

Five-Year Operation of the Oceanographic Research Vessel *Mirai*

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Abstract-The research vessel "MIRAI" is introduced as a synergy type research vessel of Japan Marine Science and Technology Center from the latter half of 1998 FY. We refer to the policy and the actual results through the practical use of R/V MIRAI in this 5 years.

□PLAN FOR OPERATION

The research cruise of "R/V MIRAI" (Fig.1) is being carried out based on 'the use plan of R/V MIRAI' that it is decided as 1997 in the cause "decade observational plan" was made. Mirai means "future" in Japanese.

It advertises in June or July, the examination of the subject is done in 'the MIRAI Research Planning Committee', and an adoption plan is made in early August, and a research cruise plan is agreed officially after that in Japan Marine Science and Technology Center board of directors (late August).

In the decade observational plan, the elucidation of the elucidation of the (1) heat transport, (2) material cycles (3) marine ecosystems and (4) ocean bottom plate dynamics are being raised. It is examined about the creative excellent research

subject and so on widely in 'the MIRAI Research Planning Committee', and adoption or rejection is decided as for the public subscription research subject based on the following priority subject.

(1) The priority subject

As for the priority subject, it points at research to belong in the following.

- i) The subject that JAMSTEC contributes to the R/V MIRAI long time settled on and the promotion of the middle observation research plan.
- ii) A joint research subject with JAMSTEC
- iii) The subject enforced by a technological promotion adjustment fee and a grant-in-aid for scientific research and an international project
- iv) The subject which others, the above committee recognized as the necessity



Fig.1 Research Vessel MIRAI

II □ NAVIGATION AND ACTUAL RESULTS

(1) Navigation trust

Five vessels of JAMSTEC position entrust the cruising company of the outside with the navigation. An incorporated company goes for Global Ocean Development Incorporated. (Abbreviation GODI) through the navigation of R/V MIRAI through JAMSTEC Ship Operations Division of Research Support Department. The employment of the crew, management of navigation in the land and a technical support, and so on are being done in a place of trust. The maintenance and renewal of the investigation or observation machines examine at "the investigation and observation machine function improvement examination group", the bureau is Ship and Ocean Engineering Division, and it is being carried out as a maintenance man thing of the year concerned or the next year.

(2) Operation days

It has 150% of the crewmen of the capacity, and 5 vessels that JAMSTEC navigates it form rotation such as a vacation with each ship as well. Because of this, the annual operating rate of each ship often exceeds 280 day, and proud of the biggest navigation days as a research ship of the government and municipal offices. Specially, R/V MIRAI has been operated

approximately 300 days per year. For example, that was 306 days in 2002 FY. So it is possible that the research of a lot of themes is carried out, not only oceanographer but also scientist of the various fields embarks on the meteorology, the geology, satellite engineering, and so on. Recently, we need much time to investigate the observation field it is getting longer the days of each cruise. Furthermore, the research fields include many different fields, they become very far from Japan, and insufficient the cruising days for even 300 days. So, we need manage the cruising date of R/V MIRAI to adjust between the project each year.

(3) Research area

All cruise tracks until 2002 (including a training cruise) are shown in Fig.2.

There are repeat observation mainly in western North Pacific, and also do in Indian Ocean, western equatorial Pacific and Arctic Ocean. Because the cruise of the public subscription type based on the main research theme which decided JAMSTEC is being done, as for R/V MIRAI, it is possible that the observation which has continuation every year in the about same area of ocean is researched. So

It has the characteristics to trace the middle scale phenomenon.

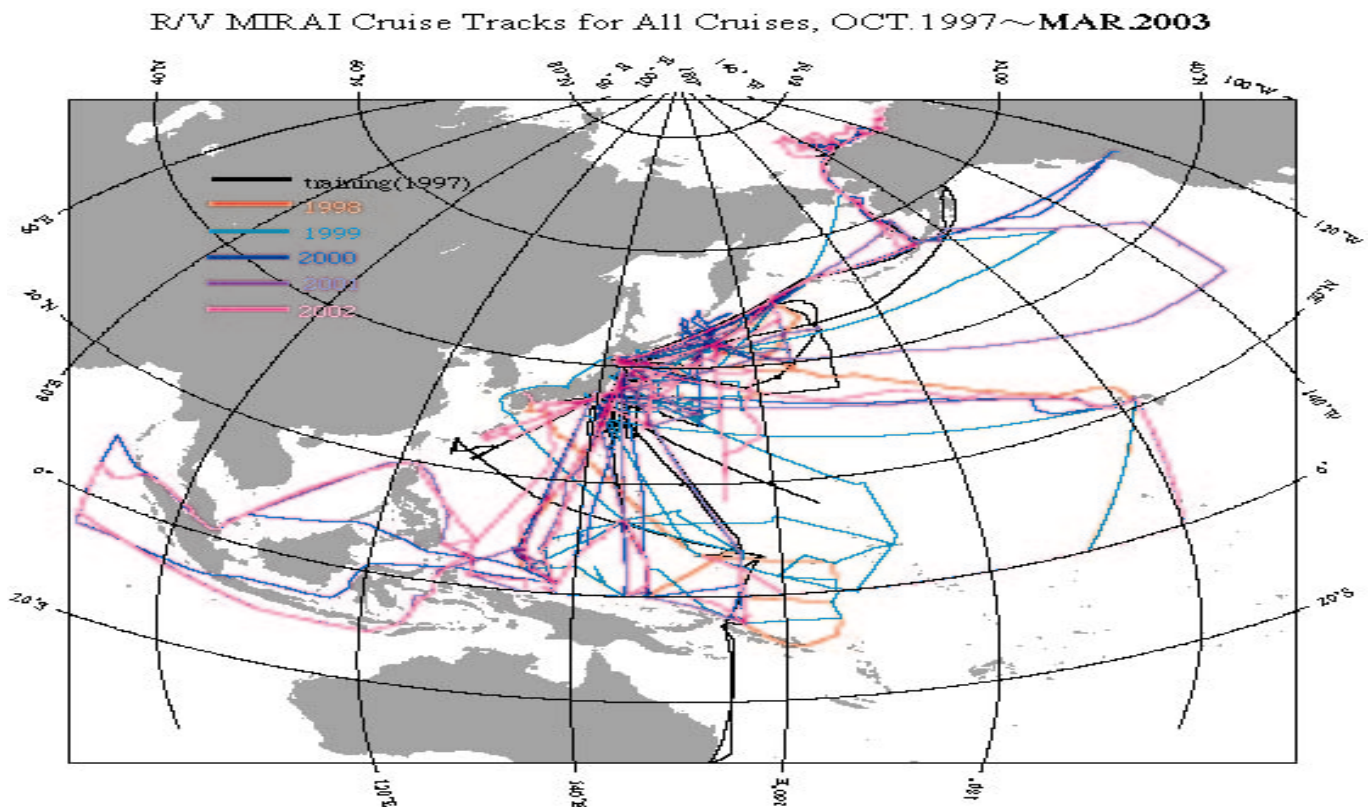


Fig.2 Cruise track of the R/V MIRAI from 1997 to 2002.

III □ EMBARKATION RESEARCHER

Although there are many scientist attending at Air-sea exchange cruise, other cruise such as TRITON buoy deployment at western equatorial Pacific, biogeochemical cruise in high latitude and physical cruise in Arctic Ocean, the rate which an observation technical staff occupies rises very much. It influences this that there are much maintenance of TRITON buoy and rates which routine work occupies during the cruise very much. Moreover, the number of application comes to exceed 100 cases in this several years, and it can ask that the public subscription type research of R/V MIRAI is permeating the field of oceanography.

IV □ RESEARCH SUPPORT

There is observation technical staff system, we called them "marine technician", as the biggest characteristics of the R/V MIRAI practical use. Though this looks like technician system in the various foreign countries, a marine technician is not in the research group, and the biggest difference is the point that it is specified for the cruise or the project fundamentally. There are three cooperative companies for supporting in JAMSTEC, Marine Works Japan (MWJ), GODI and Nippon Marine Enterprise (NME), and more than 150 technician from these companies are working on each vessel or land laboratory. On R/V MIRAI the marine technician of MWJ and GODI are supporting scientist as follows,

- i) Research support during the cruise, pre-cruise and after cruise
- ii) Proofreading of an analysis, measuring machine vessel to use in the ship and the operation of the machine
- iii) The control of the associated equipment of the land storage and maintenance
- iv) Pre-processing of the data and the sample and storage
- v) The quality control of the data and the sample
- vi) Preparation such as practical use and a repair report
- vii) Cruise report preparation assistance

Contents of support and the number are settled on the proposal that it was submitted by each scientist at the end of the preceding fiscal year in JAMSTEC Research Support Coordination Division, and it is decided that the marine technician whom the above supports embarks for each cruise. Furthermore, the great characteristic of R/V MIRAI is "sample processing and analysis are possible on board". There is an abundance of laboratories equipped with treatment and analyzing systems for various samples collected in the ocean. These machine maintenance and sample analyze are supported by marine technicians. According to this careful maintenance of equipment and experience of marine technician, we could get high accurate data continuously. It might be internationally useful, and a future is probably to use in the field that the data will obtain by R/V MIRAI. At the Southern Hemisphere circumnavigation cruise (BEAGLE 2003), which will start in August in 2003, the data acquisition standardized by the marine technician who was on the same level with the same research vessel expects to become one model of the ocean research which will be done from now on.

V □ SUMMARY

As for R/V MIRAI, from the latter half of 1998 FY, real practical use started as a synergy type research vessel. It is greatly contributed to the ocean research in Japan through the practical use of which lasts for five years of R/V MIRAI, and that importance is thought that it is taking root in the research community. A main research theme is established by JAMSTEC, and the point which is the so-called research of "the top-down type" to invite a sub-theme from other institution or university as the characteristics of the R/V MIRAI synergy type research. As for this, though it considers that there is an argument both for and against, there is an advantage to observe intensive investigation based on the specific theme. On the other hand, there is an advantage in the so-called research of "the bottom-up type" based on the independent scientist's needs as well in the point which leaves the bud of the basic research, and may both stand abreast. JAMSTEC will become an independence administrative institution from 2004 FY. Because emphasis is put on the research of "the top-down type" there more, R/V MIRAI synergy type research would continue in future, fundamentally.