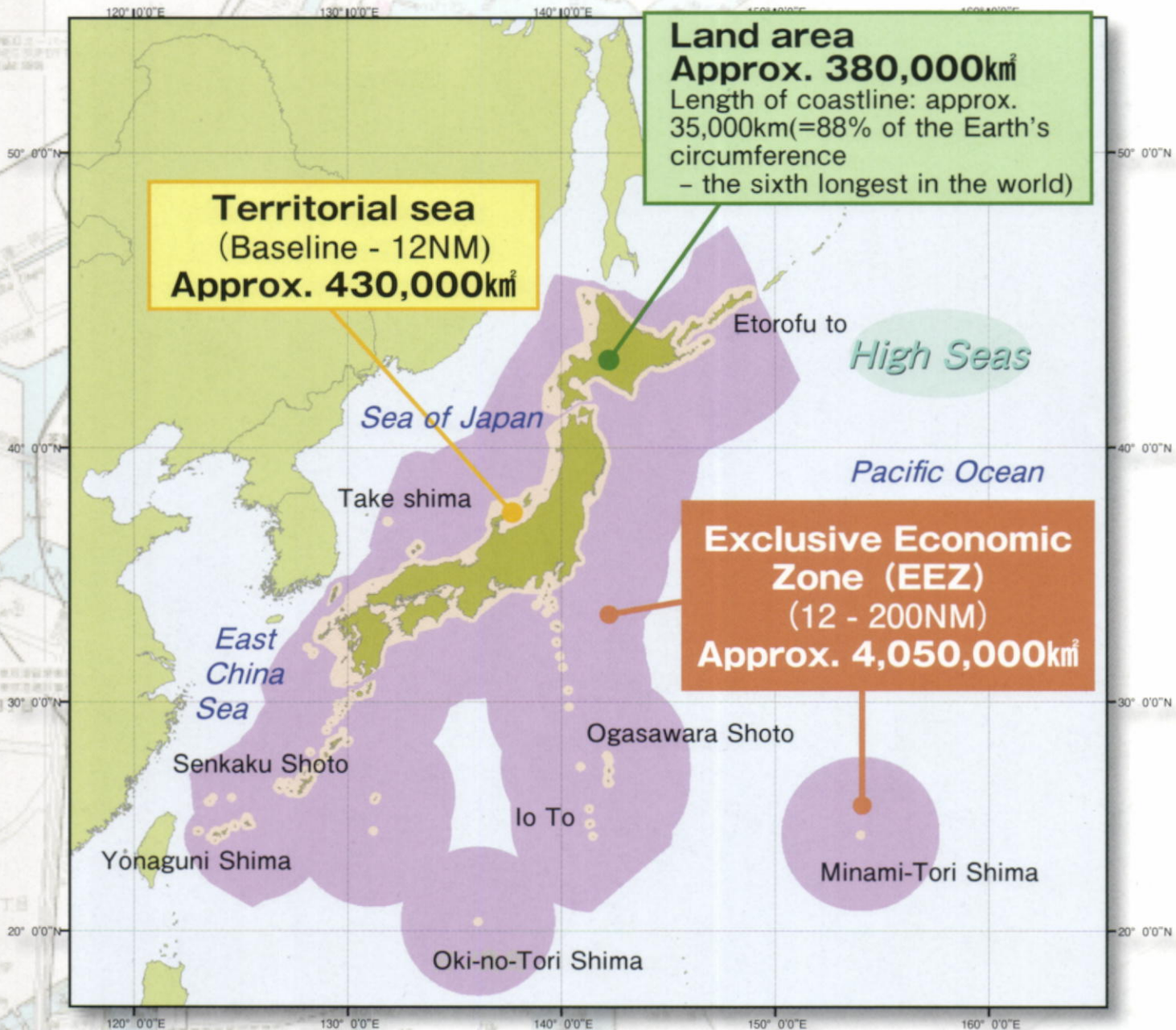




Exploring the Sea

Hydrographic and Oceanographic Department
Japan Coast Guard





Marine Information is to lead the Future

For 140 years, the Hydrographic and Oceanographic Department of the Japan Coast Guard (JHOD) has been providing nautical publications, such as nautical charts, which are essential information for maritime traffic supporting the Japanese economy. In recent years, JHOD has also been providing necessary information for marine activities to meet a variety of maritime demands.

In particular, since 2004, JHOD has been taking a leading role in united effort of the Japanese government to establish the outer limits of Japan's continental shelf in accordance with the United Nations Convention on the Law of the Sea, and promoting surveys of seafloor topography and crustal structure in order to secure Japan's marine interests.

In this circumstance, the Basic Act on Ocean Policy came into effect in July 2007, the purpose of which is to promote measures with regard to the oceans comprehensively and systematically.

The area of territorial sea and exclusive economic zone surrounding Japan is as huge as 4.47 million square kilometers. In order to benefit most from the surrounding sea, we need to conduct surveys to understand the sea to maintain scientific data, and promote the appropriate maritime policy on the basis of the scientific data.

JHOD promotes organized and efficient research with the cutting-edge technologies and make a contribution to enhancement of human knowledge about the ocean. In addition, JHOD is committed to contributing to Japan in establishing itself as a new oceanic state by appropriately managing the data obtained and promoting provision of marine information.

JHOD is expected to explore Japan's future as an oceanic state through its marine research and information provision.

History

140 years of the Hydrographic and Oceanographic Department of the Japan Coast Guard (JHOD)

- 1871 New Meiji government began marine research. The government established the Hydrographic Bureau (JHB, national hydrographic research organization) in the Navy Department of the Ministry of the Military.
- 1872 JHB published the first nautical chart "Kamaishi".
- 1921 The International Hydrographic Bureau (present International Hydrographic Organization) was established. Japan became a member state.
- 1923 JHB surveyed Sagami Bay responding to the 1923 Great Kanto Earthquake.
- 1925 JHB started using echo sounders.
- 1938 JHB began observation of ocean currents.
- 1945 The Ministry of Transport established the Hydrographic Department (JHD) as its external bureau.
- 1949 The Hydrographic Department became a part of the Japan Coast Guard.
- 1952 The distress of the survey vessel "KAIYO NO. 5" during the survey of Myojin Reef
- 1953 Practical application of geomagnetic electrokinetograph (GEK)
- 1965 The Cooperative Study of the Kuroshio and Adjacent Regions (CSK) commenced. The Oceanographic Data Center (present Japan Oceanographic Data Center) was established.
- 1969 JHD began research by the submersible research vehicle "SHINKAI".
- 1983 JHD began surveys on the continental shelf (completed in 2008).
- 1984 The survey vessel "TAKUYO" explored the deepest spot in the ocean (Challenger Deep), and determined the depth (10,924 m).
- 1995 JHD began surveys on active faults on seafloor.
- 1998 JHD began surveys on volcanoes in sea area.
- 2000 JHD began seafloor geodetic observation.
- 2002 The Hydrographic Department of the Japan Coast Guard was reorganized into the Hydrographic and Oceanographic Department (JHOD).
- 2003 JHOD began research on environmental conservation (recovery of the marine environment).
- 2008 JHOD began surveys on Japan's territorial sea and exclusive economic zone.
- 2011 JHOD moved to the new office building at Aomi.



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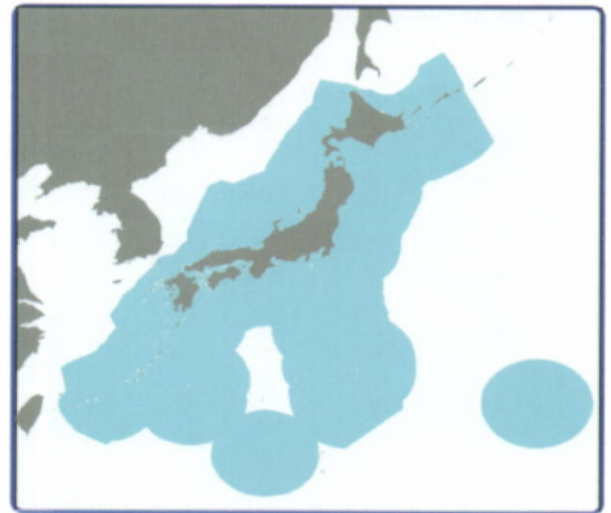
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Ocean Surveys Related to the Preservation of Marine Interests

The collection and compilation of basic information such as seafloor topography in the jurisdictional marine zones, the territorial sea and the exclusive economic zone and so on, are essential for our country Japan, an oceanic state, in order to enforce comprehensive governance on the sea and secure Japan's marine interests.

However, Japan has not acquired enough data in some sea areas, such as the East China Sea and the Sea of Japan where the boundaries of Japan's jurisdictional marine zones are in contact with those of opposite countries, due to the lack of sufficient surveys because Japan had given priority to the surveys necessary for the establishment of the outer limits of continental shelf according to the article 76 of the United Nations Convention on the Law of the Sea.

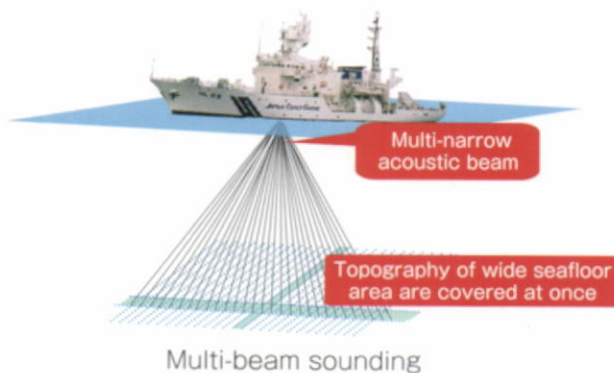
In this circumstance, Japan enacted the Basic Act on Ocean Policy in July 2007, and established the Basic Plan on Ocean Policy in March 2008 in accordance with the Act. JHOD, standing on these Act and Basic Plan, is intensively carrying out systematic surveys on seafloor topography, crustal structure and territorial sea baseline, which are indispensable for preserving Japan's marine interests.



Territorial Sea and Exclusive Economic Zone

Bathymetric Survey

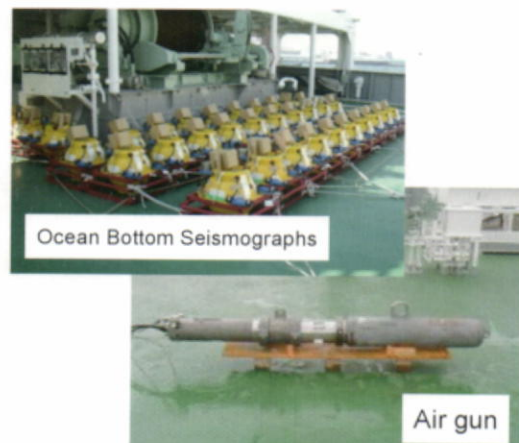
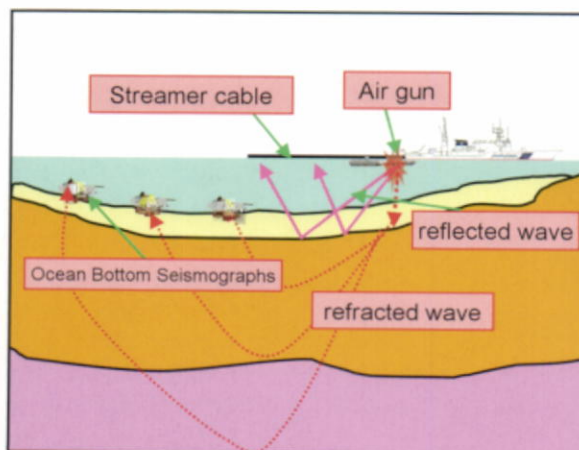
Multi-Beam Echo Sounder (MBES) equipped on the bottom of a vessel transmits very narrow acoustic beams and receives the pulses reflected at the seafloor. This technique enables us to cover the wide range of seafloor topography at once.



Operation of the bathymetric survey in the vessel

Crustal Structure Survey

This is a survey to probe under the seafloor using artificial seismic waves generated by an air gun to obtain information on the crustal structure under the seafloor such as the thickness of the geological layers and the distribution of faults.



Air gun: a device to generate strong sound wave (seismic wave) by explosion of compressed air. Streamer cable (hydrophone cable): a cable with a chain of built-in hydrophones that receives the sound wave.

Ocean Surveys for Safety of Navigation on the Sea

Nautical charts are essential for safe navigation on the sea. In order to keep the charts updated, JHOD conducts surveys on the depth of water in harbors and sailing routes mainly using echo sounders to reveal the seafloor topography.

Recently, multi-beam echo sounders (MBES) and airborne LIDAR have facilitated collecting highly dense soundings, enabling us easily to obtain three-dimensional sea bottom topographic images.

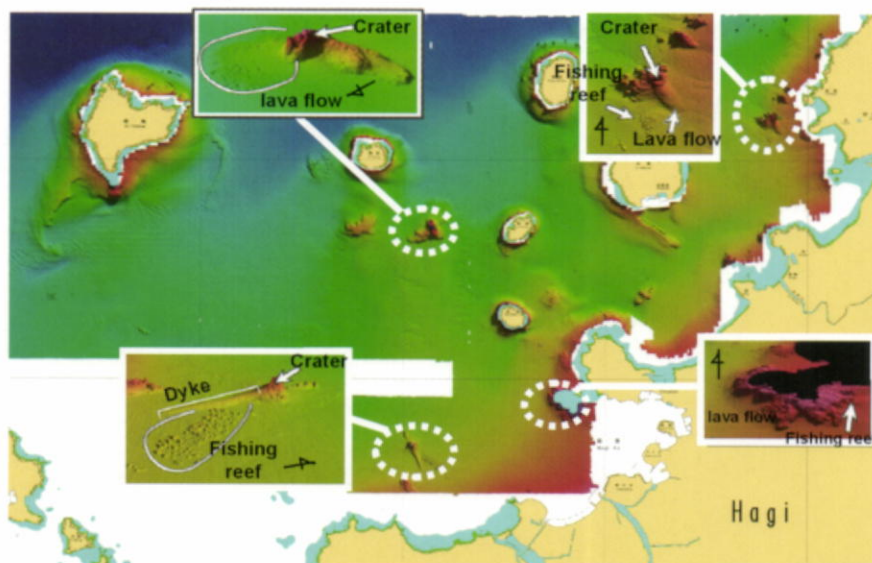
JHOD also carries out Satellite Laser Ranging (SLR) observation at the Shimosato Hydrographic Observatory where we have a fiducial point for determining the precise location of the Japanese islands.

In addition JHOD carries out surveys of tidal current, tide, ocean current etc. that are necessary for safety of navigation.

Surveys of Geomorphological and Geological Features on Seafloor

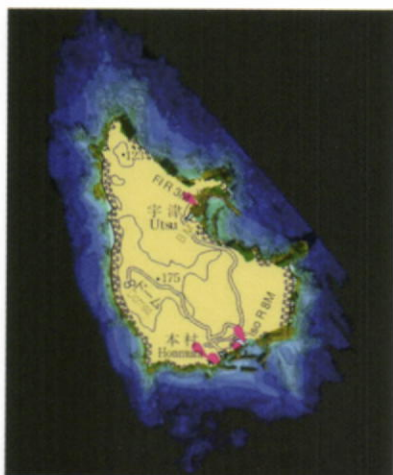
JHOD conducts geomorphological and geological surveys using state-of-the-art survey instruments

Examples of Survey Results

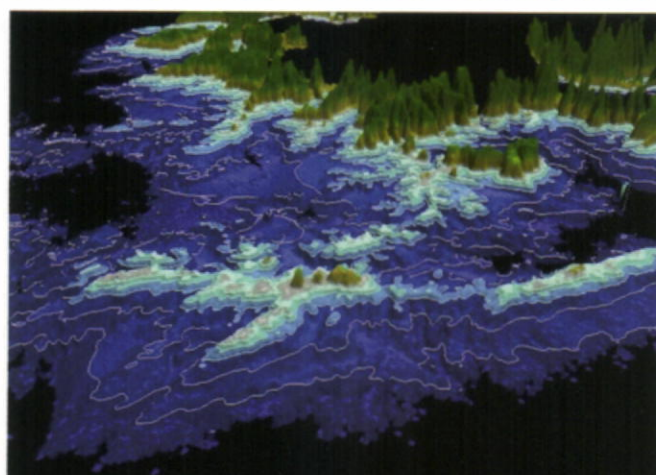


The seafloor topography off Hagi, Yamaguchi Prefecture, obtained by multi-beam sounding

Examples of Survey Results Obtained by Airborne LIDAR Bathymetry



The seafloor topography of Mishima, Yamaguchi Prefecture obtained by airborne LIDAR bathymetry

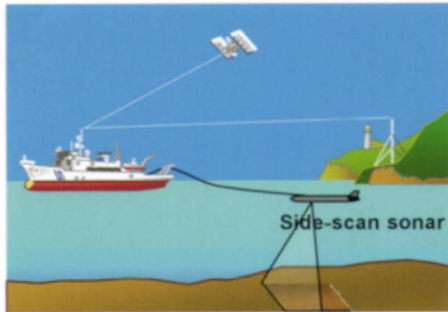


The seafloor topography near Hae-no-Hase, Tsushima Island, Nagasaki Prefecture, obtained by airborne LIDAR bathymetry

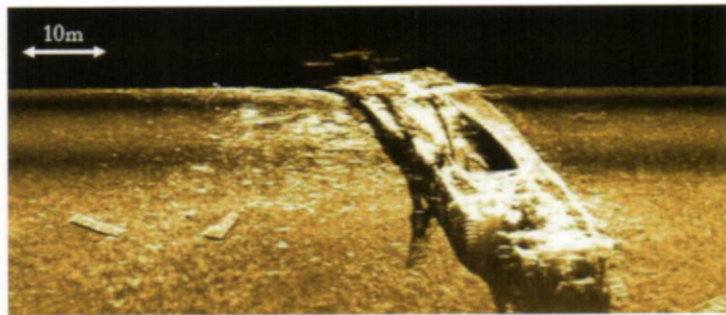
Side-scan Sonar

The seafloor condition varies place to place; it can be sandy, muddy or rocky; there can be even shipwrecks or obstructions. In order to find these situations in the opaque seawater, we use a side-scan sonar, which shows us the underwater situation with acoustic images like those taken by optical camera. The side-scan sonar is also utilized to search for the shipwrecks by the maritime accidents.

A side-scan sonar transmits acoustic signals downward from a towed vehicle in a fan-like profile and receives reflection from a sea bottom. The reflections are intense from solid objects like rocks and faint from places like flat sandy soil. It provides us visual images like photographs of the seafloor by rendering the intensity of the reflections into grayscale images.



Schematic picture of observation



The seafloor image around the shipwreck obtained by a side-scan sonar

COLUMN
03-1

Actions taken after the Great East Japan Earthquake (1)

● Hydrographic surveys for rapid recovery of affected ports and harbors.

JHOD contributed to rapid recovery of the functions of ports and harbors affected by the earthquake and tsunami in cooperation with the port authorities.

JHOD completed the hydrographic surveys of 11 harbors, mainly in the International hub ports and the Important ports, and helped port authorities open these ports and harbors for partial usage by March 26.



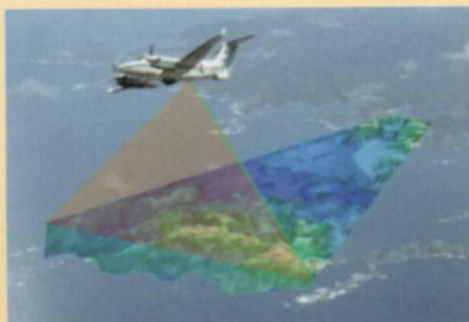
On-board survey craft of survey vessel "SHOYO" in operation at Port of Ofunato



The damaged breakwater at Port of Ofunato

● Airborne LIDAR bathymetry in the coastal Tohoku region

JHOD conducted airborne LIDAR bathymetry in the affected areas such as Sendai Bay, and revealed the situation of seafloor topography in large area.



Schematic picture of airborne LIDAR bathymetry



Survey data of south coast of Sendai Bay obtained by the airborne LIDAR

■ Satellite Laser Ranging

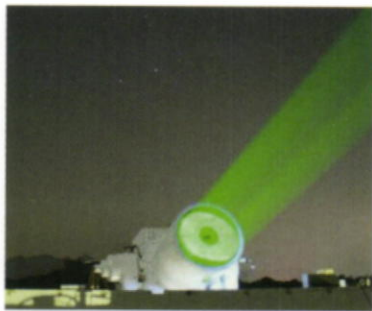
Satellite laser ranging (SLR) measures the round-trip time of laser pulses emitted from the ground station to travel to a satellite and return to the ground station. By multiplying half of the round-trip time by the speed of the light (about 300,000 km/sec), the distance from the ground station to the satellite is derived. Based on this principle, the relative position between the earth-orbiting satellite and the ground station is determined.

High-accuracy positions of off-lying islands, reefs and coasts are required for publishing/revising the nautical charts and delineating the limits of the jurisdictional marine zones including the territorial sea and the EEZ. SLR plays an important role in the precise positioning for those purposes.

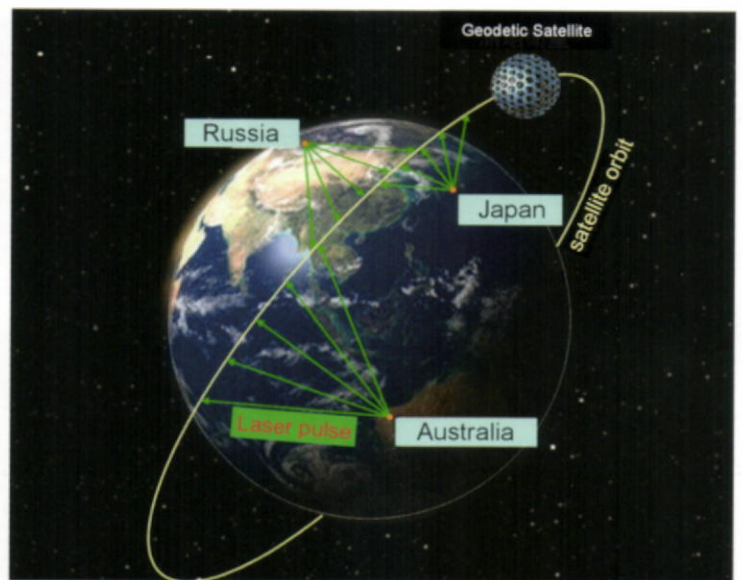
JHOD also participates in the international collaborative laser ranging observations. The Shimosato Hydrographic Observatory contributes to construction of the international geodetic coordinate system as one of the important observatories in the Far East.



Shimosato Hydrographic Observatory
(Wakayama Prefecture)



Ground station in operation

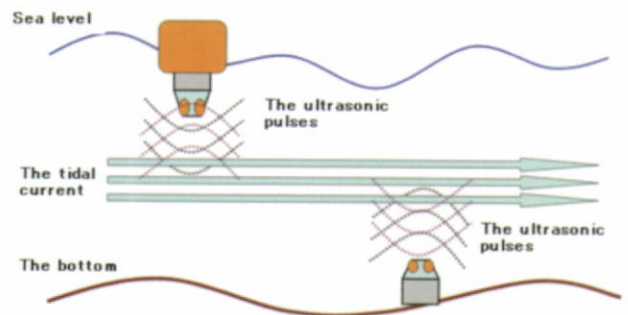


Schematic picture of SLR observation

■ Tidal Current Observation

JHOD conducts the tidal current observation (direction and strength between the tide), with a current meter (it emits ultrasonic pulses and measures the current velocity and direction from the reflected pulses) at the busy straits and ports. We provide the results in the tidal current charts, nautical charts, the Internet, and so forth.

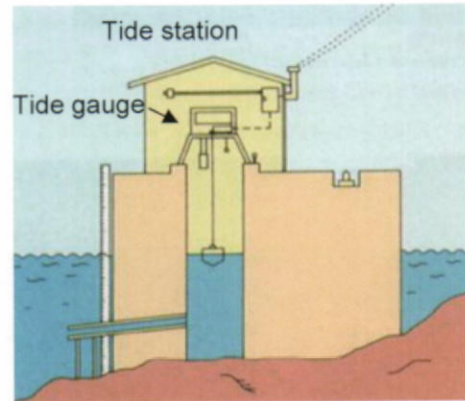
The information of tidal current is useful not only for safety of navigation on the sea, but also for marine leisure activities and conservation of marine environment.



Tidal current observation
(shows the installation method of flow meters)

Tidal Observation

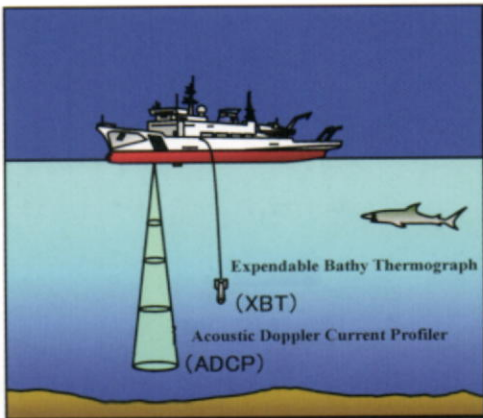
JHOD has installed the tide stations in 20 locations in Japan, and observes the tidal changes (up-and-down movement of a float in the station). We monitor all the data in our headquarters (Tokyo), and provide them over the Internet. The observed results of tidal changes serve us as basic data for predicting tide, tidal correction for bathymetric surveys and surveys on ocean current changes, as well as for monitoring the crustal displacement. They also serve us as essential data for detecting tsunamis.



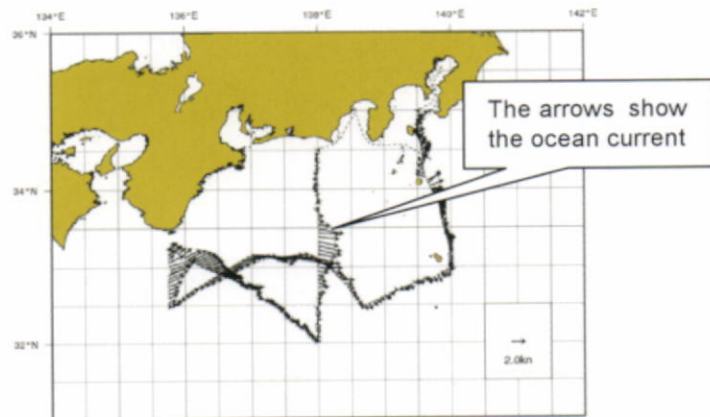
JHOD tide stations (20 locations in Japan)

Ocean Current Observation

JHOD observes the ocean currents (direction and strength) in the sea around Japan, and provides the obtained data of currents and seawater temperatures as basic information for safety of navigation on the sea. We also use the data to predict the trajectories of drifting objects; the prediction is necessary for our search and rescue operations as well as the disaster prevention.



Major observation method



Ocean current chart

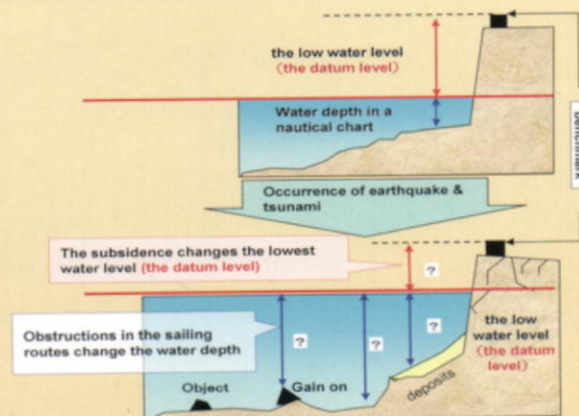
(the length and direction of arrows represents the strength and direction of ocean currents respectively)

COLUMN
03-2

Actions taken after the Great East Japan Earthquake (2)

- Determination of the low water (datum level), a depth reference in nautical charts

The lowest water level is the level of seawater at the lowest tide: a datum level for water depth described in the nautical charts. It is also used as a datum level for harbor-construction works, which is the basic information for planning, designing and construction of harbor facilities. Because of the subsidence caused by the earthquake, the bench marks became unavailable to determine the lowest water level, so JHOD resurveyed them.

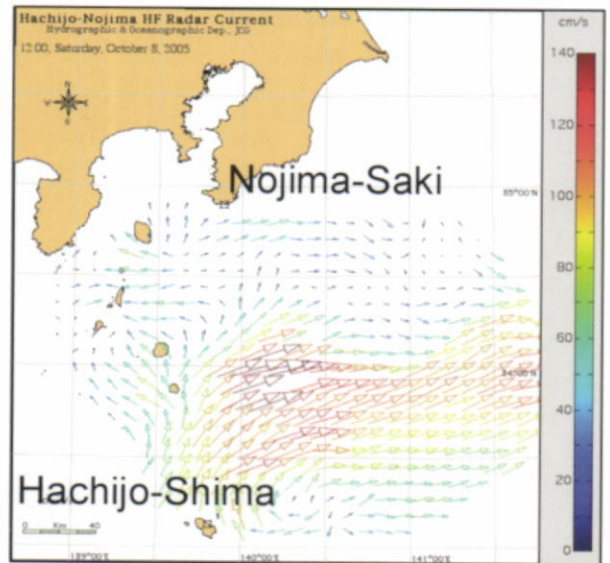


High Frequency (HF) Radar

Ocean HF radar system consists of two remotely located stations. Each station has a pair of transmitting and receiving antennas.

The radio wave emitted to the surface of seawater changes its frequency when it bounces off the moving surface. JHOD measures the ocean currents by analyzing the frequencies of two sets of reflected radio waves.

JHOD has HF radar stations at Kazehaya Saki Lighthouse in Izu Oshima Island and near Ara Saki in the Miura Peninsula for Sagami Bay area, and at Nojima Saki Lighthouse in Chiba Prefecture and near Kaminato port in Hachijo Shima Island for Izu Islands area, to observe ocean currents in each area.



Ocean current chart with the data observed by HF radar

Nojima Saki Ocean HF radar station
(Left: receiving antenna, right: transmitting antenna)

Sea Ice Observation

Ice floes approach the Sea of Okhotsk coast in Hokkaido from January. The information on ice floes is essential to ships such as fishing boats, because the boats cannot move to any direction once surrounded by the ice floes. Every year from December 20 to the end of April, 1st Regional Coast Guard Headquarters sets up the "Ice Information Center", and provides information on the ice floes in the Sea of Okhotsk (Sea Ice Bulletin) by fax or over the Internet for local ships and vessels every day. 1st Regional Coast Guard Headquarters observes the distribution of sea ice with the satellites, aircrafts, and patrol vessels.



Sea ice observation by an aircraft



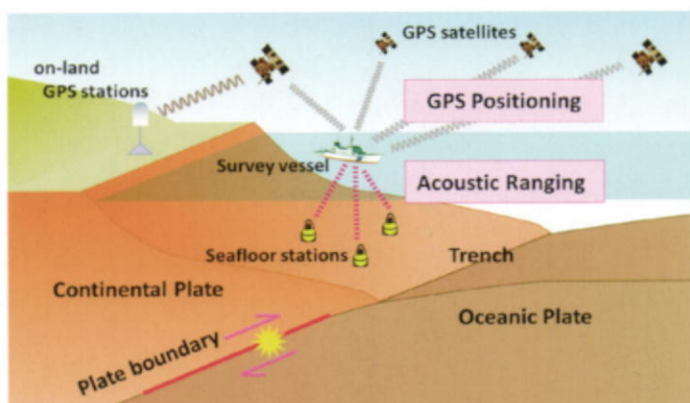
Sea ice observation by a patrol vessel

Ocean Surveys for Disaster Prevention and Environmental Conservation

JHOD conducts surveys for disaster prevention, such as seafloor geodetic observation and surveys of volcanoes in sea area, and trajectory predictions in order to ensure safe and secure lives of the citizenry by minimizing the damage of natural disaster such as earthquakes and volcanic eruptions or the damage by maritime accidents or disasters including spill of oil or harmful liquid from a stranded or destroyed vessel. JHOD also conducts environmental conservation research, such as marine pollution and radioactivity surveys to preserve the irreplaceable marine environment.

Seafloor Geodetic Observation

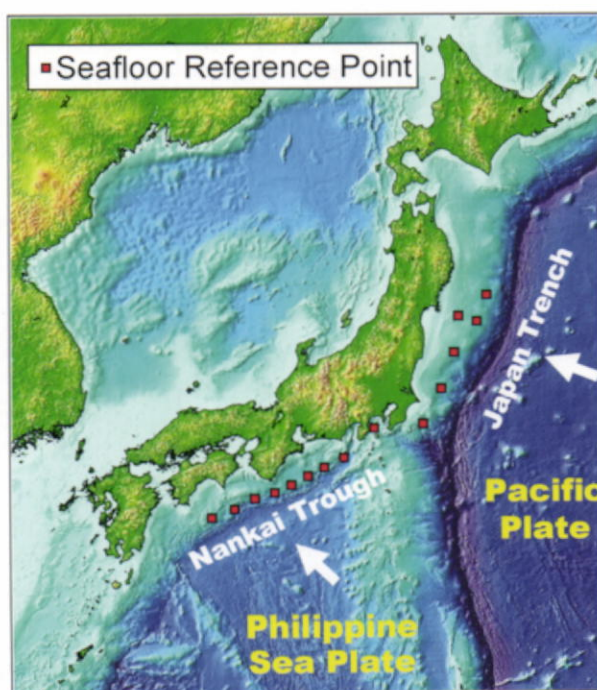
Japan is located in a tectonically active region where four tectonic plates interact with each other. Along the plate boundary, followed by the subduction of the oceanic plate, the strain accumulates in the continental plate. When strain accumulated to some extent, the coupling suddenly breaks and causes a huge earthquake. JHOD developed a system for detecting seafloor crustal movement by combining GPS and undersea acoustic ranging techniques, and has been carrying out the seafloor geodetic observation at seafloor reference points installed on the landward slope of the major trenches such as the Japan Trench and the Nankai Trough from 2000. This observation contributes to understanding of the mechanism of huge earthquakes.



Schematic picture of seafloor geodetic observation



Installing a seafloor station



Location of seafloor reference points (as of November 2011)

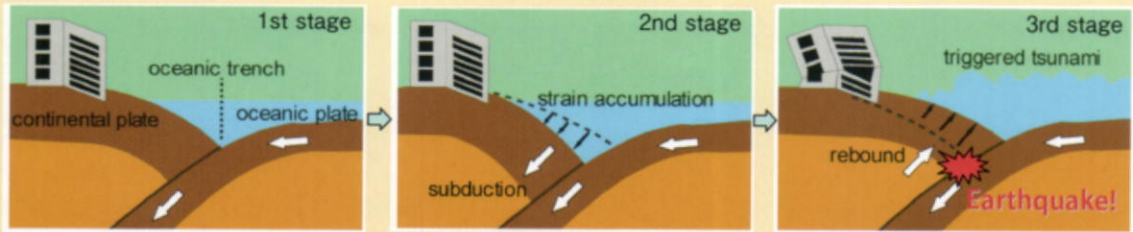
COLUMN
03-3

Actions taken after the Great East Japan Earthquake (3)

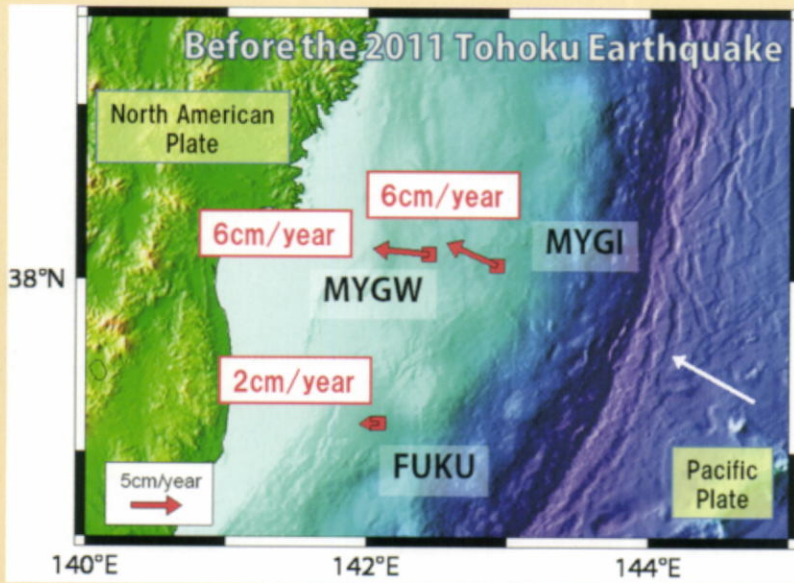
● **Detection of the substantial movement of the seafloor**

Before the 2011 Great East Japan earthquake, JHOD had detected the seafloor movement toward west-northwest at the reference points off Miyagi and off Fukushima. From the observation after the earthquake, JHOD detected opposite movement toward east-southeast associated with the earthquake. In particular, the seafloor reference point "MYGI" located near the epicenter moved about 24 m toward east-southeast.

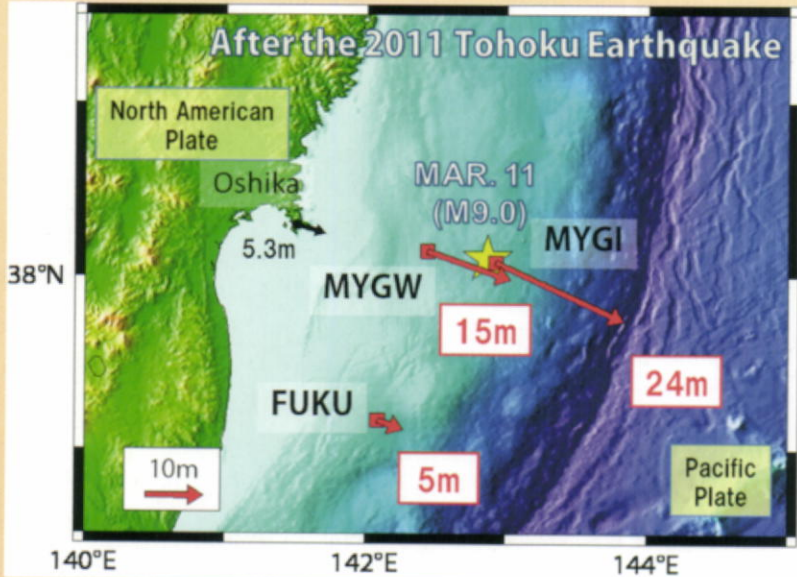
The mechanism of plate boundary earthquake is shown in the figure below. JHOD succeeded in directly detecting this type of seafloor movement by the seafloor geodetic observation.



Mechanism of plate boundary earthquake



The crustal movement corresponding to the 2nd stage in the figure above



The crustal movement corresponding to the 3rd stage in the figure above

→ Movement of Seafloor Reference Point
 → Movement of Oshika GPS station (GSI)
 ☆ epicenter

Surveys of Volcanoes in Sea Area

JHOD regularly conducts monitoring of activities of volcanic islands and submarine volcanoes in sea area of the Nanpo-Shoto (Izu-Ogasawara(Bonin)-Mariana Island Arc) and the Nansei-Shoto (Ryukyu Island Arc) with aircrafts. In addition, JHOD also conducts researches on seafloor topography, geological structure and geomagnetic characteristics by using survey vessels and high-tech autonomous survey boats, "Jinbei" and "Manbo II" to collect the basic information of the volcanoes in the sea area. "The Basic Information Maps of Volcanoes in Sea Area" are published based on the survey results.



Eruption of Nishi-No-Shima volcano (960 km south of Tokyo)

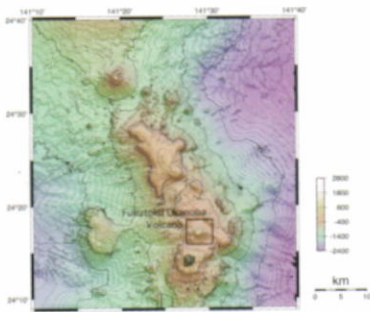


Eruption of Fukutoku-Oka-no-Ba (1200 km south of Tokyo)

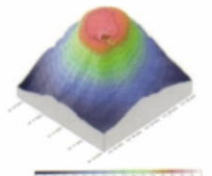


Autonomous survey boat "Jinbei"
When a submarine volcano becomes active, surveys of detailed seafloor topography, discolored water, water temperature and so on are safely conducted using "Jinbei" and "Manbo II" equipped with sophisticated survey instruments.

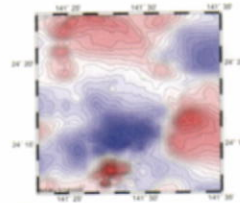
The Basic Information Map of Volcanoes in Sea Area(Fukutoku-Oka-no-Ba)



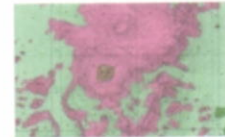
Bathymetric image around submarine volcano
(Identifying the volcanic vent and dangerous area)



3D image of submarine volcano



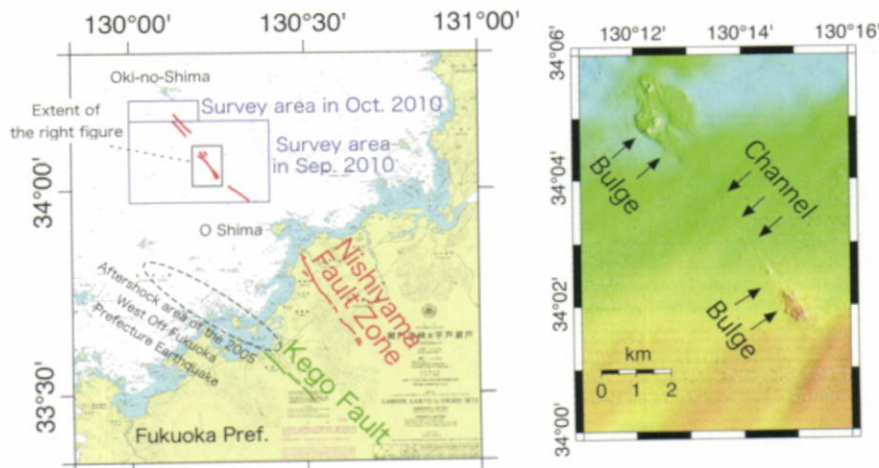
Geomagnetic total intensity anomalies
(identifying location of magma chamber)



Submarine Structural Chart
(Clarification of volcanic history)

Research for Submarine Active Faults

Since the Southern Hyogo Prefecture Earthquake in 1995, JHOD has been conducting geographical and geological researches on active faults in Japan's coastal area starting in those of three major bays, Tokyo Bay, Osaka Bay and Ise Bay. The research results have been utilized for the long-term evaluation of active faults conducted by the Headquarters for Earthquake Research Promotion.



Fault topography in Genkai Nada off the north of Fukuoka Pref.

※The tectonic bulges and channels on the seafloor due to the active faults were discovered off the north coast of Fukuoka Prefecture. These faults are considered as the seaward extension of the Nishiyama Fault Zone existing in the northern Fukuoka Prefecture

Marine Pollution Survey

JHOD is sampling the seawater and seafloor sediment inside and outside of Tokyo Bay, Ise Bay and Osaka Bay to collect fundamental data that are necessary for marine pollution prevention and environmental conservation. We have been studying the oil, PCB, heavy metal, organotin compound content in the sample.



Sampling of bottom sediment



Analyzing heavy metals

Radioactivity Survey

As part of our monitoring of marine environment, we are sampling the seawater and seafloor sediment around Japan, including the Sea of Japan and the Sea of Okhotsk, and studying anthropogenic radioactive substances produced in the nuclear experiments or by illegal dumping of nuclear waste to the sea.

JHOD is also studying the radioactivity of seawater and seafloor soil sample every quarter at the Ports of Yokosuka (Kanagawa Prefecture), Sasebo (Nagasaki Prefecture), and Kin-Nakagusuku (Okinawa Prefecture), at which the US nuclear navy fleet calls.

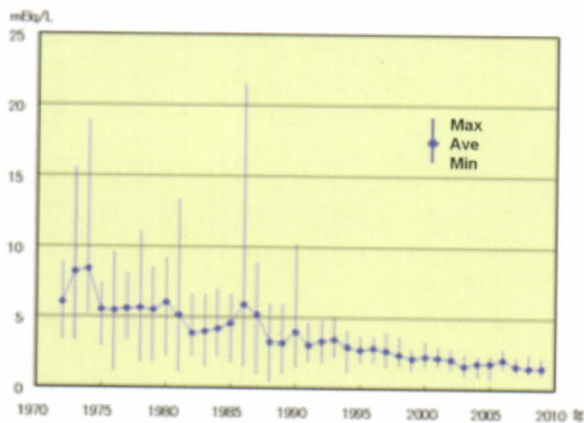


Sampling of seawater

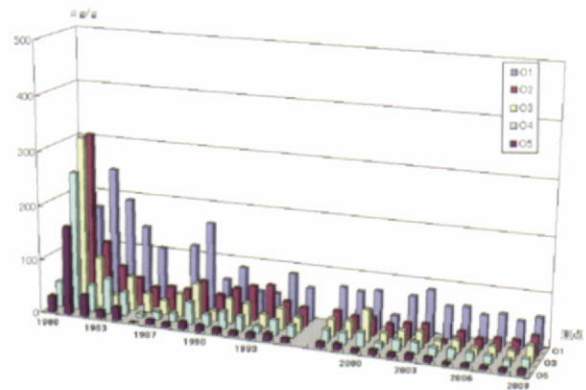


Analyzing Cobalt-60

We conduct chemical analyses of seawater and seafloor sediment samples collected by the survey or patrol boats, and release the results over the Internet.



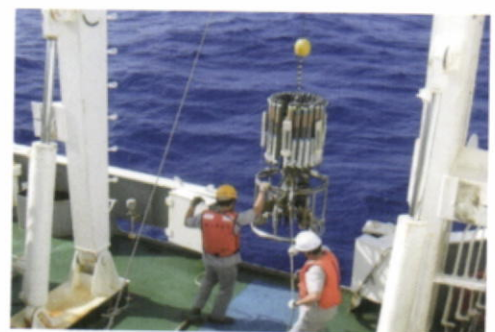
Secular change of Cesium-137; an anthropogenic radioactive nuclide over the years at the sea around Japan



Temporal change of Oil Concentration (Osaka Bay)

Western Pacific Ocean Collaborative Research

JHOD participates in the joint surveys of the Pacific Ocean region: an international collaborative observation project, and conducts detailed surveys of the temperature and salinity of seawater in the area up to the equatorial region.

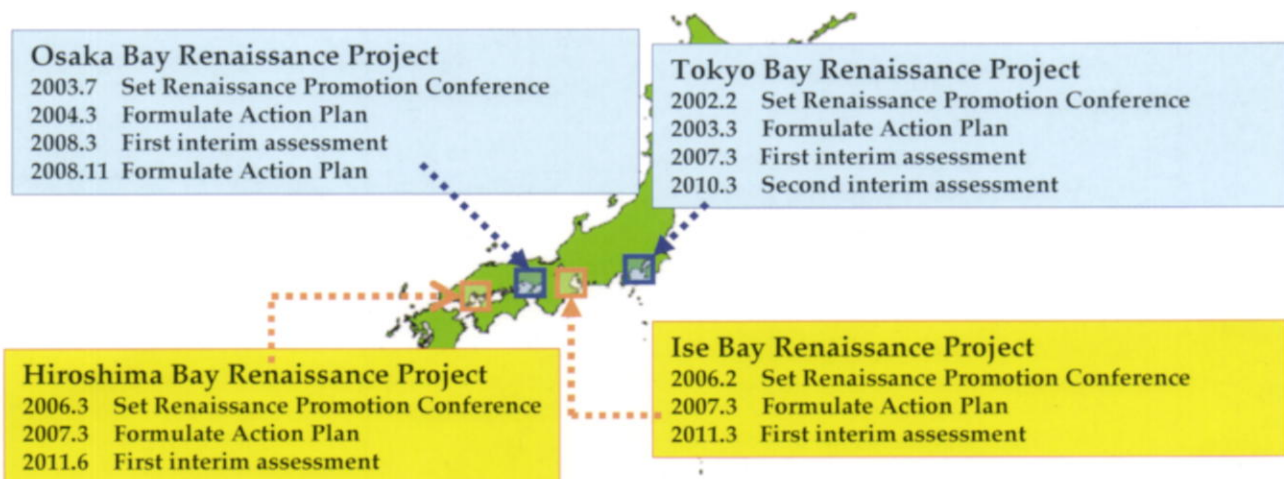


CTD Observation

Environmental Conservation Research (Marine Restoration)

In a highly enclosed sea situated just next to a metropolitan area such as Tokyo Bay, there is frequent occurrence of chronic red tide caused by increased nutrient and flow of sewage-containing water, as well as the terrain characteristic there that the seawater is hardly exchanged with that in the open sea. In addition, oxygen deficient water has been generated due to organic pollutant. These conditions greatly influence marine animals and plants.

The Marine Restoration Project is an integrated collaborative effort for conservation of marine environment among the parties concerned, including the Ministry of Land, Infrastructure, Transport and Tourism, the Japan Coast Guard, and local municipalities. The project promotes several measures including but not limited to the reduction of water pollution, the marine environment improvement in the sea areas, and the environment monitoring. The project started in 2002 in Tokyo, as "Tokyo Bay Renaissance Project", and it has been in progress at four locations in Japan: Tokyo Bay, Osaka Bay, Ise Bay, and Hiroshima Bay. JHOD has been monitoring marine environment such as seawater quality, at the monitoring post (water quality observation at a fixed location of Chiba light beacon), with survey boats, and with satellites.

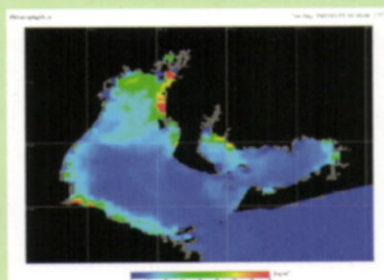


Action of JHOD : Environmental Monitoring

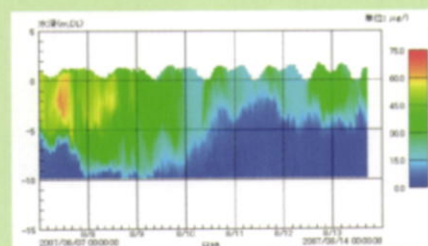
- Observation of water quality, current profile and wind profile by the monitoring post and survey ships
<http://www4.kaiho.mlit.go.jp/kaihoweb/index.jsp>
- Surveillance of red tide by artificial satellites
http://www1.kaiho.mlit.go.jp/KANKYO/SAISEI2/saisei_html/top.htm
- Real-time information provision on the Internet



Schematic picture of the observation



Satellite image



Data image of monitoring post

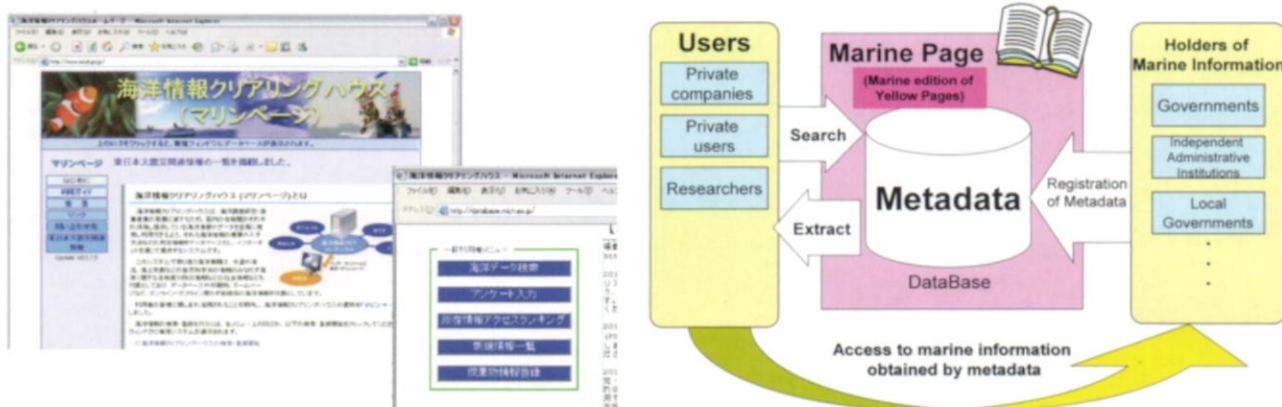
Managing and Providing Marine Information

JHOD manages the marine information obtained from various marine research institutions in an integrated fashion, and also provides users with proper information according to needs.

Marine Information Clearing House (Marine Page)

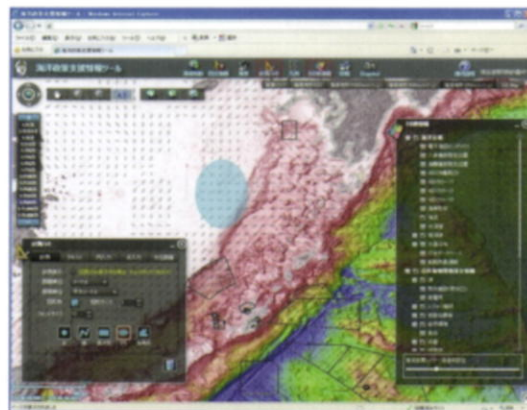
Marine Information Clearing House is an integrated database system that helps users search what sort of marine information owned by which of the party such as governmental institutions, universities, and local governments. The database provides any form of information, either online or offline, not only natural scientific information such as seawater temperatures, ocean currents and marine weathers, but also the social information such as laws and regulations concerning the sea and disaster prevention.

➡ Address of the Website : <http://www.mich.go.jp>



Marine Policy Support Information Tool (Marine Cadastre)

JHOD intends to provide its information in a more easy-to-understand and user-friendly manner: for instance, by visualization of its natural scientific information (seafloor topography, ocean currents, etc.) and social information (area for training exercise, fishery right, etc.) owned by JHOD. For this purpose, JHOD has been constructing and operating the Marine Policy Support Information Tool since 2012, a service which allows users to superimpose the information they need on the charts and display it using a web browser.



COLUMN
03-4

Actions taken after the Great East Japan Earthquake (4)

● Providing information about the Great East Japan Earthquake by the Marine Information Clearing House

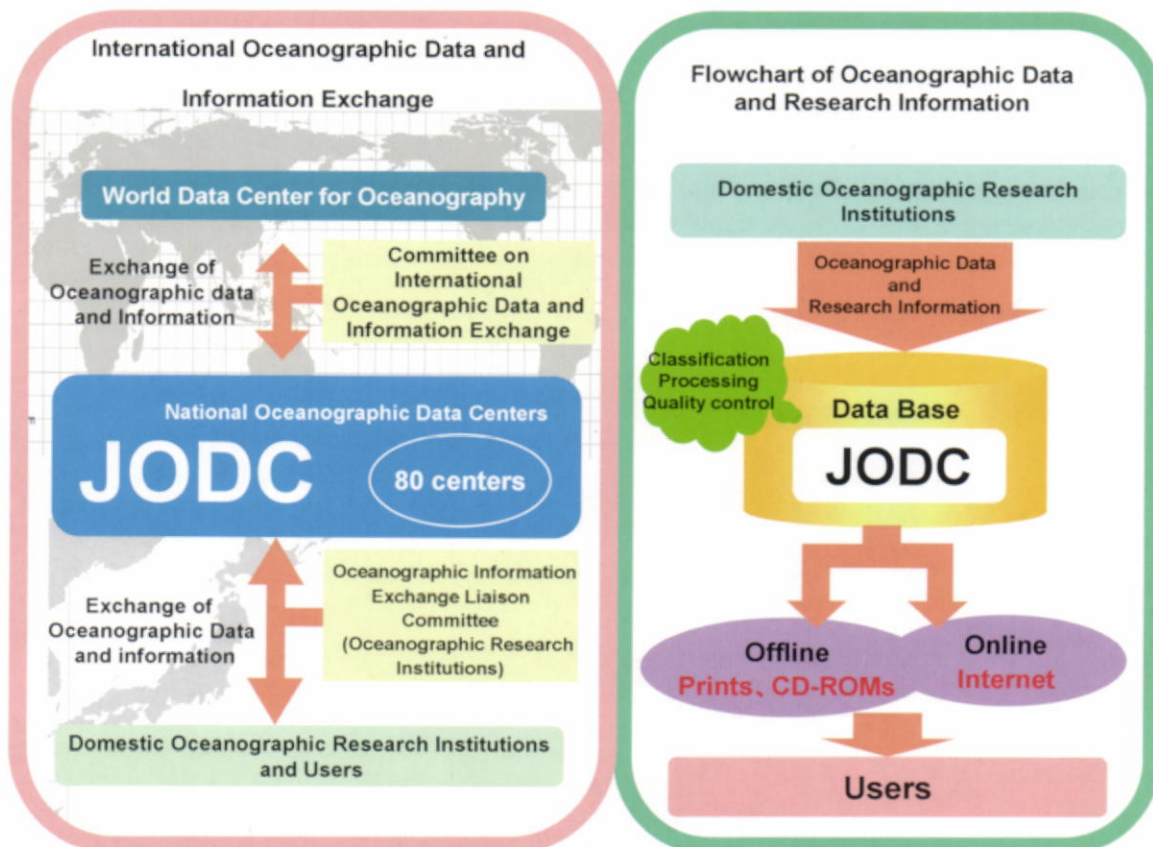
In order to promote sharing of marine information related to the Great East Japan Earthquake, JHOD set up a webpage that collects links to disaster information of earthquakes, tsunamis and marine information such as maritime traffic, fisheries, etc., owned by the governmental institutions.



Webpage for the Great East Japan Earthquake related information

Japan Oceanographic Data Center (JODC)

The Japan Oceanographic Data Center (JODC) is a representative institution of Japan (National Oceanographic Data Center: NODC) in the International Oceanographic Data and Information Exchange (IODE) System, promoted by the UNESCO Intergovernmental Oceanographic Commission (IOC). JODC has been comprehensively collecting the observation data, in cooperation with a variety of oceanographic research institutions of Oceanographic Information Exchange Liaison Committee comprised of marine research agencies such as governmental agencies including JHOD, universities and institutions and providing the information for many users in the world over the Internet, etc. The JODC collects information on a survey schedule - to enable an efficient survey, - where, when, and what kind of surveys are scheduled or conducted - from domestic oceanographic research institutions, and provides them as oceanographic survey information via Internet.



Marine Information Service Center

Marine Information Service Center provides consultation service on marine leisure, such as yachting, fishing, shellfish gathering, marine information and data for survey and research. Visitors can view nautical charts of foreign countries as well as new and old charts of Japan.

JHOD has Marine Information Service Centers in Hydrographic and Oceanographic Department (Tokyo) and 11 other Regional Coast Guard Headquarters in Japan.



Information Supporting Safety of Navigation

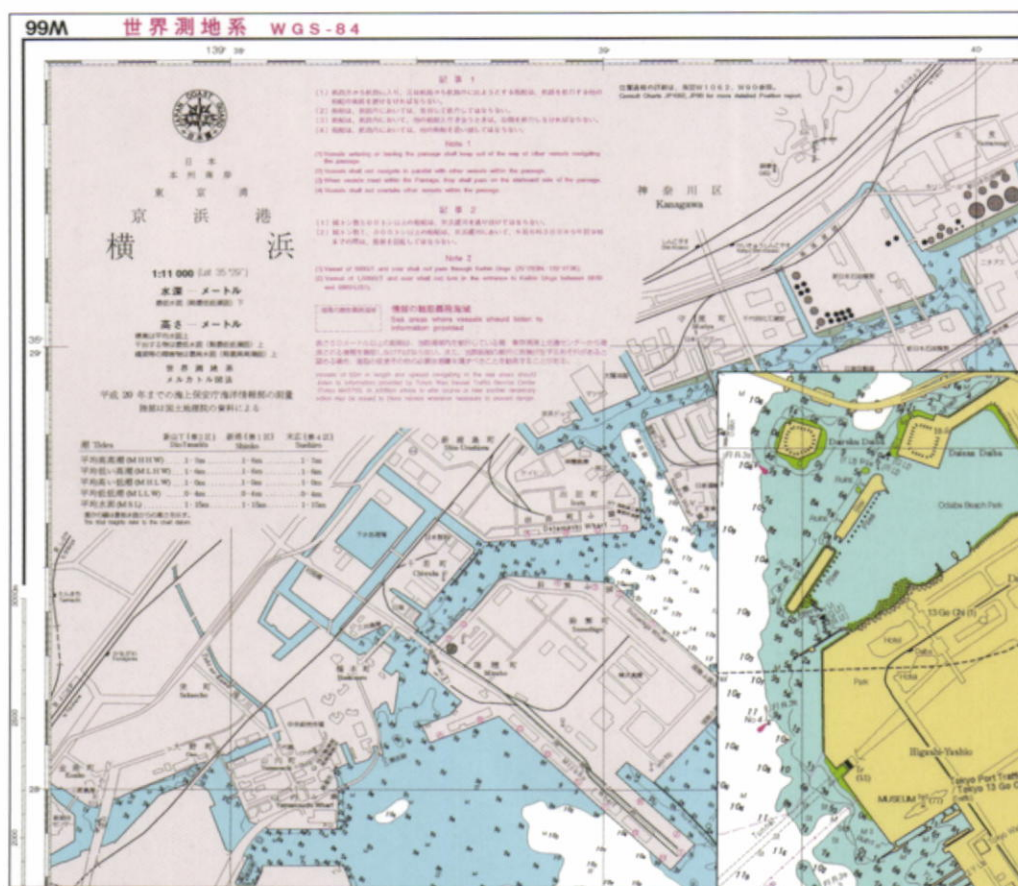
JHOD compiles the information on sailing routes and methods that are necessary for safety of navigation, and hydrographic information such as water depths, tidal currents, and tides, obtained by surveys, and provide these in nautical charts and publications. JHOD provides the updates by Notices to Mariners, Navigational Warnings, and Quick Bulletin of Ocean Conditions.

Charts Compilation & Publication

JHOD uses the navigational safety information (sailing routes and method in each area and port, etc.), the survey results at each port, and the ocean and tidal current observation data, and make their schematic diagram. JHOD then compile all information, not only water depths, but also coastline, geographical features, such as capes, constructions on the coast, and the navigational marks, such as lighthouses, using internationally agreed symbols or representations, and completes accurate and user-friendly charts, choosing appropriate scale and divisions. Not only Japanese vessels but also foreign vessels enter ports in Japan. JHOD publishes English nautical charts for foreign vessels. English nautical charts have the same contents (scale, area, etc.) as Japanese charts, but all written in English.



A staff compiling a nautical chart



Nautical chart

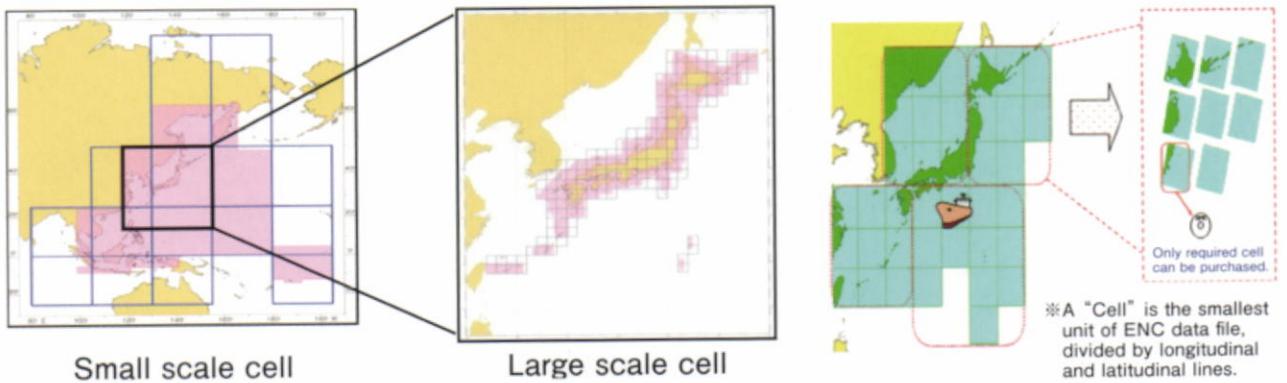
English nautical chart

Electronic Navigational Charts

JHOD publishes Electronic Navigational Charts (ENCs) for safe and efficient navigation at sea. Small scale ENCs (smaller than 1/80,000) cover entire sea area around Japan. JHOD also publishes large scale ENCs for major ports and sailing routes in the Japanese coastal sea. Each ENC covers rectangular unitary sea area (cell), divided by longitudinal and latitudinal lines. Users can purchase only the area they need in unit cell.

When JHOD has got the information on changes of coastlines or depths, JHOD provides the "Electronic Notices to Mariners" over the Internet, to update the contents of ENCs.

JHOD also promotes collaboration with the East Asian countries, to improve the contents of ENCs for the East Asian regions.



ENC Coverage published by Japan The concept of providing ENCs in each cell

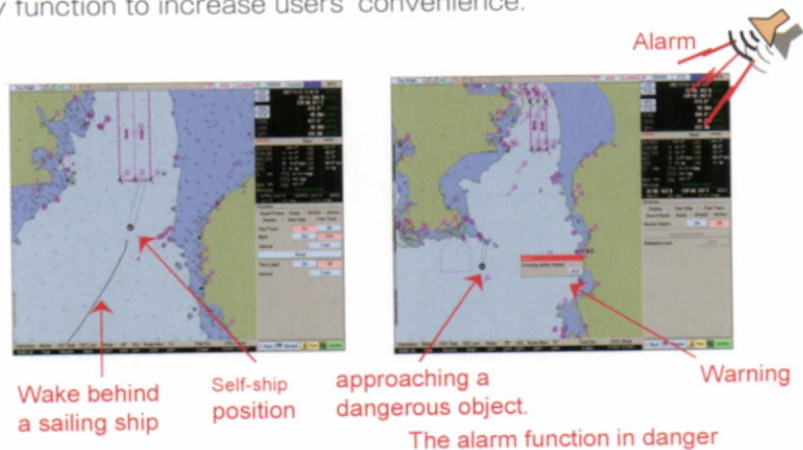
With introduction of ENCs, the display shows the location, track, sailing course, and speed of your vessel automatically.

The ENCs reduce workload of mariners by providing superposition of radar image over charts, and by issuing automatic warnings and alerts when you approach the dangerous sea area, and hence increase safety and efficiency of navigation.

The ENCs have a variety of display function to increase users' convenience.



Electronic Chart Display and Information System (ECDIS)



Example of a display

Displaying function for safe navigation.

- scale of display screen
- Distance to a way point
- Route, passed track, anchorage surveillance, etc.
- Position, direction and speed of ship
- Safety depth

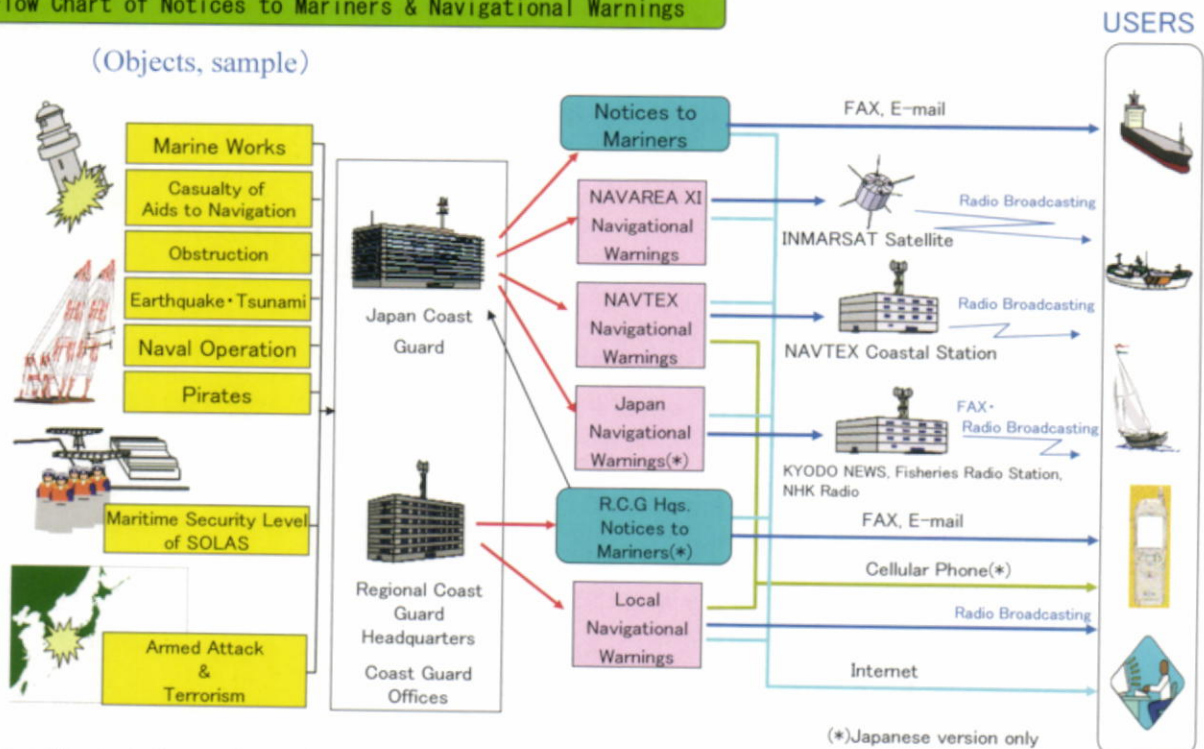
Notices to Mariners & Navigational Warnings

For safety of navigation, JHOD provides information on newly installed Aids to Navigation, and scheduled training exercises at sea in the Notices to Mariners. JHOD broadcasts, emergency information in NAVAREA XI Navigational Warnings, NAVTEX Navigational Warnings, Japan Navigational Warnings, and Local Navigational Warnings.



Navigational Warnings Operation Room

Flow Chart of Notices to Mariners & Navigational Warnings



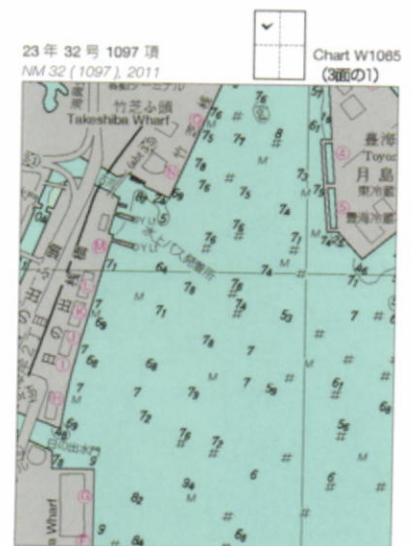
JHOD collects information within the JCG as well as from the other institutions and ordinary general vessels to provide in the Notices to Mariners and Navigational Warnings. JHOD provides the information for users through the media that are appropriate to the contents and area.

JHOD provides the Notices to Mariners through the Internet. JHOD provides the Regional Notices to Mariners by fax as well.

JHOD distributes emergency information as Navigational Warnings in many media, such as radio or satellite broadcast, as well as over the Internet.

Updating Nautical Charts

Nautical charts must be always up-to-date for safety of navigation. When JHOD receives information on the chart contents, JHOD notifies the relevant parts (Notices to Mariners) for amendment. When JHOD has a substantial amount of amendment in a chart, JHOD makes a new edition of the chart. In the Notices to Mariners, JHOD provides the correction charts to be pasted upon, as shown in the right figure, in addition to manual amendment instruction.



Correction charts

Notices to Mariners

Notices to Mariners provide information that is necessary for updating the charts, such as the changes of Aids to Navigation, etc., and about temporary situation, such as the works at sea, etc.

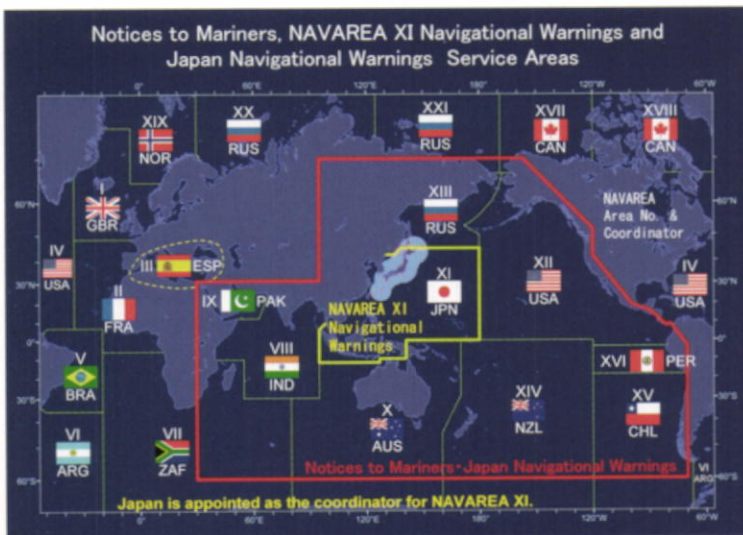
Types	Area	Provide Frequency	Language	Providing Methods
Notices to Mariners	Information on updated nautical charts and for safety of navigation. In the Pacific Ocean, the Indian Ocean and their marginal seas	Every week	English & Japanese	Internet
Regional Coast Guard Headquarters' Notices to Mariners	Responsible water and approach of Regional Coast Guard Headquarters	Every week or any time	Japanese	Internet, E-mail, Facsimile etc.

Navigational Warnings

Navigational warnings provide emergency information, such as the outage of lighthouse, floating obstructions, tugging of large object in congested area, training exercise at sea, etc.

Types	Area	Provide Frequency	Language	Providing Methods
NAVAREA XI * Navigational Warnings	For the safety of Ships sailing in the Ocean	fixed time (Three times a day) & any time	English	Radio telegraphy via INMARSAT and Internet
NAVTEX Navigational Warnings	For the safety of Ships sailing in the coastal area within about 300 miles from the Japanese coast	fixed time (Six times a day) & any time	English & Japanese	Radio telegraphy via INMARSAT and Internet
JAPAN Navigational Warnings	For the safety of Japanese Ships sailing in the Pacific Ocean, the Indian Ocean and their marginal seas	fixed time (Twice a day) & any time	Japanese	Internet, Radio Facsimile and Radio
LOCAL Navigational Warnings	For the safety of Ships sailing in port and approach	fixed time (Twice a day) & any time	English & Japanese	Radio telegraphy and Internet

*The World-Wide Navigational Warning Service consists of 21 Navigational Warning Areas (NAVAREAs). Japan is appointed as the coordinator for NAVAREA XI.



➡ Internet Address <http://www1.kaiho.mlit.go.jp/>

➡ NAVTEX Navigational Warnings & Local Navigational Warnings by cellular phone
(Japanese version only) <http://www1.kaiho.mlit.go.jp/keitai/TUHO/keiho/>

Nautical Publications

Nautical publications are essential to safety of navigation together with charts. JHOD compiles the information on sailing routes, methods, and harbor facilities, and the results of hydrographic surveys, tide and tidal current surveys, and astronomical observation, and publishes them. Nautical publications include sailing directions and special publications. Sailing directions describe the outline of ports, sailing routes, weather, and marine weather that nautical charts cannot include. Special publications describe the situation of aids to navigation, tides, tidal current forecast, location of planets and stars, etc.



Publications(Extract)
Sailing Directions
(Domestic), Sailing
Directions (Foreign),
List of Aids to Navigation,
Nautical Almanac

Hachibike Ka (40° 52' N, 141° 52' E) (Chart 5001) (See Code: 2P 5001)



Specified part	Part designated by the Regulations Law	Open part	Characteristic part	Immigration part	Domestic arrival departure part	Plan projection part	Important part
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

General information. This port is divided into three sections, Cha 1 - No. 71, and has two passages, the E and the W Passage.

The harbor area is sheltered from waves from the open sea by the completed offshore break-water (under construction). However, a passage in the West Passage sometimes becomes difficult affected by the reduced water in strong E winds, and seasonal currents in Section 1 and Section 2 may experience difficulty to remain on the berth safely due to results entering in strong N winds.

Weather. WSW land breezes are most frequent throughout year. Strong easterly or northerly winds blow when a depression passes about S of Hachibike Ka. Thick fog, which may restrict visibility for a whole day, sometimes occurs during late in August. There are a few days of occurrence which especially restrict visibility in winter.

Tides. In Hachibike Ka, mean higher high water is 2.2 m, mean lower low water is 0.7 m, and mean sea level is 0.85 m.

Marine conditions. Stranding cases of drifting objects have been reported during strong E winds due to the development of reefs and water areas outside of the breakwater.

Landmarks	Position	Remarks
Kaiko Shrine	40° 52.9' N, 141° 53.9' E	An obelisk, a shrine and two monuments stand in the center. The obelisk's northern half is a building ground of sea gulls and is whitened by their droppings from Fall to Spring.
Site and Bell Cemetery	40° 51.9' N, 141° 53.9' E	Compassless, in a rural factory yard.
Hachibike Signal Station	40° 51.8' N, 141° 51.4' E	A building, brown and white, a lantern, with a signal post (reference 30) on high above the ground on a rocky.
Hachibike O Head	40° 51.8' N, 141° 51.4' E	71 m high. There is a bridge light at the center and a signal post at the E end.
Oki Tanks	40° 52.8' N, 141° 51.8' E	Painted in various colors, blue, light yellow and etc.

The display example by the Sailing Directions "Sailing Directions for South and East Coasts of Honshu"

Types of nautical publications

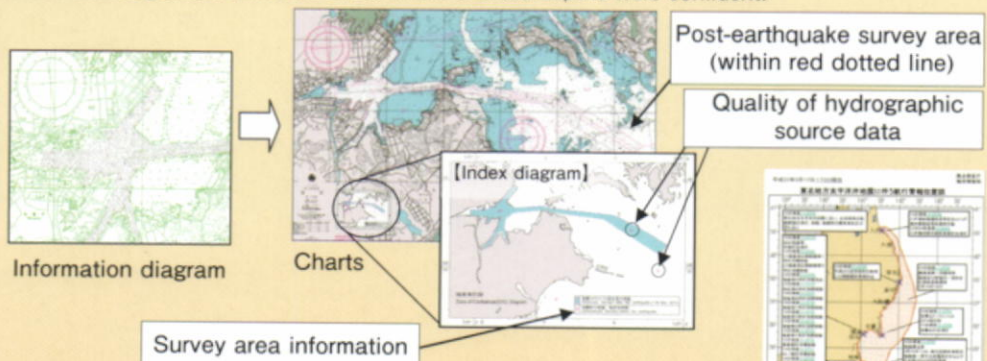
Classification	Language	Kinds
Sailing Directions	Domestic	Japanese: S.&E. COASTS OF HONSHU PILOT, NW COAST OF HONSHU PILOT, SETO NAIKAI PILOT, COAST OF HOKKAIDO PILOT, COAST OF KYUSYU PILOT
	English	Sailing Directions for South and East Coasts of Honshu, Sailing Directions for Northwest Coast of Honshu, Sailing Directions for Seto Naikai, Sailing Directions for Coast of Hokkaido, Sailing Directions for Coast of Kyushu
	Foreign	Japanese: COAST OF KOREA PILOT, COAST OF CHINA AND TAIWAN PILOT, SOUTH CHINA SEA AND MALACCA STRAIT PILOT etc. (Total 10 publications)
Special Publications	Japanese	OCEAN PASSAGE PILOT, COASTWISE PASSAGE PILOT, DISTANCE TABLE, LIST OF AIDS TO NAVIGATION (VOL.1 & VOL.2), ASTRONOMICAL NAVIGATION TABLE, NAUTICAL ALMANAC, ABRIDGED NAUTICAL ALMANAC, TIDE TABLES (VOL.1 & VOL.2), MANUAL FOR USE OF CHARTS AND PUBLICATIONS, CATALOGUE OF CHARTS AND PUBLICATIONS
	English	CATALOGUE OF CHARTS AND PUBLICATIONS

COLUMN
03-5

Actions taken after the Great East Japan Earthquake (5)

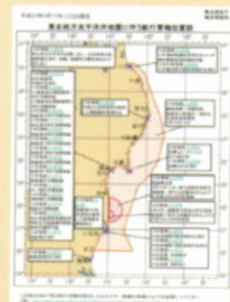
● Updating nautical charts of affected ports, aiming at rapid recovery of the quake-hit areas

In order to make the accurate status of the ports known as soon as possible, JHOD provided port authorities with an "information diagram" containing newly surveyed sounding depths. JHOD later issued new editions of the affected charts, in which the post-earthquake survey areas were shown by red dotted lines and index diagrams to indicate areas where charted depths were confident.



● Issuing Navigational Warnings and Notices to Mariners to ensure safety of navigation

Information of floating objects e.g. rubble and collapse of lighthouses were provided by Navigational Warnings via radio broadcast etc. and Notices to Mariners via the JHOD website. In addition, JHOD makes an integrated navigational warning location diagram, for users' convenience, where JHOD has incorporated the valid NAVTEX Navigational Warnings, and posted on the JHOD website.

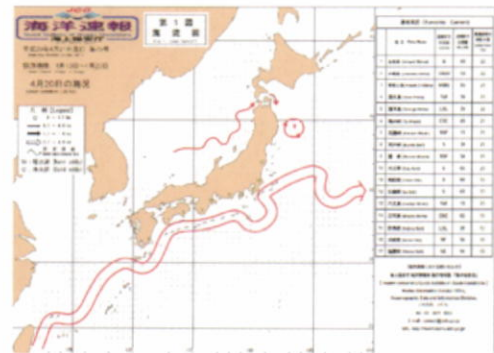


Navigational Warning Location Diagram

Quick Bulletin of Ocean Conditions

The Kuroshio Current around Japan, flowing fast (about 3 - 4 knots), influences the marine activities, such as the maritime traffic and fishery.

The Quick Bulletin of Ocean Conditions provides the vessel with daily information on the Kuroshio flow for their choice of economical sailing route.

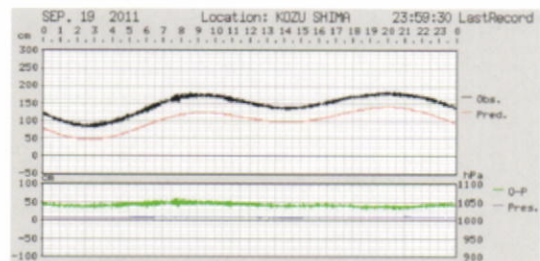


Quick Bulletin of Ocean Conditions

Real-time Tide Gauge Data

JHOD provides the real-time tide gauge data obtained by the 20 gauging stations in Japan over the Internet.

The real-time tide data is used as basic data for the tide prediction, correction of depth soundings and research on ocean current fluctuation, and also used for monitoring of crustal movements. The data is also essential for detecting tsunamis.

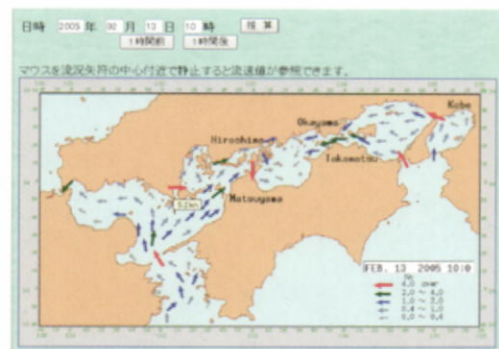


Real-time tide gauge data

Tide and Tidal Current Estimation

JHOD provides the estimates of tides at hundreds of locations in Japan over the Internet. You can also get the estimates on arbitrary time and date from the year 1 to 2100.

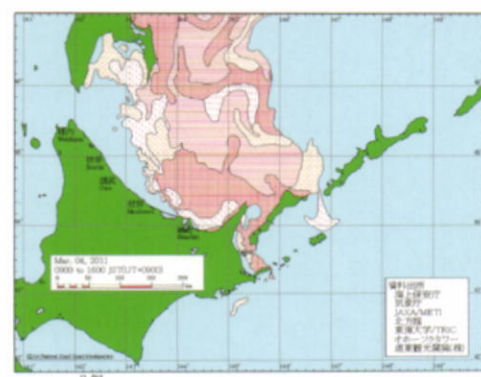
JHOD provides the estimates of tidal currents in Tokyo Bay, Ise Bay, and the Seto Inland Sea at arbitrary time and date (from year 1 to 2100).



Estimated tidal current

Ice Information Center

Ice floes appear in the Sea of Okhotsk along the coast of Hokkaido in January. The local news introduces it every winter in the program. The information on ice floes is essential to the vessels, because they cannot escape once surrounded by the ice floes. The First Regional Coast Guard Headquarters opens the Ice Information Center in every year for the period from December 20 to the end of April, providing information on the ice floes in the Sea of Okhotsk (Sea Ice Bulletin) every day by fax and the Internet.



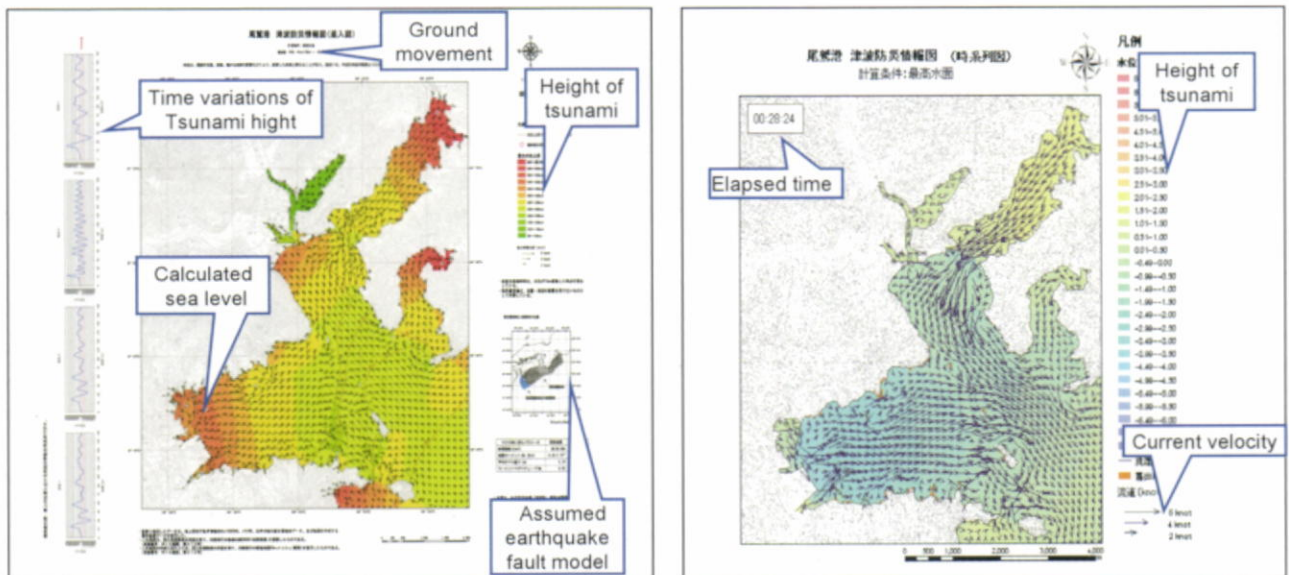
Ice condition chart

Information for Disaster Prevention

JHOD provides a variety of information for minimizing damages caused by natural disasters, such as earthquakes and tsunamis, and by maritime disasters like oil spills caused by the collision of the vessels.

Tsunami Information Map

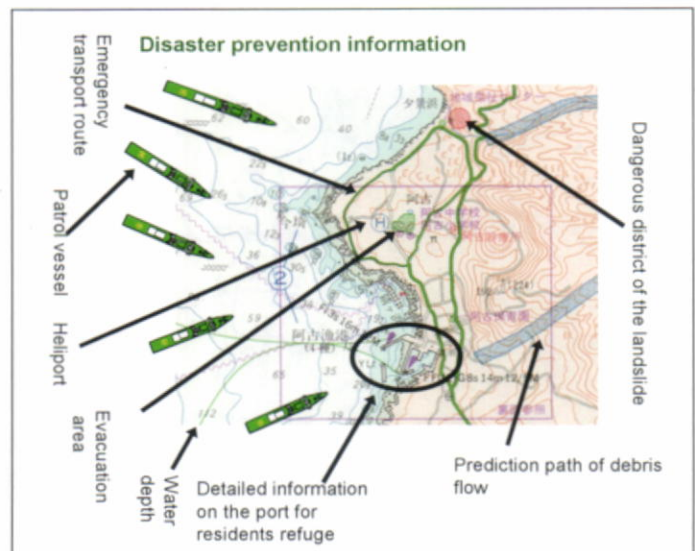
JHOD conducts numerical simulations of tsunami behavior based on detailed bathymetric data we have and provides the tsunami information maps in the harbors and coastal areas that are assumed to suffer tsunami damage when large earthquake occurs. These maps are used as basic information for preparing measures to take for tsunami disasters in harbor areas and for rescue activities.



Tsunami Information Map (Owase Port)

Coastal Disaster Prevention Information Map

Japan has many earthquakes and active volcanoes because it is located in the active margin where several tectonic plates, such as the Pacific Plate and the Eurasian Plate, complicatedly interact with each other. Japan is also in the geographical and meteorological environments that are likely to cause natural disasters, for example, severe rains during the rainy season or typhoons. JHOD publishes "The Coastal Disaster Prevention Information Map" helpful for prompt support operations, evacuation and delivery of relief aides, in remote islands and coastal area in case of natural disasters, for example, earthquakes and tsunamis. These maps provide information, which we have collected, on natural characteristics such as seafloor topography as well as social information that includes locations of agencies for disaster prevention, medical institutions and available locations for heliports, and local populations. The maps are distributed to local authorities concerning disaster prevention to help them conduct rescue activities.



Coastal Disaster Prevention Information Map (Miyake Shima)

Coastal Environmental Information Service(Ceis Net , ESI Map)

● Ceis (Coastal environmental information service) Net

JHOD collects information on natural environment, disaster prevention, coastline ESI (Environmental Sensitivity Index) in the coastal areas of all over Japan, and organizes them as the "Coastal environmental information service", in preparation for oil spill accidents. JHOD provides these pieces of information under the name of "Ceis Net" over the Internet, so as to be used by any institutions anytime involved in the oil spill prevention and removal.

Ceis Net is able to superimpose a variety of information as a reference for oil spill prevention and removal on a map to display. It can also display the photographs of coastlines and ports. It has been utilized to study the contingency plan for oil spill prevention and removal, and providing exercises for probable accidents.

Screenshot of Ceis Net (Near Tokyo Bay)



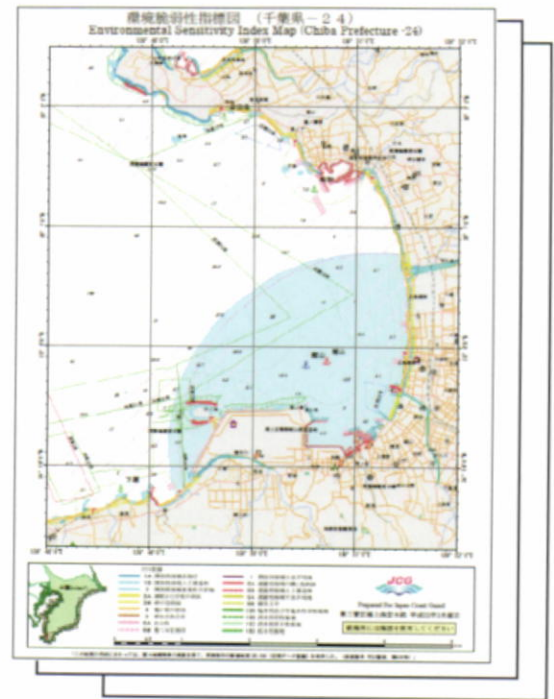
Main information items and their symbols

Information for Disaster Prevention

ESI (Environmental Sensitivity Index) Map

JHOD provides the "ESI Map" in PDF file format. The "ESI Map" is a printable version of the map which coordinates the information items chosen from the Ceis Net.

In case users can not access the Internet, or can not use computers on the accident site, the printable "ESI Map" is designed for on-site use by those involved in oil spill prevention and removal. Therefore, JHOD prepared the maps so that users would be able to connect the adjacent maps seamlessly. Coastlines of entire Japan are covered by the 2,147 pieces of 1/25,000 scale map.



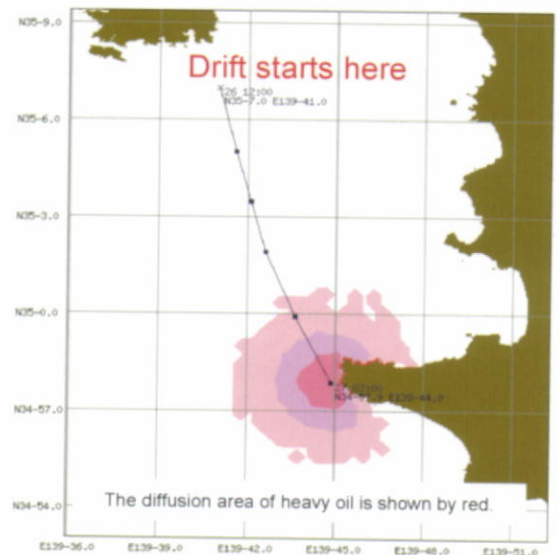
The ESI map of Tateyama

Trajectory Prediction

When there are accidents at sea, the Japan Coast Guard (JCG) responds to it by dispatching its patrol vessels or aircraft; for example, JCG searches for missing crews of the capsized vessel, and responds to the oil spill from grounded tanker, etc.

In order to execute these search and rescue operations or oil spill prevention and removal operations, JHOD predicts the trajectory of floating victims, capsized vessels, or oil spills, based on the ocean currents observed by survey vessels, patrol boats, and HF radar.

The trajectory of floating objects at sea depends on not only ocean currents but also winds and shape of the object. JHOD considers these factors to predict the trajectory.



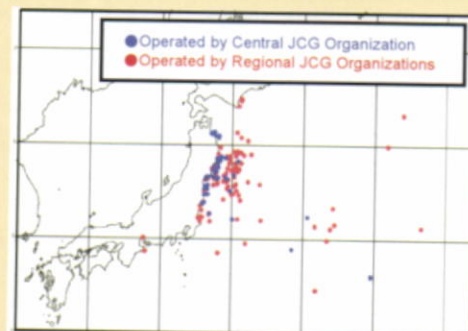
Example of trajectory prediction chart
(JHOD made this chart assuming the oil spill occurred in the mouth of Tokyo Bay)

COLUMN
03-6

Actions taken after the Great East Japan Earthquake (6)

● Conducting trajectory prediction of the drifting people and objects

Because the tsunami swept away a number of people and vessels to the sea, JHOD conducted many trajectory predictions: to narrow down the search range of drifting victims, to predict the destination of drifting vessels, and to guess the cause of drift, etc.



Initial point of drift simulation

International Activities

The International Hydrographic Organization (IHO) was established for uniformity in nautical charts worldwide. Japan, as a member state of the IHO, participates in many international conferences to contribute to establishing global standards in hydrographic field, and developing global partnership, exchanging hydrographic data and information with many countries. Japan also works as a member state of the Regional Hydrographic Commission, to develop regional partnership in the hydrographic services with the East Asian countries.

In the field of overseas technology cooperation, JHOD helps developing countries improve the hydrographic services by providing training opportunity for their hydrographers every year.

International Hydrographic Organization (IHO)



IHO (MONACO)

The IHO was established in 1970 under the "Convention on the International Hydrographic Organization," as an international organization that handles consulting and technical issues (80 member states as of December 2011). The goal of the IHO is to make navigation all over the world easier and safer by improving nautical charts and publications. The International Hydrographic Bureau, the headquarters, of the IHO, is located in the Principality of Monaco.

Japan has participated in the activities of the IHO serving as the member of the IHO committees and working groups positively.



Member states of IHO

Red: Member states of EAHC

Regional Hydrographic Commissions (RHC)



East Asia Hydrographic Commission

JHOD participates in the East Asia Hydrographic Commission (member states: China, DPR of Korea, Indonesia, Japan, Malaysia, Philippines, Republic of Korea, Singapore, Thailand), one of the Regional Hydrographic Commissions of the IHO, and is contributing to developing regional hydrographic activities, as the permanent Secretariat.

Contribution to Capacity Building in Hydrography



JHOD, in cooperation with Japan International Cooperation Agency (JICA), an independent governmental agency, provides a group training course (for about six months) "Hydrography for Charting, Disaster Prevention, and Environment Protection (Internationally Accredited Category B for Hydrographic Survey)" every year for hydrographers in developing countries in Asia and Africa. More than 370 hydrographers from 38 countries have participated in the course so far. The participants have been assuming important positions in hydrographic activities in their home countries.



Group training course on hydrographic survey

JHOD launched the "Japan Capacity Building Project", a project to foster international nautical chart experts, in 2008. This project is a part of the capacity building project promoted by the IHO, to contribute to international standardization of nautical charts and publications. The training program of the United Kingdom Hydrographic Office (UKHO) for nautical chart experts (15 weeks) has become a part of this project since 2009. The IHO selects six trainees every year, one each from six developing countries. 18 trainees from 15 countries participated in the project in 2008-2010.

Headquarters and Regional Headquarters

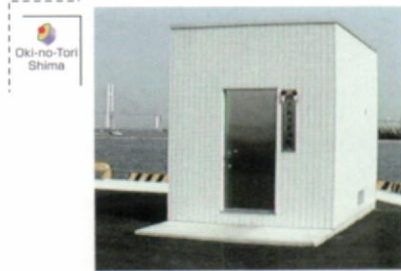


Hydrographic and Oceanographic Department, JCG

- Hydrographic and Oceanographic Department, JCG
- Regional Coast Guard Headquarters
- Hydrographic Observatory
- Tide Station



Shimosato Hydrographic Observatory (Geodetic Observation)



Yokohama Shinko Tide Station

Survey Vessels



SHOYO
(JHOD Hqs)

Gross Tonnage:3,000 tons
Length 98.0 meters



TAKUYO
(JHOD Hqs)

Gross Tonnage:2,400 tons
Length 96.0 meters



MEIYO
(JHOD Hqs)

Gross Tonnage:550 tons
Length 60.0 meters



TENYO
(JHOD Hqs)

Gross Tonnage:430 tons
Length 58.0 meters



KAIYO
(JHOD Hqs)

Gross Tonnage:550 tons
Length 60.0 meters



JINBEI
(JHOD Hqs)

Gross Tonnage:5tons
Length 11.0 meters



HAMASHIO
(3rd RCGHqs)

Gross Tonnage:27tons
Length 21 meters



ISESHIO
(4th RCGHqs)

Gross Tonnage:27tons
Length 21 meters



UZUSHIO
(5th RCGHqs)

Gross Tonnage:27tons
Length 21 meters



KURUSHIMA
(6th RCGHqs)

Gross Tonnage:27tons
Length 21 meters



HAYASHIO
(7th RCGHqs)

Gross Tonnage:27tons
Length 21 meters



ISOSHIO
(10th RCGHqs)

Gross Tonnage:27tons
Length 21 meters



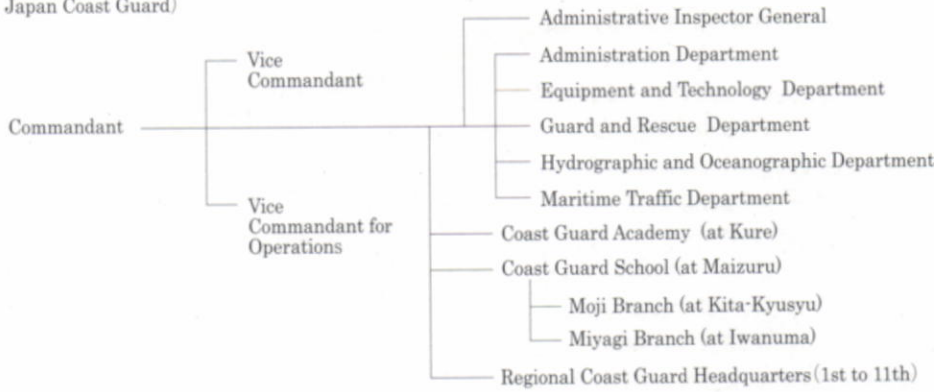
OKISHIO
(11th RCGHqs)

Gross Tonnage:27tons
Length 21 meters

Organization

Organization

(Japan Coast Guard)



(Hydrographic and Oceanographic Department)



Hydrographic and Oceanographic Department, Japan Coast Guard

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Environmental and Oceanographic Research Division

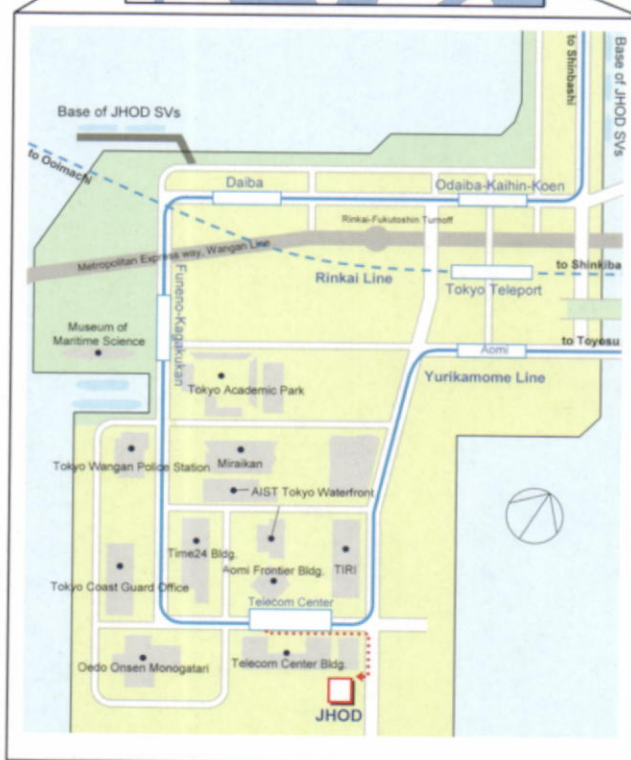
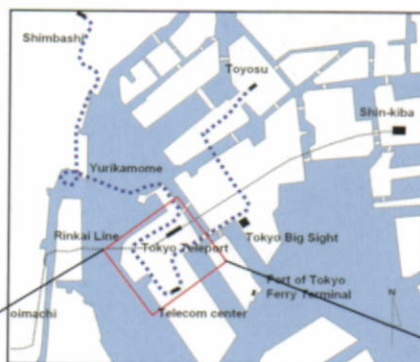
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Regional Offices

1st Regional Coast Guard Headquarters	Hydrographic and Oceanographic Department	+81-134-27-0118
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5-minute walk from the "Telecom Center" station of New Transit Yurikamome

Internet Address, Hydrographic and Oceanographic Department, Japan Coast Guard

URL: <http://www1.kaiho.mlit.go.jp/>

Information on the website

TOP	Notices, Topics Japan Oceanographic Data Center, etc.
Introduction	Introduction of the JHOD, etc.
Publications	Announcement of Nautical Charts Publication, etc.
Navigation Information	Navigational Warnings, Notices to Mariners, etc.
Disaster Prevention Information	Tsunami Simulation, etc.
Seawater Situation	Ocean Currents, Tides, Tidal Currents, etc.
Astronomy & Almanac	Times of Sunrise/Sunset, Moonrise/Moonset, etc.
Measuring the Earth	Continental Shelf Surveys, Geodetic Observation, etc.
Environmental Conservation	Coastal Environmental Conservation Information, etc.