

## **Chlorophyll *a* concentration of phytoplankton during the cruise of the 48th Japanese Antarctic Research Expedition in 2006-2007**

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### **1. Introduction**

This is a report on the phytoplankton chlorophyll *a* concentration on the cruise of the icebreaker *Shirase* during the 48th Japanese Antarctic Research Expedition (JARE) in the 2006-2007 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 Ocean Sector of the Southern Ocean.

### **2. Materials and methods**

Surface seawater was collected manually from continuously pumped up water through the hull three times a day during cruise. At stations for vertical water sampling, surface seawater was collected by a plastic bucket. Subsurface water was collected with a Niskin bottle attached to the multi-sampler on a CTD or Van-Dorn bottle. 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 fluorometer was calibrated against a chlorophyll *a* standard (Sigma Chemical Co.) using a spectrophotometer and the value of specific absorption coefficient obtained by Porra *et al.* (1989).

### **3. Data**

A map of the sampling stations during JARE-48 cruise is illustrated in Fig. 1.

Chlorophyll *a* and phaeopigment 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**

Sampling and analysis were carried out by Don-Hoon Han, Nobue Kasamatsu, Tamotsu Hoshino (National Institute of Advanced Industrial Science and Technology) and Sakae Kudoh.

#### **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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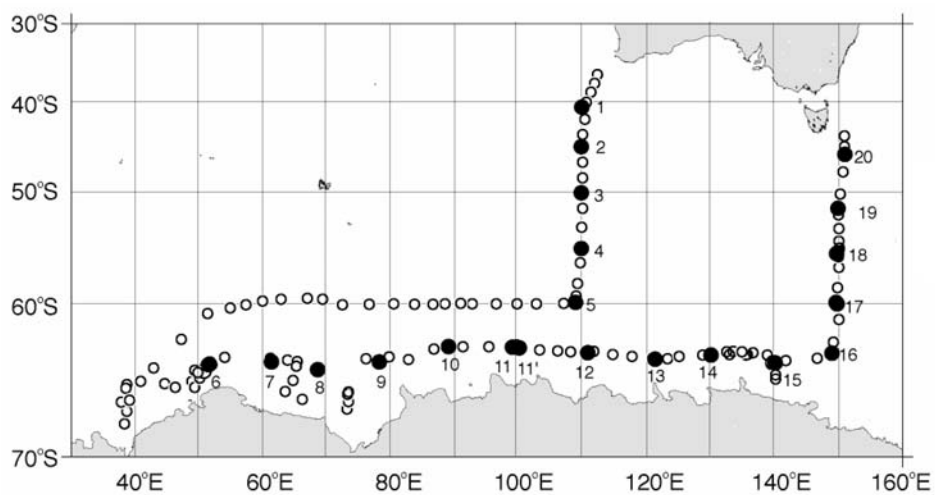


Fig. 1. Map showing the sites of sampling stations during JARE-48 in 2006/07. Open circles indicate surface water sampling by pump. Solid circles are stations for vertical water sampling.

Table 1. Chlorophyll *a* and phaeopigment concentrations of surface water during JARE-48cruise

Sample #	Pump /Bucket	Date(GMT)	Time(GMT)	Latitude		Longitude			Chl. <i>a</i> (mg m <sup>-3</sup> )	Phaeo. (mg m <sup>-3</sup> )	
				Degrees	Minutes	Degrees	Minutes	E			
Fremantle, Australia											
1	pump	2006/12/4	3:42	36	39.02	S	112	17.21	E	0.36	0.06
2	pump	2006/12/4	9:47	37	45.38	S	111	49.64	E	0.19	0.03
3	pump	2006/12/4	15:45	38	49.61	S	111	14.21	E	0.32	0.08
4	pump	2006/12/4	23:30	40	2.11	S	110	29.57	E	0.24	0.06
5	pump	2006/12/5	15:35	42	3.48	S	110	16.66	E	0.23	0.04
6	pump	2006/12/5	23:22	43	50.91	S	109	58.74	E	0.30	0.06
7	pump	2006/12/6	16:40	46	51.81	S	109	58.77	E	0.59	0.05
8	pump	2006/12/6	23:20	48	31.71	S	109	57.62	E	0.29	0.01
9	pump	2006/12/7	16:23	51	36.75	S	109	56.92	E	0.39	0.05
10	pump	2006/12/7	23:50	53	23.53	S	109	47.71	E	0.50	0.03
11	pump	2006/12/8	16:45	56	37.12	S	109	36.73	E	0.57	0.06
12	pump	2006/12/8	23:45	58	20.49	S	109	10.37	E	0.32	0.00
13	pump	2006/12/9	4:00	59	20.74	S	108	54.77	E	0.20	0.00
14	pump	2006/12/9	13:45	59	57.51	S	107	0.65	E	0.31	-0.01
15	pump	2006/12/9	23:10	59	59.31	S	102	45.63	E	0.25	-0.01
16	pump	2006/12/10	6:40	59	58.49	S	99	39.71	E	0.35	0.01
17	pump	2006/12/10	14:30	59	59.23	S	96	27.51	E	0.48	0.00
18	pump	2006/12/10	23:47	59	59.26	S	92	42.66	E	0.98	0.00
19	pump	2006/12/11	5:00	59	57.26	S	90	52.53	E	0.68	0.02
20	pump	2006/12/11	12:03	59	58.94	S	88	23.95	E	0.70	0.00
21	pump	2006/12/11	17:12	60	0.25	S	86	32.79	E	0.89	0.07
22	pump	2006/12/12	0:20	60	0.36	S	83	38.25	E	0.74	0.09
23	pump	2006/12/12	7:50	59	58.41	S	80	23.51	E	1.03	0.01
24	pump	2006/12/12	16:10	60	0.54	S	76	33.85	E	1.07	0.09
25	pump	2006/12/13	1:28	60	2.66	S	72	24.32	E	1.02	0.03
26	pump	2006/12/13	9:30	59	36.41	S	69	16.15	E	0.89	0.04
27	pump	2006/12/13	15:53	59	32.09	S	66	55.85	E	0.36	-0.01
28	pump	2006/12/14	1:22	59	37.98	S	62	45.76	E	0.32	0.00
29	pump	2006/12/14	7:47	59	46.72	S	59	53.25	E	0.14	0.00
30	pump	2006/12/14	13:36	60	2.78	S	57	18.29	E	0.16	0.00
31	pump	2006/12/14	19:00	60	19.41	S	54	51.56	E	0.11	-0.01
32	pump	2006/12/15	2:27	60	43.97	S	51	19.86	E	0.11	0.00
33	pump	2006/12/15	16:06	62	38.67	S	47	10.99	E	0.11	0.00
34	pump	2006/12/16	3:30	64	38.99	S	42	49.78	E	0.37	0.01
35	pump	2006/12/16	8:30	65	32.34	S	40	51.86	E	0.34	-0.01
Syowa Station, Antarctica											
36	pump	2007/2/16	16:28	68	7.98	S	38	19.73	E	0.16	0.00
37	pump	2007/2/16	21:53	67	25.03	S	38	38.92	E	0.19	0.01
38	pump	2007/2/17	3:10	66	50.04	S	37	49.05	E	0.16	-0.01
39	pump	2007/2/17	9:25	65	44.68	S	38	38.21	E	0.09	0.00

Sample #	Pump /Bucket	Date(GMT)	Time(GMT)	Latitude		Longitude		Chl.a (mg m <sup>-3</sup> )	Phaeo. (mg m <sup>-3</sup> )		
				Degrees	Minutes	Degrees	Minutes				
40	pump	2007/2/17	15:05	65	57.68	S	38	32.83	E	0.08	-0.01
41	pump	2007/2/17	21:07	66	43.66	S	39	8.11	E	0.12	-0.01
42	pump	2007/2/18	8:40	65	40.14	S	44	35.87	E	0.08	0.00
43	pump	2007/2/18	15:06	65	55.23	S	46	15.61	E	0.16	0.00
44	pump	2007/2/18	21:17	65	32.38	S	48	49.58	E	0.28	0.02
45	pump	2007/2/21	11:32	65	54.19	S	49	15.75	E	0.67	0.00
46	pump	2007/2/21	17:56	65	18.82	S	50	4.33	E	0.48	0.01
47	pump	2007/2/21	22:35	64	50.91	S	50	42.26	E	0.27	-0.01
48	pump	2007/2/22	3:15	64	25.23	S	51	28.57	E	0.42	0.02
49	pump	2007/2/22	12:20	64	48.25	S	49	15.45	E	0.22	-0.01
50	bucket	2007/2/23	5:00	64	56.58	S	49	48.87	E	0.27	0.00
51	pump	2007/2/23	20:04	63	55.23	S	54	0.72	E	0.13	0.00
52	pump	2007/2/24	8:43	63	59.72	S	61	8.66	E	0.15	-0.01
53	pump	2007/2/24	19:05	64	7.02	S	63	47.22	E	1.78	-1.42
54	pump	2007/2/24	23:25	64	12.82	S	65	19.35	E	0.11	0.00
55	pump	2007/2/25	7:20	64	24.61	S	65	11.41	E	0.17	-0.01
56	pump	2007/2/25	19:40	65	27.88	S	64	41.69	E	0.14	-0.01
57	pump	2007/2/25	1:45	66	10.35	S	63	26.28	E	0.21	-0.02
58	pump	2007/2/26	7:25	66	39.77	S	66	5.92	E	0.43	0.00
59	bucket	2007/2/28	8:55	67	16.29	S	73	8.05	E	1.86	0.01
60	bucket	2007/3/1	3:55	66	49.19	S	73	19.98	E	0.81	0.00
61	bucket	2007/3/1	10:55	66	21.24	S	73	9.78	E	0.57	0.02
62	bucket	2007/3/1	16:55	66	12.93	S	73	18.61	E	0.55	0.01
63	pump	2007/3/2	3:00	64	1.25	S	76	6.45	E	0.69	-0.06
64	pump	2007/3/2	13:00	63	52.76	S	79	42.81	E	1.04	-0.05
65	pump	2007/3/2	18:25	65	51.25	S	82	42.86	E	0.86	-0.04
66	pump	2007/3/3	2:08	63	20.49	S	86	41.32	E	1.02	-0.01
67	pump	2007/3/3	14:55	63	10.42	S	91	14.09	E	0.18	-0.01
68	pump	2007/3/3	22:25	63	10.01	S	95	17.27	E	0.88	-0.04
69	pump	2007/3/4	4:50	63	12.17	S	98	42.41	E	0.85	-0.09
70	pump	2007/3/5	9:30	63	25.24	S	103	15.53	E	0.32	-0.03
71	pump	2007/3/5	15:30	63	28.76	S	106	2.21	E	0.66	-0.08
72	pump	2007/3/5	20:05	63	32.32	S	108	4.97	E	0.44	-0.01
73	pump	2007/3/6	1:50	63	36.59	S	110	29.41	E	0.52	-0.02
74	pump	2007/3/6	15:10	63	40.01	S	114	46.82	E	0.71	-0.01
75	pump	2007/3/6	20:30	63	52.21	S	117	42.59	E	0.24	-0.01
76	pump	2007/3/7	2:20	63	58.79	S	120	53.73	E	1.08	-0.09
77	pump	2007/3/7	16:20	64	0.76	S	123	15.15	E	1.10	-0.05
78	pump	2007/3/7	21:25	63	50.89	S	125	4.16	E	0.94	-0.06
79	pump	2007/3/8	2:20	63	46.56	S	128	44.24	E	0.78	-0.02
80	pump	2007/3/8	14:25	63	43.75	S	132	53.79	E	0.78	-0.07

Sample #	Pump /Bucket	Date(GMT)	Time(GMT)	Latitude		Longitude		Chl.a (mg m <sup>-3</sup> )	Phaeo. (mg m <sup>-3</sup> )		
				Degrees	Minutes	Degrees	Minutes				
81	pump	2007/3/8	19:10	63	46.62	S	135	29.06	E	0.69	-0.03
82	pump	2007/3/9	1:20	63	43.55	S	135	45.46	E	0.83	-0.06
83	pump	2007/3/9	8:35	63	39.09	S	132	29.09	E	0.38	-0.04
84	pump	2007/3/9	15:46	63	30.94	S	133	29.61	E	0.22	-0.02
85	bucket	2007/3/9	21:10	63	31.71	S	134	51.65	E	0.26	-0.02
86	pump	2007/3/10	3:35	63	35.62	S	136	35.71	E	0.68	-0.02
87	pump	2007/3/10	9:30	63	44.91	S	138	48.51	E	0.27	-0.02
88	pump	2007/3/10	14:20	64	17.82	S	139	43.74	E	0.88	-0.06
89	pump	2007/3/10	21:20	65	5.63	S	140	8.29	E	1.62	-0.12
90	pump	2007/3/11	4:15	65	22.99	S	140	8.61	E	1.71	-0.17
91	pump	2007/3/11	15:00	64	8.25	S	141	44.01	E	0.38	-0.02
92	pump	2007/3/11	21:15	63	58.99	S	146	40.41	E	0.29	-0.02
93	pump	2007/3/12	12:00	62	50.85	S	149	11.23	E	0.09	0.00
94	pump	2007/3/12	20:20	61	10.76	S	149	59.99	E	0.16	-0.02
95	pump	2007/3/13	1:25	60	0.14	S	149	46.54	E	0.00	0.17
96	pump	2007/3/13	12:00	58	42.27	S	149	47.55	E	0.07	0.00
97	pump	2007/3/13	6:00	56	59.94	S	150	3.02	E	0.14	0.00
98	pump	2007/3/14	0:20	56	5.41	S	149	59.51	E	0.39	0.03
99	pump	2007/3/14	10:20	55	48.99	S	149	40.28	E	0.32	0.04
100	pump	2007/3/14	13:00	55	18.57	S	150	6.66	E	0.24	0.01
101	pump	2007/3/14	16:10	54	41.24	S	150	3.15	E	0.20	0.00
102	pump	2007/3/14	20:15	53	31.05	S	150	0.33	E	0.53	0.12
103	pump	2007/3/15	1:30	52	3.97	S	149	56.57	E	0.43	0.11
104	pump	2007/3/16	12:00	50	12.19	S	150	17.13	E	0.48	0.12
105	pump	2007/3/16	20:20	47	53.32	S	150	40.76	E	0.86	0.16
106	pump	2007/3/17	12:20	45	9.85	S	150	56.18	E	0.82	0.18
107	pump	2007/3/17	17:00	44	0.01	S	150	54.5	E	0.70	0.10

Sydney, Australia

Table 2. Vertical profile of chlorophyll *a* and phaeopigment concentrations during JARE-48.  
Water sample collected by Niskin bottles was marked as an asterisk.

Station	Date	Position	Depth (m)	Chl.a (mg m-3)	Phaeo (mg m-3)	
1	2006/12/5	40 - 54.710 S 109 - 59.35 E	0	0.27	0.03	
			10	0.23	0.03	
				20	0.21	0.03
				30	0.22	0.04
			*	50	0.18	0.04
			*	75	0.18	0.14
			*	100	0.15	0.15
			*	125	0.14	0.09
			*	150	0.05	0.03
			*	200	0.01	0.01
2	2006/12/6	45 - 04.394 S 109 - 56.306 E	0	0.38	0.06	
			10	0.33	0.11	
				20	0.38	0.06
				30	0.39	0.10
				50	0.42	0.12
				75	0.39	0.12
				100	0.40	0.11
				125	0.35	0.14
				150	0.04	0.04
				200	0.02	0.03
3	2006/12/7	50 - 00.109 S 109 - 50.925 E	0	0.23	0.01	
			10	0.23	0.01	
				20	0.24	0.02
				30	0.23	0.02
				50	0.28	0.05
				75	0.34	0.06
				100	0.21	0.12
				125	0.10	0.07
				150	0.05	0.05
				200	0.02	0.03
4	2006/12/8	54 - 51.143 S 109 - 53.135 E	0	0.27	-0.01	
			10	0.26	-0.01	
				20	0.33	-0.01
				30	0.30	0.00
				50	0.49	0.02
				75	0.49	0.01
				100	0.27	0.07
				125	0.09	0.05
				150	0.04	0.03
				200	0.01	0.02
5	2006/12/9	59 - 49.721 S 108 - 45.687 E	0	0.21	0.00	
			10	0.22	0.01	
				20	0.20	0.00
				30	0.24	0.01
				50	0.29	0.02
				75	0.21	0.05
				100	0.20	0.05
				125	0.15	0.06
				150	0.05	0.02
				200	0.01	0.02
6	2007/2/23	63 - 59.491 S 51 - 28.517 E	0	0.10	0.00	
			10	0.10	0.00	
				20	0.10	0.00
				30	0.10	0.00
				50	0.11	0.00
				75	0.15	0.01
				100	0.25	0.06
				125	0.12	0.02
				150	0.05	0.01
				200	0.01	0.01
7	2007/2/24	63 - 58.498 S 61 - 38.797 E	0	0.11	0.00	
			10	0.11	0.00	
				20	0.11	0.00
				30	0.11	0.00
				50	0.12	0.00
				75	0.22	0.00
				100	0.20	0.08
				125	0.15	0.04
				150	0.03	0.01
				200	0.01	0.01
8	2007/2/25	64 - 37.532 S 68 - 22.135 E	0	0.15	0.00	
			10	0.15	0.00	
				20	0.15	-0.01
				30	0.15	-0.01
				50	0.15	-0.01
				75	0.36	0.03
				100	0.47	0.08
				125	0.06	0.03
				150	0.03	0.02
				200	0.01	0.01
9	2007/3/2	63 - 57.338 S 78 - 27.036 E	0	0.44	0.06	
			10	0.42	0.07	
				20	0.57	0.06
				30	0.91	0.06
				50	0.11	0.04
				75	0.06	0.03
				100	0.04	0.02
				125	0.03	0.01
				150	0.02	0.01
				200	0.01	0.01
10	2007/3/3	63 - 08.783 S 89 - 30.170 E	0	0.81	-0.02	
			10	0.76	0.00	
				20	0.79	-0.01
				30	0.97	0.00
				50	0.39	0.09
				75	0.13	0.07
				100	0.07	0.03
				125	0.03	0.02
				150	0.02	0.02
				200	0.01	0.01

Station	Date	Position	Depth (m)	Chl.a (mg m-3)	Phaeo (mg m-3)	
11	2007/3/4	63 - 18.878 S 99 - 36.585 E	0	0.73	0.01	
			10	0.64	0.00	
				20	0.64	0.01
				30	0.65	0.05
				50	0.84	0.03
				75	0.10	0.03
				100	0.04	0.02
				125	0.03	0.01
				150	0.02	0.01
				200	0.01	0.01
11'	2007/3/5	63 - 20.0S 100 - 04.3E	0	0.95	-0.18	
			10	0.96	-0.12	
				20	0.95	-0.11
				30	1.00	-0.17
				50	1.10	-0.18
				75	0.07	0.16
				100	0.06	0.04
				125	0.05	0.03
				150	0.05	0.03
				200	0.04	0.03
12	2007/3/6	63 - 31.185 S 111 - 39.366 E	0	0.62	-0.01	
			10	0.59	0.04	
				20	0.61	0.01
				30	0.65	-0.05
				50	0.49	0.09
				75	0.13	0.05
				100	0.07	0.03
				125	0.03	0.02
				150	0.02	0.01
				200	0.02	0.01
13	2007/3/7	64 - 02.930 S 121 - 19.220 E	0	0.27	-0.02	
			10	0.23	0.01	
				20	0.23	0.03
				30	0.20	0.00
				50	0.33	0.09
				75	0.08	0.06
				100	0.03	0.03
				125	0.05	0.03
				150	0.03	0.03
				200	0.02	0.02
14	2007/3/8	63 - 45.946 S 130 - 03.353 E	0	0.65	-0.03	
			10	0.62	0.00	
				20	0.56	0.01
				30	0.67	-0.02
				50	0.51	0.07
				75	0.26	0.05
				100	0.10	0.04
				125	0.05	0.03
				150	0.04	0.02
				200	0.02	0.01

Station	Date	Position	Depth (m)	Chl.a (mg m-3)	Phaeo (mg m-3)		
15	2007/3/11	64 - 18.990 S 140 - 04.924 E	0	0.74	0.00		
			10	0.65	0.02		
				20	0.66	0.02	
				30	0.67	0.02	
				*	57	0.08	0.02
				*	67	0.05	0.01
				*	80	0.03	0.02
				*	100	0.02	0.01
				*	150	0.01	0.01
				*	200	0.01	0.00
16	2007/3/12	63 - 38.258 S 148 - 58.411 E	0	0.10	0.00		
			10	0.13	0.00		
				20	0.14	0.01	
				30	0.17	-0.02	
				50	0.17	-0.02	
				75	0.08	0.02	
				100	0.04	0.01	
				125	0.03	0.01	
				150	0.01	0.01	
				200	0.01	0.01	
17	2007/3/13	59 - 53.367 S 149 - 35.485 E	0	0.07	-0.01		
			10	0.08	-0.01		
				20	0.09	-0.01	
				30	0.08	0.00	
				50	0.06	0.00	
				75	0.09	0.00	
				100	0.07	0.01	
				125	0.02	0.01	
				150	0.02	0.00	
				200	0.04	0.00	
18	2007/3/14	55 - 33.774 S 150 - 03.696 E	0	0.36	0.08		
			10	0.48	0.03		
				20	0.39	0.05	
				30	0.35	0.05	
				50	0.38	0.07	
				75	0.39	0.05	
				100	0.03	0.03	
				125	0.03	0.03	
				150	0.01	0.01	
				200	0.01	0.01	
19	2007/3/16	51 - 36.276 S 149 - 53.413 E	0	0.24	0.01		
			10	0.24	0.02		
				20	0.26	0.03	
				30	0.33	0.02	
				50	0.30	0.08	
				75	0.42	0.06	
				*	100	0.07	0.05
				*	125	0.03	0.02
				*	150	0.02	0.01
				*	200	0.02	0.01



Station	Date	Position	Depth (m)	Chl.a (mg m-3)	Phaco (mg m-3)
20	2007/3/17	46 - 03.248 S	0	0.52	0.12
		150 - 57.270 E	10	0.55	0.14
			20	0.57	0.09
			30	0.52	0.13
			50	0.52	0.16
			75	0.31	0.13
		*	100	0.01	0.02
		*	125	0.01	0.01
		*	150	0.01	0.01
		*	200	0.01	0.01