

Overview of the R/V Mirai Arctic Ocean cruise in 2022

Motoyo Itoh¹, Jonaotaro Onodeara¹, Mariko Hatta¹, Shigeto Nishino¹, Amane Fujiwara¹,
Eiji Watanabe¹, Akihiko Murata^{1,2}, Takashi Kikuchi¹

¹*Institute of Arctic Climate and Environment Research, Japan Agency for Marine-Earth Science and Technology (JAMSTEC)*

²*Global Ocean Observation Research Center, Japan Agency for Marine-Earth Science and Technology (JAMSTEC)*

The Arctic Ocean cruise of Research Vessel (R/V) Mirai has been conducted from 12 August to 29 September 2022, under the Arctic Challenge for Sustainability II (ArCS II) project. The Arctic Ocean is the area with the fastest rate of global oceanic warming in the world. The detailed research of the R/V Mirai along with other icebreaking vessels, satellite observation and numerical modeling have documented the impact of inflow of the Pacific origin water. We have observed sea ice decrease and marine ecosystem changes associated with Pacific origin waters bringing heat, nutrients, fresh water into the Arctic. Its impact is getting greater and more wide spread into the entire Arctic.

In 2022, we conducted hydrographic, paleoenvironmental and biogeochemical surveys, including plankton, trace-metals, microplastic, eDNA and aerosols in the Chukchi and Beaufort Seas. Three hydrographic moorings and a sediment trap mooring were also recovered and re-deployed on the pathway of the Pacific origin water to monitor transport and impact on marine ecosystem. In the marginal ice area, various drifting buoys were launched to measure the ocean waves and sea ice interaction. Trials of an under-the-ice drone, designed for automated cruise and observations in the sea ice area, were carried out. In addition to observation of present Arctic environments, sediment records have been collected by piston, gravity, multicore and box corers to understand differences between the present environmental changes and past warming events in the Arctic Ocean.

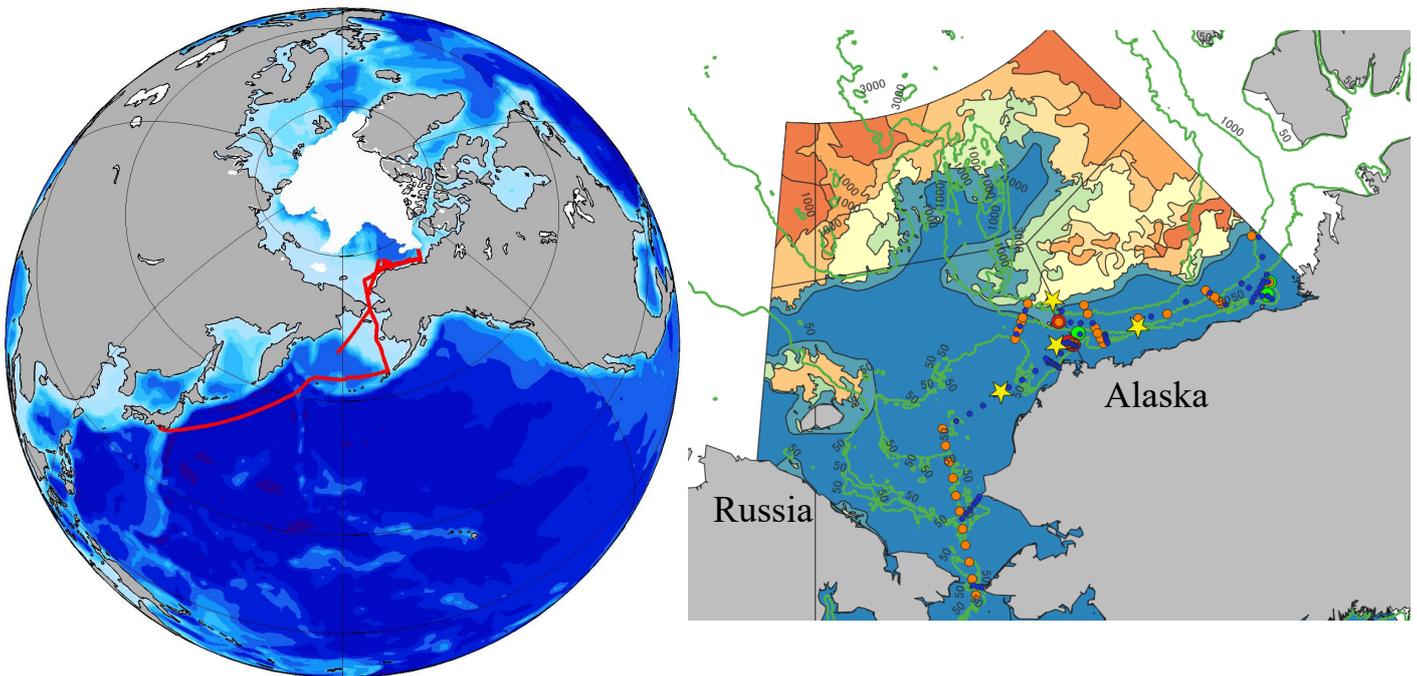


Figure 1. Map of the entire cruise area (left) and enlarged research areas in the Arctic Ocean (right). The cruise track and minimum ice coverate during the observation term from SSM/I (left) and NOAA ice chart (right) are overlaid. Orange and blue dots shows CTD/R and XCTD stations. Green and red circles denotes moorings and sediment corings stations. Yellow stars shows the locations of under ice drone trials.