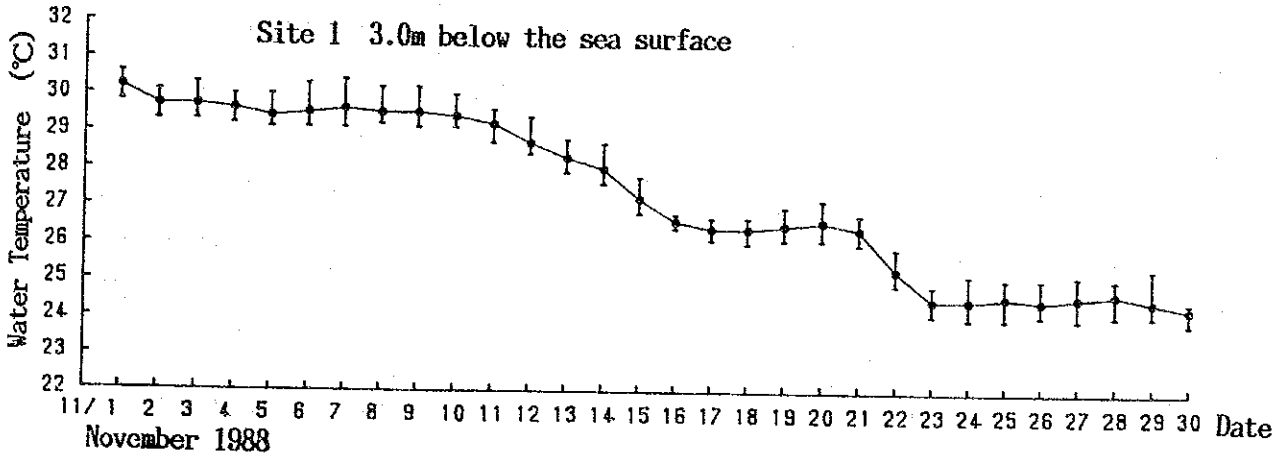


Fig. 3.10.13(1) Variation of Daily Water Temperature near UAN Intake





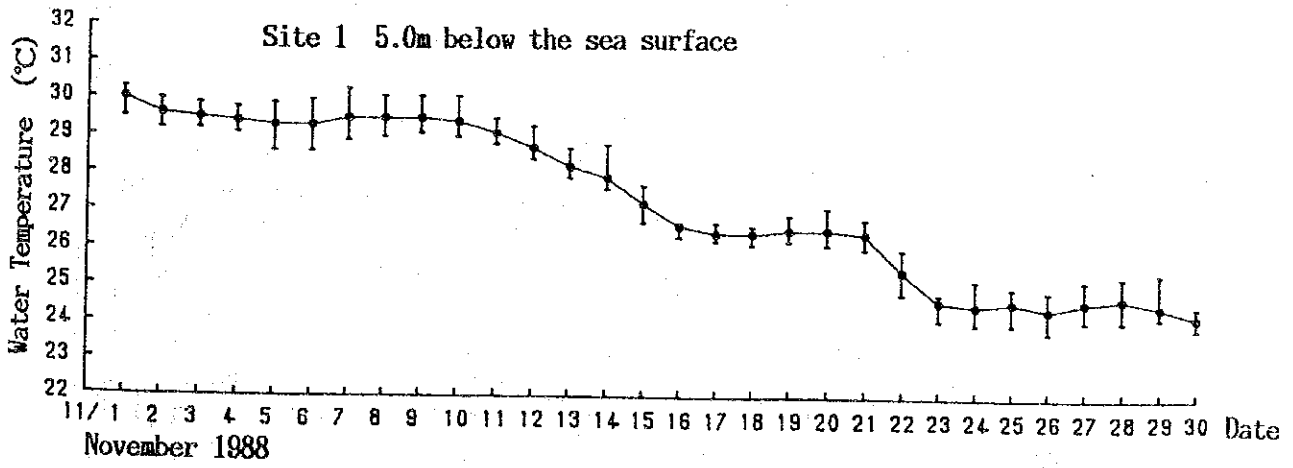
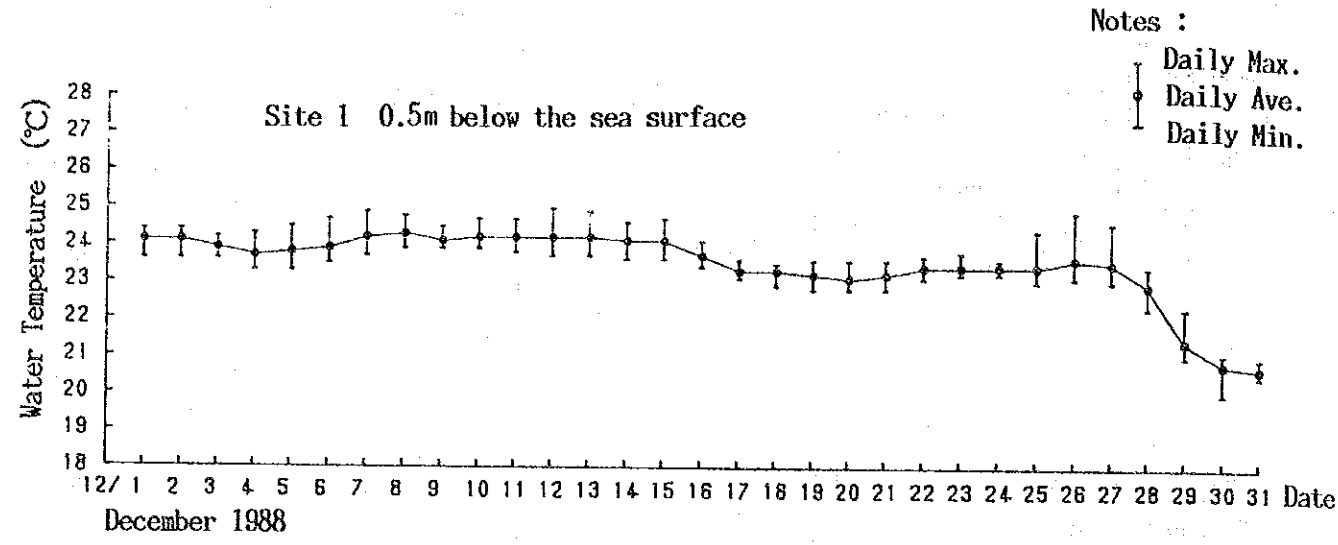
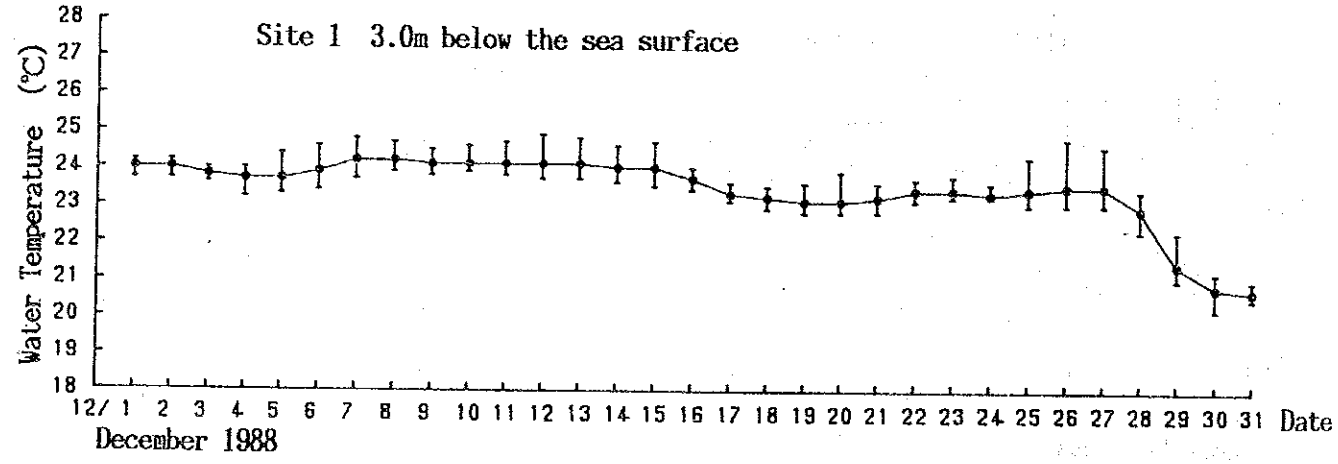


Fig. 3.10.13(2) Variation of Daily Water Temperature near UAN Intake





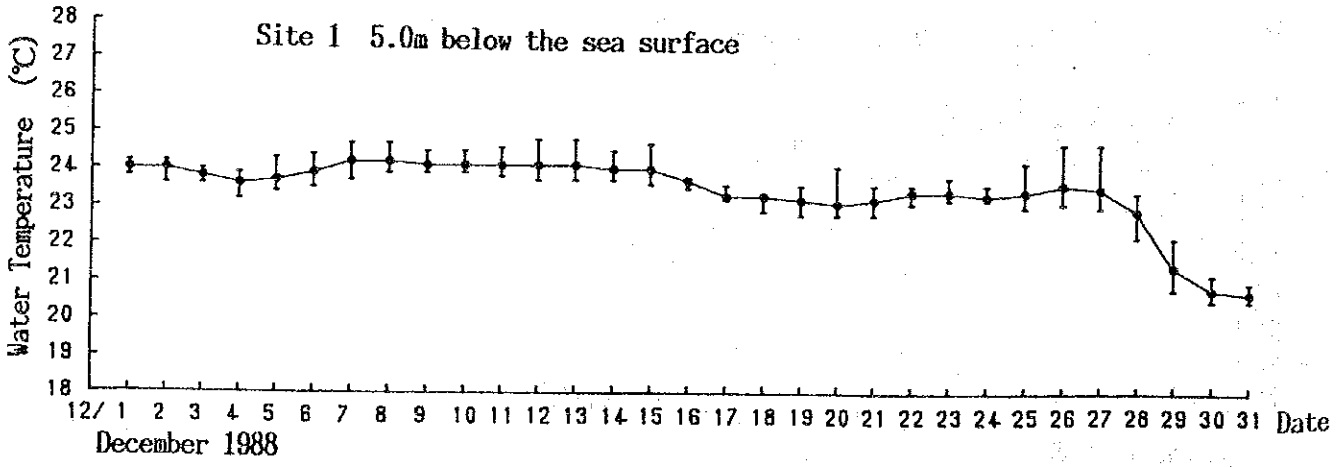
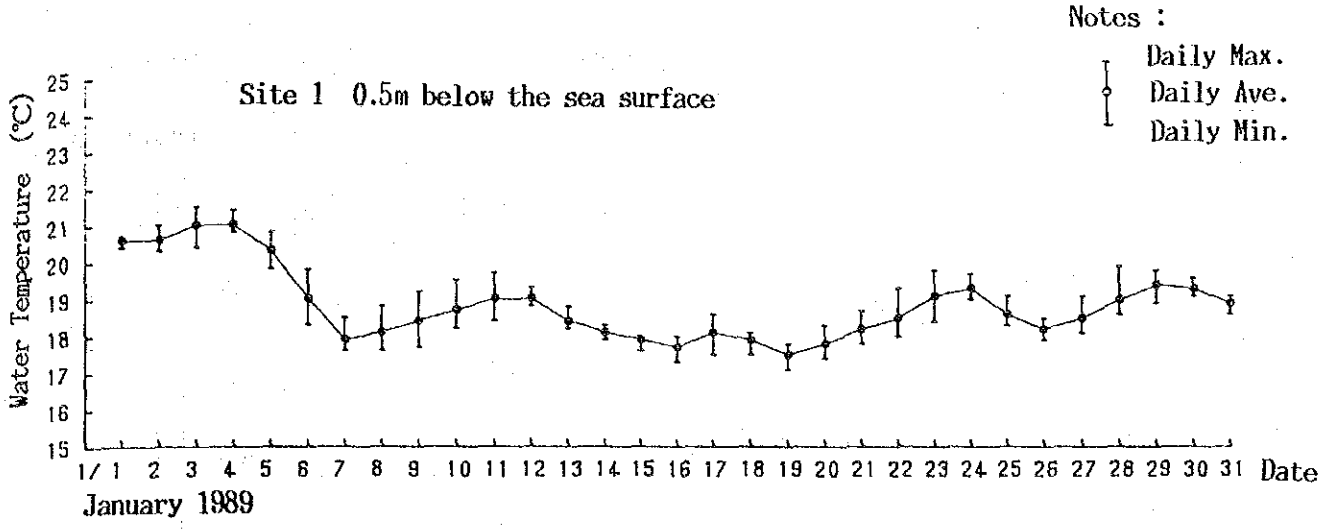
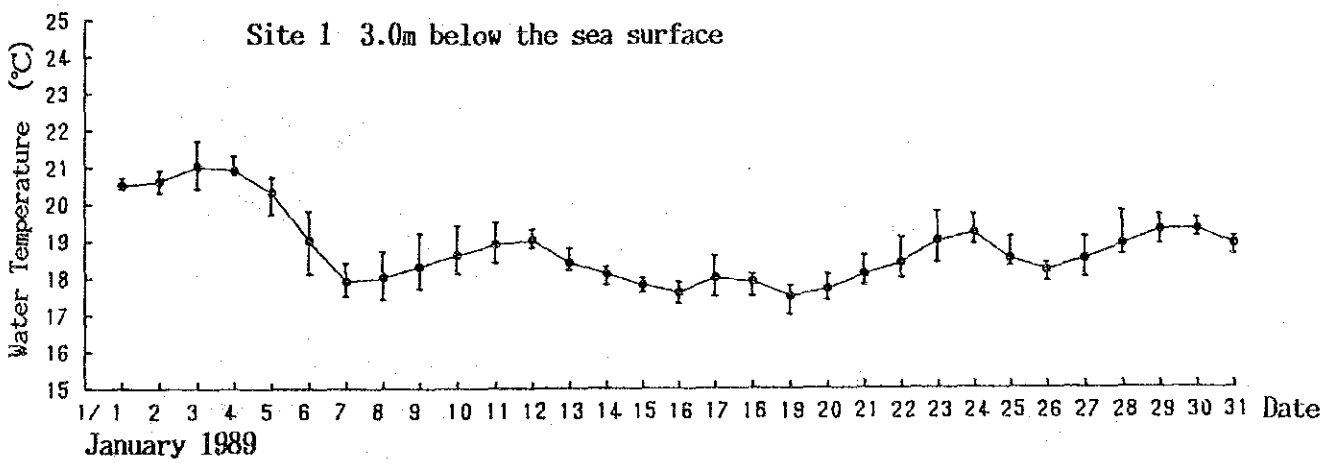


Fig. 3.10.13(3) Variation of Daily Water Temperature near UAN Intake





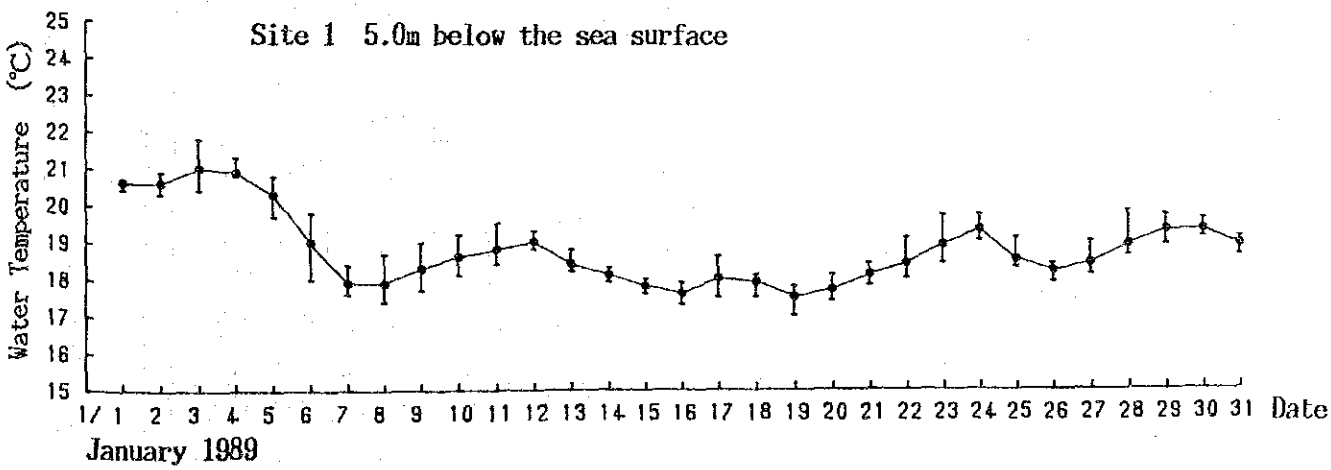
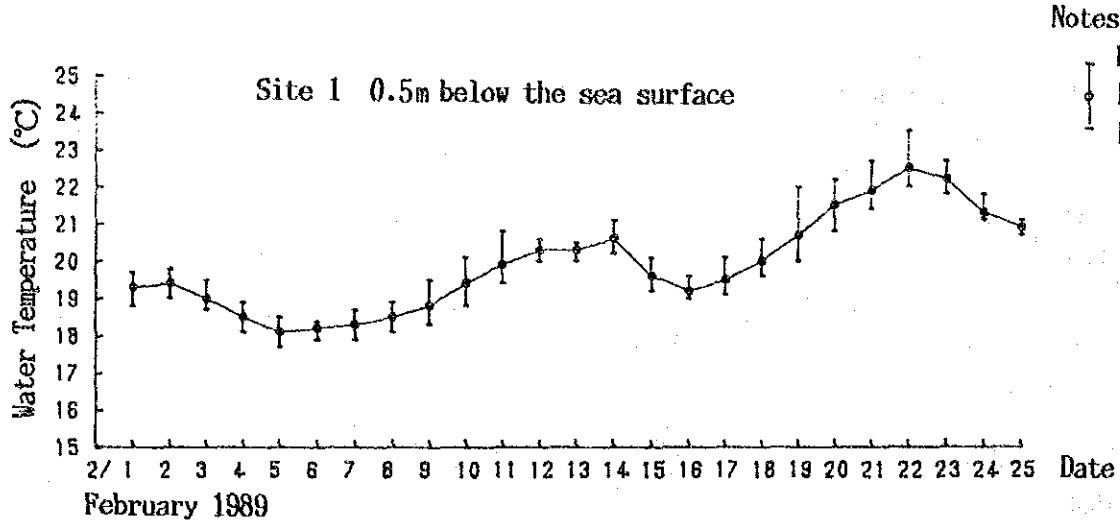
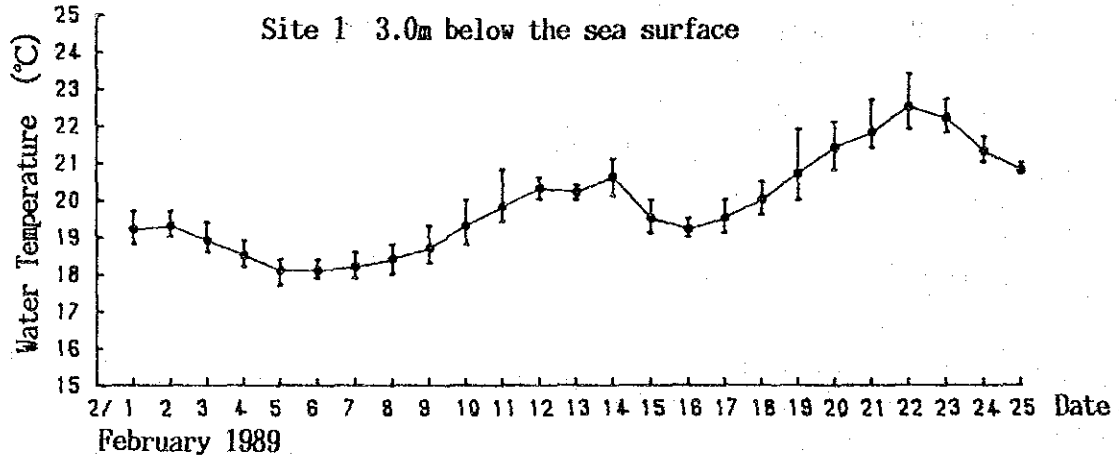


Fig. 3.10.13(4) Variation of Daily Water Temperature near UAN Intake





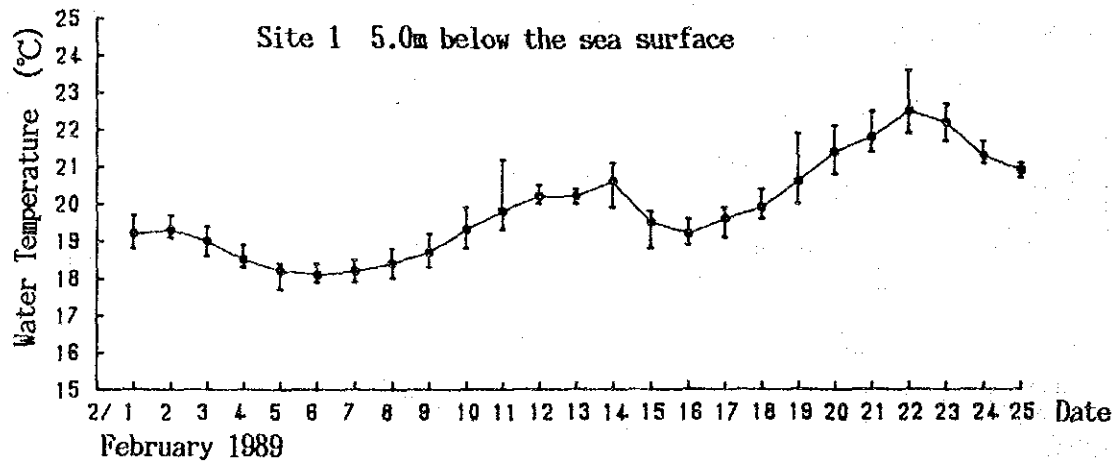


Fig. 3.10.13(5) Variation of Daily Water Temperature near UAN Intake

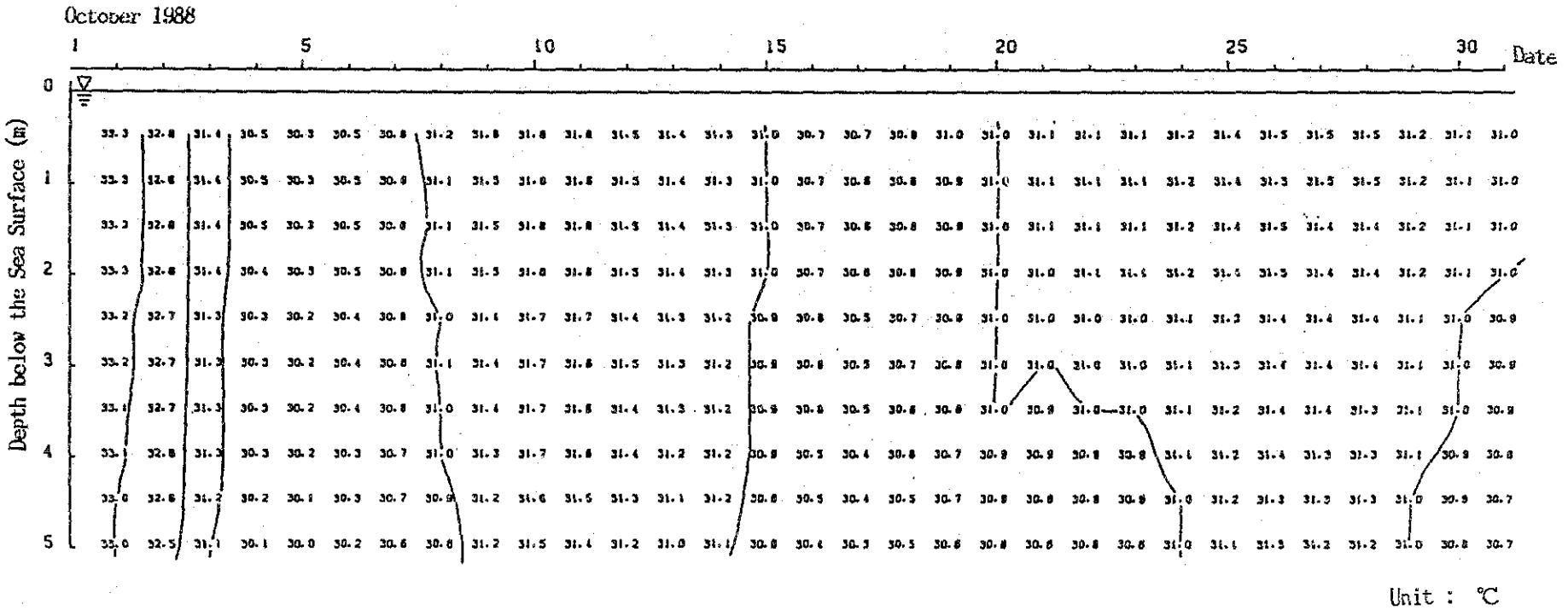


Fig. 3.10.14(1) Variation of Daily Average Water Temperature at Each Layer near UAN Intake

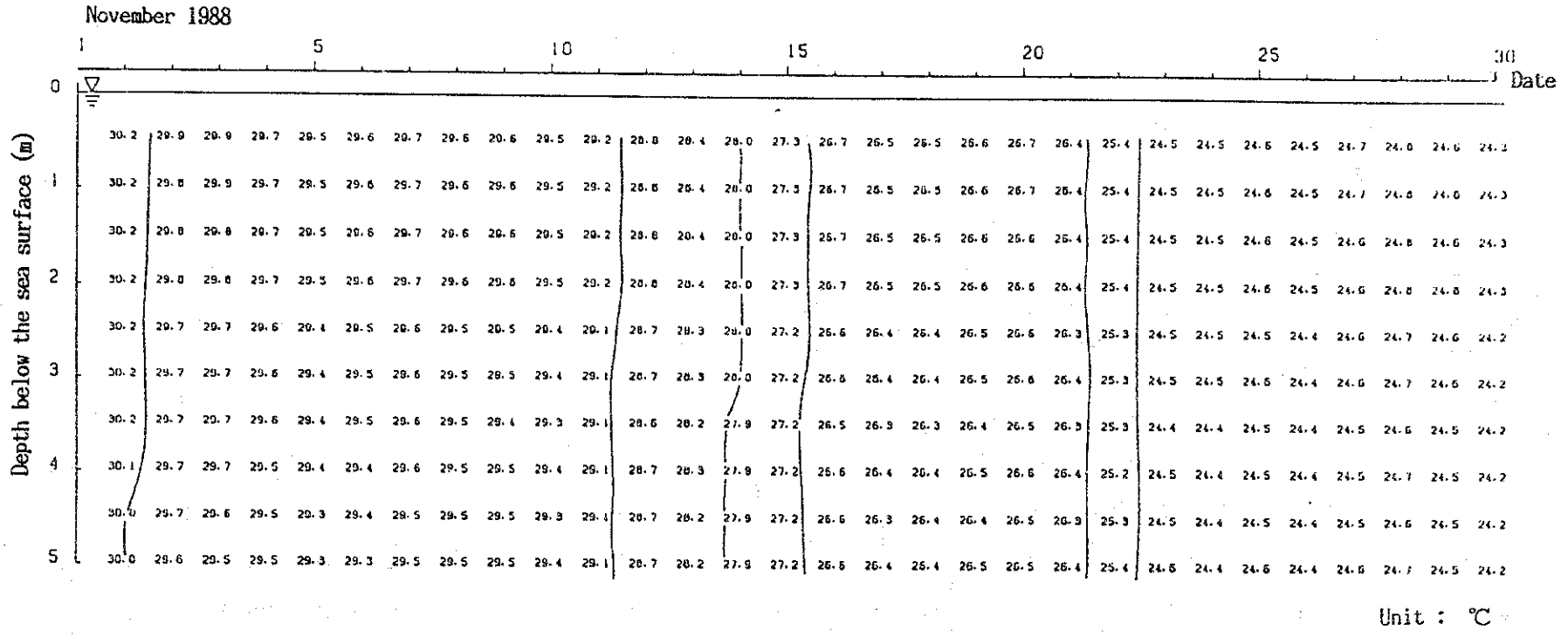


Fig. 3.10.14(2) Variation of Daily Average Water Temperature at Each Layer near UAN Intake

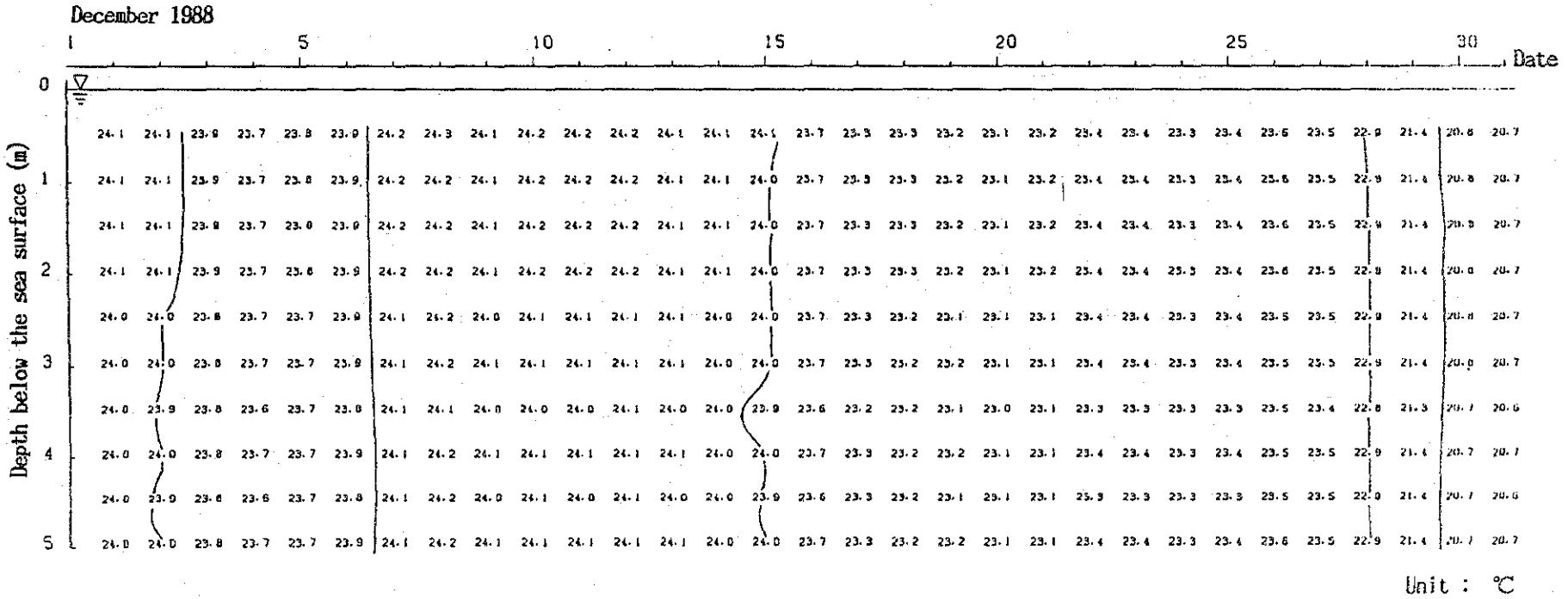


Fig. 3.10.14(3) Variation of Daily Average Water Temperature at Each Layer near UAN Intake

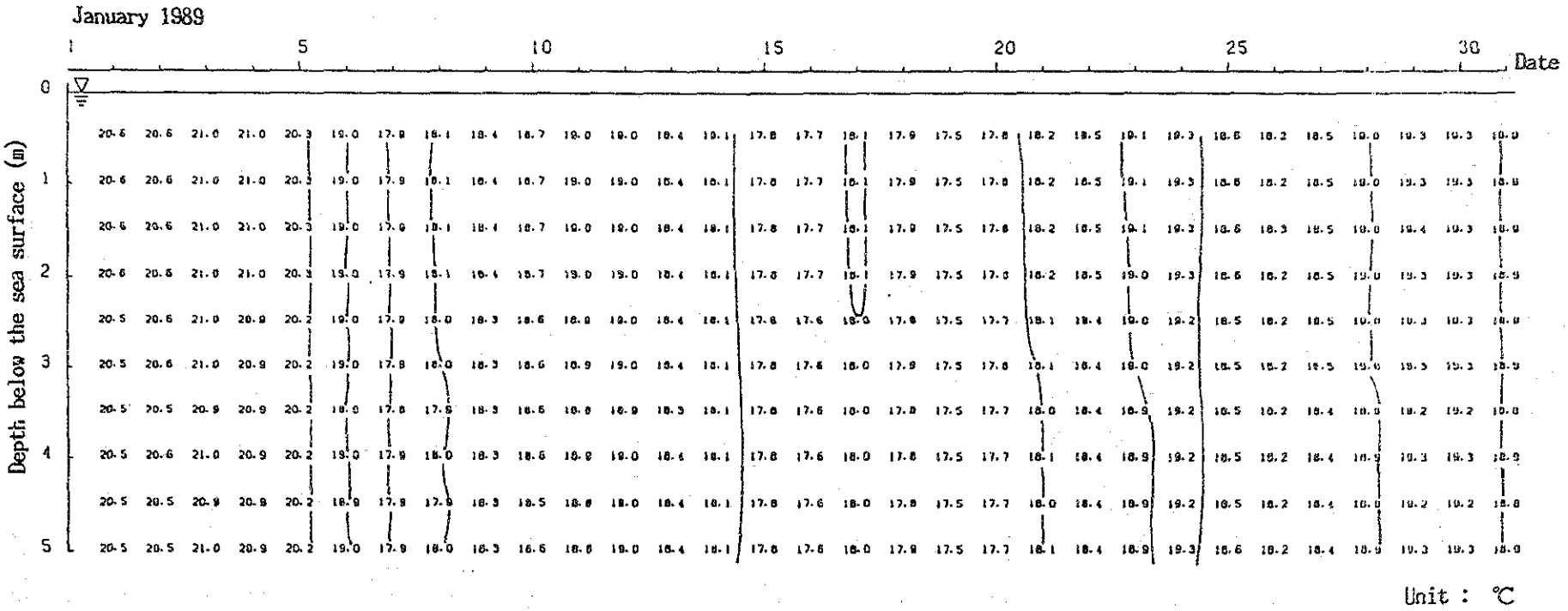


Fig. 3.10.14(4) Variation of Daily Average Water Temperature at Each Layer near UAN Intake

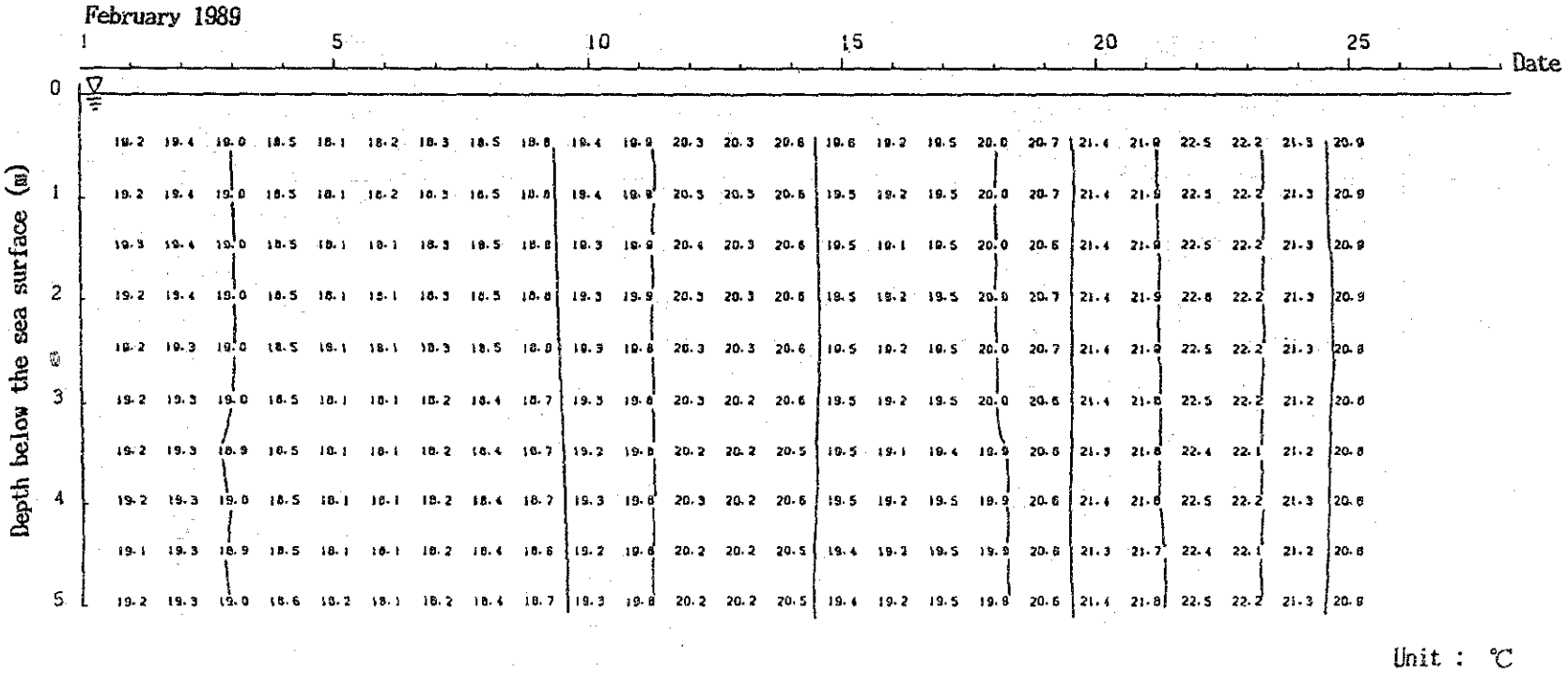


Fig. 3.10.14(5) Variation of Daily Average Water Temperature at Each Layer near UAN Intake

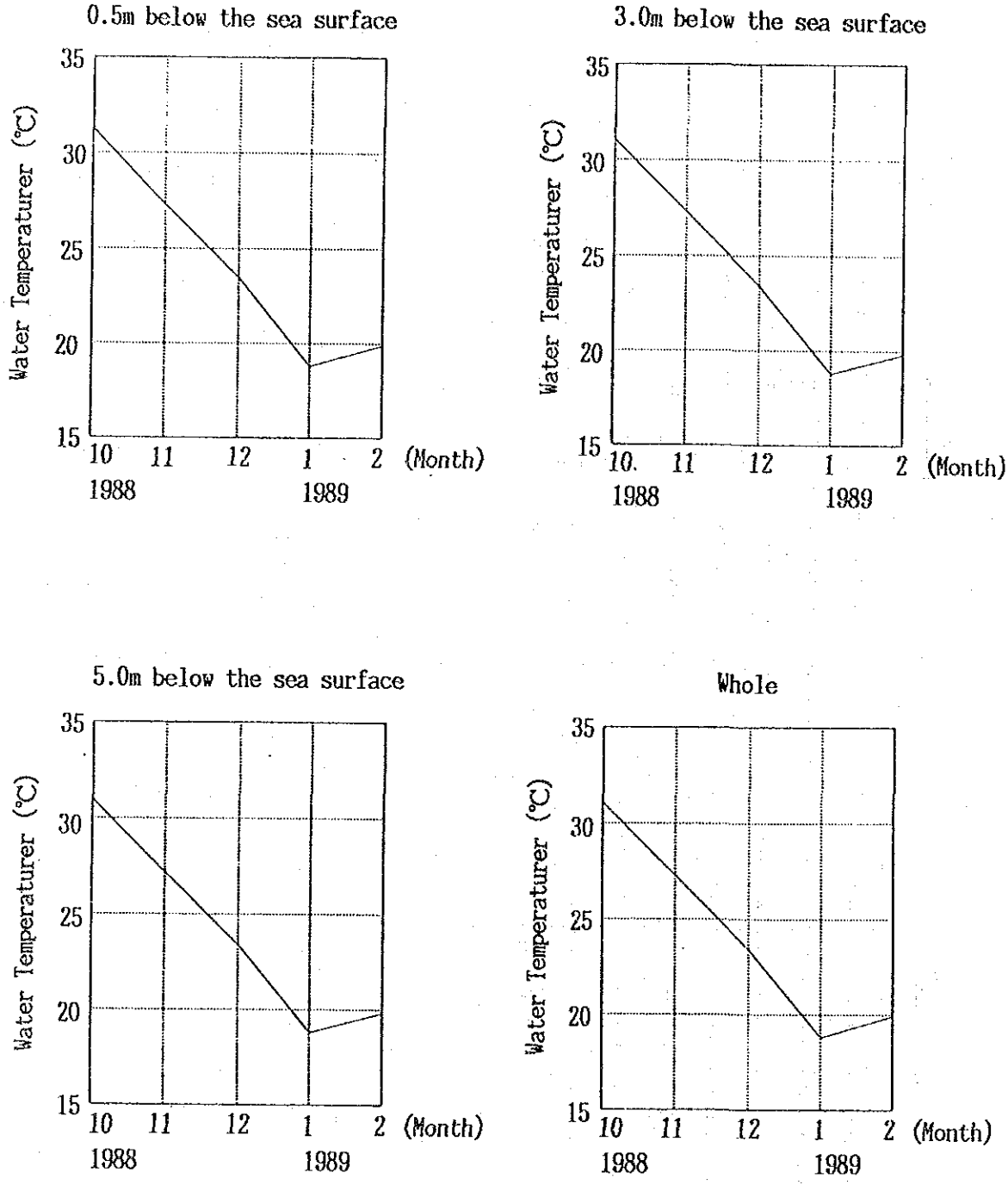


Fig. 3.10.15 Variation of Monthly Average Water Temperature

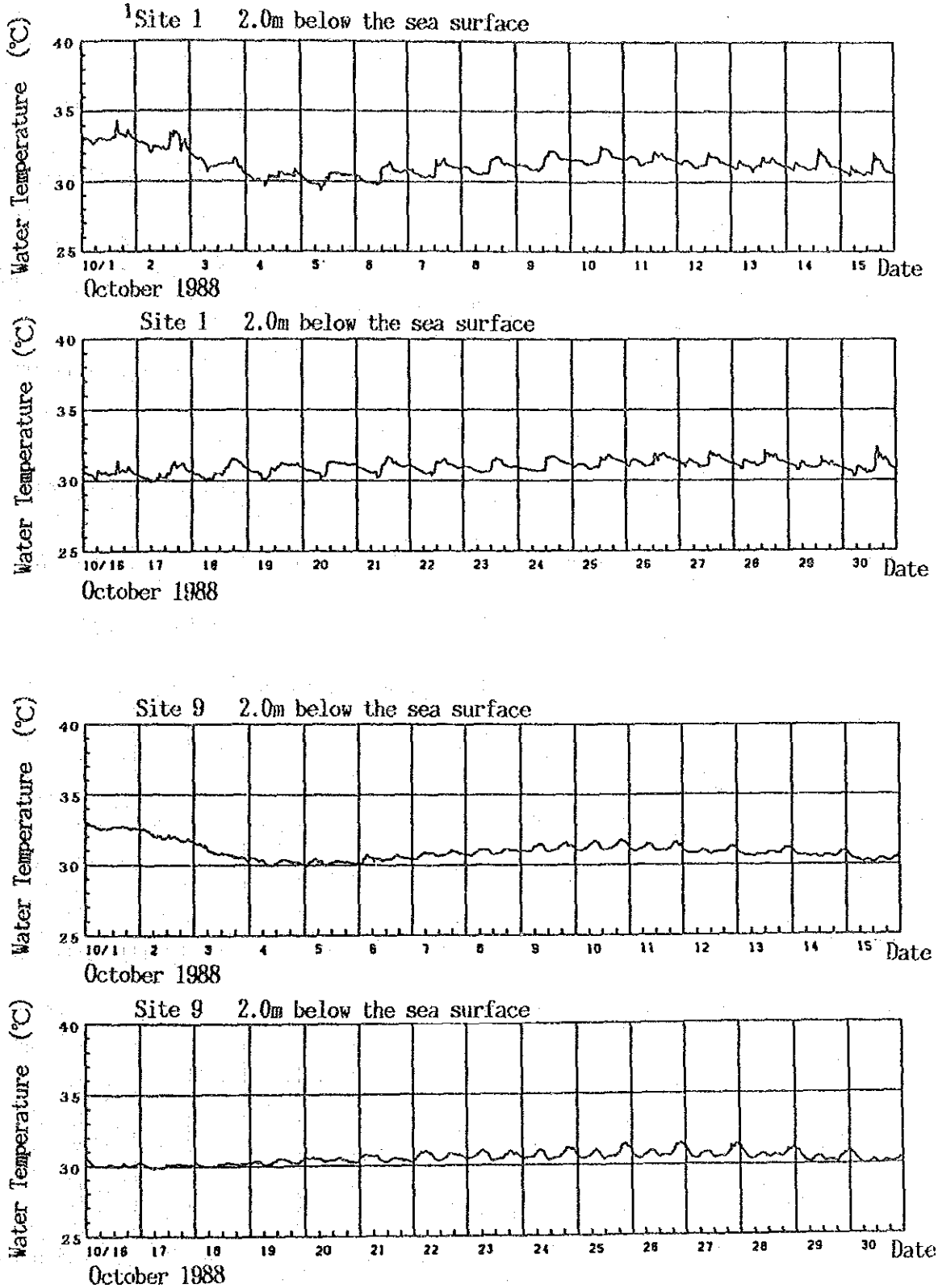


Fig. 3.10.16(1) Consecutive Observations of Water Temperature in the Second Field Survey

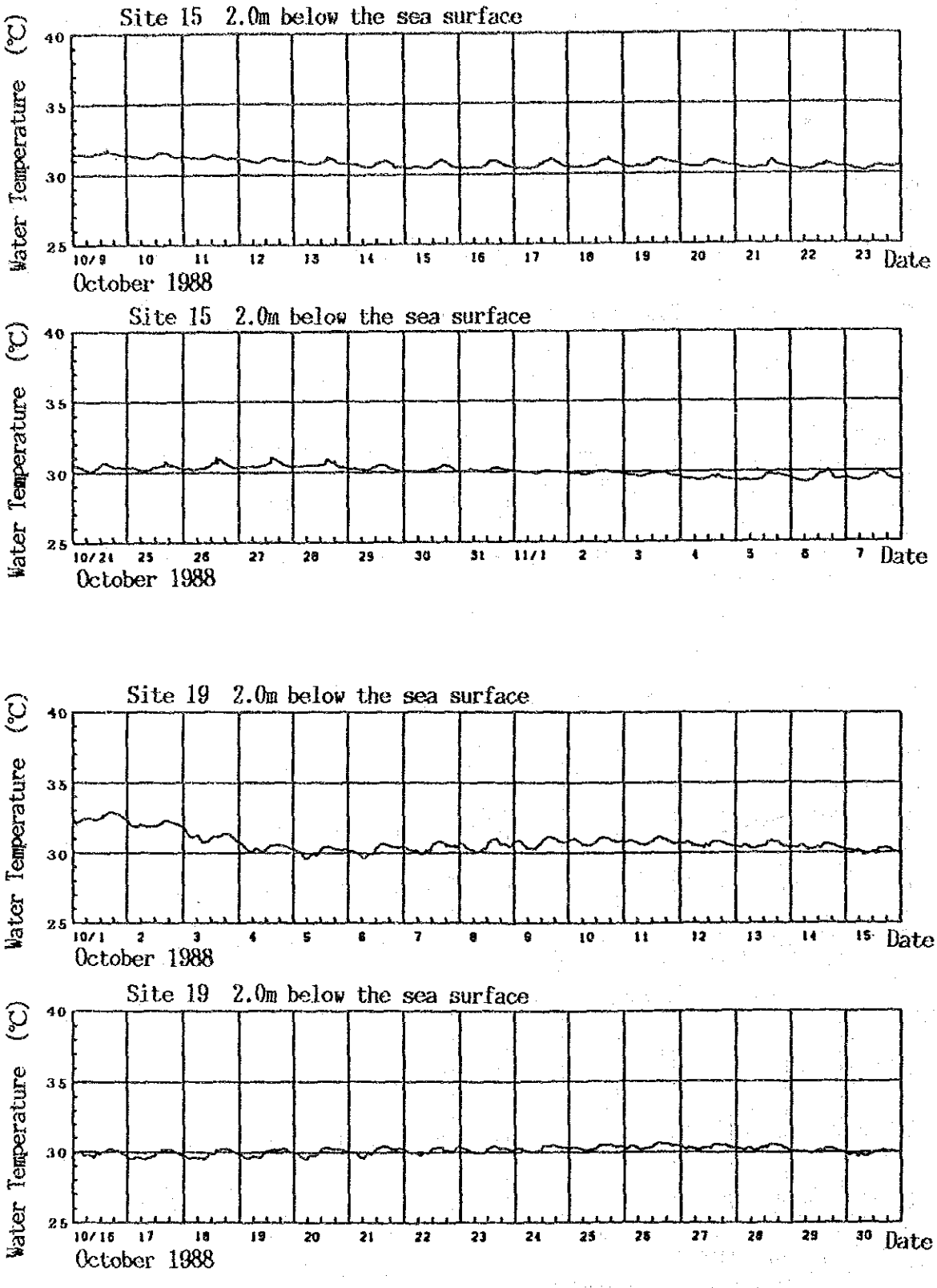
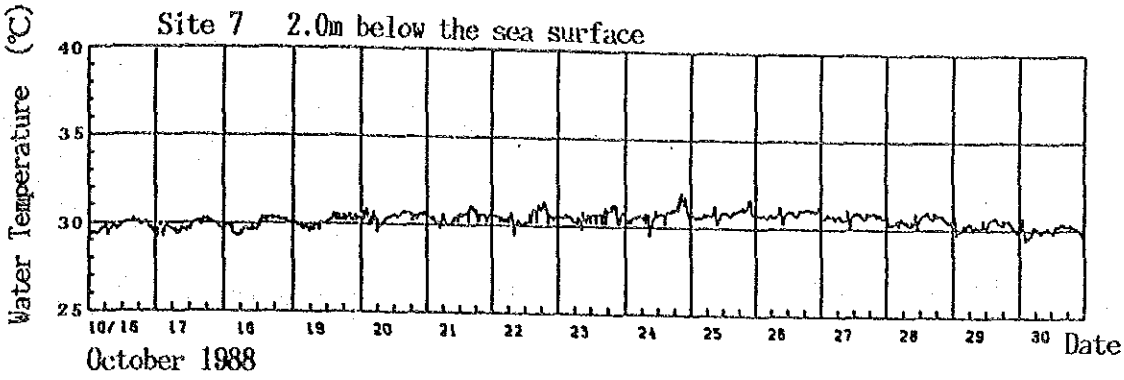
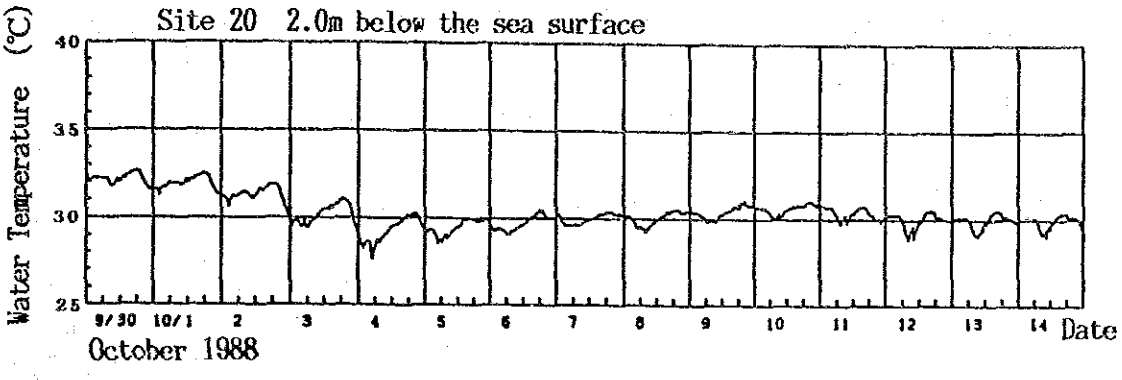
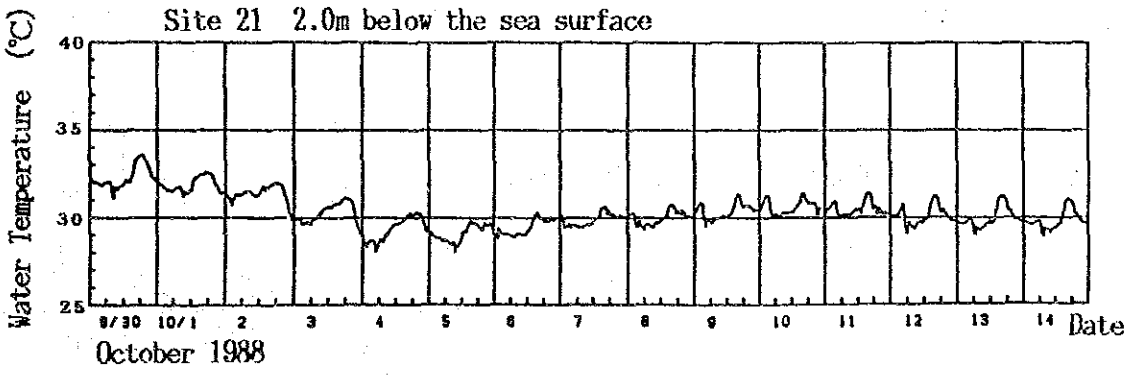


Fig. 3.10.16(2) Consecutive Observations of Water Temperature in the Second Field Survey







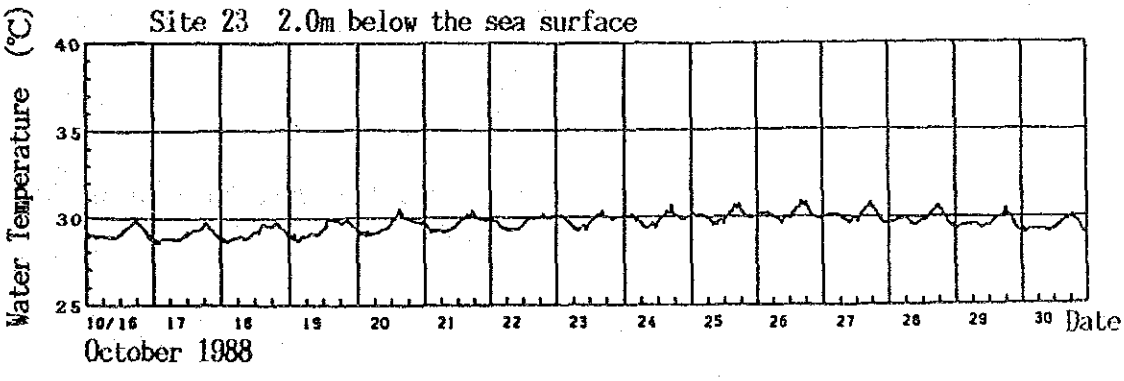
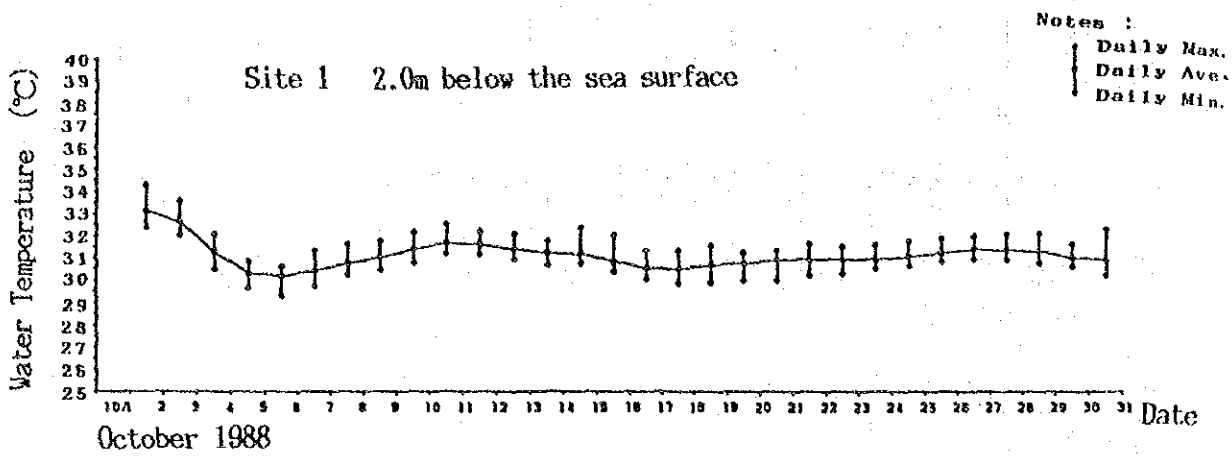


Fig. 3.10.16(3) Consecutive Observations of Water Temperature in the Second Field Survey



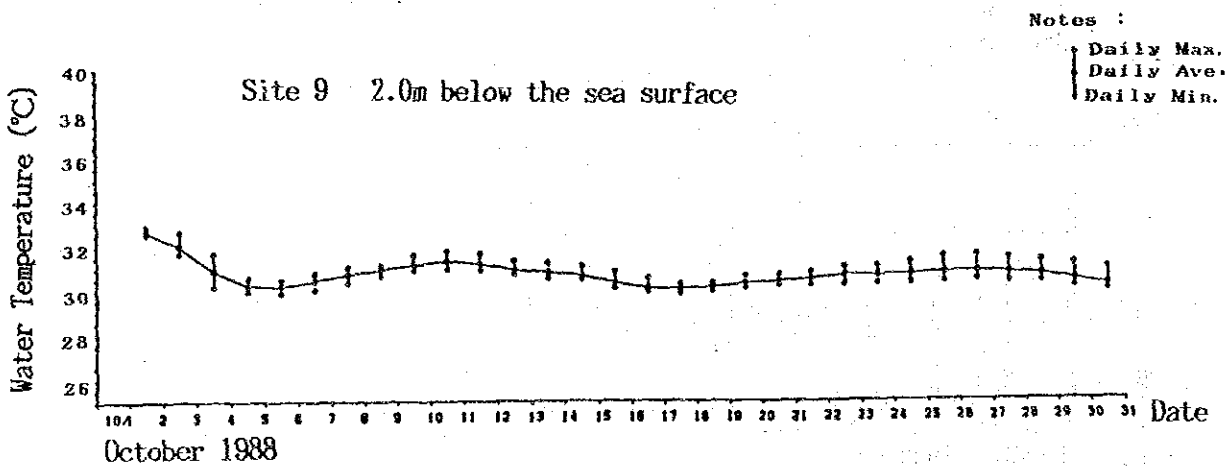
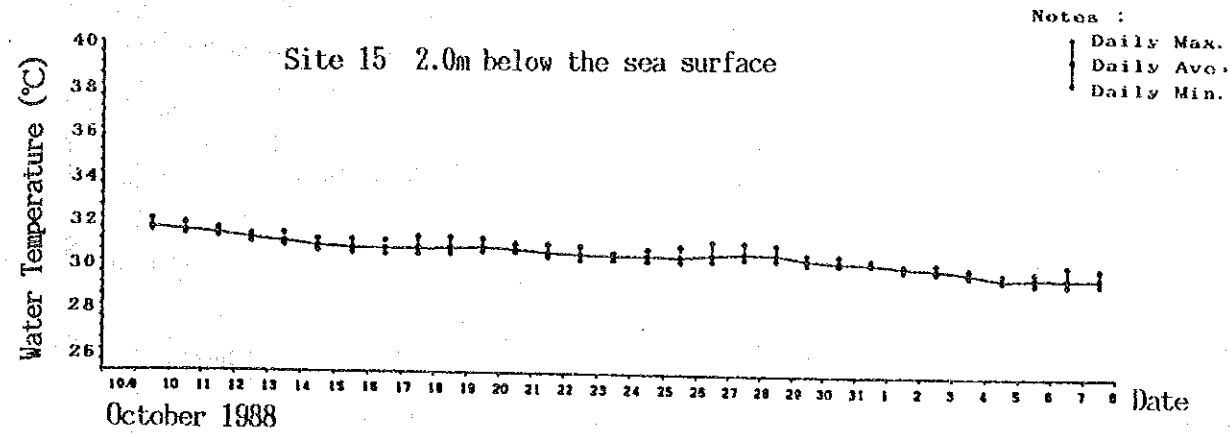


Fig. 3.10.17(1) Variation of Daily Water Temperature at Typical Sites in the Second Field Survey



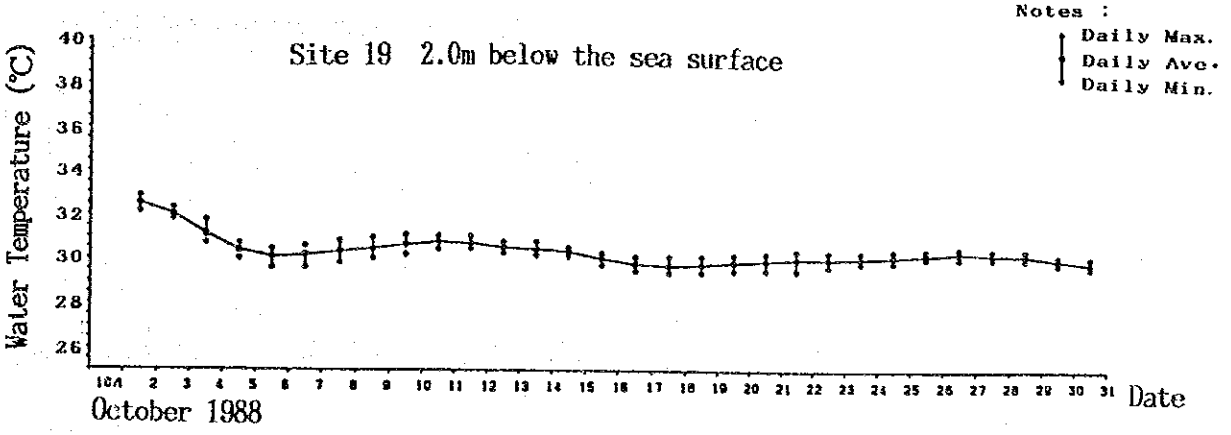
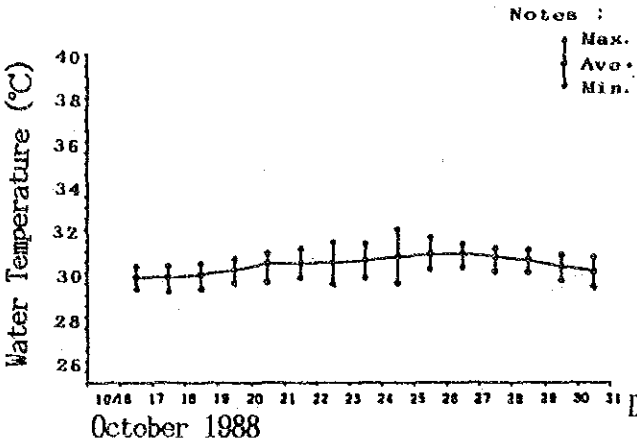
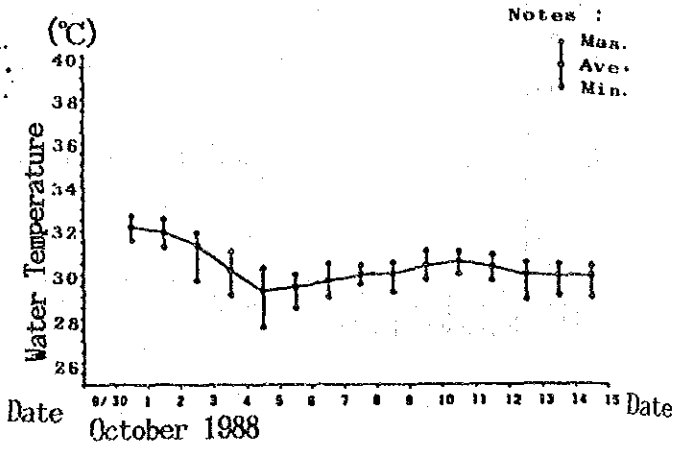


Fig. 3.10.17(2) Variation of Daily Water Temperature at Typical Sites in the Second Field Survey

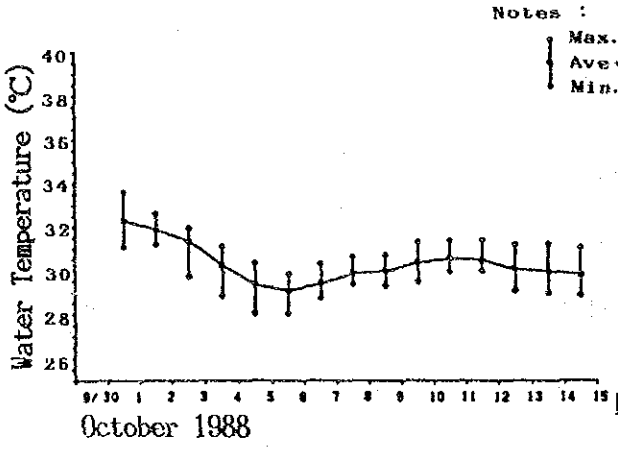
Site 7 2.0m below the sea surface



Site 20 2.0m below the sea surface



Site 21 2.0m below the sea surface



Site 23 2.0m below the sea surface

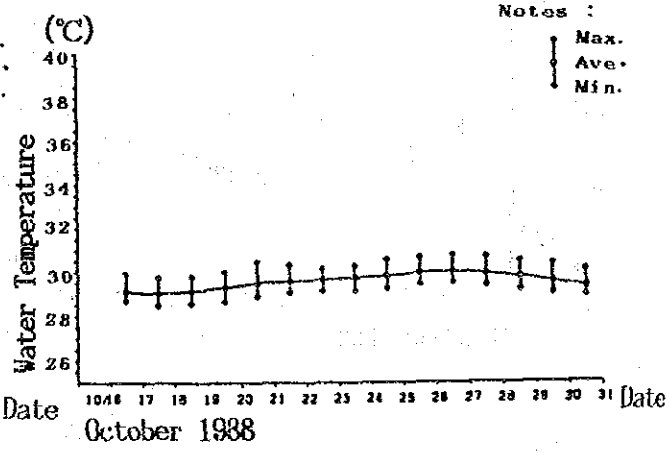


Fig. 3.10.17(3) Variation of Daily Water Temperature at Typical Sites in the Second Field Survey

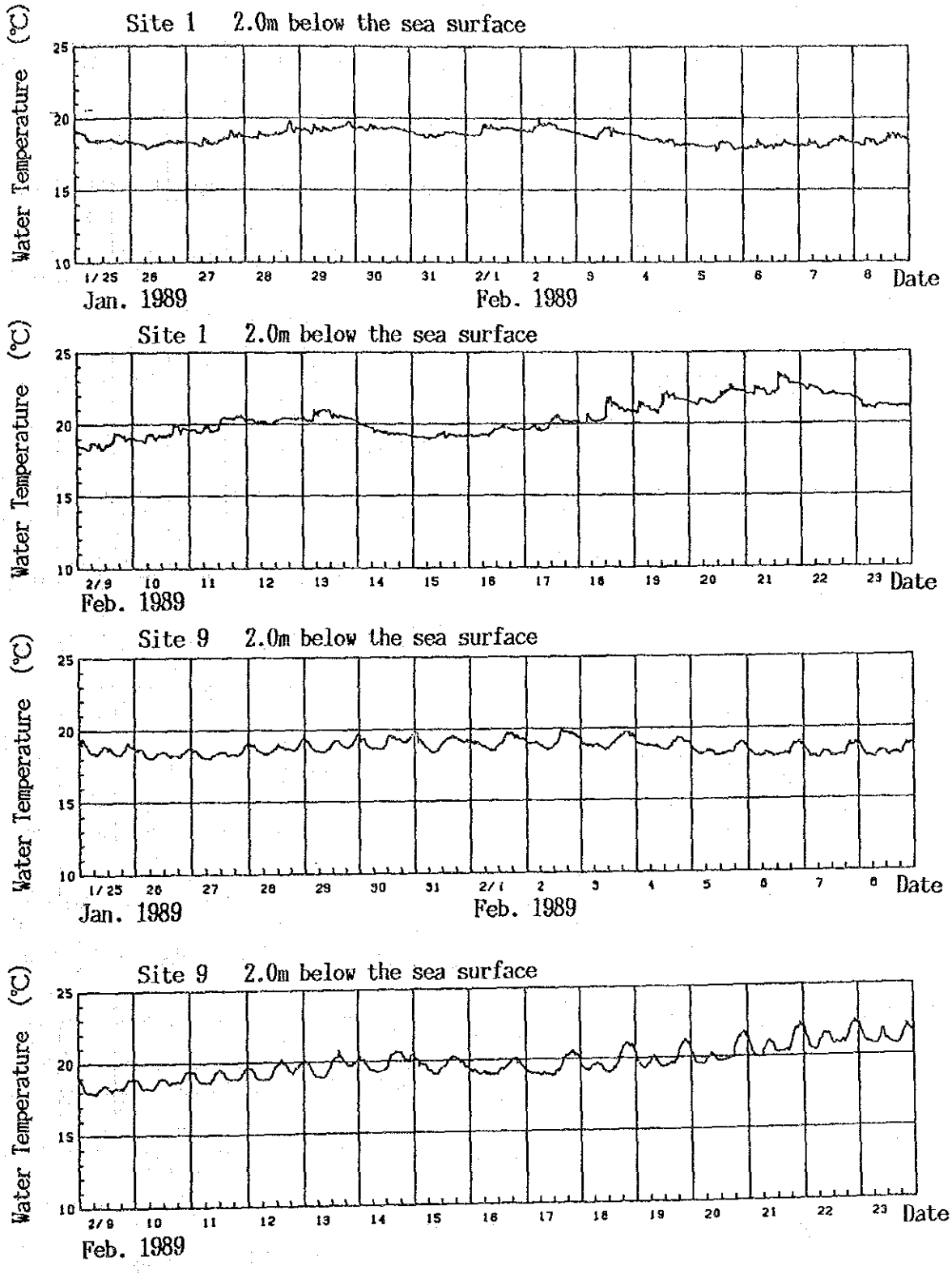


Fig. 3.10.18(1) Consecutive Observations of Water Temperature in the Third Field Survey

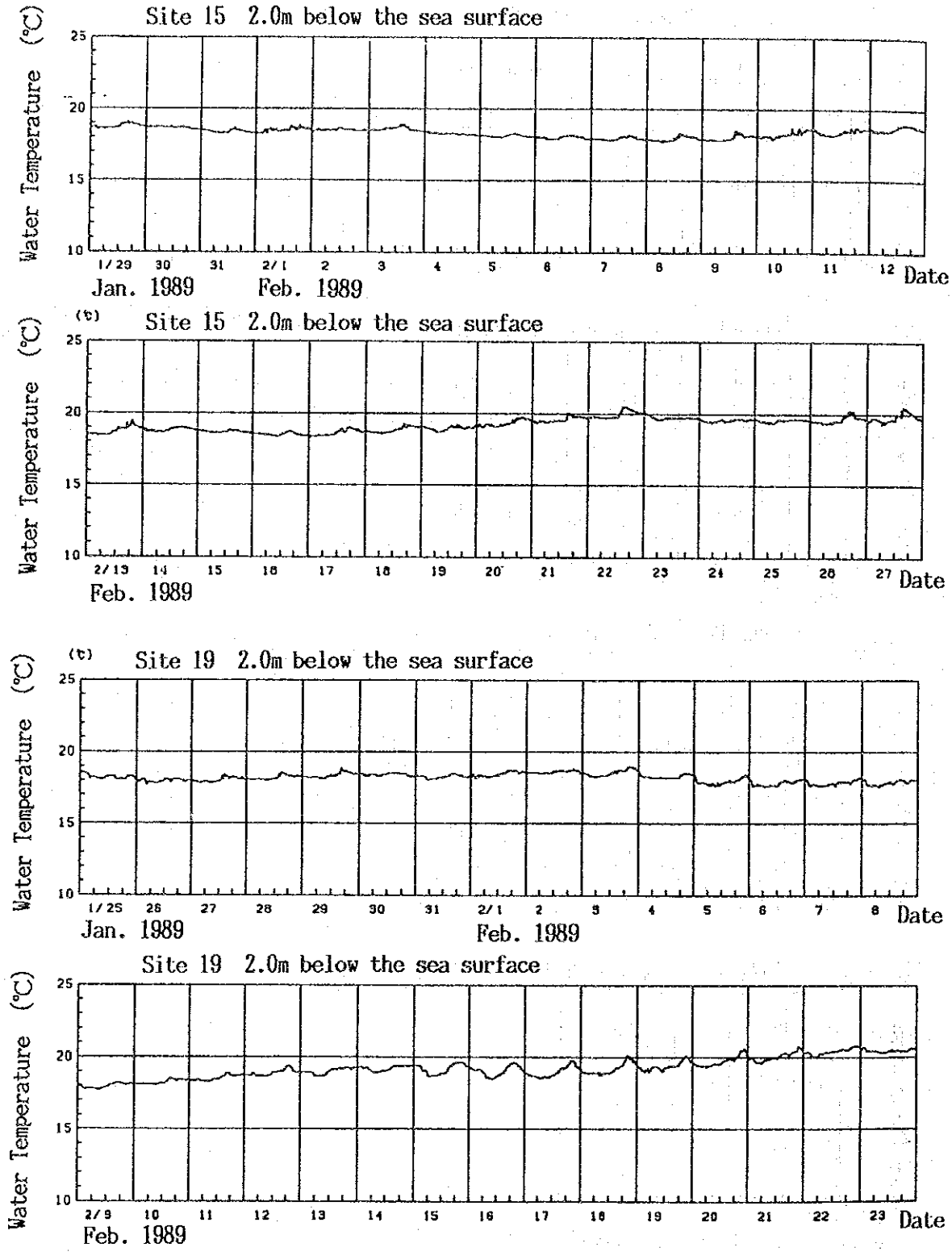
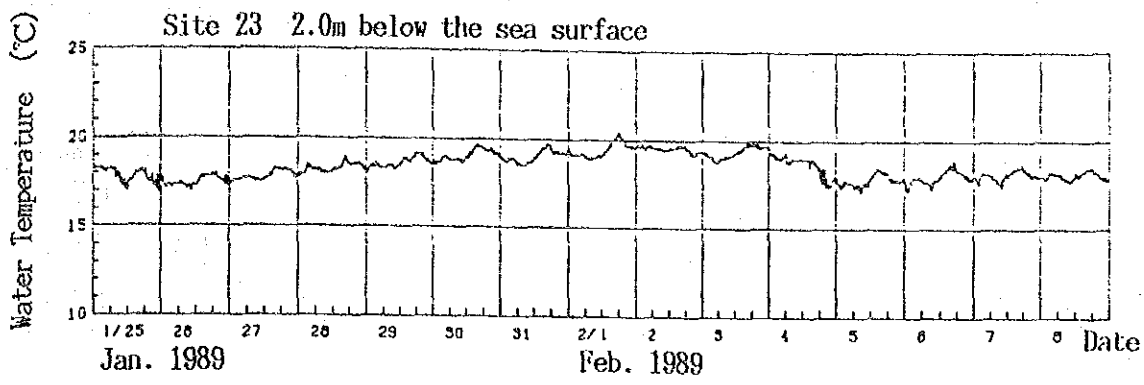
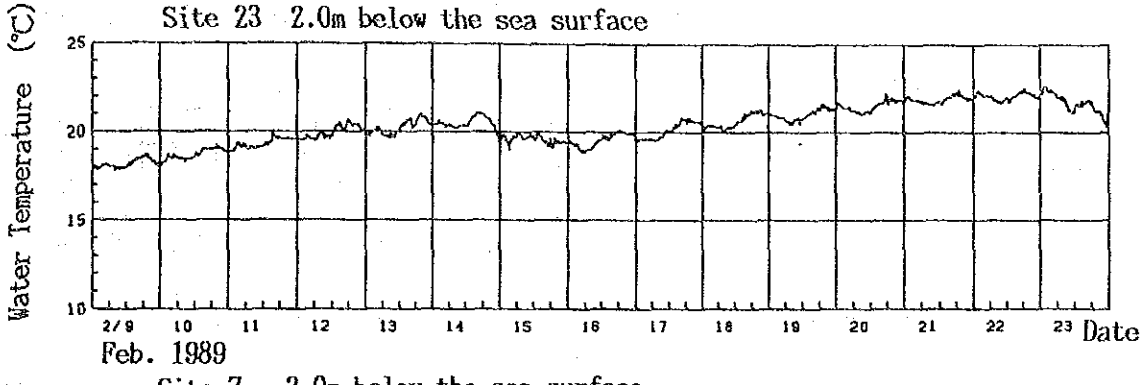
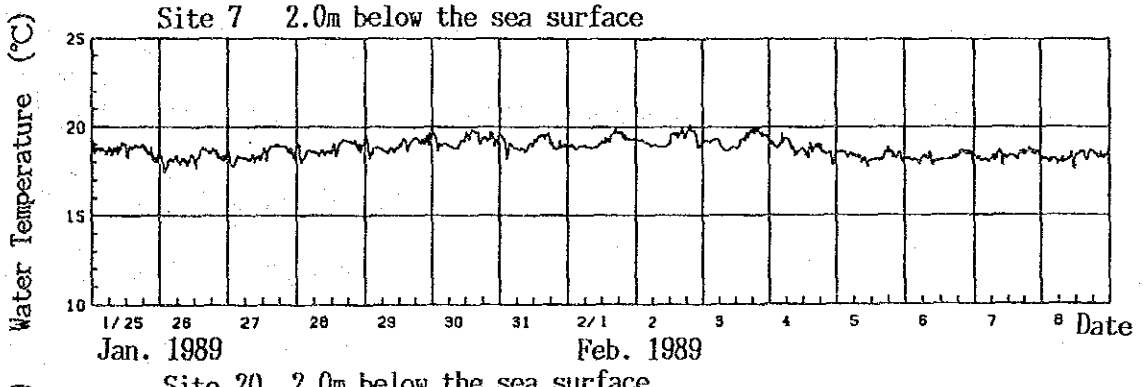
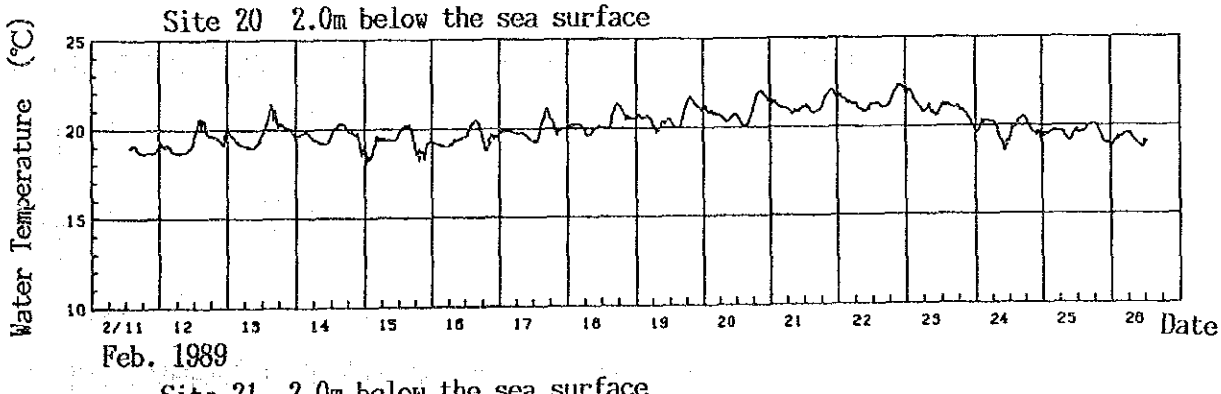


Fig. 3.10.18(2) Consecutive Observations of Water Temperature in the Third Field Survey









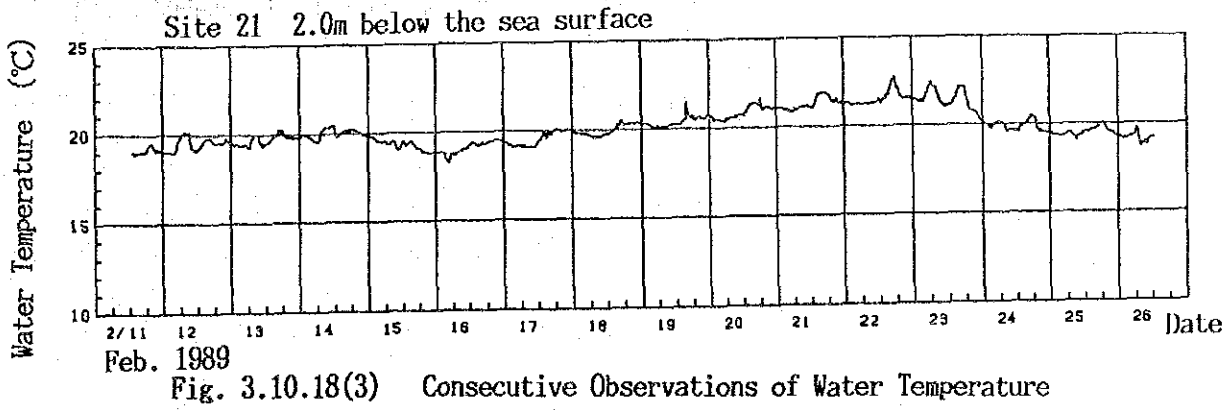
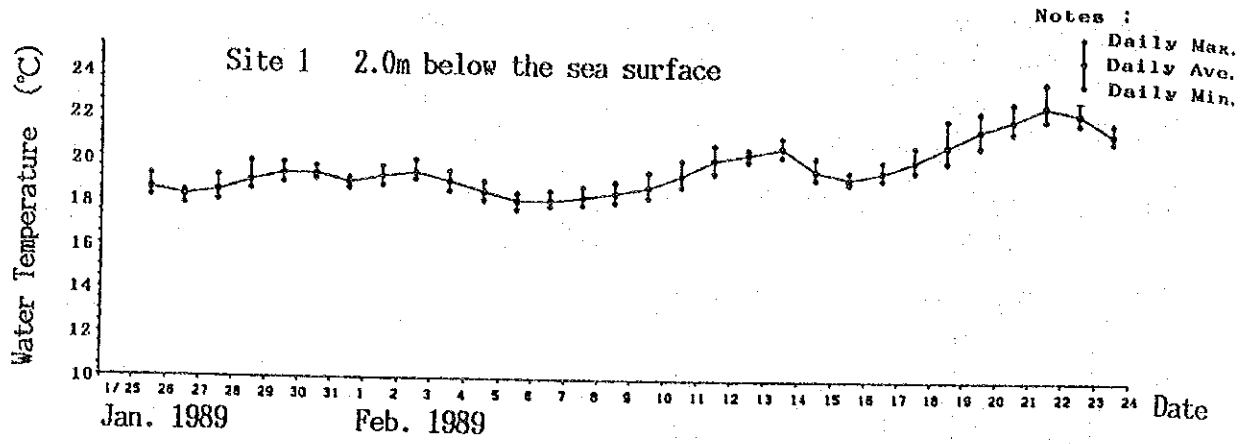


Fig. 3.10.18(3) Consecutive Observations of Water Temperature in the Third Field Survey



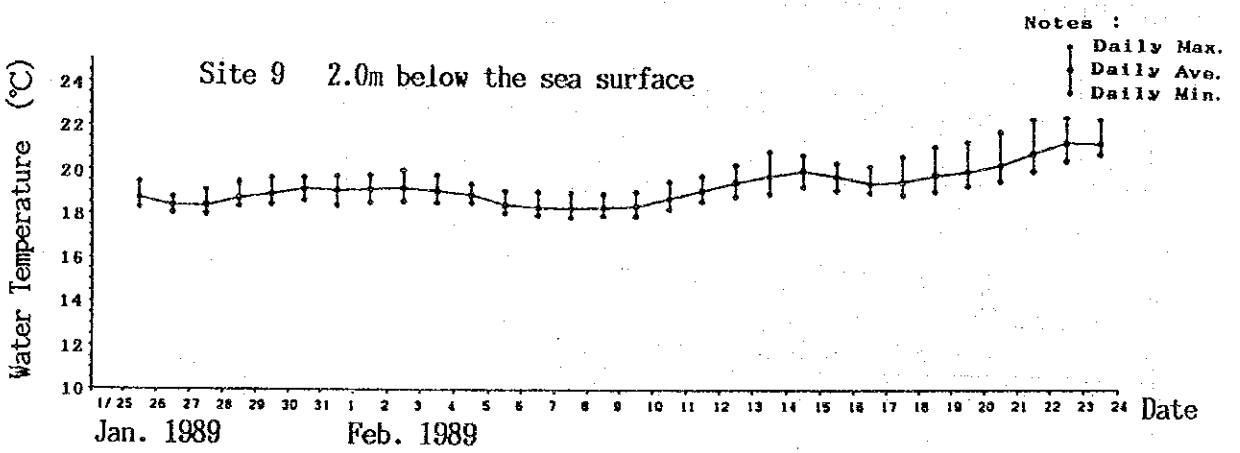
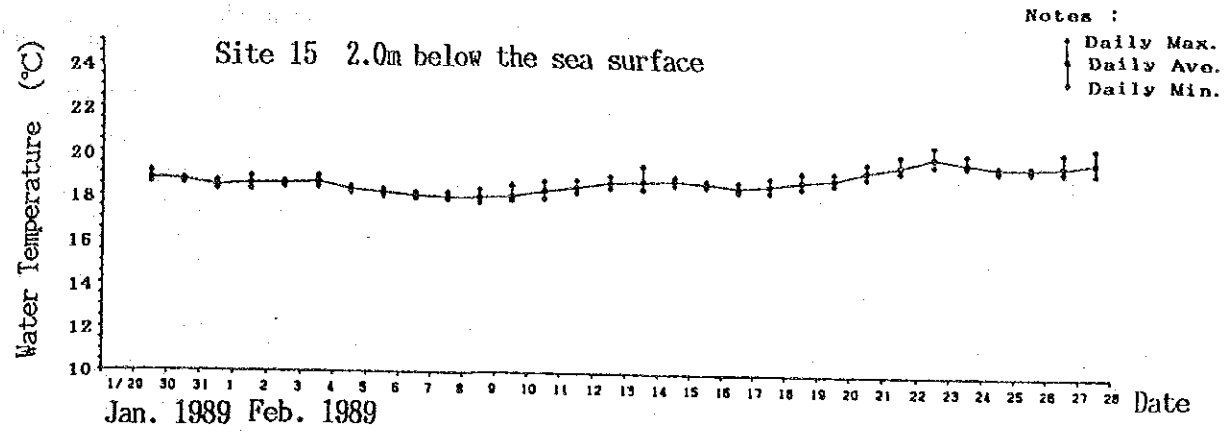
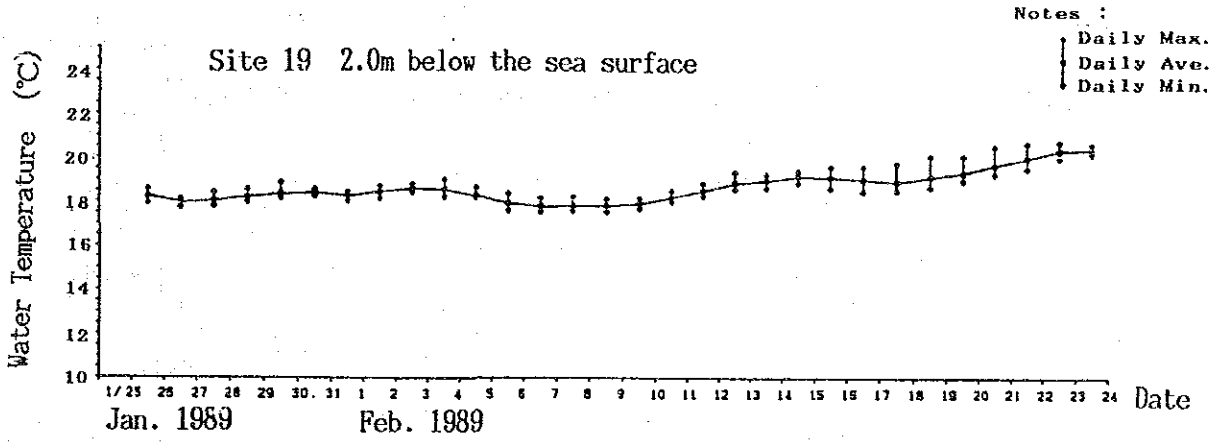


Fig. 3.10.19(1) Variation of Daily Water Temperature at Typical Sites in the Third Field Survey





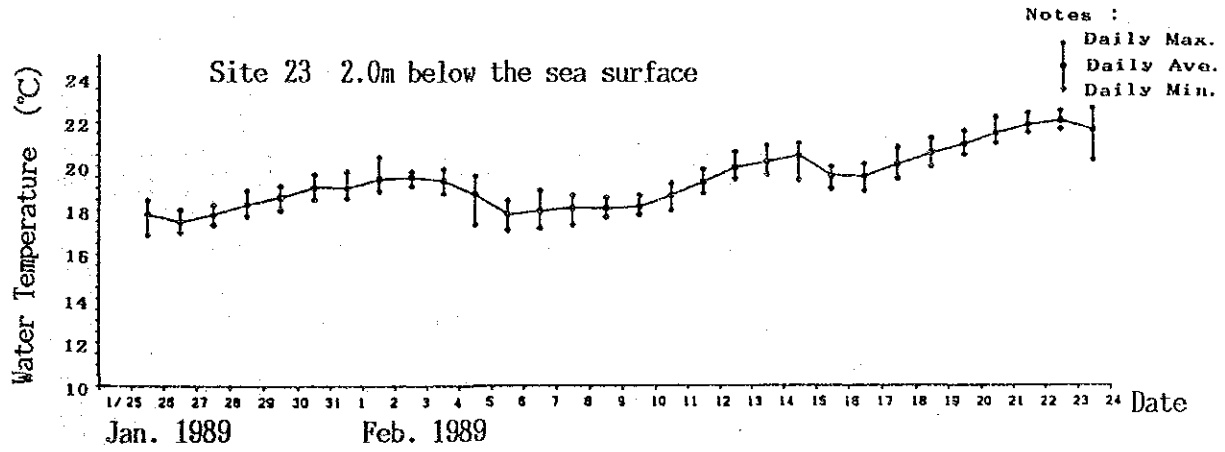


Fig. 3.10.19(2) Variation of Daily Water Temperature at Typical Sites in the Third Field Survey

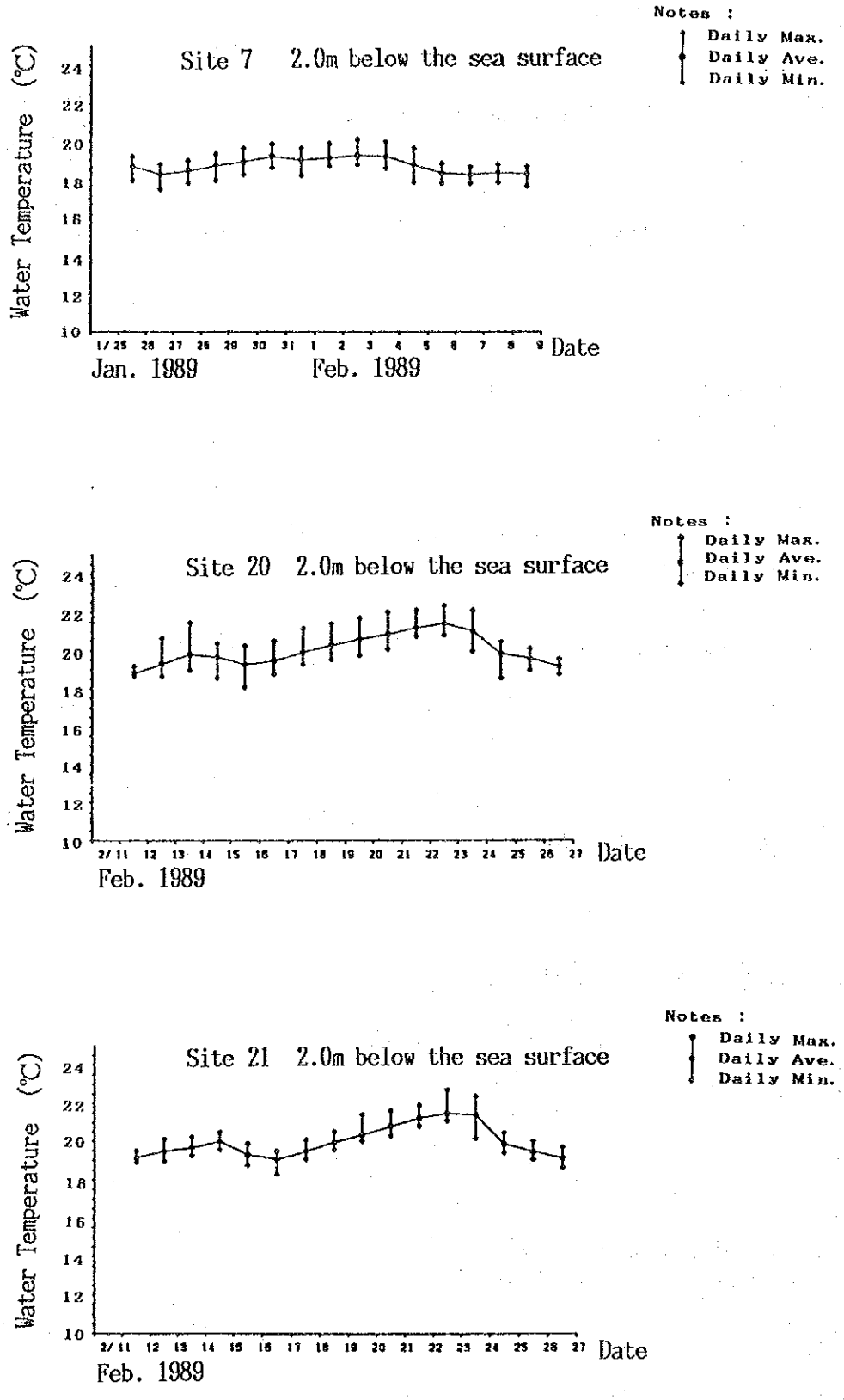


Fig. 3.10.19(3) Variation of Daily Water Temperature at Typical Sites in the Third Field Survey