Cruise Summary

1. Cruise Information

- (1) Cruise ID: MR23-06C
- (2) Vessel: R/V MIRAI
- (3) Cruise Title

Arctic Expedition for Environmental Studies by ArCSII project

(4) Chief Scientist

Amane Fujiwara (JAMSTEC)

(5) Representative of the Science Party

C23-01 Eiji Watanabe (JAMSTEC)

C23-01-101 Amane Fujiwara (JAMSTEC)

C23-01-101 Takanori Nishiyama (NiPR)

C23-01-102 Shojiro Ishibashi (JAMSTEC)

C23-01-103 Takahito Ikenoue (JAMSTEC)

C23-01-104 Kazutoshi Sato (NiPR)

C23-01-105 Kohei Matsuno (Hokkaido University)

C23-01-106 Tsubasa Kodaira (The University of Tokyo)

C23-01-108 Colin Kremer (University of Connecticut)

C23-01-109 Lisa von FRIESEN (University of Copenhagen)

C23-01-110 Eva LOPES (CIIMAR)

C23-01-111 Alix ROMMEL (SAUScottish Oceans Institute, University of St Andrews)

C23-01-112 Wei-Jun Cai (University of Delaware)

C23-01-113 Manami Tozawa (Hokkaido University)

C23-01-114 Hotaek Park (JAMSTEC)

C23-01-115 Yasunori Tohjima (NIES)

(6) Research Titles

C23-01 Arctic Expedition for Environmental Studies

C23-01-101 Observational study of the Arctic environmental changes: Pacific-Arctic interaction, biogeochemical transport, mixing and marine ecosystem C23-01-102

C23-01-103 Quantification of the microplastic inventory in the waters of the western Arctic Ocean and microplastic influx from the Pacific Ocean

C23-01-104 Changes in clouds and aerosols over the ice-free Arctic Ocean C23-01-105 Possibility of the expanding distribution in plankton and fishes associated with sea ice reduction in the Pacific sector of the Arctic Ocean

C23-01-106 Observation of air-sea-wave-ice interaction over the Pacific Arctic region

C23-01-108 Investigating the physical and ecophysiological basis of fall phytoplankton blooms in the Chukchi and Beaufort seas

C23-01-109 Nitrogen Fixation in a Changing Arctic Ocean An Overlooked Source of Nitrogen

C23-01-110 Exploring microplankton interactions and their functional roles in a changing Arctic

C23-01-111 Determining the contribution of siphonophores to mesopelagic backscatter in the Arctic

C23-01-112 Better understanding of climate-driven changes of biogeochemical dynamics in the western Arctic Ocean via R/V Mirai 2023 Cruise A perspective of stable carbon isotope

C23-01-113 Temporal variations of the carbonate chemical components the Arctic Ocean within summertime

C23-01-114 Observation of water vapor isotopic ratios

C23-01-115 Observation of atmospheric greenhouse gases and related species in the North Pacific region

(7) Cruise Period

2023/08/25 - 2023/10/04

(8) Ports of departure/call/arrival

Shimizu, JAPAN - Dutch Harbor, Unalaska Marine Center No.1-2 berth

(9) Research Area

Arctic Ocean, Bering Sea, North Pacific

(10) Cruise Track



2. Overview of the Observation

The Arctic Ocean is the area with the fastest rate of global oceanic warming in the world. The detailed research of the Research Vessel (R/V) MIRAI and other icebreaker vessels, satellite observation and numerical modeling documented the impact of the inflow of the Pacific origin water on Arctic sea ice decrease and the marine ecosystem, which is known as important sources of heat, nutrients, fresh water for the Arctic Ocean. Its impact is also getting greater and wide spreading into the entire Arctic. This cruise aimed to develop the dataset that could allow for a synoptic view of the totality of hydrographic and ecosystem changes taking place in the Arctic Ocean and facilitate advancing model development to predict the future state of the Arctic.

In 2023, the R/V MIRAI conducted hydrographic and biogeochemical surveys, including plankton, microplastic, and bottom sediment samplings, from the Chukchi Sea, the Beaufort Sea, and the East Siberian Sea to marginal ice zones of the Canada Basin. Moorings were recovered and re-deployed on the pathway of the Pacific-origin water to monitor its transport and impact on the marine ecosystem. The trials of an underwater drone were conducted from ice-edge to ice-covered areas. Some flying drones and radio sondes were used to measure meteorological parameters and to assess the conditions of sea ice and waves. Various drifting buoys were launched to measure the ocean waves, currents, and temperature.