



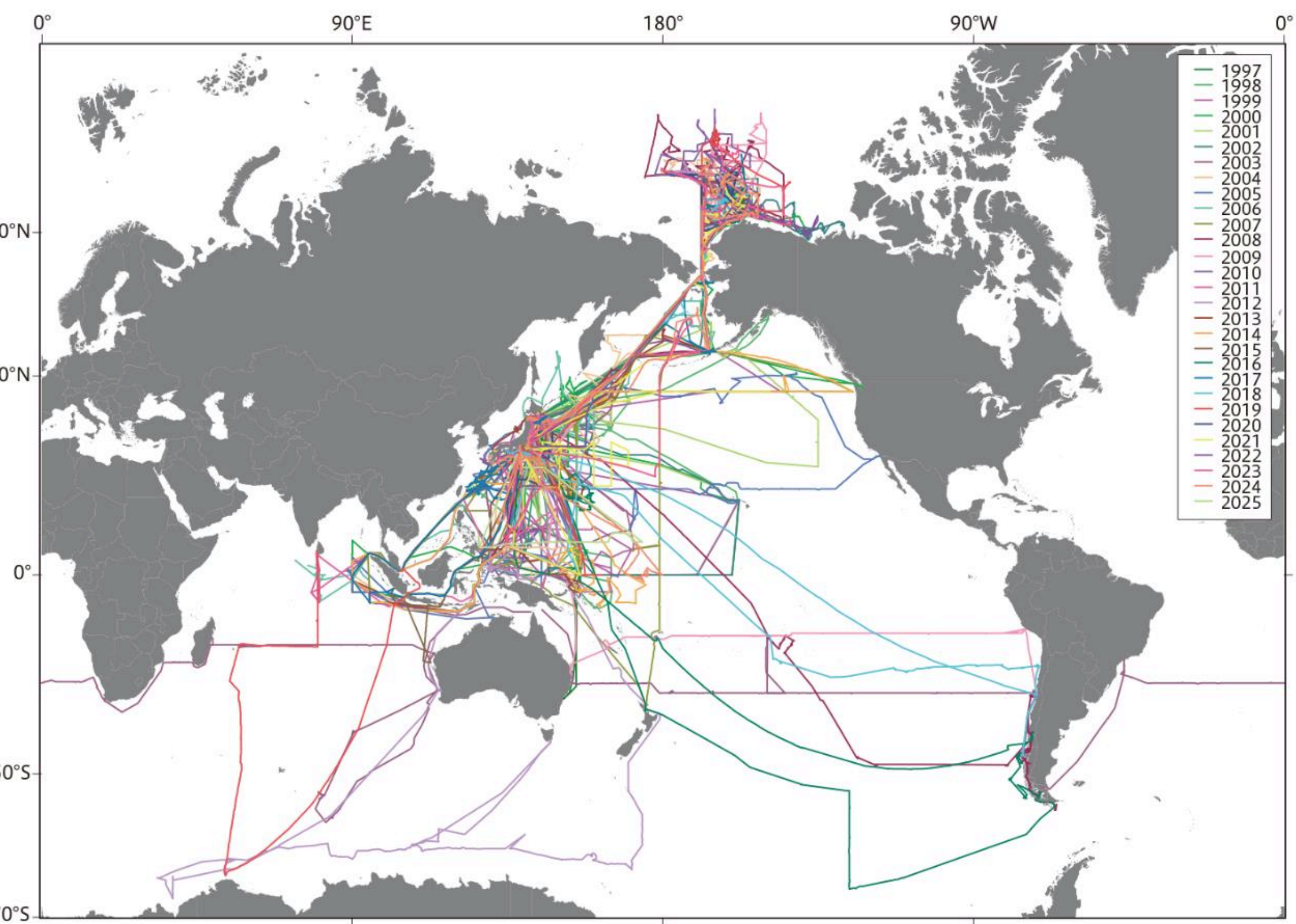
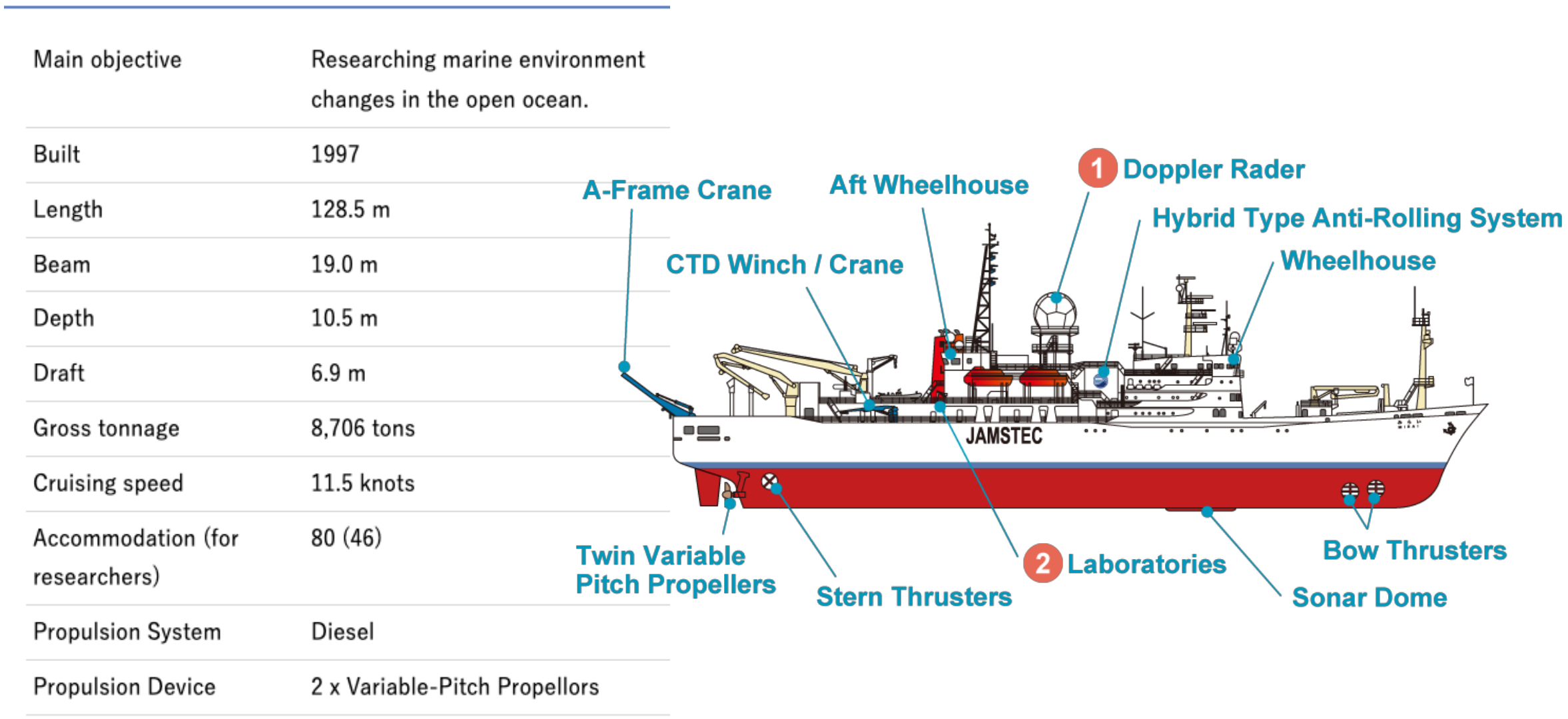
Sayonara RV Mirai (1997-2025)



Lallan P. Gupta, Masatoshi Yanagitani, Yasuhiro Namba
Research Vessels Operations Department, MarE3, JAMSTEC, Japan

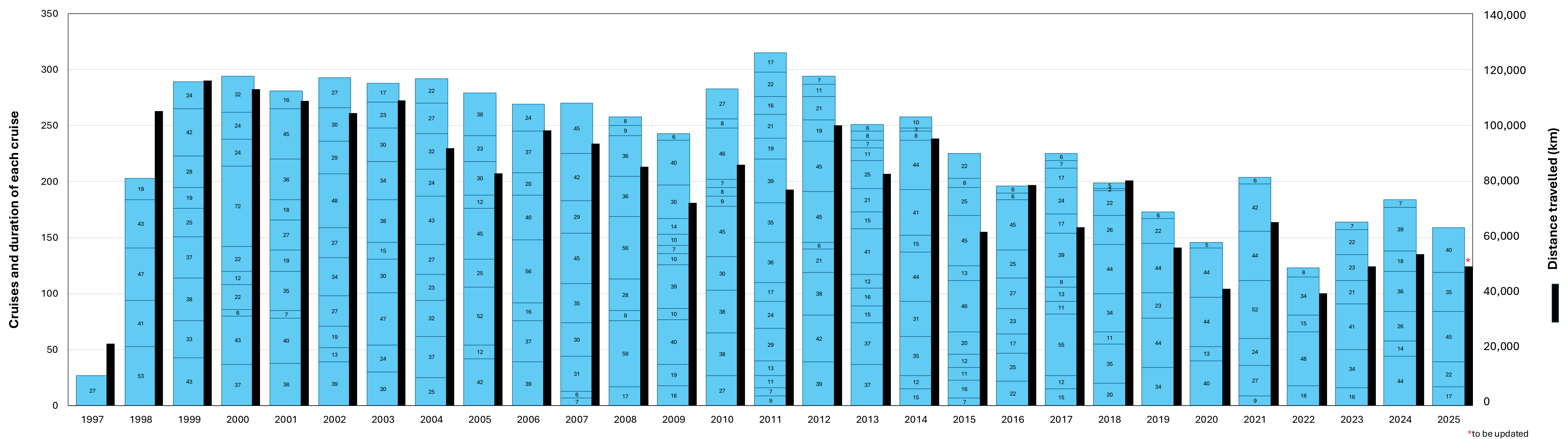
Introduction

RV Mirai's first incarnation was as Japan's first nuclear-powered ship "Mutsu"; the ship was renamed Mirai after the hull was cut, the nuclear reactor removed, and the rear part of the ship rebuilt. The ship's excellent ice-resistant performance allowed it to operate in polar regions, and its hybrid-type anti-rolling system allowed to navigate in rough weather, making it possible to conduct wide-area and long-term observations and research. Mirai conducted oceanographic research around the Antarctic Ocean, the Pacific Ocean, the Indian Ocean, subtropical and subarctic seas, and other regions of the world to study ocean heat and mass circulations, ocean ecosystems, and global environmental change.

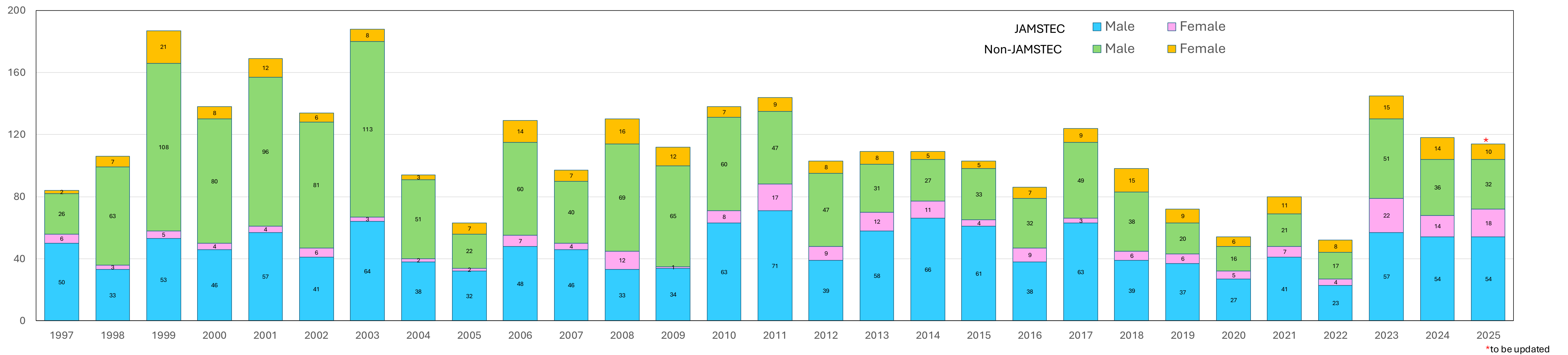


Cruise tracks

Research cruises in each fiscal year and duration of each cruise & distance travelled (km)



Researchers' gender balance onboard: JAMSTEC & non-JAMSTEC



Major research results

Biogeochemical time series observational research in the western North Pacific: Plankton, the savior of the ocean and the earth
Obtained valuable biogeochemical time-series data for nearly 30 years. Based on analyses of the data, it was verified that the western North Pacific subarctic zone has one of the highest "biological pump" efficiency in the world. On the other hand, the progress of acidification in the western North Pacific has also been detected, and concerns are beginning to arise about changes in the "biological pump" and carbon dioxide absorption capacity of this ocean area.

Arctic Ocean Observation Research: 23 trips to the Arctic in 28 years, Continued observation of the progress and impact of global warming
Conducted valuable observations in the Pacific side of the Arctic Ocean where the sea ice is disappearing, and obtained and published long-term observation data to clarify the current situation of global warming and its effects, e.g., sea ice decrease in the Arctic Ocean, the progress of freshening and acidification, changes in ocean circulation and material circulation, the impact on weather, climate and ecosystems, and the interactions between the Arctic and the surrounding seas and land areas.

Repeated hydrography cruises: Catchphrases are "Land to land" and "From the sea surface to just above the seabed"
Multiple observation points were set up on the observation line connecting the continents from land to land, and high-precision observations were made from the sea surface to just above the seabed, and this was repeated every 5 to 10 years. In addition to measuring physical parameters like water temperature, salinity, and current direction and speed, seawater was sampled at up to 36 layers from the sea surface to just above the seabed, and chemical components such as oxygen, nutrients, and carbon dioxide were analyzed on board. Data contributed to the WOCE, WHP, GO-SHIP.

Tropical and subtropical observation research: Monitoring the "heat engine" that drives the climate system
Built a tropical observation buoy network using TRITON buoys and deployed more than 200 moorings for long-time monitoring of ocean and atmospheric variations in the tropical regions for climate change research as well as weather and climate forecasts by meteorological organizations around the world.

Atmosphere-Ocean Interaction Research: The ocean and atmosphere are connected
The Madden-Julian Oscillation (MJO), in which a huge cloud group orbits the Earth along the equator for 30 to 60 days over the Indian Ocean, was successfully observed for the first time by Mirai. The data obtained in 2011 became the comparison standard for experiments to reproduce the MJO using numerical models.

Solid Earth Research: Understanding the history of Earth's activity from the seafloor
Conducted seafloor surveys using the multi-narrow beam echo sounder and sub-bottom profiler installed on the bottom of the vessel, collected sediments using a 20 m long piston corer, and collected rocks from seamounts and faults using a dredger. Also conducted underground structure exploration using air guns and streamer cables, acquired geophysical data, and conducted seafloor electromagnetic surveys to advance research on ocean floor dynamics.

Resource Survey Research: Mirai's special features also shine in the survey of seabed mineral resources
Mirai collected 26 core samples of seabed sediments from a depth of 5,500 m using a piston corer to investigate the distribution of rare earth mud off the coast of Minamitorishima. The total length of the core collected on this voyage was 304 m, the longest in a single voyage.

Research on atmospheric material circulation
Conducted research on atmospheric and oceanic material circulation from a new perspective. 15 years after the start of observations, with the support of observation technicians, it achieved continuous observations of MAXDOAS and global marine and Arctic atmospheric mapping of ozone and black carbon.

Thousands of Researchers, Engineers, Students from
223 Research organizations, Universities, Institutions of
31 Countries participated in the Mirai cruises.



The Successor: Mirai II
(operation planned to begin in Nov. 2026)

Acknowledgements

We extend our deepest appreciation to various researchers' teams, Global Ocean Development Inc. (GODI), Nippon Marine Enterprises (NME), Marine Works Japan (MWJ), various dock workers, etc., whose dedication, professionalism, and tireless efforts have been instrumental in achieving the goals of each cruise of the RV Mirai. This reflects not only the grand success of all cruises but also the collective contributions of individuals who have consistently upheld our vision and pursued excellence in every endeavor. Their unwavering commitment has shaped our legacy and laid a strong foundation for continued progress. We are profoundly grateful to them and proud to share this momentous occasion. Once again, thank you for your enduring support and for being an integral part of RV Mirai cruises.