MR06-04 Cruise Summary

1. Outline of the cruise

1. Cruise No./ R/V: MR06-04/ MIRAI
2. Title of the cruise: Study on the paleoceanography in high latitude of the North Pacific and its adjacent seas and the Arctic area.
3. Cruise period:
   Leg.1: August, 1, 2006-August, 20, 2006
   Leg.2: August, 21, 2006-September, 29, 2006
4. Port: Sekinehama - Kushiro - Dutch harbor- Dutch harbor- Sekinehama
5. Research area:
   Leg. 1: the Off Tokachi, the Okhotsk Sea and the northern area of the Japan Sea
   Leg. 2: the Bering Sea, Chukuchi Sea
6. Cruise track

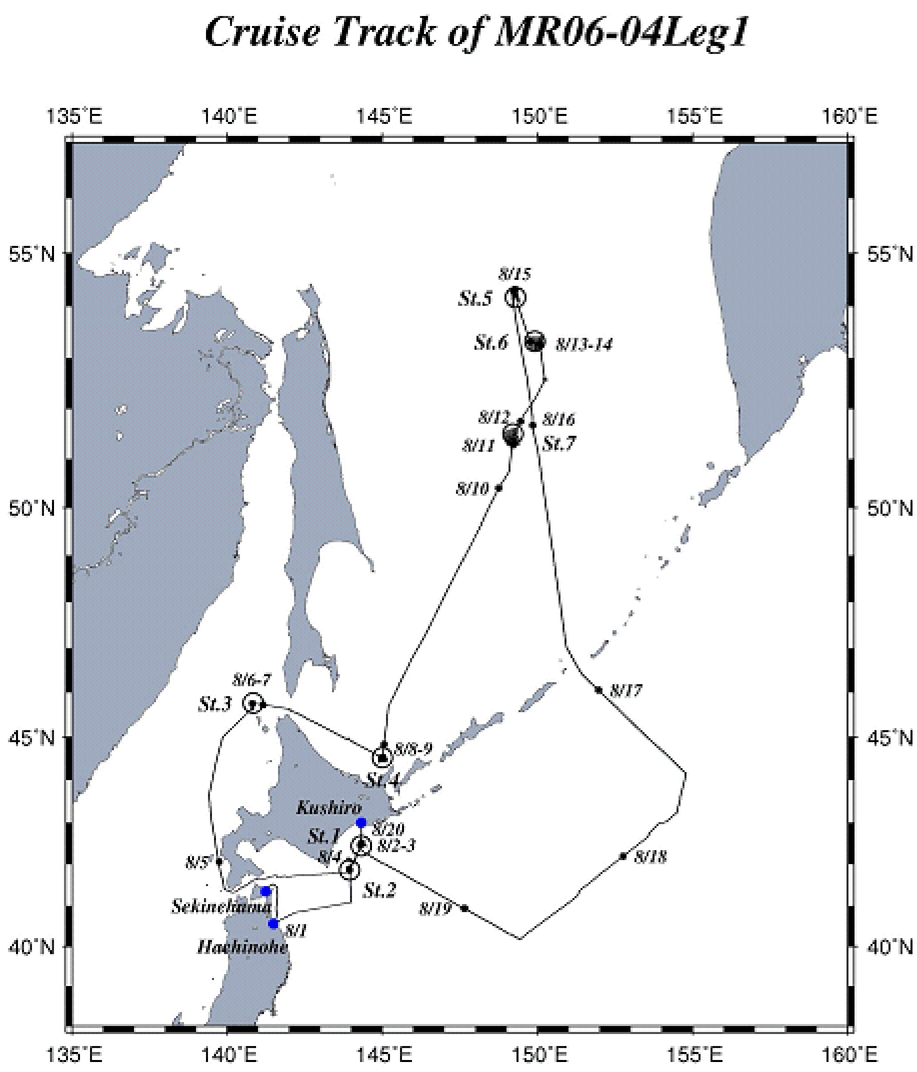

Fig.1 Cruise track, noon position and observational points in MR06-04 Leg1

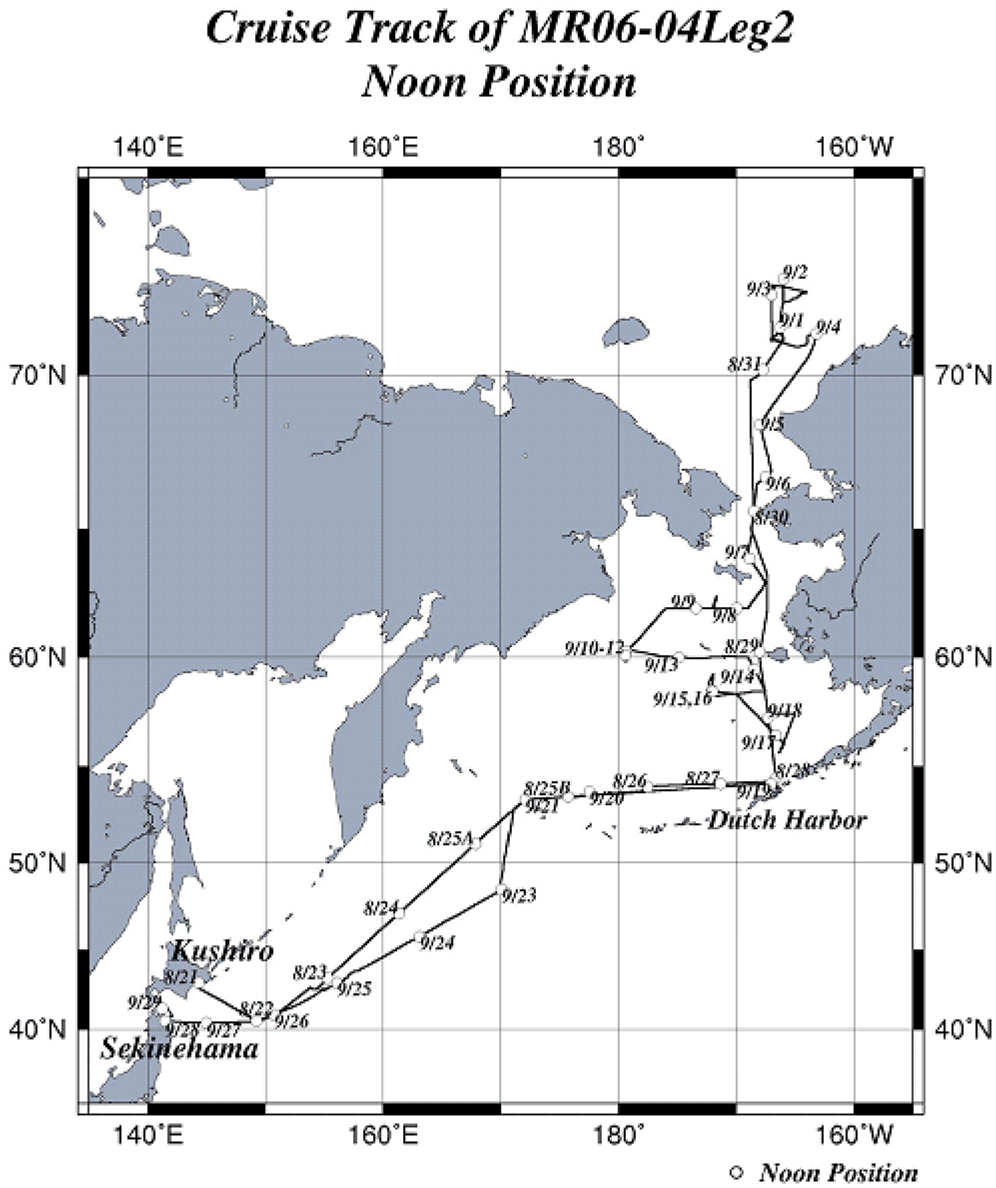

Fig. 2 Cruise track and noon position in MR06-04 Leg2

2. Participants:

1. Chief Scientist/ Affiliation (Leg.1 and Leg.2): Naomi Harada / Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
2. Principal Investigator/ Affrication: Same as above
3. Other participants

Leg.1
Yusuke Okazaki (JAMSTEC, Sediment coring)
Miyako Sato (JAMSTEC, Sediment coring)
Tatsuhiko Sakamoto (JAMSTEC, Sediment coring)
Kouichi Iijima (JAMSTEC, Sediment coring)
Saiko Sugisaki (JAMSTEC, Sediment coring)
Atsushi Kurasawa (JAMSTEC, Plankton)
Kyung Eun Lee (Korean Maritime Univ., Sediment coring)

Gorbarenko Sergey A. (Pacific Oceanological Institute, Sediment coring)
Derkachev Alexandr N. (Pacific Oceanological Institute, Sediment coring)
Vasilenko Yriyi P. (Pacific Oceanological Institute, Sediment coring)
Bosin Alexandr A. (Pacific Oceanological Institute, Sediment coring)
Tomohiro Nakamura (Hokkaido Univ., XBT, XCP, XCTD)
Ryoko Oohira (Yamagata Univ. Plankton)
Frank Griessbaum (Univ. of Tokyo, Aerosol)
Takuya Itaki (Univ. of Tokyo, Plankton, Sediment coring)
Fumiko Nakagawa (Hokkaido Univ., Water chemistry)
Akinari Hirota (Hokkaido Univ., Water chemistry)
Toyoho Ishimura (Hokkaido Univ., Water chemistry, Sediment coring)
Yoko Kishi (Tokai Univ., Water chemistry)
Masayo Okabe (Tokai Univ., Radio sonde)
Harumi Murayama (Toyama Univ., Water chemistry)

Leg.2
Kana Nagashima (JAMSTEC, Sediment coring)
Kouichi Iijima (JAMSTEC, Sediment coring)
Saiko Sugisaki (JAMSTEC, Sediment coring)
Takashi Toyofuku (JAMSTEC, Plankton)
Frank Griessbaum (Univ. of Tokyo, Aerosol)
Stephan Rella (Univ. of Tokyo, Sediment coring)
Takuya Itaki (Univ. of Tokyo, Plankton, Sediment coring)
Akira Ijiri (Hokkaido Univ., Sediment coring)
Daisuke Komatsu (Hokkaido Univ., Plankton, Water chemistry)
Akinari Hirota (Hokkaido Univ., Water chemistry)
Yasutomo Ookubo (Hokkaido Univ., Water chemistry)
Tooru Iwata (Okayama Univ., CO2 profiler)
Ippei Nagao (Nagoya Univ., Aerosol)
Fumi Takeuchi (Nagoya Univ., Sediment coring)
Motoo Utsumi (Tsukuba Univ., Microbiology)
Yoko Kishi (Tokai Univ., Water chemistry)
Hisashi Narita (Tokai Univ., Water chemistry)
Kota Katsuki (Shimane Univ., Sediment coring)
Yasuyo Koike (Tokyo University of Pharmacy and Life Science, Sediment coring)
Hidemine Kumata (Tokyo University of Pharmacy and Life Science, Sediment coring)
Ajit Kumar Manda (Toyama Univ., Water chemistry)
Susumu Konno (Yamagata Univ., Sediment coring)

3. Background and Purpose:

Marginal seas such as the Sea of Okhotsk, Japan, and Bering Seas are the lowest latitude seas whose sea surfaces become covered with ice. Their sea ice areas are significant barometers of the climate change, as they are sensitive to the warming and cooling on the global level. In contrast, the surface temperature of the southwest Sea of Okhotsk invokes the creation and development of high pressure above it during the summer. Since the Okhotsk high pressure results in cold summer in Far East Asian region such as Japan, the conditions of the Sea of Okhotsk surface significantly impact the climate change of this region. In addition, the high-latitude area of the North Pacific including its marginal seas such as the Okhotsk Sea, and the Arctic area, is closely related with climate variations of Asian countries. Consequently, understanding the changes of surface conditions of marginal seas including the Okhotsk Sea would also mean to understand climate change of both global and regional including Far East region of Eurasian continent.

The aim of this study is understanding of glacial and inter-glacial climate changes and abrupt changes in the above area, especially the sea surface temperature and salinity changes and impact of the Amur discharge on the thermohaline circulation and sea-ice and dense shelf water formation in the Okhotsk Sea. In addition, we investigated the Arctic area and the Bering Sea to understand the abrupt climatic and biodiversity changes during the near past 100 year. The observation in the Bering Sea had another aim to understand the ventilation changes at the middle depth (800-1200m), which is thought to be a source depth of intermediate water mass.

The cruise is divided in two legs of which research area are the Okhotsk and Japan Seas area (leg. 1) and the Arctic area (leg. 2). The main observation items are site survey (Sea beam and sub-bottom profiler system), sediment coring (Piston corer, Gravity corer, and Multiple corer), conductivity, temperature, and depth observation and water collection in the water column (CTD/Rosette sampler), and plankton collection in the surface water (Norpac net).

4. Relationship with Other Project:

The leg.1 cruise is part of Japan Society for the Promotion of Science (JSPS) Bilateral Joint Projects with Russia (RFBR-JSPS Joint Project) entitled "Past environmental changes recorded in the marginal Seas (Okhotsk, Japan and Bering Seas) and land -window to watch serious regional and global climate changes.

5. Preliminary results:

1. Leg.1

Total 18 piston and 7 multiple cores were collected at seven stations in this leg.1 (Fig.1 and Table 1). Two piston cores were collected at the St.1 (42-31N, 144-20'E, water depth 996m) and St.2 (41-52'N, 143-57'E, water depth 1043m), respectively with multiple cores at the Off Kushiro. For PC01, the major lithology is glass, pumice-bearing sandy silt and fossils such as foraminifera and diatom are rare. For PC02, the major lithology is bioturbated olive black diatom, spicule-bearing silt clay or clayey silt. Three piston cores were collected at the St.3 (45-45'N, 140-47'E, water depth 774m) in the northern Japan Sea. The major lithology is dark olive gray clayey diatom ooze and partly thin lamination layers appear. Three piston cores were collected at St.4 (44-32'N, 145-E, water depth 1217m) off Shiretoko in the Okhotsk Sea. The major lithology is homogeneous olive black silty clay. Three piston cores were collected at St.6 (53-17'N, 150-05'E, 1143m) and St.7 (51-17'N, 149-13'E, water depth 1249m), respectively in the international water of the central Okhotsk Sea. Two piston cores also are collected at St.5 (54-19'N, 149-10'E, water depth 831m) in the international water. For PC06, the major lithology is grayish olive diatom bearing silty clay. For PC07, the major lithology is grayish olive silty clay. For PC05, the major lithology is similar as those of PC06 and 07, and the shipboard age of core bottom is estimated to be older than the past 40 kyr. At seven stations, 13 casts of CTD/hydrography and 99 casts of plankton net observations were done.

2. Leg.2

Total 6 piston, 5 gravity and 36 multiple cores were collected at 23 stations during leg.2 (Fig.2 and Table 1). Two piston cores were collected at the St.23 (60-N, 179-28'W, water depth 1002m), St.24 (60-16'N, 179-25'W, water depth 852m), 25 (60-04'N, 179-28'W, water depth 1158m), respectively in the Bering Sea. For PC23, 24, 25, the major lithology is olive black silty clay. Some microfossils such as diatom, foraminifera are found and some lamination layers appear throughout the cores. In addition, 27 casts of CTD/hydrography and 97 casts of plankton net observations were done.

Table 1 Piston core list of MR06-04 cruis

St.	Core name	Latitude	Longitude	Water depth (m)	Core length (m)	Remarks
1	PC01-A	42-31'N	144-20'E	996	4.9	For paleoceanograpy
1	PC01-B	42-30'N	144-20'E	994	4.0	For microbiology
2	PC02-A	41-52'N	143-57'E	1043	7.1	For paleoceanograpy
2	PC02-B	41-52'N	143-57'E	1043	6.6	For microbiology
3	PC03-A	45-45'N	140-47'E	774	14.5	For Age model
3	PC03-B	45-46'N	140-47'E	775	13.6	For paleoceanography
3	**PC03-R**	**45-45'N**	**140-47'E**	**772**	**17.9**	**For Russian team**
4	PC04-A	44-32'N	145-E	1217	18.9	For Age model
4	PC04-B	44-32'N	145-E	1213	18.8	For paleoceanography
4	**PC04-R**	**44-32'N**	**145-E**	**1215**	**18.3**	**For Russian team**
5	PC05-A	54-19'N	149-16'E	831	17.9	For Age model
5	**PC05-B**	**54-19'N**	**149-16'E**	**830**	**18.6**	**For Japan and Russia**
6	PC06-A	53-17'N	150-05'E	1143	18.7	For Age model
6	**PC06-B**	**53-17'N**	**150-05'E**	**1142**	**18.7**	**For Japan and Russia**
6	**PC06-R**	**53-17'N**	**150-05'E**	**1142**	**18.3**	**For Japan and Russia**
7	PC07-A	51-17'N	149-13'E	1249	18.4	For Age model
7	PC07-B	51-17'N	149-13'E	1247	18.4	For paleoceanography
7	**PC07-R**	**51-17'N**	**149-13'E**	**1256**	**17.3**	**For Russian team**
23	PC23-A	60-10'N	179-28'W	1002	17.6	For Age model
23	PC23-B	60-10'N	179-28'W	1000	14.3	For paleoceanography
24	PC24-A	60-16N	179-25'W	852	18.1	For Age model
24	PC24-B	60-16N	179-25'W	853	16.7	For paleoceanography
25	PC25-A	60-05'N	179-28'W	1158	17.4	For Age model
25	PC25-B	60-05'N	179-28'W	1157	14.9	For paleoceanography