

## A. Cruise summary

### 1. Cruise information

(1) Cruise designation (research vessel)

MR08-05 (R/V MIRAI)

(2) Cruise title

The study of ecosystem and materials' cycle in the North Pacific

(3) Principal Investigator (PI): Makio Honda

JAMSTEC Mutsu Institute for Oceanography (MIO)

(4) Science proposals of cruise

S/N	Affiliation	PI	Proposal titles
MR08-39	JAMSTEC IORGC	Kunio YONEYAMA	Continuous surface meteorological measurements as a basic dataset.
MR08-40	JAMSTEC FRCGC	Sanae CHIBA	Community structure of surface zooplankton and its role on material' vertical transport
MR08-41	NIES	Nobuo SUGIMOTO	Study of distribution and optical characteristics of ice/water clouds and marine aerosols
MR08-43	Nagoya Univ.	Hiromi YAMAZAWA	Underway monitoring of low atmospheric and seawater radon (Rd) with high-sensitive radon detector
MR08-44	Tokyo Univ.	Koji HAMASAKI	Micrometer particles size spectrum and microbial activities in a twilight zone
MR08-45	JAMSTEC IORGC	Naoyuki KURITA	Rain and seawater sampling for stable isotopes
MR08-46	Ryukyu Univ.	Takeshi MATSUMOTO	Standardization of marine geophysical data and its application to the ocean floor geodynamics studies
MR08-47	Kyoto Univ.*	Toshi NAGATA	Full-depth analysis of microbial community structures and their auto- and heterotrophic activities
MR08-48	Chiba Univ.	Masao NAKANISHI	Study of the Pacific plate tectonics
MR08-49	Okayama Univ.	Osamu TSUKAMOTO	Surface atmospheric turbulent flux measurement
MR08-50	Chiba Univ.	Toshiaki TAKANO	Study of the global distribution and structure of oceanic cloud
MR08-51	NIES	Masao UCHIDA	Pilot study on carbon cycle of Marine Crenarchaeota in the North Pacific using geochemical and molecular biological approaches
MR08-82	Nagoya Univ.**	Toshiro SAINO	Stable carbon and nitrogen isotopes of suspended particles

\* Present affiliation: Tokyo University

\*\* Present affiliation: JAMSTEC IORGC

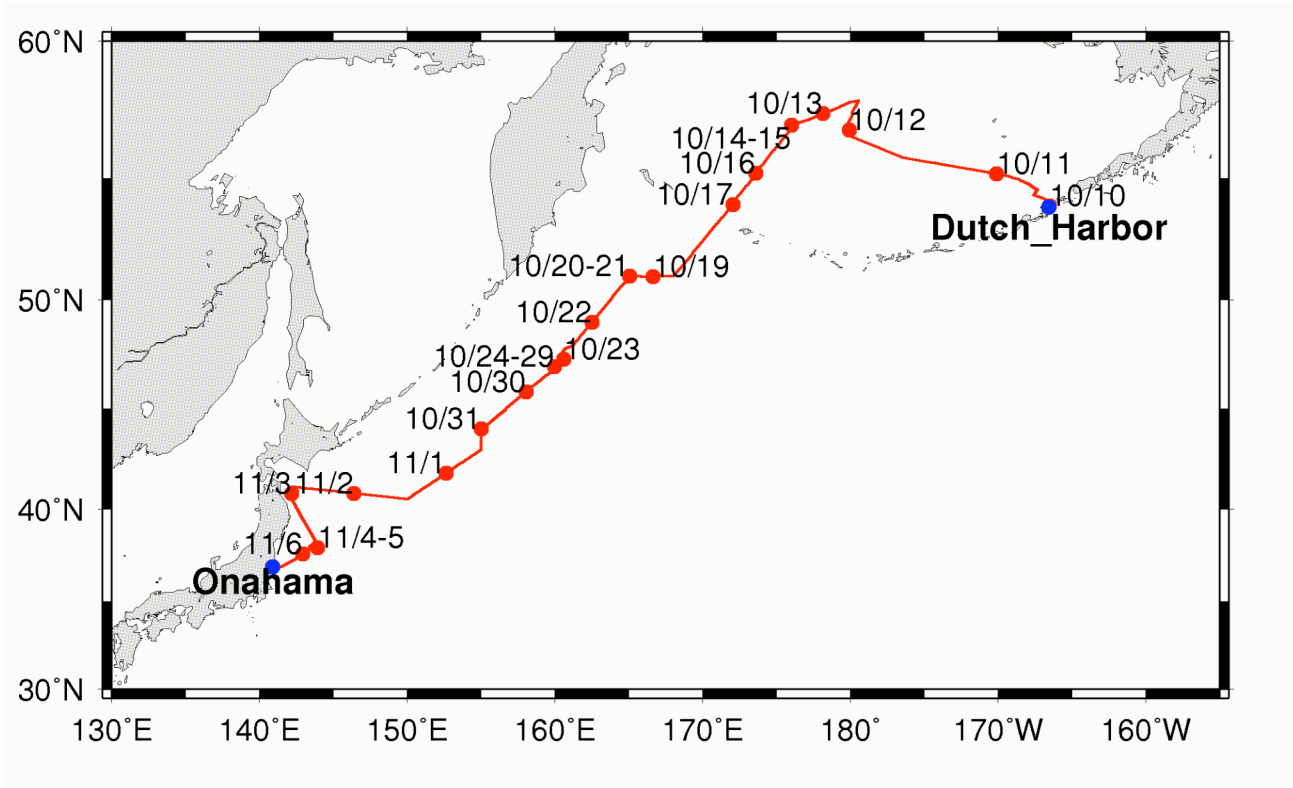
(5) Cruise period (port call)

10 October 2008 (Dutch Harbor) – 10 November 2008 (Onahama)

(6) Cruise region (geographical boundary)

The western North Pacific (60°N – 40°N, 140°E – 165°W)

(7) Cruise track and stations



## 2 Cruise Participants

	Name	Affiliation	Appointment	Tel
1	Makio HONDA (Principal Investigator)	Mutsu Institute for Oceanography (MIO) Institute of Observational Research for Global Change (IORGC) Japan Agency for Marine-Earth Science and Technology (JAMSTEC)	Sub Leader	0175-45-1071
2	Minoru KITAMURA (Deputy PI)	Extremobiosphere Research Center (XBR) JAMSTEC	Researcher	046-867-9527
3	Kazuhiko MATSUMOTO	MIO, IORGC JAMSTEC	Researcher	0175-45-1071
4	Hajime KAWAKAMI	MIO, IORGC JAMSTEC	Researcher	Same as above
5	Masahide WAKITA	Same as above	Researcher	Same as above
6	Tetsuichi FIJIKI	MIO, JAMSTEC	Researcher	Same as above
7	Sanae CHIBA	Frontier Research Center for Global Change (FRCGC) JAMSTEC	Senior scientist	045-778-5604
8	Katsunori YOSHIDA	Safety and Environment Management Office, JAMSTEC	Engineer	046-867-9104
9	Noriyuki OHYA	Nagoya University	Graduated student	052-789-5134
10	Koji HAMASAKI	Tokyo University	Associate professor	03-5351-6337
11	Hideki FUKUDA	Same as above	Assistant professor	Same as above
12	Ayako OKAMOTO	Same as above	Same as above	Same as above
13	Taichi YOKOKAWA	Netherlands Oceanographic Institution Tokyo University	Post doctor	Same as above
14	Fumihiko YAMAZAKI	Chiba university	Graduate student	043-290-3311
15	Yukiko KUROKI	Tsukuba University	Graduate student	029-850-2042
16	Chie SATO	Same as above	Same as above	Same as above
17	Shiro YOSHIDA	Same as above	Undergraduate student	Same as above
18	Fuyuki SHIBATA (Principal Marine Tech.)	Marine Works Japan Inc. (MWJ)	Marine Technician	045-787-0041
19	Hiroshi MATSUNAGA	Same as above	Same as above	Same as above
20	Masanori ENOKI	Same as above	Same as above	Same as above
21	Masaki TAGUCHI	Same as above	Same as above	Same as above
22	Ai YASUDA	Same as above	Same as above	Same as above
23	Tatsuya TANAKA	Same as above	Same as above	Same as above
24	Katsunori SAGISHIMA	Same as above	Same as above	Same as above
25	Tomoyuki TAKAMORI	Same as above	Same as above	Same as above
26	Misato KUWAHARA	Same as above	Same as above	Same as above
27	Yasuhiro ARII	Same as above	Same as above	Same as above
28	Hiroki USHIROMURA	Same as above	Same as above	Same as above
29	Ayaka HATSUYAMA	Same as above	Same as above	Same as above
30	Miyo IKEDA	Same as above	Same as above	Same as above
31	Yoshiko ISHIKAWA	Same as above	Same as above	Same as above
32	Hayato MATSUSHITA	Same as above	Same as above	Same as above

33	Shoko TATAMISASHI	Same as above	Same as above	Same as above
34	Tomonori WATAI	Same as above	Same as above	Same as above
35	Yuichi SONOYAMA	Same as above	Same as above	Same as above
36	Ken-ichiro SATO	Same as above	Same as above	Same as above
37	Yusuke SATO	Same as above	Same as above	Same as above
38	Kento FUKABORI	Same as above	Same as above	Same as above
39	Hiroyuki HAYASHI	Same as above	Same as above	Same as above
40	Wataru TOKUNAGA (Principal Marine Tech.)	Global Ocean Development Inc. (GODI)	Same as above	045-849-6630
41	Kazuho YOSHIDA	Same as above	Same as above	Same as above

### 3. Overview of MR08-05

#### (1) Objective

To collect oceanographic data in late autumn in the northwestern North Pacific for the sake of understanding cycles of chemical substances focusing on CO<sub>2</sub> and role of ecosystem in materials' cycle

#### (2) Overview of MR08-05

Main mission of this cruise was to collect oceanographic data in late autumn in the northwestern North Pacific for the sake of understanding of cycles of chemical substances focusing on CO<sub>2</sub> and role of ecosystem such as zooplankton and bacteria in materials' cycle.

As same as previous cruises, we suffered from bad weather and sea condition. However we successfully conducted most of all comprehensive observation scheduled at most of all stations unlike we expected.

#### (Observation in the Bering Sea)

We could conduct comprehensive biogeochemical observation (measurements of dissolved materials, primary productivity, phyto-plankton pigments, grazing pressure, bacteria production and collection of zooplankton with IONESS) in the open sea of the Bering Sea for the first time.

Although it was autumn season, biomass of phytoplankton is large (concentration of chlorophyll is > 1.5 mg m<sup>-3</sup>) and diatom was pre-dominant (Fig. 1), which is indicating that the Bering Sea is indeed "Sea of Silica" (Tsunogai and Noriki, 1979). In addition, we could conduct "transect" observation from the central part of the Bering Sea (57°N) to the former time-series station KNOT (44° N) in the northwestern North Pacific. We measured vertical profiles of dissolved oxygen, nutrients, carbon species and chlorofluorocarbon each one-degree (Fig.2). These results will supply important information about exchange of water and chemical substances between the northwestern North Pacific and the Bering Sea.

#### (Observation for study of the role of ecosystem in materials' cycle)

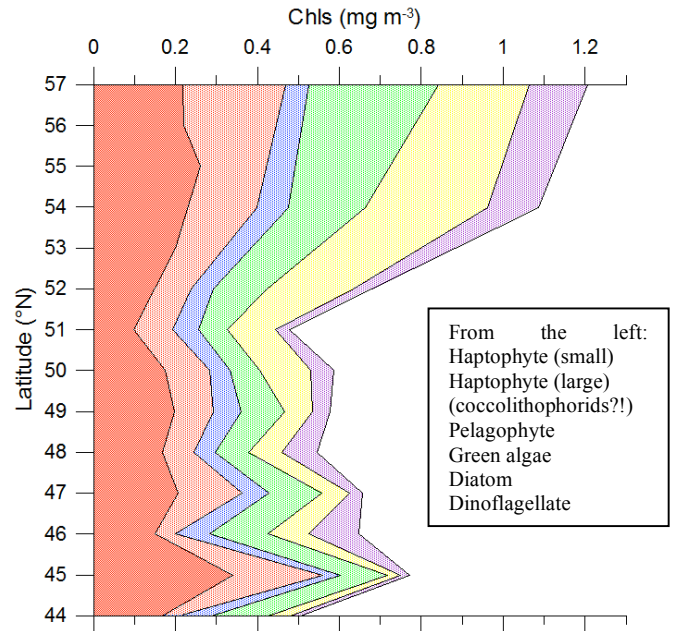


Fig.1 Concentration of chlorophyll for respective major phyto-planktons

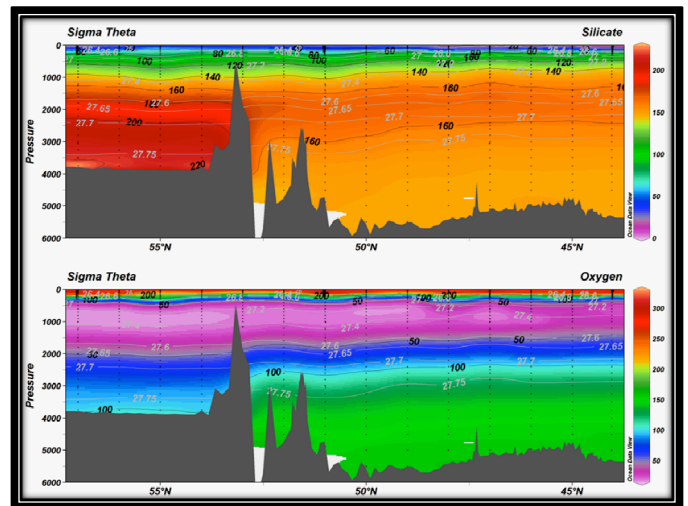


Fig.2 Vertical section of silicate (upper panel) and oxygen (lower panel) from station AB (57°N) to station KNOT (44°N)

At several major stations including our time-series station K2, measurements of primary productivity, phytoplankton pigments, and sinking particles and suspended particles using the drifting buoy, in situ Large Volume Pump and Laser system (LISST) were conducted. On the other hand, collection of zooplankton using “giant” plankton net (IONESS) and measurements of grazing pressure and bacteria production were also conducted. Based on the preliminary results, primary productivity (PP) at station K2 was approximately  $200 \text{ mg-C m}^{-2} \text{ day}^{-1}$  and approximately 60% of PP was grazed by micro-zooplankton. In near future, these results, especially bacteria production measured with radioisotope, will become very informative about the role of ecosystem in the materials’ cycle.

(Time-series observation with mooring system)

Mooring system with automatic water sampler, optical sensor package, and sediment traps, which was deployed in September 2007, was successfully recovered. Base on the first inspection of collected materials below 300 m, materials’ flux were low in winter and increased from late spring to autumn (Fig. 3). After recovery of samples and data, replacement of new battery, and initialization of each samplers, this mooring system was re-deployed on 28 October. This mooring system will be recovered in January 2010.

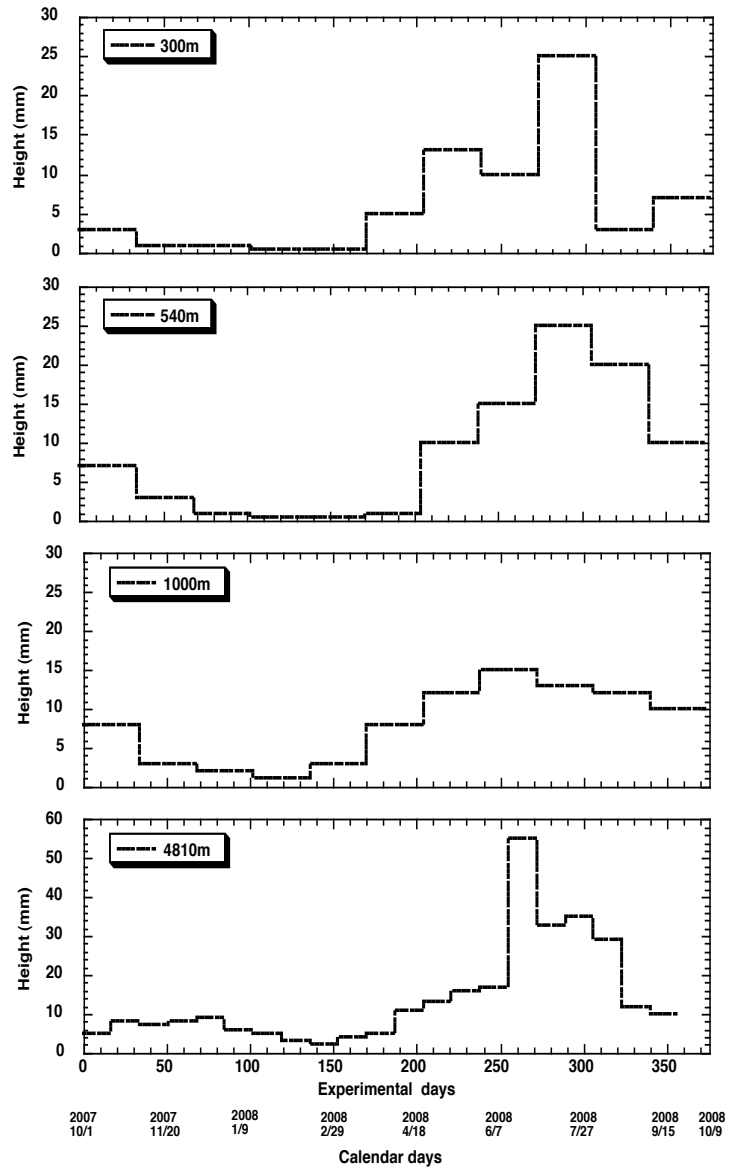


Fig.3 Seasonal variability of total mass flux based on measurement of heights of flux in collecting cups at 300m, 540m, 1000m and 4810m.