

Cruise Summary

1. Cruise Information

- Cruise ID: MR13-06
- Name of vessel: R/V Mirai
- Title of the cruise: Study on environmental changes in the sea-ice reduction regions of the Arctic Ocean
- Chief scientist [Affiliation]: Shigeto Nishino [JAMSTEC-RIGC]

- Studies on board

- Representative of the Science Party [Affiliation]: Naomi Harada [JAMSTEC-RIGC]
 - Title of proposal: Sea-ice reduction in the western Arctic Ocean and its impact on the variation of biogenic particulate fluxes
- Representative of the Science Party [Affiliation]: Toru Hirawake [Hokkaido University]
 - Title of proposal: Study on the response of lower trophic level ecosystem to environmental changes in the Arctic Ocean
- Representative of the Science Party [Affiliation]: Toshi Nagata [Atmosphere and Ocean Research Institute, The University of Tokyo]
 - Title of proposal: Study on the spatial variations of microbial community and DOM/POM and their controlling mechanism in the Canada Basin of the Arctic Ocean
- Representative of the Science Party [Affiliation]: Masao Ishii [Meteorological Research Institute]
 - Title of proposal: Study on the cycles of greenhouse gasses and their climatological responses in the Arctic region
- Representative of the Science Party [Affiliation]: Nobuyoshi Yamashita [National Institute of Advanced Industrial Science and Technology]
 - Title of proposal: Assessment of environmental impact on the efflux of chemical materials from the sea-ice due to its melt in the Arctic Ocean

- Studies not on board

- Representative of the Science Party [Affiliation]: Kazuma Aoki [Toyoma University]
 - Title of proposal: Maritime aerosol optical properties from measurements of ship-borne sky radiometer
- Representative of the Science Party [Affiliation]: Nobuo Sugimoto [National Institute for Environmental Studies]
 - Title of proposal: Lidar observations of optical characteristics and vertical distribution of aerosols and clouds

- Representative of the Science Party [Affiliation]: Yugo Kanaya [JAMSTEC-RIGC]
 - Title of proposal: Study on material cycles from wide-area observations of maritime gas and aerosol
- Representative of the Science Party [Affiliation]: Masao Nakanishi [Chiba University]
 - Title of proposal: Tectonics of the mid-Cretaceous Pacific Plate
- Representative of the Science Party [Affiliation]: Takeshi Matsumoto [Ryukyu University]
 - Title of proposal: Standardization of marine geophysical data and its application to the ocean floor geodynamics studies

- Cruise period:
 - Leg 1: 28 August 2013 – 7 October 2013
 - Leg 2: 9 October 2013 – 21 October 2013

- Ports of call:
 - 28 August 2013, Dutch Harbor (leave port)
 - 7 October 2013, Dutch Harbor (arrival in port)
 - 9 October 2013, Dutch Harbor (leave port)
 - 20 October 2013, Hachinohe (arrival in port)
 - 21 October 2013, Sekinehama (arrival in port)

- Research area:
 - Arctic Ocean, Bearing Sea, North Pacific Ocean

○ Research map

Cruise Track of MR13-06Leg1

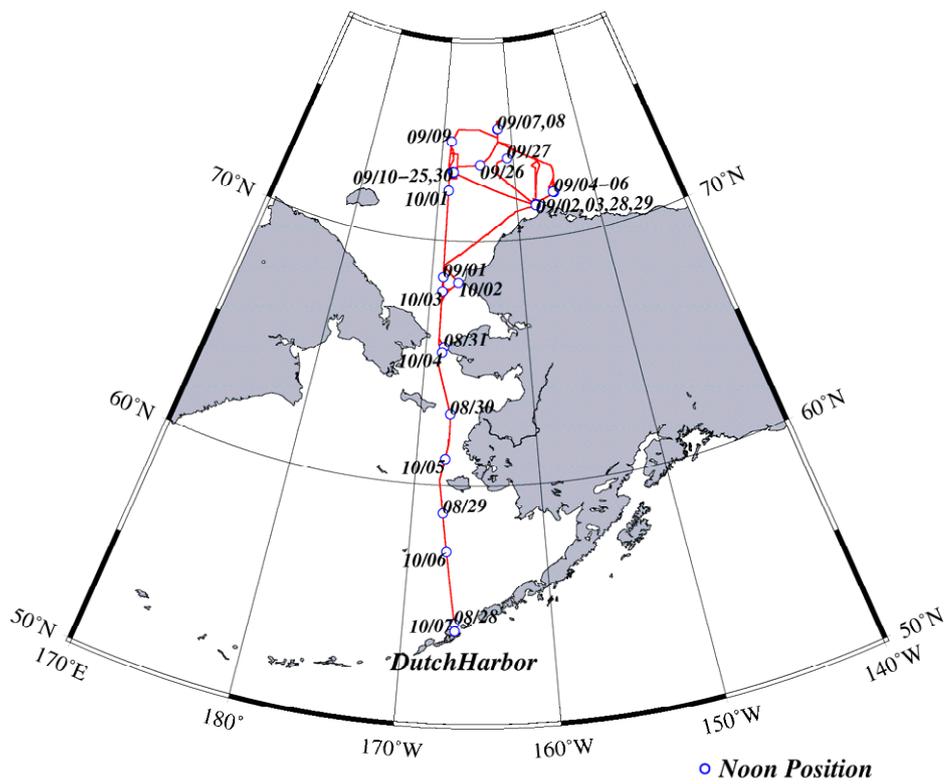


Figure 1. Research area and cruise track of MR13-06 Leg 1.

Cruise Track of MR13-06Leg2

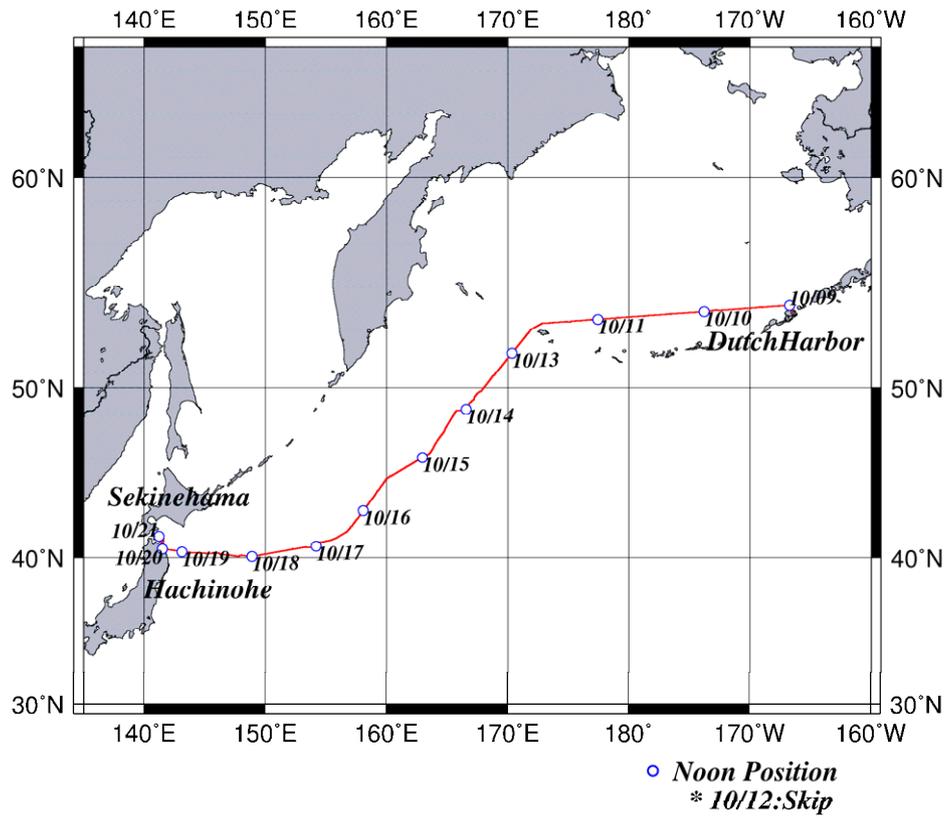


Figure 2. Research area and cruise track of MR13-06 Leg 2.

2. Overview of the Observation

On the basis of our previous observations and theoretical considerations, we have come to realize that the Arctic Ocean plays an important role in global climate changes.

The objectives of this cruise are as follows:

- a. To quantify on-going changes in ocean, atmosphere, and ecosystem, which are related to the recent Arctic warming and sea-ice reduction.
- b. To clarify important processes and interactions among atmosphere, ocean, and ecosystem behind changes of the Arctic Ocean.
- c. To collect data for understanding the effects of the Arctic Ocean changes on global climate.

In this research cruise, we conducted:

- a. Fixed point observations with radiozonde, Doppler radar, general meteorological equipments, CTD (Conductivity, temperature, and depth sensors), XCTD (expendable CTD), seawater samplers, current profilers, turbulence ocean microstructure acquisition profiler, plankton nets, optical instruments, sea surface monitoring system, drifting buoys, and so on.
- b. Wide-area observations with the metrological and oceanographic equipments described above.
- c. Mooring observations to measure annual changes in seawater temperature, salinity, currents, dissolved oxygen, chlorophyll a, zooplankton (by acoustics), marine mammal (by acoustics), and sediments (by sediment traps).
- d. Continuous observations of sea bottom topography, gravity, and magnetic fields along the cruise track, in addition to the continuous meteorological and oceanographic observations by general meteorological equipments and sea surface monitoring system, respectively.

This research cruise included the following publicly-offered studies:

- Studies on board

- Sea-ice reduction in the western Arctic Ocean and its impact on the variation of biogenic particulate fluxes [JAMSTEC-RIGC]
- Study on the response of lower trophic level ecosystem to environmental changes in the Arctic Ocean [Hokkaido University]
- Study on the spatial variations of microbial community and DOM/POM and their controlling mechanism in the Canada Basin of the Arctic Ocean [Atmosphere and Ocean Research Institute, The University of Tokyo]
- Study on the cycles of greenhouse gasses and their climatological responses in the Arctic region [Meteorological Research Institute]
- Assessment of environmental impact on the efflux of chemical materials from the sea-ice due to its melt

in the Arctic Ocean [National Institute of Advanced Industrial Science and Technology]

- Studies not on board

- Maritime aerosol optical properties from measurements of ship-borne sky radiometer [Toyoma University]
- Lidar observations of optical characteristics and vertical distribution of aerosols and clouds [National Institute for Environmental Studies]
- Study on material cycles from wide-area observations of maritime gas and aerosol [JAMSTEC-RIGC]
- Tectonics of the mid-Cretaceous Pacific Plate [Chiba University]
- Standardization of marine geophysical data and its application to the ocean floor geodynamics studies [Ryukyu University]