

Chlorophyll *a* concentration of phytoplankton during cruises of the 49th and 50th Japanese Antarctic Research Expedition in 2007-2009

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1. Introduction

This is a report on the phytoplankton chlorophyll *a* concentration on cruises of the icebreaker *Shirase* and *Aurora Australis* during the 49th and 50th Japanese Antarctic Research Expedition (JARE-49, JARE-50) in 2007-2009 austral summer. Chlorophyll *a* concentration of phytoplankton was measured in two series: (1) spatial variation of chlorophyll *a* in the surface water along the cruise track, and (2) vertical profile of chlorophyll *a* in the Indian Sector of the Southern Ocean.

2. Materials and methods

Surface seawater was collected manually from continuously pumped up water through the hull two times a day during cruises. At stations for vertical water sampling, surface seawater was collected by a plastic bucket. Subsurface water was collected with a Van-Dorn bottle or a Niskin bottle attached to the multi-sampler on a CTD. Seawater samples of 200 ml were filtered onto a glass fiber filter (Whatman, GF/F). The filter was immediately soaked in *N, N*-dimethylformamide (Suzuki and Ishimaru, 1990), and pigments were extracted. The concentrations of chlorophyll *a* and phaeopigments were determined fluorometrically (Parsons *et al.*, 1984) with a fluorometer (Turner Design, 10-AU). The chlorophyll *a* was measured by the Holm-Hansen method until JARE-49 cruise (Holm-Hansen *et al.*, 1965). However, it was revealed that acidification technique had some errors with the existence of algal chlorophyll *b* (Welshmeyer, 1994). Thus, we adapted the Welshmeyer method from JARE-50 cruise. The fluorometer was calibrated against a chlorophyll *a* standard (Wako Chemical Co.) using a spectrophotometer in ships and the value of specific absorption coefficient obtained by Porra *et al.* (1989).

3. Data

Maps of the sampling stations during JARE-49 and JARE-50 cruises are illustrated in Fig. 1 and Fig. 2 respectively. Chlorophyll *a* and phaeopigments (only JARE-49 cruise) concentrations in sea

surface and subsurface water are shown in Table 1 and 2, respectively. Some data on phaeopigment concentrations were described as below zero, which may be attributed to a calibration error of the fluorometer. The data in this report are available on digital media.

4. Scientists on board

JARE-49: Icebreaker *Shirase*

Takahiro Iida and Sakae Kudoh (National Institute of Polar Research)

JARE-50: Multipurpose Vessel *Aurora Australis*

Takahiro Iida, Tsuneo Odate (National Institute of Polar Research)

Atsushi Tanimura (Mie University)

Graham Hosie (Australian Antarctic Division)

5. Data policy

Before using the data for publication or presentation, please request permission in writing. Inquiries should be addressed to:

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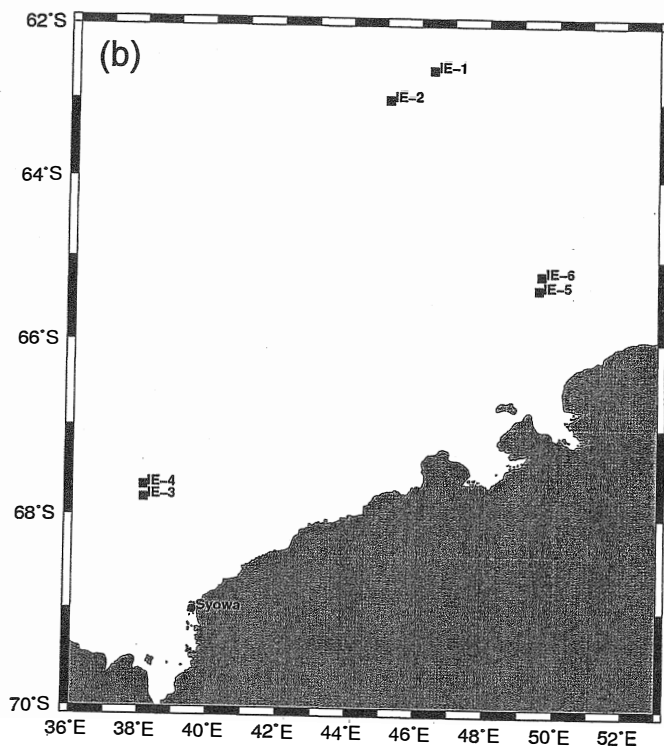
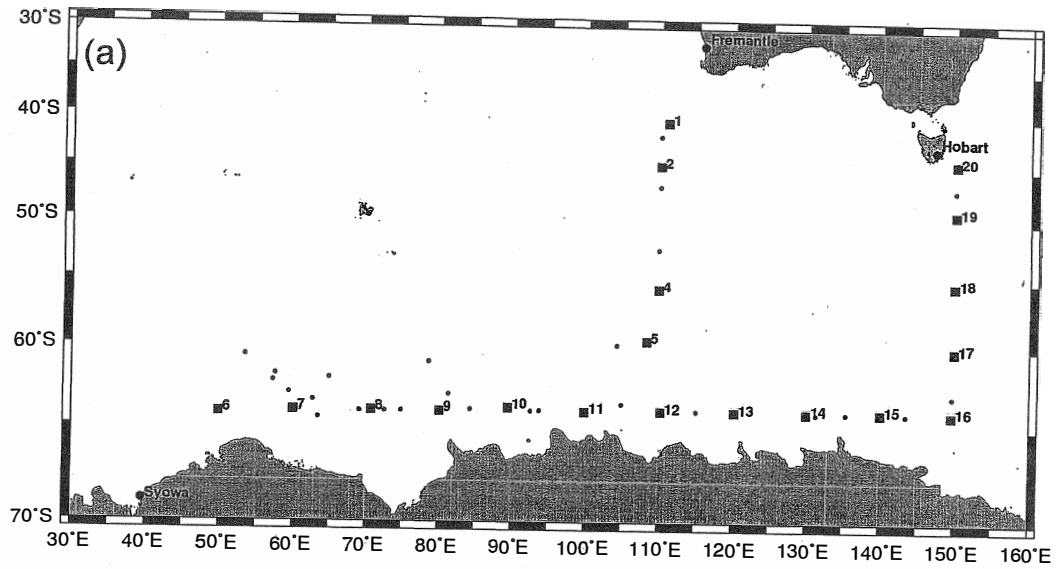


Fig. 1. The sampling stations during JARE-49 cruise in 2007/08 in the Southern Ocean (a) and Lützow-Holm Bay (b). Solid circles indicate surface water sampling by pump. Solid squares are stations for vertical water sampling.

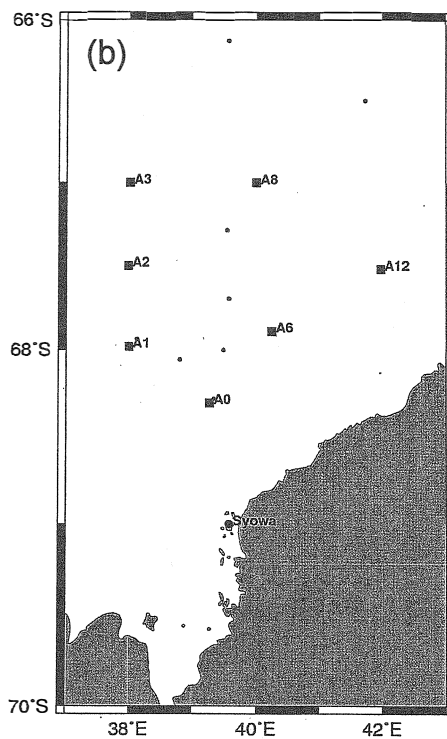
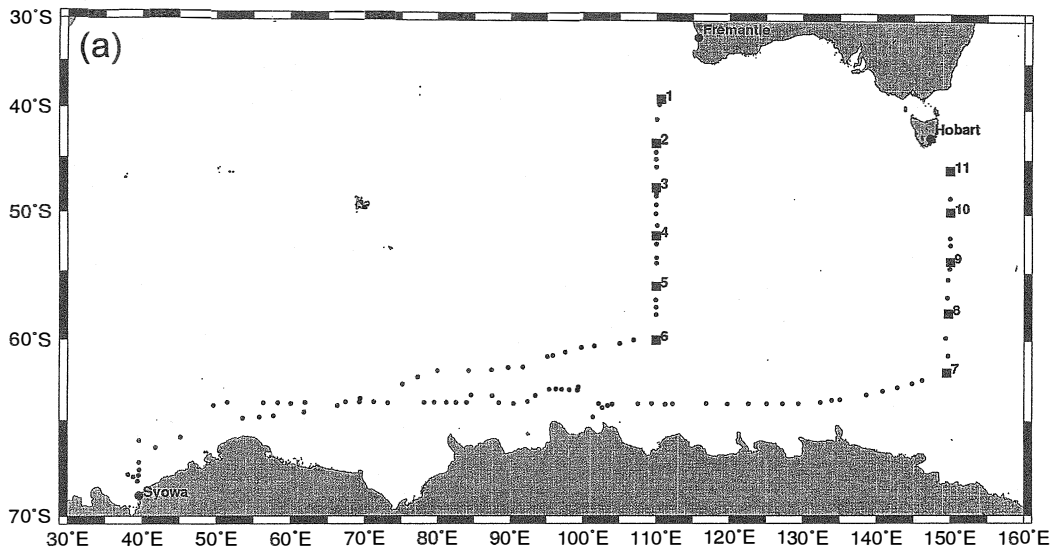


Fig. 2. The sampling stations during JARE-50 cruise in 2009 in the Southern Ocean (a) and Lützw-Holm Bay (b). Solid circles indicate surface water sampling by pump. Solid squares are stations for vertical water sampling.

Table 1-1. Chlorophyll *a* and phaeopigments concentrations of surface water pumped up from hull during JARE-49 cruise.

Sample #	Date(GMT)	Time(GMT)	Latitude			Longitude			Chl <i>a</i>	Phaeo.
			Degrees	Minutes		Degrees	Minutes		(mg m ⁻³)	(mg m ⁻³)
Fremantle, Australia										
S1	2007/12/5	12:48	41	59.8	S	109	59.8	E	0.48	0.12
S2	2007/12/6	12:55	46	53.2	S	110	0.1	E	0.49	0.10
S3	2007/12/7	12:55	52	31.3	S	109	48.9	E	0.72	0.09
S4	2007/12/8	13:29	59	49.9	S	104	15.7	E	0.66	0.01
S6	2007/12/11	14:06	61	1.1	S	78	35.3	E	1.03	0.01
S7	2007/12/12	15:37	62	5.7	S	64	55.1	E	1.73	0.09
Syowa station, Antarctica										
S8	2008/2/29	16:52	64	27.8	S	63	30	E	0.40	0.03
S9	2008/3/1	11:47	62	58.1	S	59	29.3	E	0.39	-0.03
S10	2008/3/1	16:55	62	16.9	S	57	11.6	E	0.16	-0.01
S11	2008/3/2	8:28	60	40	S	53	26.2	E	0.20	-0.02
S12	2008/3/2	18:05	61	51.8	S	57	32.3	E	0.91	0.08
S13	2008/3/3	6:13	63	23.4	S	62	45.9	E	0.86	0.06
S15	2008/3/3	22:42	64	0.2	S	69	10.4	E	1.74	0.14
S16	2008/3/4	9:39	63	59.9	S	72	37.9	E	0.87	0.04
S17	2008/3/4	14:37	63	59.5	S	74	53.2	E	0.29	0.06
S18	2008/3/5	9:28	63	2.9	S	81	21.7	E	0.26	0.02
S19	2008/3/5	15:42	63	56.9	S	84	22.1	E	0.41	0.03
S20	2008/3/6	11:53	63	57.7	S	92	38	E	1.38	0.14
S21	2008/3/6	14:00	63	57.3	S	93	49	E	1.42	0.18
S22	2008/3/7	13:24	63	32.1	S	104	58.8	E	0.18	0.04
S23	2008/3/8	12:35	63	58.8	S	115	6.2	E	0.28	0.04
S24	2008/3/10	5:26	64	1.6	S	131	26.4	E	0.19	0.04
S25	2008/3/10	12:53	63	59.7	S	135	30.4	E	0.19	0.02
S26	2008/3/11	10:34	64	0.2	S	143	39.2	E	0.18	0.03
S27	2008/3/12	7:02	63	1.2	S	149	51.4	E	0.51	0.03
S29	2008/3/16	9:22	47	0.6	S	150	0.4	E	0.64	0.31
S30	2008/3/17	1:50	44	1.1	S	150	12.6	E	1.06	0.42
Sydney, Australia										

Table 1-2. Chlorophyll *a* concentrations of surface water during JARE-50 cruise.

Sample #	Date(GMT)	Time(GMT)	Latitude			Longitude			Chl <i>a</i> (mg m ⁻³)
			Degrees	Minutes		Degrees	Minutes		
Fremantle, Australia									
S1	2009/1/1	9:14	39	36.0	S	110	26.1	E	0.30
S2	2009/1/1	15:38	41	9.2	S	110	3.3	E	0.24
S3	2009/1/2	9:08	44	19.0	S	109	59.8	E	0.38
S4	2009/1/2	12:33	45	0.3	S	109	59.0	E	0.30
S5	2009/1/2	15:42	45	47.0	S	110	2.8	E	0.30
S6	2009/1/3	7:00	48	11.3	S	110	0.9	E	0.26
S7	2009/1/3	9:00	48	26.8	S	109	59.5	E	0.22
S8	2009/1/3	12:00	49	13.5	S	110	0.3	E	0.29
S9	2009/1/3	15:30	50	1.0	S	109	59.1	E	0.25
S10	2009/1/4	9:00	51	3.9	S	110	5.9	E	0.51
S11	2009/1/4	7:12	52	40.3	S	110	1.1	E	0.66
S12	2009/1/4	12:32	53	48.6	S	110	0.7	E	0.70
S13	2009/1/4	14:40	54	15.3	S	110	1.9	E	0.72
S14	2009/1/5	9:02	57	7.2	S	109	57.0	E	0.53
S15	2009/1/5	11:48	57	40.4	S	109	59.5	E	0.60
S16	2009/1/5	14:20	58	13.2	S	110	0.1	E	0.53
S17	2009/1/6	11:05	60	0.3	S	106	53.9	E	0.30
S18	2009/1/6	15:24	60	14.5	S	105	1.8	E	0.53
S19	2009/1/7	1:10	60	25.2	S	101	32.1	E	0.30
S20	2009/1/7	5:16	60	31.7	S	99	47.9	E	0.57
S21	2009/1/7	10:10	60	48.9	S	97	33.8	E	0.55
S22	2009/1/7	14:13	61	2.4	S	95	49.4	E	1.37
S23	2009/1/7	16:40	61	6.6	S	95	4.6	E	1.48
S24	2009/1/8	1:12	61	47.9	S	91	42.8	E	0.93
S25	2009/1/8	5:42	61	47.9	S	89	38.6	E	3.29
S26	2009/1/8	10:30	61	59.6	S	87	24.3	E	3.60
S27	2009/1/8	16:56	62	0.4	S	84	16.1	E	4.52
S28	2009/1/9	3:41	62	0.1	S	79	57.8	E	1.94
S29	2009/1/9	9:30	62	25.1	S	77	16.9	E	0.24
S30	2009/1/9	14:30	62	50.9	S	75	6.9	E	0.41
S31	2009/1/10	3:10	63	46.4	S	69	19.7	E	0.29
S32	2009/1/10	9:20	64	10.4	S	66	13.2	E	0.27
S33	2009/1/10	17:55	64	34.0	S	61	43.2	E	0.33
S34	2009/1/11	3:12	64	44.9	S	57	40.1	E	0.36
S35	2009/1/11	7:00	64	50.7	S	55	45.3	E	0.32
S36	2009/1/11	11:30	64	54.3	S	53	28.9	E	0.30
S37	2009/1/12	4:00	65	55.6	S	45	7.1	E	0.37
S38	2009/1/12	10:28	66	29.9	S	41	43.4	E	0.27
S39	2009/1/12	15:48	67	17.3	S	39	32.7	E	0.64
S40	2009/1/12	19:25	67	56.2	S	38	7.5	E	3.48
Syowa Station, Antarctica									

Table 1-2. Continued.

Sample #	Date(GMT)	Time(GMT)	Latitude			Longitude			Chl <i>a</i> (mg m ⁻³)
			Degrees	Minutes		Degrees	Minutes		
S41	2009/1/28	5:55	67	41.9	S	39	34.6	E	0.36
S42	2009/1/28	8:17	68	0.0	S	39	29.3	E	0.40
S43	2009/1/28	15:55	66	7.8	S	39	33.7	E	0.41
S44	2009/1/28	17:53	68	3.4	S	38	48.6	E	0.47
S45	2009/1/29	5:15	68	17.1	S	39	20.4	E	0.55
S46	2009/2/4	13:00	64	10.0	S	49	32.8	E	0.19
S47	2009/2/4	17:15	63	58.2	S	51	23.8	E	0.26
S48	2009/2/5	4:10	64	0.0	S	56	19.6	E	0.24
S49	2009/2/5	8:00	63	59.9	S	58	12.8	E	0.21
S50	2009/2/5	12:05	64	2.4	S	59	59.0	E	0.32
S51	2009/2/5	16:04	63	59.4	S	61	52.9	E	0.28
S52	2009/2/6	4:12	63	56.5	S	67	23.5	E	0.26
S53	2009/2/6	8:00	63	57.5	S	69	14.2	E	0.95
S54	2009/2/6	12:05	63	56.0	S	71	13.6	E	0.55
S55	2009/2/6	16:03	64	0.6	S	73	7.0	E	0.25
S56	2009/2/7	3:06	63	58.7	S	78	7.1	E	0.29
S57	2009/2/7	6:00	63	58.2	S	79	30.1	E	2.51
S58	2009/2/7	9:20	63	58.4	S	81	9.6	E	1.69
S59	2009/2/7	12:00	63	58.0	S	82	29.4	E	1.67
S60	2009/2/7	14:58	63	59.0	S	84	0.0	E	2.09
S61	2009/2/7	18:35	63	30.7	S	84	34.8	E	2.40
S62	2009/2/8	2:09	63	32.9	S	87	30.3	E	2.05
S63	2009/2/8	6:13	63	59.3	S	88	24.6	E	2.45
S64	2009/2/8	10:01	63	59.2	S	90	25.8	E	0.85
S65	2009/2/8	14:06	63	52.4	S	92	22.8	E	4.90
S66	2009/2/8	17:50	63	31.5	S	93	26.4	E	3.41
S67	2009/2/9	2:03	63	9.0	S	95	20.0	E	1.44
S68	2009/2/9	4:30	63	6.2	S	96	16.7	E	1.10
S69	2009/2/9	6:45	63	9.2	S	97	2.2	E	1.16
S70	2009/2/9	9:43	63	9.8	S	98	6.8	E	0.61
S71	2009/2/9	14:04	63	11.3	S	99	13.9	E	0.58
S72	2009/2/9	17:06	63	0.6	S	99	22.1	E	0.40
S73	2009/2/10	1:04	64	46.5	S	101	21.6	E	0.61
S74	2009/2/10	5:08	64	2.1	S	102	8.9	E	0.50
S75	2009/2/10	9:09	64	16.5	S	102	37.6	E	0.50
S76	2009/2/10	13:06	64	11.2	S	103	20.2	E	0.38
S77	2009/2/10	15:35	64	4.2	S	104	0.7	E	0.30
S78	2009/2/11	0:03	64	0.1	S	107	29.6	E	0.20
S79	2009/2/11	4:04	63	59.6	S	109	24.0	E	0.24
S80	2009/2/11	8:10	64	1.3	S	111	13.9	E	0.19
S81	2009/2/11	12:08	64	0.9	S	112	14.5	E	0.30
S82	2009/2/12	0:04	64	0.5	S	116	50.1	E	0.32
S83	2009/2/12	5:55	63	59.6	S	119	41.1	E	0.94
S84	2009/2/12	12:04	64	2.1	S	122	34.0	E	1.29
S85	2009/2/12	18:40	64	2.1	S	125	4.7	E	2.37

Table 1-2. Continued.

Sample #	Date(GMT)	Time(GMT)	Latitude			Longitude			Chl <i>a</i> (mg m ⁻³)
			Degrees	Minutes		Degrees	Minutes		
S86	2009/2/12	23:04	64	0.0	S	127	14.1	E	1.25
S87	2009/2/13	3:12	63	59.7	S	129	22.9	E	1.64
S88	2009/2/13	8:15	63	57.0	S	132	20.5	E	1.66
S89	2009/2/13	11:02	63	48.5	S	133	55.3	E	2.41
S90	2009/2/13	13:45	63	45.3	S	135	3.7	E	0.27
S91	2009/2/13	22:03	63	28.2	S	138	39.8	E	0.89
S92	2009/2/14	2:15	63	15.5	S	140	52.2	E	0.38
S93	2009/2/14	0:00	63	2.8	S	142	51.1	E	0.85
S94	2009/2/14	0:00	62	47.7	S	144	54.2	E	0.16
S95	2009/2/14	0:00	62	36.8	S	146	13.9	E	0.12
S96	2009/2/15	6:02	60	59.6	S	149	42.8	E	0.49
S97	2009/2/15	0:00	59	49.2	S	149	21.8	E	0.59
S98	2009/2/16	7:03	56	56.5	S	149	37.1	E	0.35
S99	2009/2/16	14:20	55	30.9	S	149	41.4	E	0.62
S100	2009/2/16	18:27	54	39.6	S	149	56.3	E	0.19
S101	2009/2/17	7:04	52	43.2	S	150	0.8	E	0.70
S102	2009/2/17	10:24	52	5.9	S	149	57.8	E	0.93
S103	2009/2/18	7:10	48	34.6	S	149	57.4	E	0.40

Hobart, Australia

Table 2-1. Vertical profile of chlorophyll *a* and phaeopigments concentrations during JARE-49 cruise. ND indicates no data.

Station	Station Information			Chl <i>a</i>		Phaeo.		Station	Station Information			Chl <i>a</i>		Phaeo.	
				Depth (m)	(mg m ⁻³)	(mg m ⁻³)	Depth (m)					(mg m ⁻³)	(mg m ⁻³)	Depth (m)	(mg m ⁻³)
1	Date (GMT)	2007/12/5	0	0.55	0.10	8	Date (GMT)	2008/3/4	0	1.76	0.18				
	Latitude	40°35.2'S	10	0.48	0.13		Latitude	63°58.0'S	10	2.22	0.29				
	Longitude	110°59.8'E	20	0.54	0.18		Longitude	70°48.0'E	20	2.10	0.24				
	Time (GMT)	1:13	30	0.54	0.11		Time (GMT)	3:11	30	1.96	0.25				
			50	0.53	0.10				50	0.66	0.22				
			75	0.31	0.27				75	0.38	0.17				
			100	0.19	0.14				100	0.18	0.13				
			125	0.06	0.05				125	0.11	0.08				
		150	0.06	0.04			150	0.08	0.07						
		200	0.01	0.02			200	0.05	0.05						
2	Date (GMT)	2007/12/6	0	0.96	0.10	9	Date (GMT)	2008/3/5	0	0.17	0.04				
	Latitude	44°52.5'S	10	0.99	0.16		Latitude	64°00.0'S	10	0.19	0.04				
	Longitude	110°01.5'E	20	0.92	0.11		Longitude	80°10.0'E	20	0.18	0.04				
	Time (GMT)	1:08	30	0.92	0.15		Time (GMT)	3:40	30	0.17	0.03				
			50	0.54	0.17				50	0.20	0.05				
			75	0.48	0.25				75	0.21	0.10				
			100	0.40	0.22				100	0.10	0.06				
			125	0.36	0.21				125	0.05	0.04				
		150	0.23	0.18			150	0.05	0.04						
		200	0.11	0.13			200	0.01	0.03						
4	Date (GMT)	2007/12/8	0	0.45	0.04	10	Date (GMT)	2008/3/6	0	1.44	0.10				
	Latitude	55°37.0'S	10	0.47	0.05		Latitude	63°40.0'S	10	1.58	0.09				
	Longitude	109°53.0'E	20	0.42	0.02		Longitude	89°32.0'E	20	1.45	0.12				
	Time (GMT)	6:10	30	0.41	0.03		Time (GMT)	3:04	30	1.53	0.12				
			50	0.44	0.02				50	1.17	0.13				
			75	0.45	0.05				75	0.37	0.15				
			100	0.44	0.03				100	0.18	0.07				
			125	0.23	0.10				125	0.09	0.04				
		150	ND	ND			150	0.07	0.03						
		200	ND	ND			200	0.04	0.03						
5	Date (GMT)	2007/12/9	0	0.43	0.01	11	Date (GMT)	2008/3/7	0	0.71	0.08				
	Latitude	59°29.0'S	10	0.40	0.02		Latitude	63°59.0'S	10	0.67	0.06				
	Longitude	108°22.0'E	20	0.39	0.02		Longitude	100°00.0'E	20	0.66	0.08				
	Time (GMT)	1:40	30	0.38	0.00		Time (GMT)	2:05	30	0.73	0.09				
			50	0.50	0.03				50	0.43	0.14				
			75	0.43	0.03				75	0.26	0.12				
			100	0.27	0.08				100	0.16	0.08				
			125	0.13	0.05				125	0.07	0.04				
		150	0.10	0.03			150	0.07	0.04						
		200	0.06	0.02			200	0.10	0.03						
6	Date (GMT)	2008/2/28	0	0.49	0.04	12	Date (GMT)	2008/3/8	0	0.24	0.00				
	Latitude	64°10.0'S	10	0.52	0.03		Latitude	63°57.0'S	10	0.24	0.04				
	Longitude	49°58.0'E	20	0.67	0.08		Longitude	110°20.0'E	20	0.23	0.02				
	Time (GMT)	10:07	30	0.57	0.05		Time (GMT)	2:13	30	0.42	0.01				
			50	0.64	0.03				50	0.72	0.04				
			75	0.55	0.34				75	0.48	0.17				
			100	0.36	0.05				100	0.13	0.09				
			125	0.16	0.26				125	0.05	0.03				
		150	0.15	0.04			150	0.03	0.03						
		200	0.14	0.05			200	0.14	0.04						
7	Date (GMT)	2008/2/29	0	0.48	0.01	13	Date (GMT)	2008/3/9	0	0.14	0.00				
	Latitude	64°00.0'S	10	0.58	0.03		Latitude	63°58.0'S	10	0.14	0.00				
	Longitude	60°06.0'E	20	0.69	0.07		Longitude	120°21.0'E	20	0.15	0.00				
	Time (GMT)	6:40	30	0.65	0.05		Time (GMT)	0:00	30	0.23	0.01				
			50	0.66	0.06				50	0.46	0.06				
			75	0.47	0.08				75	0.02	0.02				
			100	0.14	0.05				100	0.25	0.11				
			125	0.09	0.05				125	0.10	0.04				
		150	0.03	0.03			150	0.02	0.02						
		200	0.02	0.03			200	0.02	0.02						

Table 2-1. Continued.

Station	Station Information	Depth (m)	Chl α		Phaeo.		Station	Station Information	Depth (m)	Chl α		Phaeo.					
			(mg m ⁻³)	(mg m ⁻³)	(mg m ⁻³)	(mg m ⁻³)				(mg m ⁻³)	(mg m ⁻³)						
14	Date (GMT)	2008/3/10	0	0.34	0.04	IE-1	Date (GMT)	2007/12/14	0	0.69	0.03	IE-2	Date (GMT)	2007/12/14	0	1.33	0.01
	Latitude	64°00.0'S	10	0.42	0.00		Latitude	62°34.7'S	10	0.79	-0.04		Latitude	62°57.8'S	10	1.33	-0.05
	Longitude	130°10.0'E	20	0.38	-0.01		Longitude	46°25.5'E	20	0.89	0.00		Longitude	45°07.95'E	20	1.27	0.01
	Time (GMT)	0:04	30	0.42	0.01		Time (GMT)	2:40	30	0.89	0.01		Time (GMT)	6:20	30	1.75	-0.01
			50	0.61	0.13				50	0.71	0.04				50	1.53	0.16
			75	0.35	0.15				75	0.51	0.13				75	0.54	0.08
			100	0.19	0.11				100	0.28	0.07				100	0.28	0.07
			125	0.11	0.06				125	0.12	0.05				125	0.16	0.04
		150	0.04	0.03			150	0.05	0.02			150	0.08	0.02			
		200	0.02	0.02			200	0.02	0.03			200	0.11	0.02			
15	Date (GMT)	2008/3/11	0	0.64	0.00	IE-3	Date (GMT)	2008/2/20	0	0.76	0.09	IE-4	Date (GMT)	2008/2/20	0	0.38	0.03
	Latitude	63°59.0'S	10	0.65	0.02		Latitude	67°48.2'S	10	0.59	0.02		Latitude	67°40.0'S	10	0.51	0.03
	Longitude	140°12.0'E	20	0.65	0.01		Longitude	38°04.5'E	20	0.97	0.03		Longitude	38°04.0'E	20	0.47	0.04
	Time (GMT)	23:00	30	0.53	0.01		Time (GMT)	12:10	30	0.81	0.06		Time (GMT)	14:10	30	0.52	0.05
			50	0.56	0.00				50	0.64	0.09				50	0.47	0.05
			75	0.55	0.22				75	0.15	0.05				75	0.14	0.10
			100	0.13	0.08				100	0.12	0.07				100	0.19	0.19
			125	0.06	0.03				125	0.07	0.05				125	0.14	0.11
		150	0.05	0.03			150	0.06	0.06			150	0.11	0.09			
		200	0.03	0.02			200	0.05	0.05			200	0.04	0.04			
16	Date (GMT)	2008/3/12	0	0.15	0.02	IE-5	Date (GMT)	2008/2/28	0	1.83	0.19	IE-6	Date (GMT)	2008/2/28	0	1.83	0.19
	Latitude	64°00.0'S	10	0.16	0.01		Latitude	65°11.6'S	10	1.88	0.29		Latitude	65°11.6'S	10	1.88	0.29
	Longitude	149°49.0'E	20	0.16	0.02		Longitude	49°29.2'E	20	2.21	0.25		Longitude	49°33.4'E	20	2.21	0.25
	Time (GMT)	22:04	30	0.16	0.01		Time (GMT)	4:37	30	2.65	0.38		Time (GMT)	5:50	30	2.65	0.38
			50	0.24	0.01				50	3.11	0.12				50	3.11	0.12
			75	0.36	0.06				75	2.02	0.26				75	2.02	0.26
			100	0.23	0.11				100	1.89	0.19				100	1.89	0.19
			125	0.13	0.07				125	1.09	0.23				125	1.09	0.23
		150	0.05	0.03			150	ND	ND			150	ND	ND			
		200	0.01	0.02			200	0.18	0.04			200	0.18	0.04			
17	Date (GMT)	2008/3/13	0	0.61	0.03	IE-6	Date (GMT)	2008/2/28	0	1.83	0.19	IE-6	Date (GMT)	2008/2/28	0	1.83	0.19
	Latitude	60°02.0'S	10	0.56	0.04		Latitude	67°40.0'S	10	0.51	0.03		Latitude	65°11.6'S	10	1.88	0.29
	Longitude	150°03.0'E	20	0.54	0.04		Longitude	38°04.0'E	20	0.47	0.04		Longitude	49°29.2'E	20	2.21	0.25
	Time (GMT)	22:10	30	0.51	0.04		Time (GMT)	14:10	30	0.52	0.05		Time (GMT)	4:37	30	2.65	0.38
			50	0.57	0.04				50	0.47	0.05				50	3.11	0.12
			75	1.13	0.14				75	0.14	0.10				75	2.02	0.26
			100	0.59	0.23				100	0.19	0.19				100	1.89	0.19
			125	0.28	0.21				125	0.14	0.11				125	1.09	0.23
		150	0.15	0.12			150	0.11	0.09			150	ND	ND			
		200	0.07	0.05			200	0.04	0.04			200	0.18	0.04			
18	Date (GMT)	2008/3/14	0	0.55	0.03	IE-5	Date (GMT)	2008/2/28	0	1.93	0.16	IE-6	Date (GMT)	2008/2/28	0	1.83	0.19
	Latitude	55°12.0'S	10	0.40	0.05		Latitude	65°22.0'S	10	1.68	0.09		Latitude	65°11.6'S	10	1.88	0.29
	Longitude	150°02.0'E	20	0.35	0.06		Longitude	49°29.2'E	20	1.62	0.17		Longitude	49°33.4'E	20	2.21	0.25
	Time (GMT)	22:32	30	0.44	0.07		Time (GMT)	4:37	30	1.74	0.18		Time (GMT)	5:50	30	2.65	0.38
			50	0.39	0.06				50	2.16	0.30				50	3.11	0.12
			75	0.36	0.07				75	1.63	0.27				75	2.02	0.26
			100	0.44	0.13				100	1.17	0.20				100	1.89	0.19
			125	0.51	0.15				125	0.52	0.13				125	1.09	0.23
		150	0.38	0.15			150	0.20	0.09			150	ND	ND			
		200	0.03	0.04			200	0.29	0.06			200	0.29	0.06			
19	Date (GMT)	2007/3/16	0	0.87	0.24	IE-6	Date (GMT)	2008/2/28	0	1.83	0.19	IE-6	Date (GMT)	2008/2/28	0	1.83	0.19
	Latitude	49°16.0'S	10	0.83	0.27		Latitude	65°11.6'S	10	1.88	0.29		Latitude	65°11.6'S	10	1.88	0.29
	Longitude	150°04.0'E	20	0.84	0.24		Longitude	49°33.4'E	20	2.21	0.25		Longitude	49°33.4'E	20	2.21	0.25
	Time (GMT)	22:10	30	0.84	0.27		Time (GMT)	5:50	30	2.65	0.38		Time (GMT)	5:50	30	2.65	0.38
			50	0.86	0.27				50	3.11	0.12				50	3.11	0.12
			75	0.89	0.31				75	2.02	0.26				75	2.02	0.26
			100	0.83	0.31				100	1.89	0.19				100	1.89	0.19
			125	0.05	0.06				125	1.09	0.23				125	1.09	0.23
		150	0.02	0.03			150	ND	ND			150	ND	ND			
		200	0.01	0.02			200	0.18	0.04			200	0.18	0.04			
20	Date (GMT)	2008/3/17	0	0.92	0.30	IE-6	Date (GMT)	2008/2/28	0	1.83	0.19	IE-6	Date (GMT)	2008/2/28	0	1.83	0.19
	Latitude	44°19.0'S	10	1.01	0.29		Latitude	65°11.6'S	10	1.88	0.29		Latitude	65°11.6'S	10	1.88	0.29
	Longitude	150°08.0'E	20	1.05	0.36		Longitude	49°33.4'E	20	2.21	0.25		Longitude	49°33.4'E	20	2.21	0.25
	Time (GMT)	22:11	30	0.97	0.44		Time (GMT)	5:50	30	2.65	0.38		Time (GMT)	5:50	30	2.65	0.38
			50	0.60	0.31				50	3.11	0.12				50	3.11	0.12
			75	0.24	0.20				75	2.02	0.26				75	2.02	0.26
			100	0.06	0.05				100	1.89	0.19				100	1.89	0.19
			125	0.02	0.02				125	1.09	0.23				125	1.09	0.23
		150	0.01	0.02			150	ND	ND			150	ND	ND			
		200	0.01	0.02			200	0.18	0.04			200	0.18	0.04			

Table 2-2. Vertical profile of chlorophyll *a* concentrations during JARE-50 cruise.

Station	Station Information	Depth (m)	Chl.a		Station	Station Information	Depth (m)	Chl.a	
				(mg m ⁻³)					(mg m ⁻³)
1	Date (GMT)	2009/1/1	0	0.36	7	Date (GMT)	2009/2/14	0	0.33
	Latitude	39°01.8'S	10	0.40		Latitude	62°05.1'S	10	0.34
	Longitude	110°41.3'E	20	0.39		Longitude	149°34.4'E	20	0.36
	Time (GMT)	1:29	30	0.41		Time (GMT)	21:46	30	0.54
			50	0.62				50	0.34
			75	0.48				75	0.11
			100	0.15				100	0.08
			125	0.03				125	0.04
			150	0.04				150	0.06
			200	0.01				200	0.09
2	Date (GMT)	2009/1/2	0	0.57	8	Date (GMT)	2009/2/15	0	0.60
	Latitude	43°26.4'S	10	0.50		Latitude	58°07.3'S	10	0.56
	Longitude	109°59.9'E	20	0.51		Longitude	149°44.8'E	20	0.73
	Time (GMT)	0:42	30	0.55		Time (GMT)	21:39	30	0.75
			50	0.49				50	0.75
			75	0.48				75	0.95
			100	0.27				100	0.38
			125	0.10				125	0.06
			150	0.04				150	0.14
			200	0.02				200	0.10
3	Date (GMT)	2009/1/3	0	0.27	9	Date (GMT)	2009/2/16	0	0.68
	Latitude	47°39.2'S	10	0.22		Latitude	54°05.9'S	10	0.67
	Longitude	109°58.9'E	20	0.21		Longitude	150°00.1'E	20	0.63
	Time (GMT)	0:44	30	0.26		Time (GMT)	21:31	30	0.66
			50	0.34				50	0.70
			75	0.38				75	0.69
			100	0.39				100	0.65
			125	0.10				125	0.14
			150	0.06				150	0.08
			200	0.02				200	0.05
4	Date (GMT)	2009/1/4	0	0.59	10	Date (GMT)	2009/2/17	0	0.50
	Latitude	51°57.9'S	10	0.53		Latitude	49°49.0'S	10	0.41
	Longitude	110°02.9'E	20	0.51		Longitude	150°01.7'E	20	0.52
	Time (GMT)	0:43	30	0.56		Time (GMT)	21:28	30	0.61
			50	0.68				50	0.56
			75	0.92				75	0.56
			100	0.32				100	0.55
			125	0.11				125	0.23
			150	0.08				150	0.16
			200	0.07				200	0.10
5	Date (GMT)	2009/1/5	0	0.47	11	Date (GMT)	2009/2/18	0	1.20
	Latitude	56°06.5'S	10	0.61		Latitude	45°59.7'S	10	1.27
	Longitude	110°00.0'E	20	0.76		Longitude	150°00.6'E	20	1.20
	Time (GMT)	0:29	30	0.93		Time (GMT)	21:22	30	0.63
			50	0.87				50	0.43
			75	0.53				75	0.24
			100	0.32				100	0.14
			125	0.07				125	0.04
			150	0.08				150	0.04
			200	0.09				200	0.05
6	Date (GMT)	2009/1/6	0	0.47					
	Latitude	59°59.9'S	10	0.44					
	Longitude	109°59.0'E	20	0.43					
	Time (GMT)	0:35	30	0.53					
			50	0.57					
			75	0.54					
			100	0.38					
			125	0.21					
			150	0.11					
			200	0.04					

Table 2-2. Continued.

Station	Station Information	Depth (m)	Chl.a		Station	Station Information	Depth (m)	Chl.a	
			(mg m ⁻³)					(mg m ⁻³)	
A0	Date (GMT)	2009/1/30	0	0.35	A8	Date (GMT)	2009/1/23	0	0.34
	Latitude	68°18.5'S	10	0.36		Latitude	67°00.1'S	10	0.32
	Longitude	39°16.6'E	20	0.38		Longitude	39°59.8'E	20	0.38
	Time (GMT)	6:30	30	0.49		Time (GMT)	16:00	30	0.47
			50	0.67				50	0.60
			75	0.43				75	0.64
			100	0.14				100	0.11
			125	0.09				125	0.08
			150	0.10				150	0.06
			175	0.12				175	0.06
		200	0.18			200	0.07		
A1	Date (GMT)	2009/1/23	0	0.57	A12	Date (GMT)	2009/1/24	0	0.70
	Latitude	67°58.8'S	10	0.59		Latitude	67°31.2'S	10	0.60
	Longitude	37°59.9'E	20	0.62		Longitude	41°58.3'E	20	0.64
	Time (GMT)	8:00	30	0.48		Time (GMT)	7:15	30	0.54
			50	0.57				50	0.47
			75	0.32				75	0.23
			100	0.23				100	0.21
			125	0.11				125	0.13
			150	0.13				150	0.20
			175	0.16				175	0.16
		200	0.22			200	0.13		
A2	Date (GMT)	2009/1/15	0	0.24					
	Latitude	67°30.1'S	10	0.26					
	Longitude	37°59.3'E	20	0.29					
	Time (GMT)	12:40	30	0.27					
			50	0.34					
			75	0.40					
			100	0.25					
			125	0.15					
			150	0.18					
			175	0.12					
		200	0.09						
A3	Date (GMT)	2009/1/15	0	0.34					
	Latitude	67°00.1'S	10	0.33					
	Longitude	38°00.6'E	20	0.42					
	Time (GMT)	7:00	30	0.46					
			50	0.44					
			75	0.20					
			100	0.04					
			125	0.07					
			150	0.05					
			175	0.05					
		200	0.07						
A6	Date (GMT)	2009/1/24	0	0.51					
	Latitude	67°53.4'S	10	0.49					
	Longitude	40°14.6'E	20	0.50					
	Time (GMT)	14:17	30	0.50					
			50	0.40					
			75	0.35					
			100	0.26					
			125	0.22					
			150	0.16					
			175	0.15					
		200	0.11						