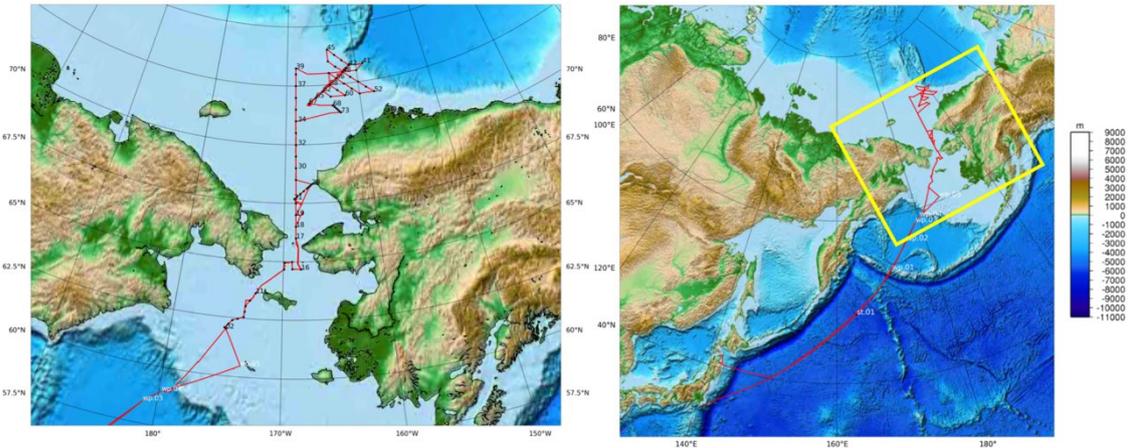


Submission date: December 21, 2018

## Cruise Summary

### 1. Cruise Information

- Cruise ID: MR18-05C
- Name of vessel: R/V Mirai
- Title of the cruise: Arctic Challenge for Sustainability (ArCS)
- Chief scientist [Affiliation]: Jun Inoue [National Institute of Polar Research]
  
- Studies on board
  - Representative of the Science Party [Affiliation]: Jun Inoue [National Institute of Polar Research]  
Title of proposal: Predictability study on weather and sea-ice forecasts linked with user engagement
  - Representative of the Science Party [Affiliation]: Fumikazu Taketani [JAMSTEC]  
Title of proposal: Ship-based observations of trace gases and aerosols over the Arctic Ocean, Bering Sea, and Northwestern Pacific Ocean
  
- Studies not on board
  - Representative of the Science Party [Affiliation]: Yasunori Tohjima [National Institute of Environmental Studies]  
Title of proposal: Ship-board observations of atmospheric greenhouse gases and related species in the Arctic ocean and the western North Pacific
  - Representative of the Science Party [Affiliation]: Akihiko Murata [JAMSTEC]  
Title of proposal: Spatial and temporal changes of seawater CO<sub>2</sub> and CH<sub>4</sub> in the western Arctic Ocean
  
- Cruise period:  
24 October 2018 – 7 December 2018
  
- Ports of call:
  - 24 October 2018, JAMSTEC Sekine-hama (leave port)
  - 25 October 2018, Hachinohe (arrival in and leave port)
  - 7 December 2018, Shimizu (arrival in port)
  
- Research area:  
Arctic Ocean, Bearing Sea, North Pacific Ocean



**Figure 1:** Research area and cruise track of MR18-05C.

## 2. Overview of the Observation

Skillful forecasts of atmosphere, sea ice, and ocean in the Arctic region are very important not only for ship navigation but also human activities in the Arctic coastal areas and beyond. Recent unusual state of the Arctic Ocean in particular during early winter would cause a delay of freezing, much snowfall, warming in the atmosphere and ocean, and extreme weather events in the midlatitudes. To understand the current status of the Arctic Ocean during early winter, this cruise focused on

- observing the temporal and spatial variabilities of atmosphere, sea ice, and ocean during a period of sea-ice advancing,
- evaluating and improving numerical predictions of atmosphere, sea ice, and ocean based on in-situ data, and
- Monitoring the temporal and spatial variabilities of greenhouse gases in the atmosphere and ocean during the early winter.

These activities contribute to the Year of Polar Prediction (YOPP).

Here, we conducted a daily repeat section including the marginal ice zone from 9 November to 21 November 2018. Main observations consist of radiosondes, cloud particle sensor sondes, Doppler radar, Lidar, general meteorological measurements, aerosol samplings, CTD (Conductivity, temperature, and depth sensors), XCTD (expendable CTD), seawater samplings, current profilers, sea spray, sea surface monitoring system, drifting wave buoys, etc.

Continuous observations were also done along the cruise track (the meteorological and oceanographic observations by using general meteorological equipment and sea surface monitoring system, etc.)

This research cruise included the following studies:

- Studies on board
- Predictability study on weather and sea-ice forecasts linked with user engagement [National Institute of

Polar Research]

- Ship-based observations of trace gases and aerosols over the Arctic Ocean, Bering Sea, and Northwestern Pacific Ocean [JAMSEC]
  
- Studies not on board
- Ship-board observations of atmospheric greenhouse gases and related species in the Arctic ocean and the western North Pacific [National Institute of Environmental Studies]
- Spatial and temporal changes of seawater CO<sub>2</sub> and CH<sub>4</sub> in the western Arctic Ocean [JAMSTEC]