

# Cruise Summary

## 1. Cruise Information

Cruise ID: KH-23-3

Name of vessel: Hakuho-maru

Title of cruise: SOLAS Japan Integrated Process Study in the western North Pacific (SOLAS-JIPS)

Part-I

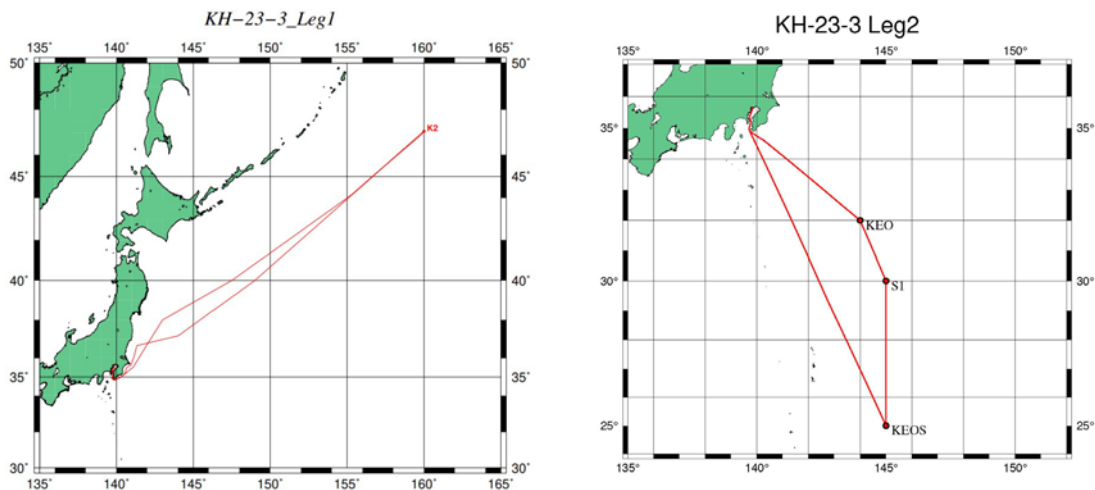
Chief Scientist [Affiliation]: Koji Hamasaki [Atmosphere and Ocean Research Institute, The University of Tokyo]

Cruise period: 2-29, July 2023

Ports of departure / call / arrival: 7/2 Tokyo -7/15 Tokyo, 7/17 Tokyo-7/29 Tokyo

Research area: western North Pacific

Research map



Title of proposal: SOLAS Japan Integrated Process Study in the western North Pacific (SOLAS-JIPS)

Representative of Science Party [Affiliation]:

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Yoko Iwamoto [Hiroshima University]

Jun Nishioka, Yuzo Miyazaki, Sohiko Kameyama [Hokkaido University]

Akinori Ito, Minako Kurisu [JAMSTEC]

## 2. Overview of Research Activities

Specific research topics

- ✓ Marine ecosystem responses to atmospheric depositions
- ✓ Air-sea fluxes of greenhouse gases (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, etc.), DMS and VOCs
- ✓ Dynamics of organic matter and microbial communities in the sea surface microlayer and sea spray

aerosols

- ✓ Cloud condensation/ice nuclei activities of sea spray aerosols
- ✓ Concentration and isotopic ratios of iron in surface water and the sea surface microlayer
- ✓ Biological responses in relation to photochemical reactions

The western North Pacific is a spatio-temporally dynamic area dominated by strong current systems. At the same time, it is also an area that is susceptible to the effects of various substances carried from land by westerly winds and the volcanic eruptions that sometimes occur in the Pacific Ring of Fire. Observation and comparative analysis of biogeochemical processes under various oceanic and meteorological conditions in such oceans are considered important for understanding the interaction between the atmosphere and the ocean. In recent years, the contribution of aerosol particles from sea droplets to cloud condensation nuclei and ice nuclei has also been required to analyze the particle generation flux and its chemical composition at the air-sea interface. It is not fully understood how qualitative and quantitative changes in organic matter and reactive nitrogen associated with changes in marine biological activity affect the chemical and physical properties of aerosols, generation of secondary aerosols from various volatile organic matter, and subsequent cloud formation?

In this research cruise, we observed various processes related to the transfer of materials and energy across the air-sea interface in the western North Pacific Ocean in order to deepen integrative understanding of biogeochemical interactions in the boundary region from the oceanic photic layer to the troposphere. Taking full advantage of the Hakuho-maru's ability to carry a variety of ocean and atmospheric observation facilities and equipment, we conducted integrative observations. In particular, by staying in the same area and sampling the sea surface microlayer intensively, it is expected that new knowledge can be obtained about the flux of iron, organic matter, and nitrogen between the ocean and the atmosphere. The data obtained from these process observations are also useful for validating models that assess the relationship between the ocean and the atmosphere, such as material fluxes, climate impacts, and feedbacks to marine ecosystems.

We stayed at observation areas in the subarctic and subtropical regions of the western North Pacific for about a week, respectively, conducting observations of oceanic photic zone and atmosphere such as CTD water sampling, sea surface microlayer water sampling, flux buoys, measurements of chemical and physical parameters of the atmosphere (gas phase and aerosol), in-situ filtration of suspended particles, and continuous surface seawater observation.