

## Cruise Summary

### 1. Cruise information

Cruise ID: MR17-04

Research vessel: MIRAI

Cruise title: Collaborative experiment on Biogeochemical and Ecosystem Studies for sub-Arctic sea

Cruise period (port call):

Leg.1 10 July (Sekinehama, Aomori, Japan) – 2 August 2017 (Dutch Harbor, Alaska, USA)

Leg.2 5 August (Dutch Harbor, Alaska, USA) – 21 August 2017 (Dutch Harbor, Alaska, USA)

Research area: The subarctic western North Pacific and Bering Sea

Ship Captain: Toshihisa Akutagawa (Nippon Marine Enterprises, Ltd.)

Chief Scientist:

Leg.1 Tetsuichi Fujiki (Research and Development Center for Global Change, JAMSTEC)

Leg.2 Yoshihiro Fujiwara (Department of Marine Biodiversity Research, JAMSTEC)

Deputy Chief Scientist:

Leg.1 Katsunori Kimoto (Research and Development Center for Global Change, JAMSTEC)

Leg.2 Shinji Tsuchida (Department of Marine Biodiversity Research, JAMSTEC)

Representative of the Science Party:

Leg.1 Naomi Harada (Research and Development Center for Global Change, JAMSTEC)

Leg.2 Yoshihiro Fujiwara (Department of Marine Biodiversity Research, JAMSTEC)

Public research assignment:

1. Observation of seawater density and vertical mixing

Hiroshi Uchida (Research and Development Center for Global Change, JAMSTEC)

2. Spatial observations of aerosols in the marine atmosphere: Toward elucidation of interactions with climate and ecosystems

Yuko Kanaya (Research and Development Center for Global Change /Institute of Arctic Climate and Environmental Research, JAMSTEC)

3. Cumulus-scale air-sea interaction study by shipboard in-situ observations

Masaki Katsumata (Research and Development Center for Global Change, JAMSTEC)

4. Aerosol optical characteristics measured by Ship-borne Sky radiometer

Kazuma Aoki (University of Toyama)

### 2. Research brief

Leg. 1

The subarctic western North Pacific is a cyclonic upwelling gyre (western subarctic gyre; WSG) that extends from the northeast of Japan to near the international dateline. To investigate the spatial and temporal variability of biogeochemical processes in the WSG, time-series observations have

been carried out since 1997 at stations KNOT (44°N, 155°E) and /or K2 (47°N, 160°E) in the WSG, indicating that ocean acidification was rapidly progressing in this gyre. However, the effect of ocean acidification on lower trophic levels in this region is not well understood. To better understand the response of lower trophic level ecosystem to multiple environmental stressors (e.g., warming, acidification and deoxygenation), we conducted the following observations and operations at Sta. K2 during this cruise.

- (1) Recovery and deployment of hybrid profiling buoy system
- (2) CTD cast and water sampling/biochemical analysis
- (3) Assessment of phytoplankton productivity by fast repetition rate fluorometry
- (4) Zooplankton sampling by using the VMPS, ORI and NORPAC nets
- (5) Observation of zooplankton biomass by acoustic zooplankton fish profiler
- (6) Particle collection by using in situ filtration system
- (7) On-deck incubation experiments
- (8) Measurements of shortwave and longwave radiation
- (9) Upper ocean current measurements by shipboard ADCP
- (10) Sea surface water sampling
- (11) Multi observation glider observation
- (12) Deployment of biogeochemical profiling floats

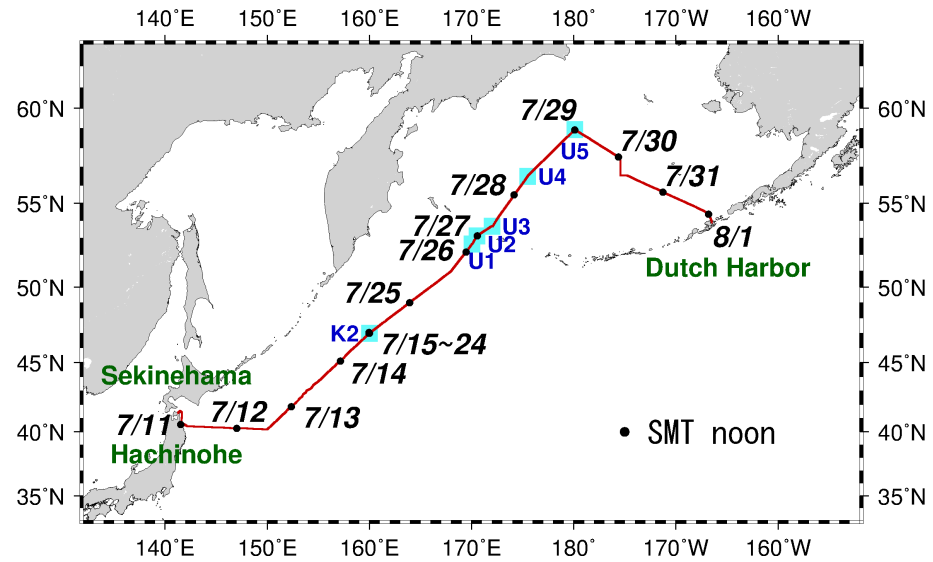
## Leg. 2

A highly productive habitat named as “Green Belt” locates along the edge of the continental shelf in the Bering Sea. Enormous seabirds and whales accumulate in a limited area of the south-eastern Bering Sea during summer, which is called as “the Aleutian Magic”. To elucidate the mechanism of this biological phenomenon, we conducted oceanographic researches using R/V *Mirai* during the period of the Aleutian Magic. This cruise started on August 5, 2017 at Dutch Harbor, Alaska, USA and ended on August 21, 2017 at Dutch Harbor. We conducted bottom observations and biological sampling using a deep-tow camera system equipped with a dredger (11 tows), multi-layer plankton sampling using the Vertical Multiple Plankton Sampler (VMPS, 32 casts), sediment core sampling using a multiple corer (13 casts), water sampling and physico-chemical measurements using a CTD and Niskin bottle carousel (46 casts in total) at depths between 0 – 2500 m. Sediments in areas shallower than 1000 m were coarse and no evidence was seen for extraordinary organic falls. In contrast, sediments in areas deeper than 1500 m were fine, which were similar to “ordinary” deep-sea sediments. About 10 times of the Aleutian Magic were observed during this cruise at a depth of 100 m at the east end of the Bering Canyon. These events occurred in a small region (named as “Station M”), which was similar to that of previous records. CTD/hydro casts and plankton sampling were conducted across Station M. Higher concentrations of

turbidity and chlorophyll were observed at downstream location from the station. Many *Limacina* and *Clione* gastropods were collected and a dense aggregation of juvenile cods were observed at Station M.

### 3. Cruise track and stations

Leg.1



Leg.2

