Japan Marine Science and Technology Center (JAMSTEC) started to collect geophysical data in 1980's since the first multi-narrow beam echo sounder (MNBES) system was introduced on board R/V Kaiyo. At present, four research vessels of the JAMSTEC are equipped with the various marine geophysical instruments.

In the JAMSTEC, the oceanographic database obtained by the R/V Mirai already exists. From 1999, Nippon Marine Enterprises Ltd. (NME) has been commissioned to process and manage the geophysical data from JAMSTEC. The geophysical and oceanographic data sets obtained during the cruises are gathered into the Data Management Office (DMO) in JAMSTEC. Primary purpose of the database is to give high quality data and to give easy access system for the user.

First of all, the geophysical data from the research vessels are edited and formatted. The data are then processed and visualized by post-processing software, generic mapping tools (GMT). Processed bathymetric maps, gravity and geomagnetics anomaly maps are selected and constructed into the geophysical database.

The database is extended as soon as the additional data are collected, and will be used as the basis for further cruise planning to fill out sparse data areas. In the future, the geophysical database will be combined with the other databases in JAMSTEC. In this paper, We would like to focus attention on MNBES bathymetric data, various geophysical data base on this data.

**Keywords**: Geophysical data, Bathymetric data, Datamanagement Office, SeaBeam, Quality control
INTRODUCTION

The scientific purpose of Deep-sea research programs are understanding and solve the dynamics of the earth's interior in the JAMSTEC, for example, motion of convergence or generate plate. In order to do this, geophysical data become to the essential information.

Marine geophysical data of bathymetry, geomagnetics, and gravity have been acquired and integrated since the 1960's internationally by major oceanographic institutions. JAMSTEC, which was established in 1972, started to collect these data in 1980's since the first MNBES system was introduced on board R/V Kaiyo. At present, four research vessels (R/Vs Kaiyo, Yokosuka, Kairei, and Mirai) of the JAMSTEC are equipped with the various marine geophysical instruments such as MNBES system, proton magnetometer, three-component magnetometer, and gravity meter (Table 1).

In this paper, we introduce our object-oriented database.

DATA MANAGEMENT OFFICE

The collected geophysical data has gathered the DMO, which was established in 1998. The DMO can be classified into two groups, the quality-check group and the database management group (Fig. 1). Two groups are closely related each other.

In the QC group, there are persons in charge for every data of various observation fields. We collect the data and consider the processing method, development of a quality evaluation system and it's technique, data offer format in alignment with a user's (researcher) needs. Especially, the geophysical data is performing processing united with the characteristic. Then, registration to a database is performed (Table 2).

Table 1 Geophysical observation instruments equipped with JAMSTEC's research vessels

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Kairei</th>
<th>Mirai</th>
<th>Yokosuka</th>
<th>Kaiyo</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNBES</td>
<td>SeaBeam Inc.</td>
<td>Upgrade of SeaBeam 2112</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SeaBeam2112.004</td>
<td>SeaBeam 2112</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravity meter</td>
<td>Bodenseewerk KSS31</td>
<td>LaCoste&amp;Romberg S-116 S-63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proton magnetometer</td>
<td>KGE* PROTO10</td>
<td>Geomatics G-811 PROTO10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three Component Magnetometer</td>
<td>Tierra Tecnica Ltd., SFG1214</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*KGE: Kawasaki Geological Engineering Co., Ltd.

Table 2 Processing and registration form based on each geophysical data. Including data existence, obtaining on-going, and future planning.

<table>
<thead>
<tr>
<th>Data</th>
<th>Instrument</th>
<th>Processing</th>
<th>Registration form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathymetric</td>
<td>SeaBeam</td>
<td>Debug format conversion</td>
<td>Raw &amp; edited data (SeaBeam original format)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mapping</td>
<td>XYZ data, Grid data (bathymetric map)</td>
</tr>
<tr>
<td>Side-scan</td>
<td>SeaBeam</td>
<td>Filtering</td>
<td>Image (Side-scan map)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Format conversion</td>
<td></td>
</tr>
<tr>
<td>Sub-bottom</td>
<td>Gravity Meter</td>
<td>Format conversion</td>
<td>Image (Sub-bottom profiler)</td>
</tr>
<tr>
<td>Gravity</td>
<td>Gravity Meter</td>
<td>Gravimetric connection</td>
<td>XYG data correction data for connection</td>
</tr>
<tr>
<td>Geomagnetic</td>
<td>magnetometers</td>
<td>Format conversion hinned-out</td>
<td>XYM data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>processing</td>
<td></td>
</tr>
</tbody>
</table>
METHOD

In this chapter, the processing method about the geophysical various data is introduced.

Bathymetric data:

After editing the discontinuous data produced by the rough sea condition and debugging the spike noise, A various bathymetric maps are created by grid data using the spline function (Fig 2). The data is complied and kept for every cruise and every research area. The data of a SeaBeam format is original, and since it is lacking in flexibility, it is performing conversion to the format which can be treated with the mapping software (GMT; Generic Mapping Tools) of flexibility.

Moreover, sound velocity compensation reexamine in order to guarantee quality if needed.

Besides raw data, edit data, and grid, various bathymetric maps are also kept by postscript file.

SBP data;

This data is important, which becomes possible to acquiring the information under the seafloor. But, Since there was no display and reproduction software, it developed.

This SBP data does perform registration to a database only images, it offers the digital raw data by each demand.

Gravity data;

Raw data is registered. The data is complied and kept for every cruise and every research area. Since the data of format is original, it is performing conversion to the format which can be treated with the mapping software. It began to start a gravimetric connection.

Geomagnetic data;

For the total magnetism obtained with the proton magnetometer, and the three component magnetism obtained with the three component magnetometer, Raw data is registered and complied and kept for every cruise and every research area.

The noise of the three component magnetism value recorded by 8Hz is eliminated if needed, and the work thinned out to a value for 1 minute is done. From now on, removal of hull magnetism tackled, and remains as a subject.

Inventory data;

Cruise log - Those with data in which the cruise information is acquired with electric navigation equipment, such as time and a position, is mentioned in second, furthermore this log are registered and managed as inventory information.

Vertical temperature profile - This data obtained by XBT, XCTD, etc. has registered as a inventory data using for sound velocity compensation of the bathymetric data. The compensation formula is using the formula of Mackenzie.

EXAMPLE OF QUALITY CHECK

In order to grasp a draft peculiar to each ship, for the "Yokosuka" and "Kairei" which equips SeaBeam

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Fig. 2  Bathymetric data processing work flow chart.
2112.004 system, relative depth-sounding value bias compensation was tried.

At the same flat point (Fig. 3- a and b), Center depth value of water was compared. Furthermore, it asked for the average of the difference. The point that latitude and longitude of the same point corresponded to 3 digits the bottom by the decimal system of a degree was said, and 73 points' were chosen in A are (Fig. 3- a) in 2770 points and B area (Fig. 3- b).

Consequently, in A area, the directly under center depth value of “Yokosuka” was high 0.76m, and the +4.61m difference came out similarly in B area. These differences in both area were became ratio of 0.12% (A area) of ratio 0.0175% (B area) to the average depth, 4338.41 m (A area), and 3798.94 m (B area), respectively. According to the spec of SeaBeam Corporation, “Direction less than ratio of 0.2% or ±1m of center depth of water are large either”, it has fitted in the error which any has in the catalog spec, and a significant difference is not accepted. Therefore, it is thought that there is no influence which a draft has on SeaBeam center depth of water among both vessels.

This result thinks both vessels are sister ships, and the system carried is also the same. From now on, it considers performing same verification also to the center depth value acquired with another vessels. Moreover, same verification is performed also about “HS-10” bathymetric system and “Classic SeaBeam” system, so the bathymetric data accumulated in the past is also utilized.

**FUTURE SUBJECT and VIEW**

It is pressing need to create the quality control standard for guaranteeing not only early construction (Fig. 4) of a database but also the reliability of various data as a subject required for the future target and data public presentation which aim at the support tool for submarine geographical map reference or crust structure model establishment.

Examination of a data format for the processing method of various or public presentation and the drift tendency of each instruments are due to be investigated from now on.

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**Fig. 3-a. A area**

**Fig. 3-b. B area**

**Fig. 3** The SeaBeam survey lines and a bathymetric map of RV's "Yokosuka" and "Kairei" in A and B areas.

**Fig. 4** The Bathymetric database under development.

Creation of the present interchange phase and the registration work of data are done for the purpose of during this year. It considers giving the function which can be searched with research area, a cruise name, and a vessel.
Moreover, the quality and quantity of a database improve, also promoting verification with the diastrophism under the actual seabed. Furthermore, it returned to the observation field (onboard) which is the front line of data acquisition of the result obtained by the quality control, and aims at contributing also to improvement and speeding up of observation technique.

The following subjects will be raised if the above is summarized.

a. Decision of a quality control standard (various data)
b. Grasp of a draft value (Bathymetric and gravity data)
c. Return the information of quality-check to the observation field

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