

# Oceanographic Data of the 13th Japanese Antarctic Research Expedition 1971–1972

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第13次南極地域観測隊海洋部門報告

板東 保・岩永 義幸\*

要旨：第13次南極地域観測において，定常観測（1971～1972）として行なった表面観測，バシサーモグラフ観測，温度—塩分—深度記録計による観測，および鉛直（各層採水）観測の結果を報告する。

This report deals with the data of the oceanographic observations made on board the icebreaker FUJI during the summer mission of the 13th Japanese Antarctic Research Expedition in 1971–1972. The track chart of the cruise is shown in Fig. 1. The locations of the Salinity-Temperature-Depth (STD) recorder observation stations, the vertical (serial) observation stations and the bathythermograph (BT) observation stations in the Southern Ocean are given in Fig. 2.

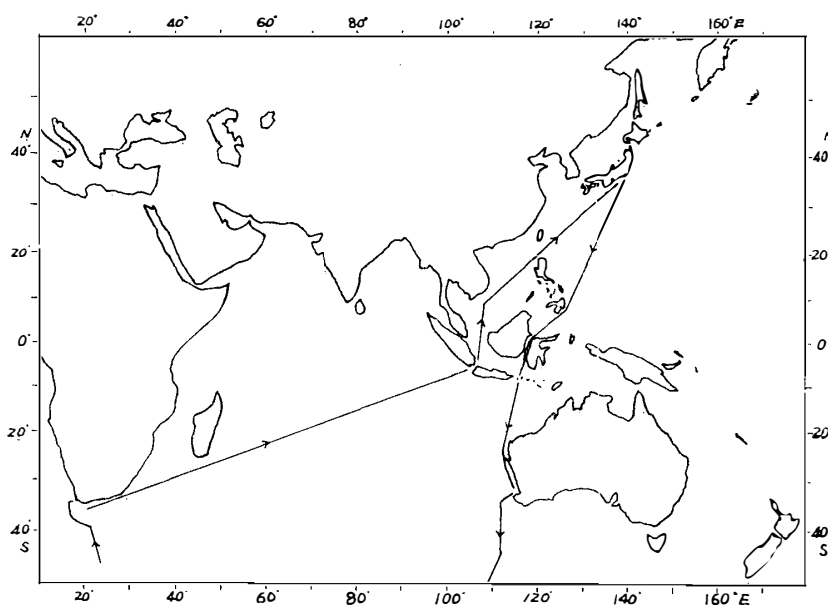


Fig. 1. Track of JARE-13 cruise 1971–1972.

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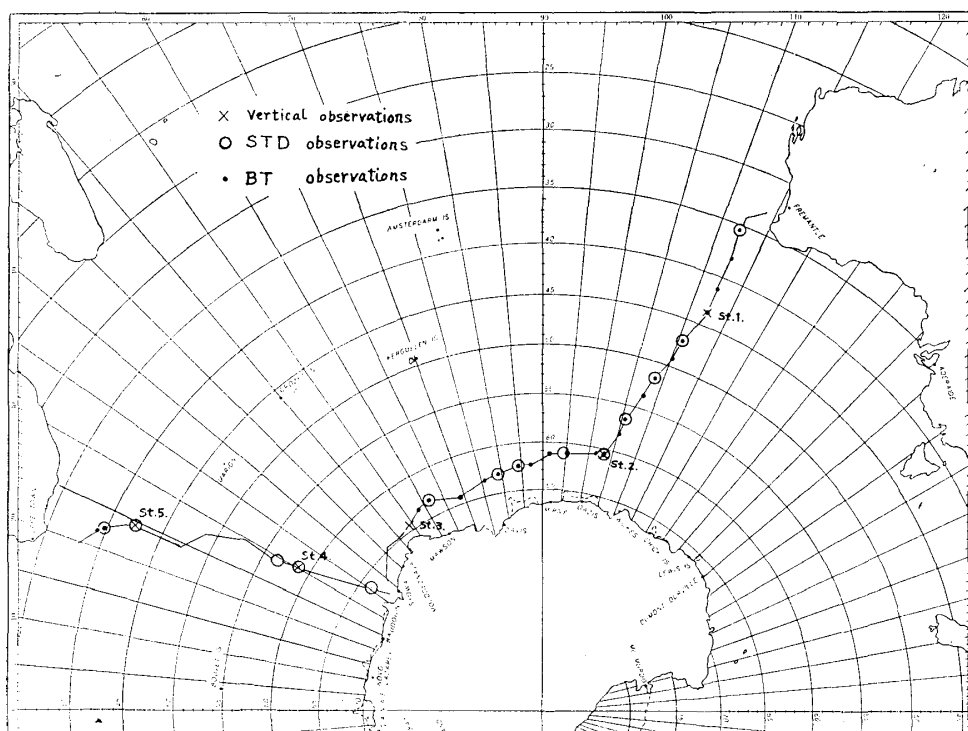


Fig. 2. Track of JARE-13 cruise and oceanographic station.

**Surface observation:** Surface temperature measurements and surface water samplings for chemical analysis were made three times a day during the cruise from Fremantle to Cape Town through Syowa Station and twice a day for the rest of the cruise so far as the circumstances permitted. The results are given in Table 1.

**Current measurement:** Measurements of surface current were made by GEK throughout the cruise except in the magnetic equator region and in the pack ice area. The results are also shown in Table 1.

**Bathythermograph observation:** Water temperature in the upper layer (surface to about 250 meters depth) was measured with bathythermograph (BT) at almost the same frequency as the surface observations. The results are given in Table 2.

**Salinity temperature depth recorder observation:** The vertical distribution of temperature and salinity was measured at 14 stations in the Southern Ocean along the track from Fremantle to Cape Town through Syowa Station by a Salinity-Temperature-Depth recorder. The records are shown in Fig. 3.

**Vertical (serial) observation:** The observations were made at 5 stations in the Southern Ocean along the cruise from Fremantle to Cape Town (Fig. 2).

The observed data are shown in Table 3 with relevant meteorological data. The interpolated and computed values (temperature, salinity,  $\sigma_t$  and dynamic depth anomalies) at standard depths are also included in Table 3. These values

were calculated by the electric computer available at the Japanese Oceanographic Data Center of the Hydrographic Department.

**Chemical analysis of sea water:** The following are the elements and the methods (or instrument) of analysis. The results are also presented in Table 3.

Salinity	Inductive salinometer (Auto-Lab Model 401 MK III)
pH	pH meter (KPH-51B Yokogawa Electric Works Inc.)
Dissolved oxygen	Winkler's Method
Phosphate-P	Molybdenum blue method*
Reactive silicate-Si	Molybdenum yellow method*
Nitrate-N	Modified Morris and Riley method*
Nitrite-N	Sulphanilamide and N-(1-naphthyl)-ethylene-diamine 2 HCl were used as reagent*.
Ammonium-N	Indophenol method
Alkalinity	After 15.00 ml of N/100 HCl was added to 50.0 ml sample, pH of the sample was measured and alkalinity was calculated by Strickland's table*.

#### Acknowledgements

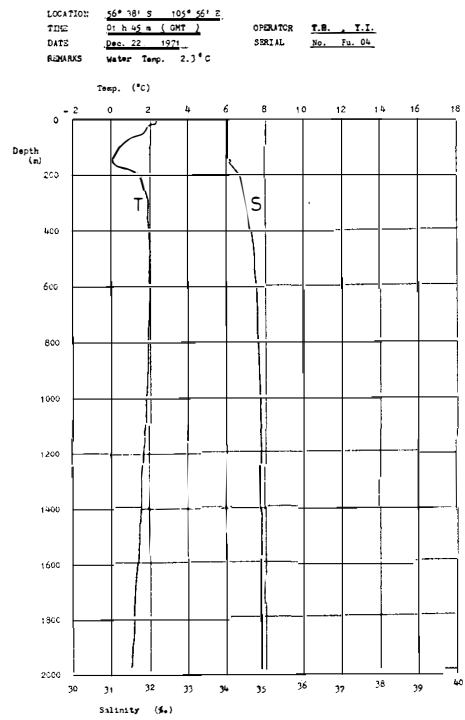
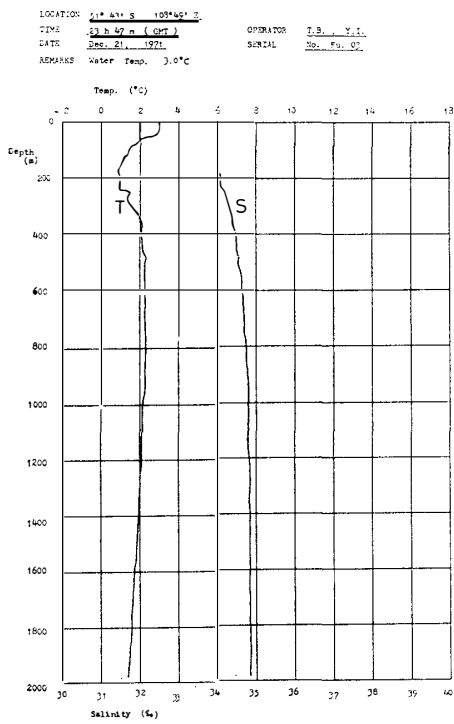
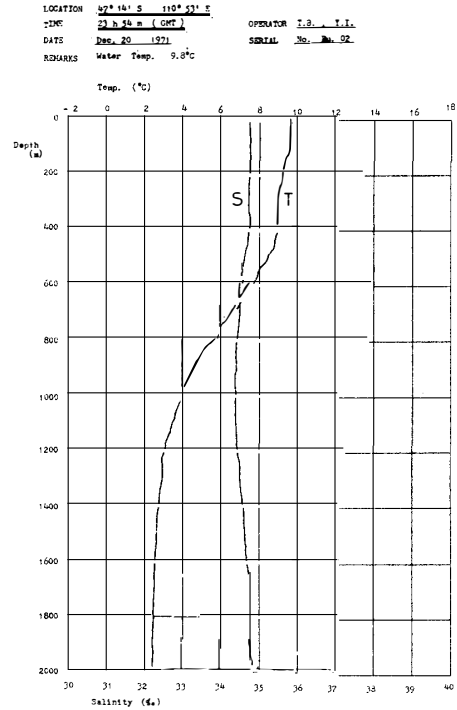
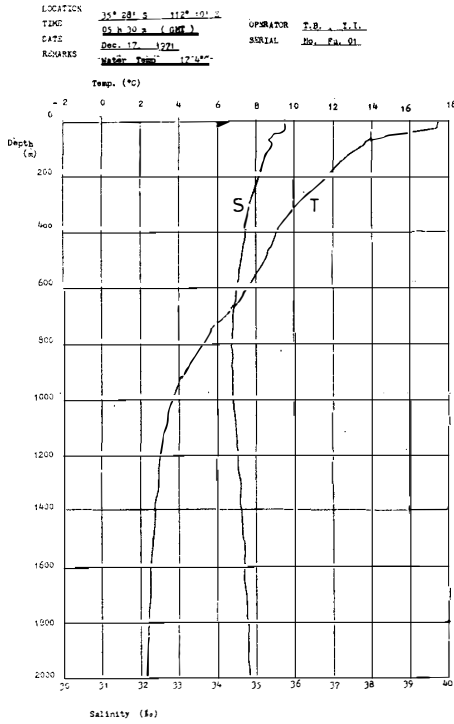
The authors are indebted to Captain F. MAEDA of the icebreaker FUJI and his officers and crew for their co-operation which made these observations possible.

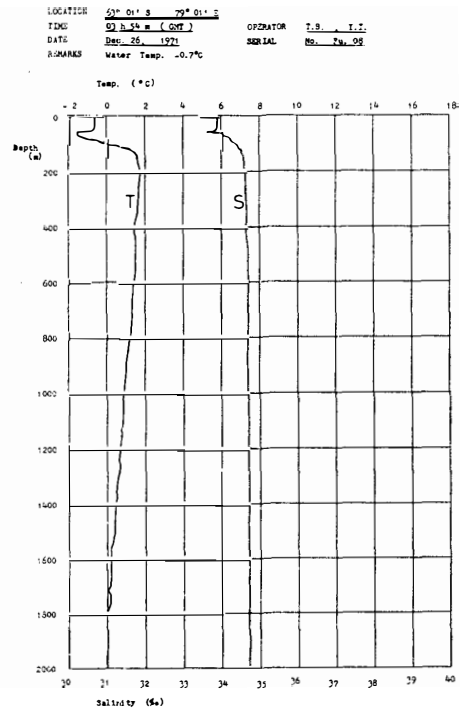
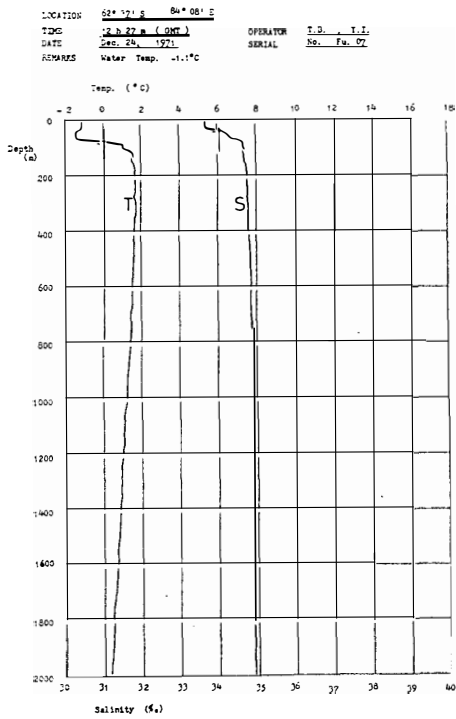
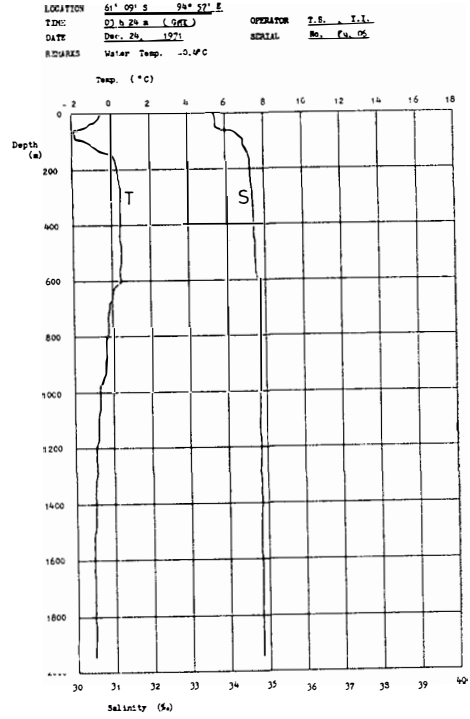
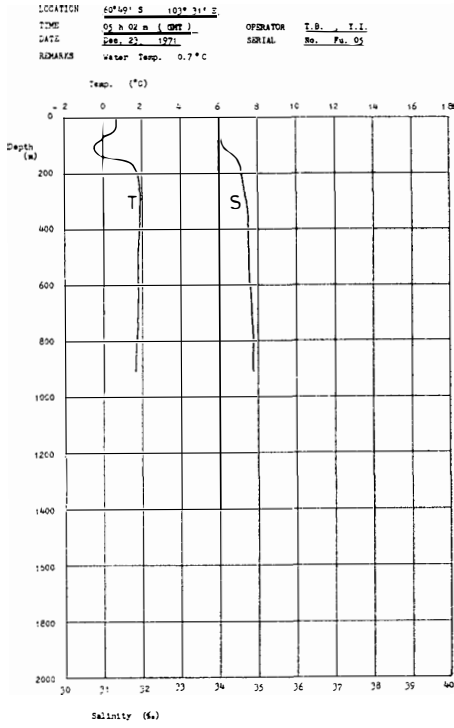
*(Received September 20, 1972)*

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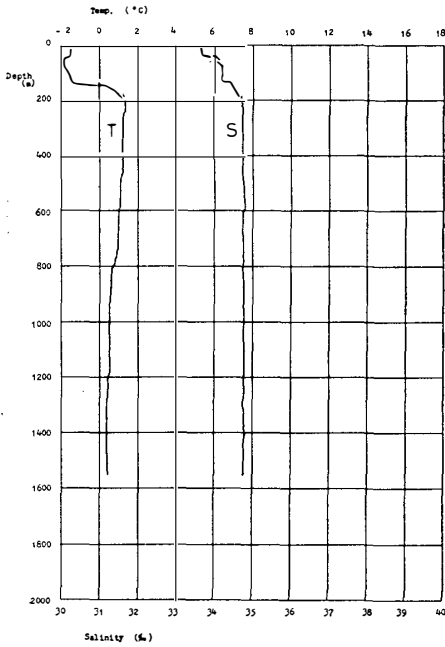
\* J. D. H. Strickland and T. R. Parsons, Manual of Sea Water Analysis (Fisheries Research Board of Canada).

Fig. 3. The results of STD observation.

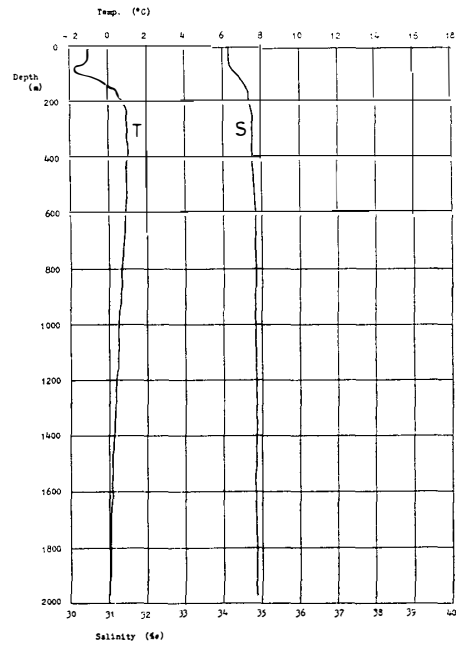




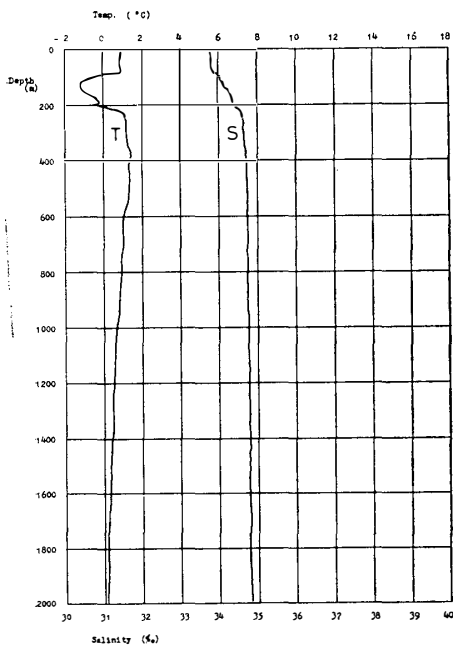
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 DATE Dec. 26, 1972 SERIAL No. Pa. 09  
 REMARKS Water Temp. -1.4°C



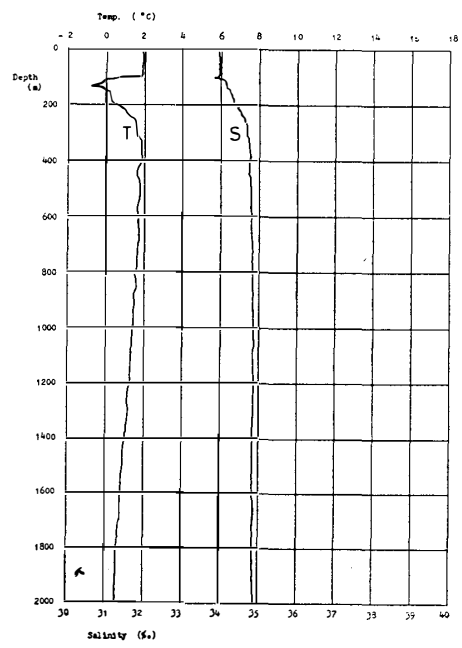
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 REMARKS Water Temp. -1.0°C



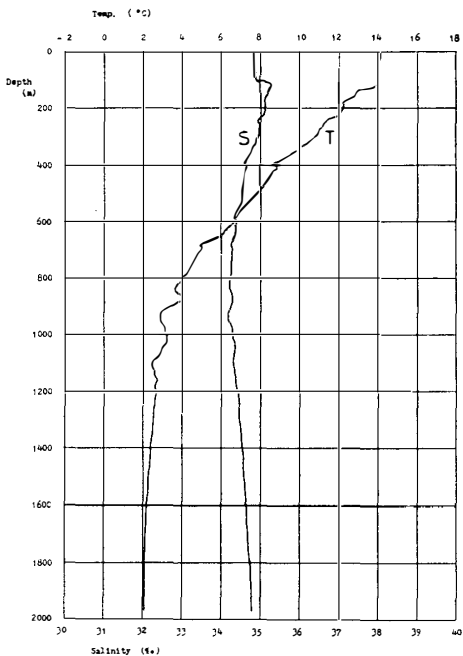
LOCATION 68° 42' S 30° 22' E  
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 DATE Mar. 31, 1972 SERIAL No. Pa. 11  
 REMARKS Water Temp. 0.9°C



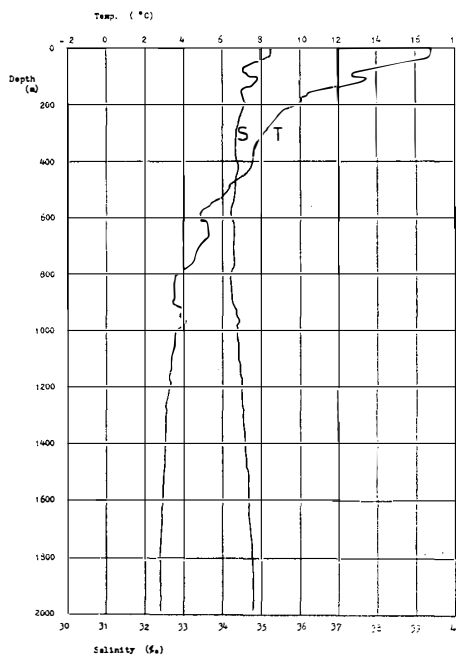
LOCATION 66° 24' S 22° 11' E  
 TIME 06 h 04 m (GMT) OPERATOR T.B. Y.I.  
 DATE Jan. 1, 1973 SERIAL No. Pa. 12  
 REMARKS Water Temp. 1.9°C



LOCATION 42° 11' S 20° 31' E  
 TIME 08.00 a (GMT) OPERATOR F.B. Y.I.  
 DATE Apr. 5, 1972 SERIAL No. Pa. 13  
 REMARKS Water Temp. 14.1°C



LOCATION 20° 49' S 22° 33' E  
 TIME 08.55 a (GMT) OPERATOR F.B. Y.I.  
 DATE Apr. 6, 1972 SERIAL No. Pa. 14  
 REMARKS Water Temp. 16.8°C



Date	Time		Position		Air temp.	Water temp.	S	pH	O <sub>2</sub>	Phosphate-P	Silicate-Si	Nitrite-N	Nitrate-N	Ammonia-N	Alkalinity	Current	
	GMT	LMT	Lat.	Long.	°C	‰										cc/L	µg-atoms/L
Dec. 23	1100	1800	60-49S	101-44E	1.0	-0.2	33.739	8.12	8.02	2.00	47	0.30	27	0.2	2.37		
24	0200	0800	61-12	95-22	0.1	-0.4	33.672	8.18	8.18	1.81	47	0.29	26	0.2	2.40		
	0700	1300	61-13	93-49	0.0	-0.2	33.718	8.07	8.20	1.72	41	0.28	26	0.1	2.37		
	1200	1800	61-27	91-43	1.9	0.0	33.639	7.97	8.17	1.68	37	0.29	25	0.3	2.28		
25	0200	0800	62-22	88-03	0.0	-0.9	33.921	8.03	8.01	1.89	62	0.17	27	0.3	2.27		
	0700	1300	62-31	86-11	-0.1	-1.0	33.823	8.08	8.04	1.89	57	0.17	26	0.6	2.46		
	1200	1800	62-37	84-08	0.5	-1.1	33.632	8.00	8.12	1.87	48	0.28	26	0.5	2.34		
26	0300	0800	63-00	79-12	-0.5	-1.1	33.856	7.98	7.97	1.87	51	0.26	29	0.8	2.39	317	0.4
	0800	1300	63-09	77-45	0.0	-1.1	33.696	7.97	8.17	1.89	57	0.27	29	0.2	2.39		
	1300	1800	63-21	75-36	-0.3	-0.6	33.813	7.95	8.00	1.85	51	0.25	28	0.6	2.38	305	0.2
27	0500	1000	64-21	69-16	-0.5	-1.2		8.03	8.00	1.95	68	0.26	29	0.2	2.37	222	0.1
	1300	1800	63-50	66-29	0.8	-1.3	33.710	8.02	8.00	1.97	62	0.29	30	0.5	2.37		
28	0400	0800	63-24	61-53	-0.9	-1.5	33.694	8.01	8.06	1.93	55	0.28	29	0.4	2.35	298	0.6
	0900	1300	63-24	60-27	-0.4	-1.3	33.832	7.96	8.07	1.91	55	0.27	29	0.3	2.33		
	1400	1800	63-35	58-10	-0.9	-1.4	33.780	7.97	8.05	1.93	56	0.27	29	0.8	2.35	299	0.4
29	0400	0800	64-26	54-12	-1.6	-1.8	33.743	8.02	7.98	1.97	56	0.26	28	0.8			
	0600	1000	64-30	54-15	-1.2	-1.8	33.771	8.09	8.04	1.95	51	0.27	27	0.8	2.35		
30	0500	0800	65-02	49-36	-1.0	-1.8	33.642	8.12	7.92	1.97	62	0.24	27	0.6	2.39		
	1000	1300	64-51	48-03	0.0	-1.3	33.495	8.03	7.95	2.00	66	0.29	27	0.8	2.36		
	1500	1800	64-48	46-02	-0.8	-0.5	33.954	7.98	7.85	2.02	69	0.27	28	0.8	2.43		
31	0500	0800	66-40	41-15	-3.1	-1.3	32.931	8.05	7.85	1.97	66	0.35	27	0.6			
	1000	1300	67-08	41-06	0.3	-1.1	33.082	8.05	7.45	1.89	70	0.21	26	1.1	2.39		
1972			Arrive at Ongul Island														
			Leave Ongul Island														
Mar. 29	0500	0800	66-11S	35-23E	-1.3	-1.0	34.139	8.08	7.82	2.00	61	0.29	28	0.8	2.39		
	1000	1300	65-34	34-48	-0.8	-1.0	34.217	8.02	7.84	2.00	60	0.23	28	0.5	2.39		



Date	Time		Position		Air temp.	Water temp.	S	pH	O <sub>2</sub>	Phos- phate-P	Sili- cate-Si	Ni- trite-N	Ni- trate-N	Ammo- nia-N	Alka- linity	Current		
	GMT	LMT	Lat.	Long.	°C	‰	cc/L		µg-atoms/L					meq/L	Dir.	Speed (kt)		
31	1600	1900	64-34S	33-58E	-0.6	-0.5	34.090	8.11	7.77	1.98	60	0.31	28	1.0	2.38			
	0600	0800	59-32	30-51	1.1	1.4	33.896	8.06	7.67	1.75	37	0.37	25	0.1	2.35			
Apr. 1	1200	1400	58-42	30-19	1.3	0.9	33.807	8.07	7.81	1.71	46	0.38	26	1.0	2.34			
	0600	0800	56-24	29-09	1.0	1.9	33.914	8.02	7.61	1.71	34	0.34	25	0.6	2.32			
2	1200	1400	55-38	29-13	1.0	1.9	33.919	8.09	7.61	1.71	33	0.34	24	0.0	2.33			
	1700	1900	54-50	29-41	2.0	2.3	33.979	8.16	7.52	1.77	32	0.32	25	0.2	2.34			
3	0600	0800	52-36	29-53	3.3	2.5	33.970	8.13	7.50	1.75	35	0.32	25	0.0	2.36			
	1200	1400	51-37	29-20	4.4	3.4	33.884	8.13	7.35	1.69	23	0.32	24	0.7	2.36			
4	1700	1900	50-52	28-59	4.7	4.6	33.841	8.13	7.23	1.56	10	0.28	22	0.3	2.33			
	0600	0800	49-00	27-41	4.2	3.7	33.859	8.15	7.31	1.62	20	0.34	24	0.0	2.33			
5	1200	1400	48-28	27-00	4.9	6.5	33.821	8.20	6.87	1.44	2	0.31	19	0.2	2.37			
	1700	1900	48-05	26-13	4.7	6.3	33.815	8.15	6.92	1.42	1	0.29	19	0.4	2.35			
6	0600	0800	47-00	24-13	4.1	6.5	33.821	8.11	6.89	1.40	1	0.32	19	0.2	2.29			
	1200	1400	45-43	24-13	5.4	7.8	33.855	8.12	6.68	1.35	2	0.26	17	0.1	2.28			
7	1700	1900	44-46	24-17	6.0	8.2	33.884	8.11	6.70	1.25	2	0.22	16	0.2	2.28			
	0600	0800	42-14	24-28	10.5	14.1	33.835	8.28	5.72	0.48	8	0.16	5.3	0.1	2.46			
8	1700	1900	41-32	23-58	19.2	19.9	35.470	8.32	5.08	0.15	2	0.16	0.4	0.2	2.47			
	0600	0800	39-49	22-32	17.1	16.8	35.253	8.27	5.51	0.29	2	0.09	1.4	0.2	2.44	359	0.5	
9	1400	1600	39-16	21-59	19.3	17.4	35.327	8.30	5.35	0.31	2	0.11	1.4	0.2	2.46			
	1700	1900	39-14	21-59	17.9	18.1										48	0.8	
10	0600	0800	38-18	20-37	19.5	21.5	35.451	8.33	4.99	0.10	2	0.02	0.0	0.1	2.45			
	1200	1400	38-07	19-49	18.5	23.2	35.371	8.34	4.87	0.10	2	0.03	0.0	0.1	2.45			
11			Arrive in Cape Town															
12			Leave Cape Town															
13	0600	0800	34-47S	22-32E	17.8	19.3	35.285	8.31	5.39	0.17	2	0.04	0.0	0.3	2.43			
	1600	1800	34-32	25-04	21.0	21.9	35.255	8.33	5.32	0.17	1	0.02	0.0	0.3	2.48			

Date	Time		Position		Air temp.	Water temp.	S	pH	O <sub>2</sub>	Phos- phate-P	Sili- cate-Si	Ni- trite-N	Ni- trate-N	Ammono- nia-N	Alka- linity	Current	
	GMT	LMT	Lat.	Long.	°C	‰										cc/L	µg-atoms/L
Apr. 16	0600	0800	33-44S	27-47E	22.9	24.9	35.268	8.34	4.77	0.12	2	0.03	0.0	0.3	2.49		
	1600	1800	32-56	29-42	24.9	25.3	35.257	8.32	4.75	0.08	1	0.03	0.0	0.5	2.49		
17	0600	0800	31-27	32-50	23.1	24.2	35.354	8.32	4.82	0.10	1	0.02	0.0	0.2	2.42		
	1600	1800	30-24	34-58	22.7	25.1	35.350	8.33	4.79	0.10	1	0.02	0.0	0.4	2.42		
18	0600	0800	28-52	38-21	23.1	24.9	35.381	8.35	4.80	0.06	2	0.02	0.0	0.3	2.43		
	1600	1800	28-04	40-15	23.8	24.9	35.155	8.33	4.71	0.08	2	0.03	0.0	0.2	2.43		
19	0500	0800	27-00	42-54	23.1	25.3	35.218	8.35	4.76	0.06	2	0.01	0.0	0.6	2.43		
	1500	1800	26-07	44-56	24.8	24.9	35.210	8.33	4.82	0.15	2	0.02	0.0	0.2	2.43		
20	0500	0800	25-19	47-53	24.9	26.5	35.068	8.34	4.68	0.19	2	0.01	0.0	0.5	2.41		
	1500	1800	24-22	49-54	24.5	26.3	35.133	8.34	4.66	0.08	0	0.01	0.0	0.2	2.43		
21	0400	0800	23-09	52-36	25.2	26.4	35.165	8.34	4.68	0.08	1	0.03	0.0	0.1	2.42		
	1400	1800	22-11	54-48	25.2	26.3	35.233	8.34	4.68	0.15	1	0.02	0.0	0.4	2.42		
22	0400	0800	20-50	57-34	25.9	26.4	35.143	8.33	4.67	0.13	1	0.04	0.0	1.0	2.41		
	1400	1800	20-09	59-51	26.1	26.8	34.729	8.31	4.66	0.06	1	0.02	0.0	0.4	2.40		
23	0400	0800	19-21	62-52	26.5	26.3	34.842	8.33	4.68	0.10	2	0.02	0.0	0.2	2.38	285	0.5
	1400	1800	18-53	64-57	26.0	26.7	34.839	8.31	4.65	0.17	1	0.02	0.0	0.1	2.40		
24	0300	0800	18-14	67-50	25.8	26.7	34.760	8.32	4.64	0.17	0	0.02	0.0	0.3	2.38	348	0.6
	1300	1800	17-45	69-55	26.8	26.8	34.707	8.32	4.64	0.15	1	0.03	0.0	0.2	2.39		
25	0300	0800	17-08	72-41	26.3	26.8	34.535	8.34	4.65	0.08	1	0.01	0.0	0.3	2.37	292	0.8
	1300	1800	16-53	74-45	26.0	26.9	34.420	8.34	4.63	0.15	1	0.03	0.0	0.2	2.37		
26	0300	0800	16-26	77-19	24.7	26.0	34.462	8.35	4.73	0.17	2	0.01	0.1	0.1	2.36		
	1300	0800	15-59	79-13	24.9	23.5	35.064	8.25	4.97	0.50	8	0.10	4.7	0.4	2.40		
27	0200	0800	15-44	81-41	26.2	26.9	34.241	8.33	4.64	0.08	2	0.02	0.0	0.2	2.39		
	1200	1800	15-25	83-58	26.7	27.3	34.166	8.34	4.59	0.12	2	0.02	0.0	0.1	2.36		
28	0200	0800	14-29	87-06	27.1	27.5	34.107	8.35	4.77	0.10	1	0.03	0.0	0.4			
	1200	1800	13-28	89-18	27.3	27.5	34.165	8.35	4.60	0.08	1	0.02	0.0	0.1	2.35		

Date	Time		Position		Air temp.	Water temp.	S	pH	O <sub>2</sub> cc/L	Phos- phate-P	Sili- cate-Si	Ni- trite-N	Ni- trate-N	Ammo- nia-N	Alka- linity meq/L	Current	
	GMT	LMT	Lat.	Long.	°C	‰	μg-atoms/L					Dir.	Speed (kt)				
29	0200	0800	12-12S	92-13E	28.0	28.1	34.029	8.36	4.56	0.06	0	0.02	0.0	0.3	2.33		
	1200	1800	11-20	94-26	27.1	28.5	34.159	8.34	4.54	0.17	1	0.03	0.0	0.4	2.38		
30	1100	1800	9-30	99-10	28.6	28.7	33.683	8.35	4.55	0.08	1	0.05	0.0	0.2	2.30		
May 1	0100	0800	8-18	101-48	28.4	28.8	33.727	8.36	4.58	0.08	1	0.04	0.0	0.2	2.30		
	1100	1800	7-25	103-32	28.7	29.0	32.704	8.30	4.54	0.10	9	0.04	0.0	0.2	2.26		
3			Arrive in Djakarta														
5			Leave Djakarta														
5	1100	1800	5-37	106-59	28.7	30.0	32.985		4.40								
6	1100	1800	0-57	107-44	29.2	30.1	32.696	8.31	4.56	0.08	5	0.01	0.0	0.3	2.27		
7	0100	0800	2-05N	108-21E	29.0	29.4	33.082	8.32	4.55	0.02	4	0.00	0.0	0.4	2.23		
	1100	1800	4-13	108-52	28.5	29.5	33.341	8.34	4.57	0.02	1	0.00	0.0	0.2	2.29		
8	0100	0800	7-27	108-46	30.4	29.5	33.723	8.36	4.53	0.08	2	0.00	0.0	0.1	2.33		
	1100	1800	9-13	110-03	29.3	29.5	33.545	8.30	4.55	0.02	1	0.00	0.0	0.1	2.31		
9	0000	0800	11-26	112-08	29.3	29.2	33.592	8.34	4.57	0.02	2	0.00	0.0	0.1	2.34		
	1000	1800	12-55	113-51	30.2	29.4	33.454	8.34	4.52	0.04	1	0.01	0.0	0.1	2.36		
10	0000	0800	15-02	116-15	29.5	29.5	33.602	8.33	4.48	0.04	2	0.01	0.0	0.3	2.32		
	1000	1800	16-39	118-02	29.4	29.7	33.621	8.32	4.50	0.00	2	0.01	0.0	0.1	2.37		
11	0000	0800	18-53	120-28	29.5	29.8	33.581	8.34	4.47	0.02	2	0.00	0.0	0.1	2.32		
	1000	1800	20-23	122-18	28.5	28.8	34.049	8.36	4.59	0.06	2	0.02	0.0	0.3	2.39		
12	2300*	0800	22-27	124-22	26.9	25.5	34.547	8.36	4.78	0.04	2	0.01	0.0	0.2	2.38	124	0.8
	0900	1800	24-00	126-12	28.0	26.6	34.552	8.36	4.68	0.04	1	0.01	0.0	0.3	2.40	328	0.6
13	2300*	0800	26-20	128-41	25.7	24.8	34.651	8.36	4.83	0.06	1	0.02	0.0	0.2	2.40	241	0.4
	0900	1800	28-00	130-22	25.0	24.0	34.505	8.31	4.88	0.06	1	0.02	0.0	0.3	2.35	136	0.8
14	2300*	0800	30-08	132-10	25.6	24.3										66	1.1
	0900	1800	31-42	133-34	24.7	22.2										197	1.3

\* The time of the date of the preceding day.

Table 2. Bathythermograph data.

St. No.	Date			Time		Position		Temperature (°C) at indicated depth (m)										
	Day	Month	Year	GMT	LMT	Lat.	Long.	0	10	20	30	50	75	100	125	150	200	250
1	26	Nov.	1971	2300*	0800	31-50N	137-51E	21.7	21.7	21.7	21.8	21.8	21.8	20.3	19.5			
2	26			0900	1800	29-59	136-32	23.5	23.6	23.6	23.6	23.6	23.5	20.7	19.2	18.5	17.8	
3	27			2300*	0800	27-08	135-17	22.7	22.7	22.7	22.8	22.8	21.8	20.3	19.6	19.0		
4	27			0900	1800	25-10	134-23	25.0	25.0	24.8	24.7	24.7	21.5	19.5	18.5	18.0	17.2	
5	28			2300*	0800	22-16	133-02	24.6	24.6	24.6	24.6	24.6	24.6	23.3	21.2	20.0	18.0	
6	28			0900	1800	20-15	132-07	26.9	26.8	26.8	26.8	26.8	26.8	24.8	23.2	21.6		
7	29			2300*	0800	17-30	131-00	27.2	27.2	27.3	27.3	27.3	24.9	23.8	22.3	21.3	18.4	
8	29			0900	1800	15-23	129-55	27.8	27.8	27.8	27.8	27.8	27.7	26.8	24.6	23.5	19.7	
9	30			2300*	0800	12-31	128-41	28.4	28.4	28.4	28.4	28.4	27.8	26.3	24.4	22.5	17.3	
10	30			0900	1800	10-19	127-54	28.8	28.7	28.7	28.6	28.6	28.5	27.2	24.0	22.2	16.1	
11	1	Dec.	1971	2300*	0800	7-14	126-57	28.6	28.6	28.7	28.5	28.6	27.8	25.5	21.9	18.1	13.9	
12	5			0900	1800	10-45S	115-11E	28.2	28.2	28.0	28.0	26.9	25.2	22.2	19.1	17.0	14.4	
13	6			2300*	0700	13-27	114-48	28.0	28.0	28.0	28.0	26.8	25.6	24.6	23.5	20.8	15.7	
14	6			1000	1800	15-42	114-23	26.1	26.1	25.5	24.6	24.4	23.3	22.7	21.6	19.9	18.6	14.8
15	7			2300*	0700	18-12	113-48	25.1	25.1	25.1	24.9	24.4	23.9	23.1	22.4	21.1	19.0	
16	7			1000	1800	20-16	113-27	24.6	24.6	24.3	24.4	24.3	23.6	23.0	22.3	22.0	19.8	
17	8			2300*	0700	22-58	112-53	22.4	22.4	22.4	22.4	22.4	22.4	21.7	21.4	21.1	19.8	
18	8			1000	1800	25-12	112-29	21.1	21.1	21.1	21.2	21.1	21.0	20.8	20.2			
19	9			2300*	0700	28-07	112-52	20.7	20.7	20.7	20.7	20.5	19.7	19.4	18.9	18.6	17.8	16.8
20	9			1000	1800	30-09	113-49	19.5	19.5	18.6	18.6	17.7	16.5	16.1	15.2	14.9	13.7	
	10					Arrive in Fremantle												
	16					Leave Fremantle												
21	17			0500	1300	35-28	112-10	17.4	17.4	17.4	17.4	16.2	14.1	13.7	13.2	12.6	12.1	
22	18			2300*	0700	38-43	112-15	13.6	13.6	13.6	13.1	12.7	11.9	11.6	11.6	11.5	11.2	
23	18			1000	1800	41-12	112-17	12.1	12.1	11.4	11.2	10.6	10.1	9.5	9.5	9.7	9.6	
24	19			2300*	0700	43-46	112-18	10.4	10.4	10.4	10.4	10.2	10.0	9.4	9.2	9.1	9.1	9.1
25	19			1000	1800	44-50	112-02	10.1	10.1	10.1	10.0	9.9	9.8	9.8	9.6	9.6	9.5	9.4
26	20			2300*	0700	47-07	110-56	9.7	9.7	9.7	9.7	9.7	9.7	9.8	9.8	9.7	9.5	9.3
27	20			1000	1800	49-03	110-11	5.9	5.9	5.8	5.8	5.8	4.6	3.7	3.7	3.6	3.7	
28	21			2300*	0700	51-36	108-53	3.0	2.5	2.6	2.6	2.5	1.5	1.2	3.0			
29	21			1000	1800	53-29	107-52	3.4	3.0	3.0	2.9	2.8	2.1	1.9	1.5	1.4	1.3	
30	22			0200	0900	56-38	105-56	2.3	2.3	1.9	1.8	1.7	1.1	0.7	0.7	0.5		

Tamotsu BANDO and Yosiyuki IWANAGA

[南極資料]

St. No.	Date			Time		Position		Temperature (°C) at indicated depth (m)											
	Day	Month	Year	GMT	LMT	Lat.	Long.	0	10	20	30	50	75	100	125	150	200	250	
31	22	Dec.	1971	1100	1800	58-04S	105-04E	1.3	1.3	1.1	1.0	0.8	0.5	-0.2	-0.4	-0.2			
32	23			0100	0800	60-47	103-29	0.6	0.6	0.6	0.5	0.1	-0.1	-0.4	-0.3	0.5	1.9		
33	23			1100	1800	60-49	101-44	-0.2	-0.2	-0.2	-0.4	-1.1	-0.4	1.1	1.6	0.7			
34	24			0200	0800	61-12	95-22	-0.4	-0.4	-0.8	-1.1	-1.6	-1.6	-1.3	-0.6				
35	24			1200	1800	61-27	91-43	0.0	0.0	0.0	-0.1	-1.3	-1.0	-0.3	0.6	1.2			
36	25			0400	1000	62-26	87-25	-0.9	-0.9	-0.9	-0.9	-1.4	-1.4	-1.2					
37	25			1200	1800	62-37	84-08	-1.1	-1.1	-1.1	-1.1	-1.4	0.0	0.1	1.4				
38	26			0400	0900	63-01	79-01	-1.1	-1.1	-1.1	-1.1	-1.9	-1.1	0.5	1.0				
39	26			1300	1800	63-21	75-36	-0.6	-0.5	-0.5	-0.5	-0.4	1.0	1.7	1.7				
40	27			0600	1100	64-23	68-59	-1.2	-1.1	-1.1	-1.1	-1.5	-1.3	-1.1	-0.1	1.1			
41	28			0400	0800	63-24	61-53	-1.5	-1.5	-1.4	-1.4	-1.8	-1.7	-1.1	0.9	1.4			
42	28			1400	1800	63-35	58-10	-1.4	-1.4	-1.3	-1.3	-1.4	-1.3	0.7					
						Arrive in Ongul Island Leave Ongul Island													
43	6	Apr.	1972	0600	0800	39-49	22-32	16.8	16.8	16.8	16.3	14.2	12.9	12.4	11.1	10.6	9.6		
44	6			1700	1900	39-14	21-59	18.1	18.1	18.0	18.0	17.8	17.5	15.2	13.8	13.1			
	10 14			Arrive in Cape Town Leave Cape Town															
	3 5	May	1972	Arrive in Djakarta Leave Djakarta															
45	11			2300*	0800	22-27N	124-22E	25.5	25.5	25.5	24.9	23.1	22.7	22.4	22.2	22.0			
46	12			0900	1800	24-00	126-12	26.6	26.1	24.7	24.1	23.0	22.3	21.8	21.5	21.1			
47	12			2300*	0800	26-20	128-41	24.8	24.8	23.7	22.6	21.1	20.7	20.3	19.8				
48	13			0900	1800	28-00	130-22	24.0	24.0	23.8	23.2	22.4	21.7	21.2	20.9	20.5			
49	13			2300*	0800	30-08	132-10	24.3	24.3	24.3	24.2	23.7	23.5	22.9	22.0	21.5	19.7		
50	14			0900	1800	31-42	133-34	22.2	20.4	19.8	19.8	19.2	18.1	17.8	17.5	17.4			

\* The time of the date of the preceding day.

Table 3. Vertical observation data.

St. 1

Date : Dec. 19, 1971  
 Time(GMT) : 2330\*-0330  
 (LMT) : 0730-1130  
 Lat. : 43-46S  
 Long. : 112-21E

Meteorological observation

Time(GMT) : 0100  
 (LMT) : 0900  
 Weather : Mainly cloudy  
 Air temp. : 10.0°C  
 Atm. Press. : 1020.5 mb  
 Wind Dir. : WSW  
 Vel. : 14 kt  
 Humidity : 76%  
 Sea : 3  
 Swell : WSW 1

Observed											Interpolated				
Depth (m)	T(°C)	S(‰)	pH	O <sub>2</sub> (cc/L)	PO <sub>4</sub> -P	SiO <sub>3</sub> -Si	NO <sub>2</sub> -N	NO <sub>3</sub> -N	NH <sub>4</sub> -N	Alkalinity (meq/L)	Depth (m)	T(°C)	S(‰)	σ <sub>t</sub>	ΔD
0	10.4	34.680	8.21	6.48	0.88	5	0.20	11	0.1	2.47	0	10.4	34.680	26.14	0.000
8	10.42	34.671	8.21	6.72	0.90	10	0.29	12	0.3	2.44	10	10.43	34.670	26.64	0.014
15	10.45	34.669	8.21	6.50	0.86	5	0.24	11		2.44	20	10.42	34.669	26.64	0.028
22	10.40	34.669	8.21	6.47	0.88	6	0.62	11	0.3	2.45	30	10.35	34.672	26.66	0.042
38	10.23		8.20	6.54	0.88	5	0.30	12	0.4	2.45	50	10.19	34.679	26.69	0.070
56	10.13	34.680	8.20	6.45	0.88	5	0.54	13	0.9	2.44	75	9.89	34.672	26.73	0.104
73	9.93	34.673	8.22	6.41	0.95	4	0.58	11	0.7	2.45	100	9.42	34.659	26.80	0.136
108	9.29	34.655	8.20	6.32	0.97	6	0.62	13	0.1	2.45	125	9.25	34.656	26.83	0.168
141	9.26	34.655	8.19	6.29	1.03	4	0.37	13	0.1	2.44	150	9.23	34.646	26.82	0.200
175	9.15	34.622	8.19	6.36	1.03	6	0.55	14	0.0	2.46	200	9.12	34.629	26.83	0.263
208	9.11	34.634	8.19	6.32	1.03	6	0.06	15	0.2	2.43	250	9.05	34.643	26.85	0.326
274	9.01	34.647	8.17	6.26	1.01	5	0.06	13	0.2		300	8.97	34.652	26.87	0.389
340	8.92	34.658	8.17	6.23	1.07	11	0.14	14	0.0	2.43	400	8.84	34.662	26.90	0.513
406	8.83	34.657	8.17	6.21	1.07	6	0.05	15	0.4	2.44	500	8.65	34.417	26.74	0.645
473	8.74	34.412	8.15	6.07	1.13	6	0.02	15	0.0	2.45	600	7.94	34.484	26.90	0.779
538	8.46	34.462	8.14	5.75	1.26	8	0.07	19	0.3	2.44	700	7.19	34.520	27.04	0.900
671	7.33	34.503	8.05	4.92	1.62	14	0.07	26	0.0	2.44	800	6.82	34.577	27.13	1.010
810	6.79	34.582	8.02	4.86	1.72	17	0.02	24	0.0		1000	6.13	34.615	27.25	1.212
978	6.25	34.609	8.01	4.87	1.79	23	0.03	27			1200	5.04	34.666	27.43	1.388
1306	3.14		7.93	4.46	2.39	50	0.02	33	0.0		1500	3.54	34.724	27.64	1.596
1692	2.66	34.751	7.91	3.99	2.29	72	0.01	34	0.1		2000	2.37	34.726	27.74	1.846
2092	2.35	34.709	7.91	4.20	2.21	80	0.00	37	0.1		2500	2.08	34.588	27.66	2.100
2505	2.08	34.586	7.95	4.57	1.95	85	0.05	34	0.0	2.54	3000	1.55	34.397	27.55	2.397
2945	1.62	34.420	7.93	4.65	2.12	96	0.06	30	0.0	2.52					

St. 2

Date : Dec. 23, 1971  
 Time(GMT) : 0210-0500  
 (LMT) : 0910-1200  
 Lat. : 60-48S  
 Long. : 103-30E

Meteorological observation

Time(GMT) : 0200  
 (LMT) : 0900  
 Weather : Mainly cloudy  
 Air temp. : 0.2°C  
 Atm. Press. : 992.6 mb  
 Wind Dir. : ESE  
 Vel. : 14 kt  
 Humidity : 93%  
 Sea : 3  
 Swell : SE 1

No. 46, 1973]

Oceanographic Data of the 13th JARE 1971-1972

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Observed											Interpolated				
Depth (m)	T(°C)	S(‰)	pH	O <sub>2</sub> (cc/L)	PO <sub>4</sub> -P	SiO <sub>3</sub> -Si	NO <sub>2</sub> -N	NO <sub>3</sub> -N	NH <sub>4</sub> -N	Alkalinity	Depth (m)	T(°C)	S(‰)	σ <sub>t</sub>	ΔD
					(μg-atoms/L)					(meq/L)					
0	0.7	33.995	8.16	8.01	1.89	37	0.33	28	0.4	2.34	0	0.7	33.995	27.28	0.000
8	0.59	33.998	8.14	8.03	1.91	33	0.33	27	0.2	2.35	10	0.59	33.996	27.29	0.008
18	0.59	33.997	8.13	8.05	1.87	33	0.34	28	0.2	2.35	20	0.59	34.006	27.29	0.016
26	0.57	34.034	8.12	8.03	1.89	33	0.38	28	0.2	2.40	30	0.57	34.039	27.32	0.024
42	0.53	34.036	8.10	8.04	1.89	32	0.33	29	0.2	2.40	50	0.40	34.037	27.33	0.039
63	0.16	34.040	8.10	8.17	1.85	26	0.34	28	0.1	2.40	75	0.08	34.042	27.35	0.057
82	0.03	34.044	8.09	8.07	1.87	29	0.38	28	0.1	2.41	100	-0.37	34.057	27.39	0.075
101	-0.39	34.058	8.06	7.97	2.04	35	0.34	28	0.2	2.43	125	-0.53	34.092	27.42	0.092
120	-0.59	34.076	8.05	7.93	2.08	40	0.32	29	0.4	2.43	150	0.04	34.201	27.48	0.108
157	0.29	34.240	7.95	6.41	2.33	51	0.08	33	0.0	2.43	200	1.66	34.463	27.59	0.136
193	1.58	34.444	7.87	4.74	2.42	68	0.03	36	0.3	2.44	250	1.82	34.544	27.64	0.161
233	1.76	34.571	7.84	4.44	2.42	73	0.02	37	0.0	2.46	300	1.92	34.607	27.69	0.183
309	1.93	34.616	7.85	4.24	2.35	78	0.03	35	0.1	2.46	400	1.94	34.658	27.73	0.225
382	1.90	34.651	7.85	4.26	2.33	79	0.04	34	0.1	2.47	500	1.97	34.712	27.77	0.263
458	2.03	34.682	7.87	4.29	2.31	80	0.02	33	0.1	2.49	600	1.78	34.718	27.79	0.299
536	1.88	34.732	7.87	4.32	2.25	83	0.02	33	0.1	2.50	700	1.75	34.723	27.79	0.333
618	1.76	34.712 D	7.88	4.39	2.16	85	0.04	33	0.0	2.50	800	1.73	34.739	27.81	0.367
748	1.76	34.735	7.88	4.46	2.18	86	0.02	32	0.1	2.49	1000	1.56	34.742	27.82	0.433
896	1.65	34.743	7.89	4.55	2.14	89	0.02	32	0.1	2.49	1200	1.37	34.736	27.83	0.498
1124	1.44	34.738	7.89	4.65	2.16	94	0.02	32	0.0	2.49	1500	1.08	34.726	27.84	0.591
1511	1.07	34.726	7.89	4.73	2.14	105	0.01	32	0.2	2.49	2000	0.67	34.704	27.85	0.788
1891	0.75	34.711	7.86	4.81	2.25	114	0.02	33	0.1	2.49	2500	0.33	34.683	27.85	0.876
2289	0.46	34.687	7.87	4.90	2.23	119	0.00	34	0.3	2.50	3000	0.11	34.679	27.86	1.004
2709	0.22	34.682	7.85	5.12	2.27	121	0.05	34	0.1	2.50	3500	-0.03	34.678	27.87	1.121
3135	0.07	34.678	7.84	5.24	2.27	122	0.03	33	0.1	2.49					
3563	-0.05	34.678	7.83	5.46	2.27	123	0.06	33	0.2	2.50					

St. 3

Date : Dec. 23, 1971  
 Time(GMT) : 0600-0800  
 (LMT) : 1000-1200  
 Lat. : 64-30S  
 Long. : 54-15E

## Meteorological observation

Time(GMT) : 0600  
 (LMT) : 1000  
 Weather : Mainly cloudy  
 Air temp. : -1.2°C  
 Atm. Press. : 982.4 mb  
 Wind Dir. : E  
 Vel. : 16 kt  
 Humidity : 85%  
 Sea : 0  
 Swell : ESE 1

Observed											Interpolated				
Depth (m)	T(°C)	S(‰)	pH	O <sub>2</sub> (cc/L)	PO <sub>4</sub> -P	SiO <sub>3</sub> -Si	NO <sub>2</sub> -N	NO <sub>3</sub> -N	NH <sub>4</sub> -N	Alkalinity (meq/L)	Depth (m)	T(°C)	S(‰)	σ <sub>t</sub>	ΔD
0	-1.8	33.771	8.09	8.04	1.95	51	0.27	27	0.8	2.35	0	-1.8	33.771	27.20	0.000
10	-1.58	33.778	8.90	7.96	1.93	55	0.29	28	0.8	2.33	10	-1.58	33.778	27.20	0.009
19	-1.56	33.788	8.09	8.02	1.95	51	0.29	27	0.8	2.32	20	-1.56	33.788	27.21	0.017
28	-1.58	33.787	8.09	8.01	1.95	53	0.34	27	0.9	2.34	30	-1.58	33.780	27.20	0.026
47	-1.58	33.788	8.08	7.97	1.97	51	0.31	27	0.8	2.35	50	-1.61	33.831	27.25	0.043
69	-1.71	34.137	8.04	7.52	1.97	58	0.26	28	0.6	2.37	75	-1.65	34.183	27.53	0.061
91	-1.28	34.264	8.01	6.80	2.08	66	0.28	31	0.3	2.39	100	-0.94	34.316	27.62	0.074
113	-0.34	34.393	7.96	5.86	2.18	74	0.19	32	0.2	2.40	125	0.27	34.469	27.69	0.085
134	0.69	34.521	7.92	4.95	2.31	87	0.11	33	0.5	2.42	150	1.10	34.575	27.72	0.095
179	1.41	34.623	7.88	4.35	2.37	92	0.08	34	0.4	2.42	200	1.50	34.644	27.75	0.114
223	1.51	34.658	7.87	4.31	2.33	93	0.04	34	0.3	2.43	250	1.55	34.675	27.77	0.132
268	1.56	34.684	7.88	4.35	2.27	95	0.04	34	0.5	2.50	300	1.57	34.697	27.78	0.149
364	1.53	34.707	7.90	4.42	2.23	95	0.05	33	0.3	2.48	400	1.47	34.704	27.80	0.182

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Tamotsu BANDO and Yoshiyuki IWANAGA

[南極資料]



St. 4

Date	: Mar. 31, 1972	Time(GMT)	: 1200	Wind Dir.	: NNW
Time(GMT)	: 1200-1348	(LMT)	: 1400	Vel.	: 31 kt
	(LMT): 1400-1548	Weather	: Mainly cloudy	Humidity	: 88%
Lat.	: 58-42S	Air temp.	: 1.6°C	Sea	: 4
Long.	: 30-19E	Atm. Press.	: 1002.2 mb	Swell	: NNW 6

Meteorological observation

Observed											Interpolated				
Depth (m)	T(°C)	S(‰)	pH	O <sub>2</sub> (cc/L)	PO <sub>4</sub> -P	SiO <sub>3</sub> -Si	NO <sub>2</sub> -N	NO <sub>3</sub> -N	NH <sub>4</sub> -N	Alkalinity (meq/L)	Depth (m)	T(°C)	S(‰)	σ <sub>t</sub>	ΔD
0	0.9	33.807	8.09	7.81	1.71	46	0.38	26	1.0	2.34	0	0.9	33.807	27.12	0.000
6	1.01	33.790	8.09	7.90	1.71	46	0.39	26	0.2	2.30	10	1.03	33.788	27.09	0.010
19	1.02	33.791	8.09	7.82	1.71	45	0.37	26	0.4	2.30	20	1.02	33.791	27.10	0.020
32	1.03	33.791	8.08	7.79	1.71	45	0.41	26	0.6	2.29	30	1.03	33.791	27.10	0.029
64	1.06	33.796	8.07	7.77	1.75	45	0.47	26	0.2	2.30	50	1.15	33.776	27.08	0.049
96	-0.62	34.090	8.04	7.89	1.96	56	0.56	29	0.4	2.33	75	0.48	33.893	27.21	0.072
123	-0.61	34.167	8.01	7.36	2.06	62	0.17	30	0.4	2.32	100	-0.68	34.104	27.44	0.091
162	0.63	34.411	7.90	5.42	2.29	72	0.07	34	0.5	2.35	125	-0.56	34.179	27.49	0.107
204	1.38	34.575	7.87	4.47	2.31	83	0.04	35	0.6	2.37	150	0.20	34.332	27.58	0.121
311	1.50	34.622	7.85	4.39	2.27	85	0.07	35	1.0	2.39	200	1.33	34.563	27.69	0.144
436	1.48	34.678	7.86	4.41	2.25	90	0.05	34	0.3	2.39	250	1.60	34.628	27.73	0.164
570	1.49	34.708	7.87	4.48	2.21	93	0.04	33	0.4	2.40	300	1.55	34.629	27.73	0.184
952	1.03	34.708	7.87	4.68	2.19	105	0.04	33	0.3	2.41	400	1.49	34.663	27.76	0.221
1284	0.72	34.694	7.88	4.68	2.02	110	0.02	33	0.1	2.42	500	1.49	34.695	27.78	0.255
1614	0.48	34.687	7.86	4.78	2.23	116	0.02	33	0.4	2.42	600	1.47	34.711	27.80	0.287
											700	1.37	34.716	27.81	0.321
											800	1.25	34.717	27.82	0.352
											1000	0.98	34.706	27.83	0.413
											1200	0.79	34.698	27.84	0.472
											1500	0.56	34.689	27.85	0.558

St. 5

Date : Apr. 5, 1972  
 Time(GMT) : 0610-0908  
 (LMT) : 0810-1108  
 Lat. : 42-14S  
 Long. : 24-28E

Meteorological observation

Time(GMT) : 0600  
 (LMT) : 0800  
 Weather : Rain  
 Air temp. : 10.5°C  
 Atm. Press. : 1014.3 mb  
 Wind Dir. : ENE  
 Vel. : 23 kt  
 Humidity : 94%  
 Sea : 3  
 Swell : SW 2

Depth (m)	T(°C)	S(‰)	pH	O <sub>2</sub> (cc/L)	Observed						Alkalinity (meq/L)	Interpolated				
					PO <sub>4</sub> -P	SiO <sub>3</sub> -Si	NO <sub>2</sub> -N	NO <sub>3</sub> -N	NH <sub>4</sub> -N	Depth (m)		T(°C)	S(‰)	σ <sub>t</sub>	ΔD	
					(μg-atoms/L)											
0	14.1	34.835	8.28	5.72	0.48	8	0.16	5.3	0.1	2.46	0	14.1	34.835	26.06	0.000	
7	14.18	34.839	8.27	5.76	0.50	7	0.17	5.3	0.2	2.45	10	14.20	34.841	26.04	0.020	
15	14.21	34.842	8.28	5.68	0.48	4	0.23	5.4	0.8	2.46	20	14.20	34.841	26.04	0.040	
22	14.20	34.840	8.28	5.66	0.50	5	0.19	5.3	0.1	2.45	30	14.20	34.839	26.04	0.059	
37	14.21										50	14.20	34.839	26.04	0.099	
56	14.20	34.840	8.27	5.67	0.50	4	0.23	5.5	0.0	2.44	75	14.21	34.840	26.04	0.149	
75	14.21	34.840	8.27	5.68	0.52	4	0.20	5.4	0.3	2.44	100	14.42	34.964	26.09	0.199	
94	14.22	34.840	8.26	5.67	0.46	7	0.16	5.4	0.1	2.46	125	14.72	35.312	26.29	0.245	
112	14.80	35.234	8.22	4.86	0.65	7	0.14	7.0	0.1	2.46	150	14.10	35.267	26.39	0.289	
150	14.10	35.267	8.20	4.75	0.73	6	0.05	8.6	0.5	2.46	200	12.91	35.156	26.55	0.370	
187	13.20	35.194	8.19	4.91	0.75	7	0.03	9.6	0.3	2.46	250	12.04	34.048	26.64	0.445	
224	12.42	35.087	8.16	5.07	0.83	7	0.04	11	0.0	2.44	300	11.39	34.985	26.71	0.517	
299	11.41	34.987	8.09	5.39	1.00	8	0.03	13	0.0	2.43	400	9.83	34.722	26.78	0.656	
395	9.90	34.737	8.03	5.04	1.29	10	0.01	18	0.0	2.44	500	8.54	34.467	26.90	0.791	
492	8.66	34.475	7.89	4.71	1.85	24	0.02	28	0.0	2.44	600	7.04	34.408	26.97	0.918	
686	5.86	34.423	7.85	4.85	1.81	25	0.02	28	0.1	2.43	700	5.73	34.417	27.15	1.029	
881	4.43	34.363	7.79	4.81	2.15	35	0.02	32	0.1	2.44	800	4.91	34.382	27.22	1.127	
1173	3.32	34.474	7.72	4.18	2.21	56	0.02	35	0.2	2.46	1000	3.87	34.391	27.34	1.305	
1688	2.71	34.760	7.74	4.59	1.98	60	0.02	28	0.2	2.48	1200	3.26	34.490	27.48	1.458	
2146	2.57	34.826	7.75	4.99	1.73	60	0.02	25	0.1	2.49	1500	2.81	34.662	27.66	1.644	
											2000	2.57	34.824	27.81	1.879	