PHYSICAL FEATURES

1. SUBMARINE TOPOGRAPHY
2. SUBMARINE GEOLOGY
3. CURRENT, SEA TEMPERATURE AND SALINITY (WINTER, SUMMER)

1. Submarine Topography

The Japanese Islands are arcuate in shape, and are located on the boundary between the Asian and the Pacific plates; on the Asian continent side, there are marginal seas such as the Sea of Okhotsk, the Japan Sea and the East China Sea, and on the Pacific side, trenches parallel to the island are present, such as the Japan Trench and the Izu-Ogasawara Trench. Ocean floor nearly devoid of relief extends from the trenches.

The seabed from the coastline to a point about 200 m in depth has a particularly gentle slope, and is called the continental shelf. Though the continental shelf is vitally important for fisheries and the exploitation of underground resources, it is relatively narrow around the Japanese Islands, except near the Sōya Kaikyō and the Tusima Kaikyō. The area around the continental shelf is steep and is called the continental slope; its landforms are variable with numerous deep sea plains. The slope becomes steeper near the trench and is called the trench slope. The ocean floor accounts for most of the sea floor from a depth of four to six thousand meters; its surface is almost flat but contains some relief such as ridges, rises and seamounts. Trenches such as the Japan Trench extend between the continental slope and the ocean floor.

The Japan Sea can be divided into the Japan Basin and the Yamato Basin, with the Yamato Ridge between them. A great part of the Japan Basin is more than 3,000 meters is depth. The Yamato Basin shows more complicated landforms than the Japan Basin and is about 2,500 meters in depth. The most shallow part of the Yamato Ridge is about 250 m in depth. Which is very shallow compared with the two basins mentioned above.

2. Submarine Geology

The sea floor is an area of active sedimentation, with Quaternary sediment covering a great part of the sea bed. In addition, pre-tertiary sediments and volcanic rocks are exposed at horsts, anticline sections of strata, seamounts, etc.

Submarine geology is determined by sonic and seismic prospecting, which provides a profile of the geological structure. Sediments are also surveyed directly by drilling on the ocean floor, dredge sampling and observation deep sea submersible and so on; such research clarifies the distribution, age and features of the sediments.

The submarine topography on the Pacific side of Northeast Japan is divided by the Japan Trench. The east side of the trench comprises a flat ocean floor about 6,000 meters in depth, consisting of basalt, pelagic sediment over basalt, seamounts, etc. The west side of the trench is composed of sediment carried from the land. Folds paralles to slightly oblique to the trench have developed there, and the structure becomes complicated due to mixing of both deep sea sediment and land-originated sediment near the trench. The Nankai Trough lies between the island arc and the Sikoku Basin on the Pacific side of Southwest Japan, but trench-formed topography is buried by thick sediment. A volcanic front consisting of volcanic islands and submarine volcanoes lies parallel to the Izu-Ogasawara Trench and the Nansei Island Trench. These trenches are on the boundary between the ocean plate and the island arc and are the area where the ocean plate is being subducted.

In the Japan Sea, folds and faults with axes parallel to the Japanese Islands have developed on the coast. They are particularly well developed in Northeast Japan. The Yamato Basin and the Japan Basin lie outside these structures, where and thick stratified sediments cover oceanic crust, consisting of basalt and other rocks. The Yamato Tai and the Kita-yamato Tai comprise continental crust consisting of granite and other materials.

[Salient Points of the Legend and Map Compilation]

The map partly reorganizes the 1:3,000,000 scale Submarine Geology around Japan published in *Geological Atlas of Japan* by the Geological Survey of Japan.

3. Current, Sea Temperature and Salinity (Winter, Summer)

The following currents in the seas near Japan greatly influence its climate; warm currents — The Kurosio (Japan Current) and Tusima Current — mainly flowing in a northeast direction, and a cold current — the Oyasio — mainly flowing in a southwest direction.

The Kurosio, one of the greatest sea currents in the world, originates east of Taiwan and moves into the East China Sea between Taiwan and Iriomote Zima. Once again entering the Pacific near the Takara Islands, the Kurosio flows relatively close to land south of Sikoku and Honsyū. However, as a cold water mass often makes its appearance in the sea off the coast extending from Sizuoka to Wakayama Prefectures, the Kurosio sometimes flows a longer distance around the outside of this mass. The Kurosio flows to the east, producing branches or meandering off the coast of the Kantō District.

The Tusima Warm-Current moves into the Japan Sea through the Tusima Kaikyō and flows along the coast of Honsyū. Though most of the Tusima Warm-Current flows into the Pacific through the Tugaru Kaikyō or into the Sea of Okhotsk through Sōya Kaikyō, part of it flows as far as the waters off the west coast of Sakhalin. In the Japan Sea, the cold Liman Current flows along the coast of the Soviet Maritime Province to reach the waters off the Korean Peninsula.

The Oyasio, flowing in the waters east of the Tisima Islands, moves down to the waters southeast of Hokkaidō and then flows south to meet the Kurosio off the Sanriku coast. The Oyasio is rich in nutrients and plankton. The Oyasio is far weaker in strength than the Kurosio.

The Kurosio and the Tusima Warm-Currents are high in temperature, salinity and transparency. The water color of the Kurosio is dark indigo, while the temperature, salinity and transparency of the Oyasio are low and its color blue-green. The Oyasio is rich in nutrients and plankton.

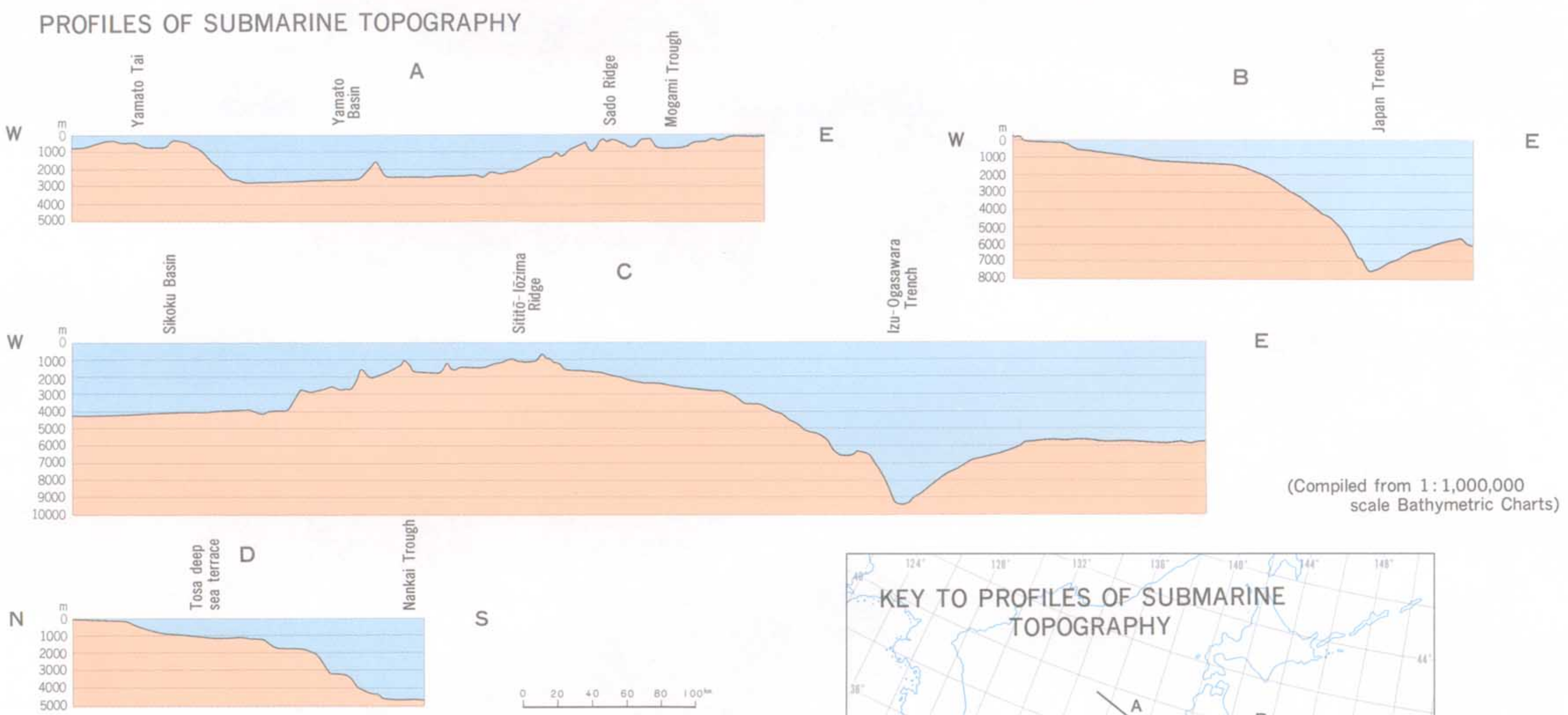
[Salient Points of the Legend and Map Compilation]

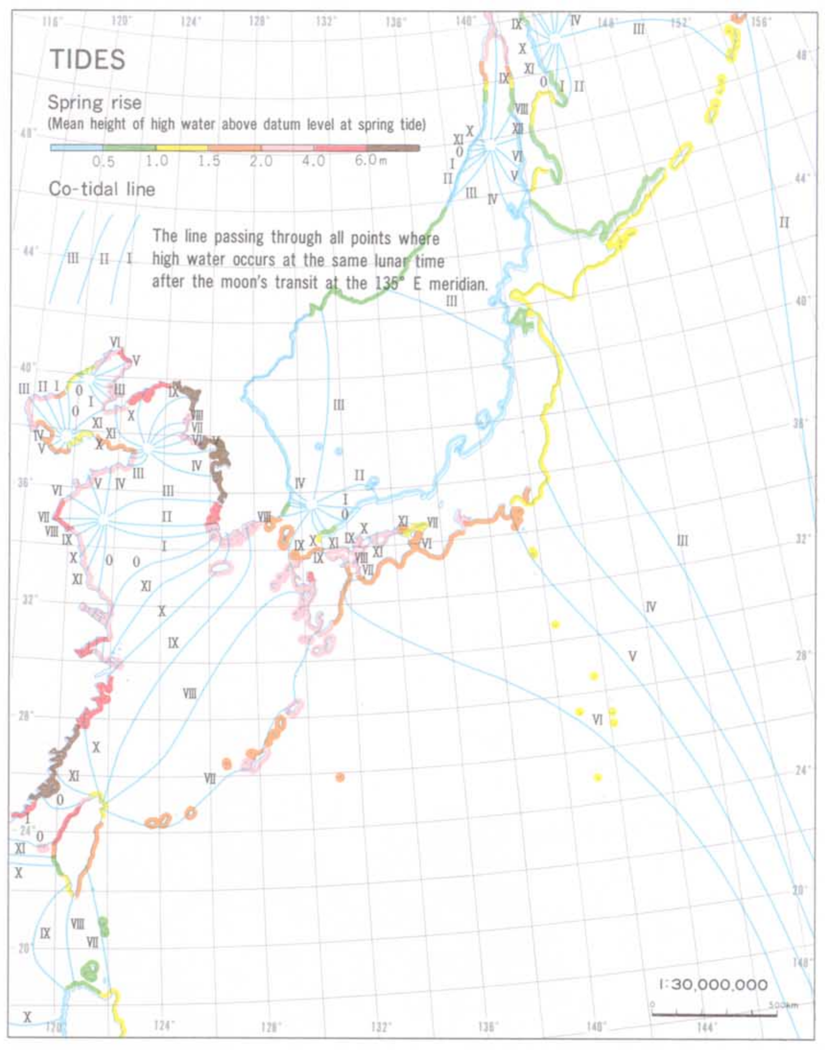
Current: in the areas of one degree latitude and longitude, the mean drift and mean direction of a current on the surface in winter (January to March) and summer (July to September) are shown by arrows. The data covers the period from 1953 to 1987.

Sea temperature and salinity: the mean values for winter (February) and summer (August) in the sections of one degree latitude and longitude were used in drawing isolines. The data cover the period from 1923 to 1987.

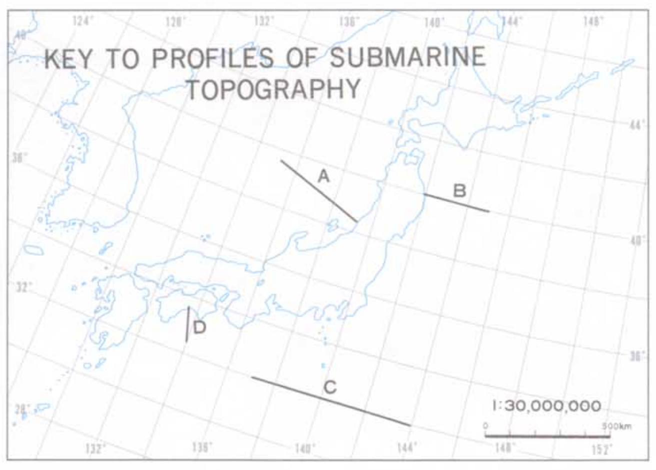
[Sources]

1. Hydrographic Department, Maritime Safety Agency, 1:10,000,000 scale International Charts, 1979−1983
2. Hydrographic Department, Maritime Safety Agency, 1:1,000,000 scale Bathymetric Charts, 1980−1983
3. Hydrographic Department, Maritime Safety Agency, 1:1,000,000 scale Ocean Sounding Charts, 1985−1988
4. Mogi A. and Sato T., Submarine Topography of the Continental Margin Around Japan I, *Kagaku*, vol.45, No.9. 1975
5. Inoue E. and Honza E., Submarine Geology around Japan (1:3,000,000 scale), Geological Survey of Japan, 1982
6. Hydrographic Department, Maritiome Safety Agency data
7. Japan Oceanographic Data Center, *Marine Environmental Atlas, Northwestern Pacific Ocean*, 1975
8. Japan Oceanographic Data Center, *Marine Environmental Atlas, Northwestern Pacific Ocean, II (by seasons, by months)*, 1978
9. Hydrographic Department, Maritime Safety Agency, *Tide Tables*
10. National Astronomical Observatory, *Chronological Scientific Tables*

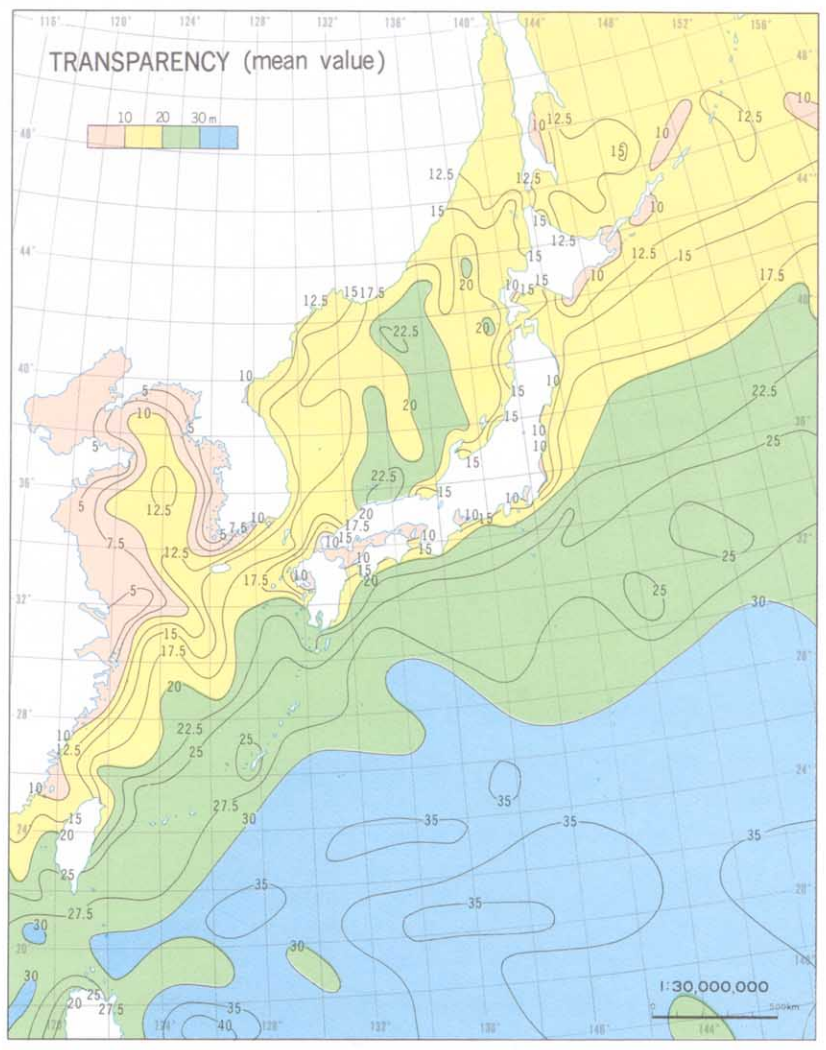




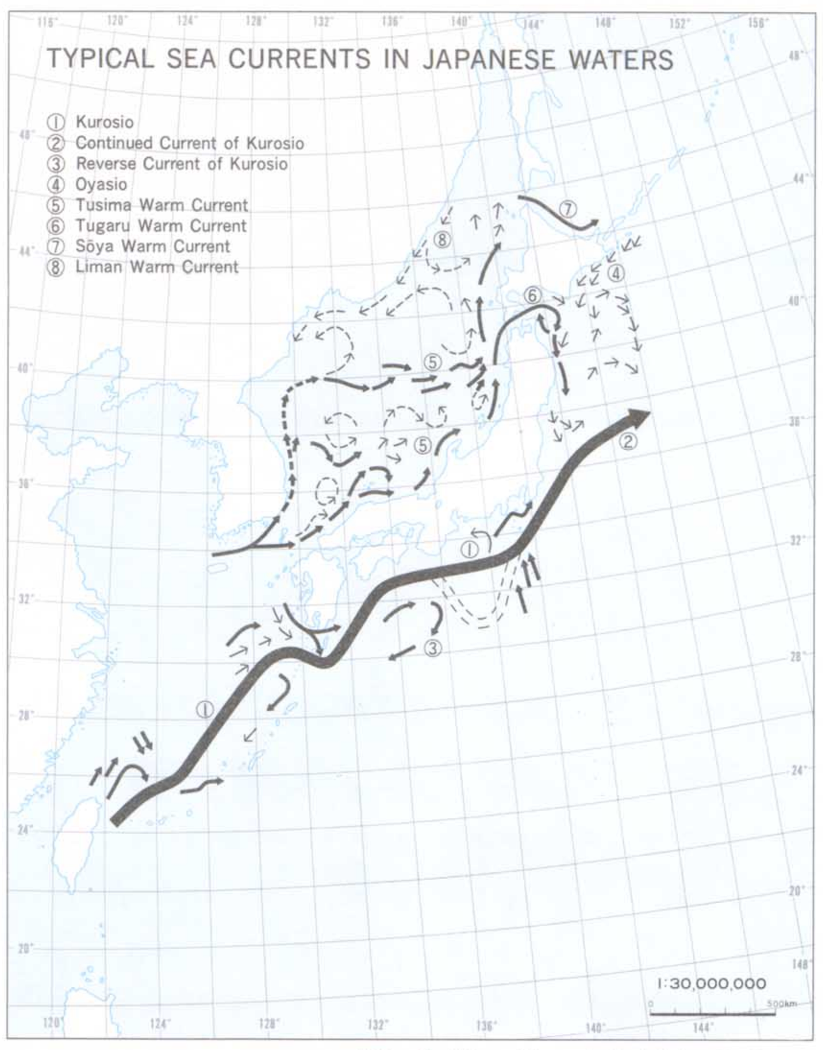
(Compiled from *Tide Tables*)



(Mogi and Sato, 1975)



(Compiled from *Marine Environmental Atlas*)



(Compiled from *Chronological Scientific Tables*)

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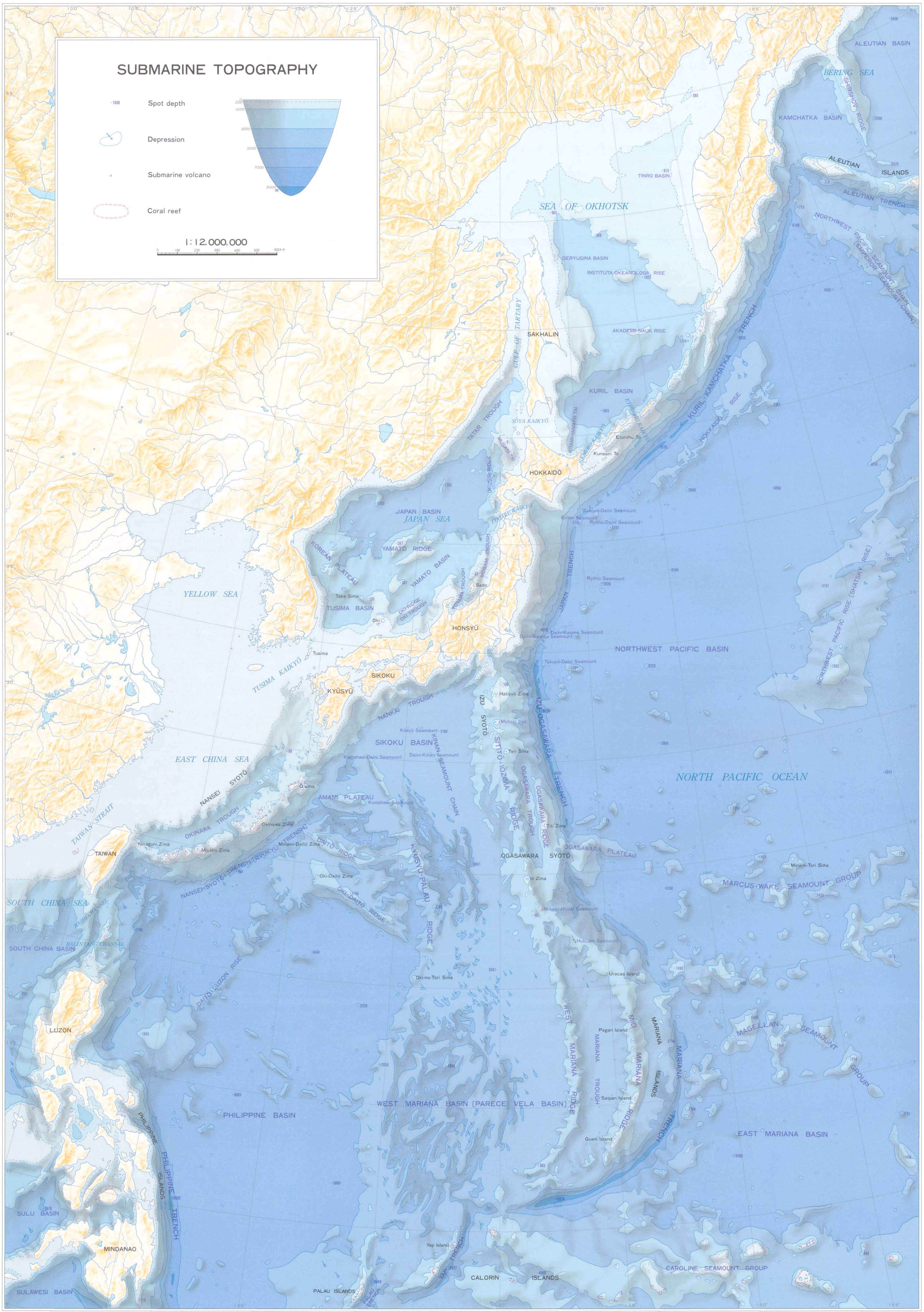
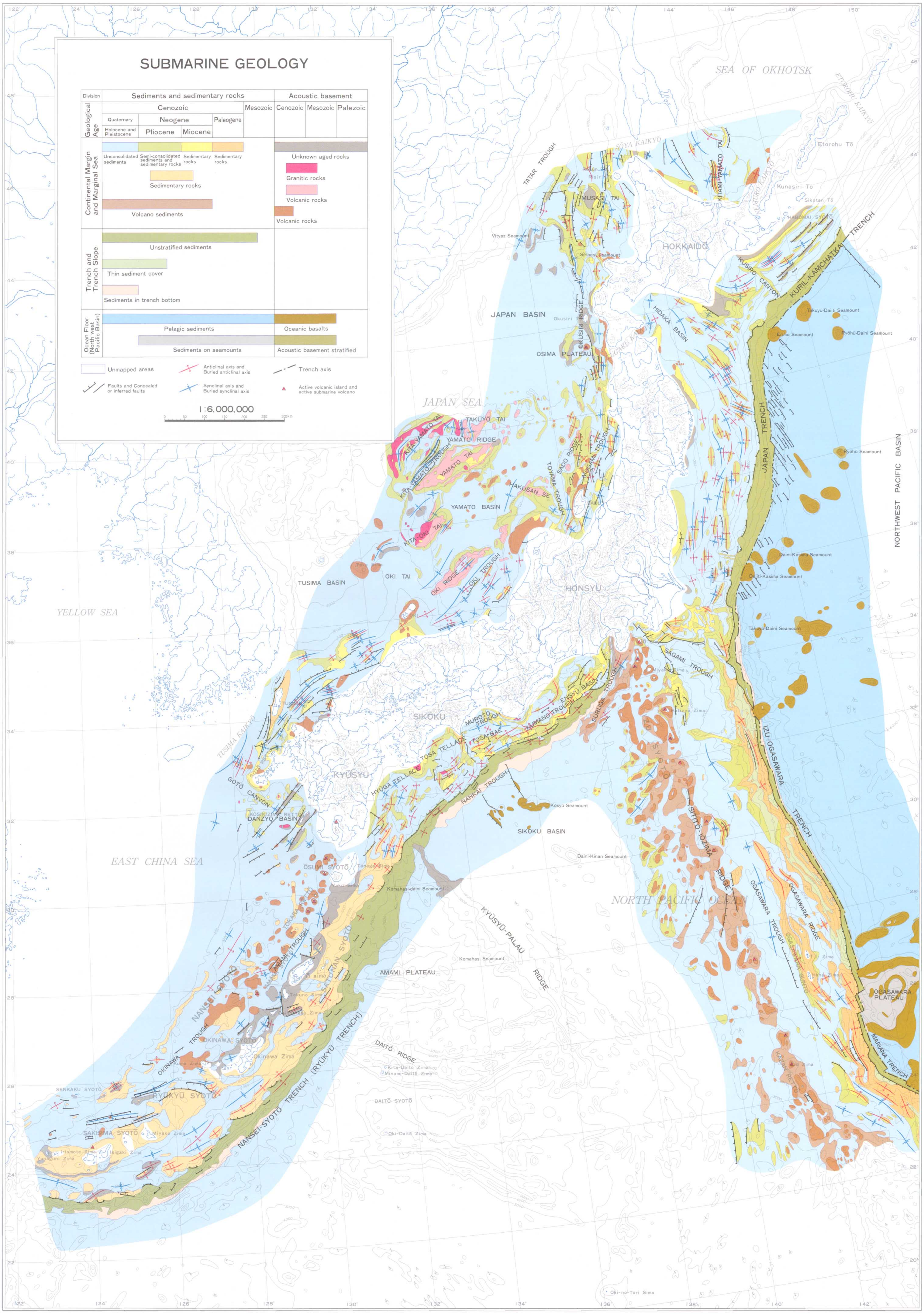
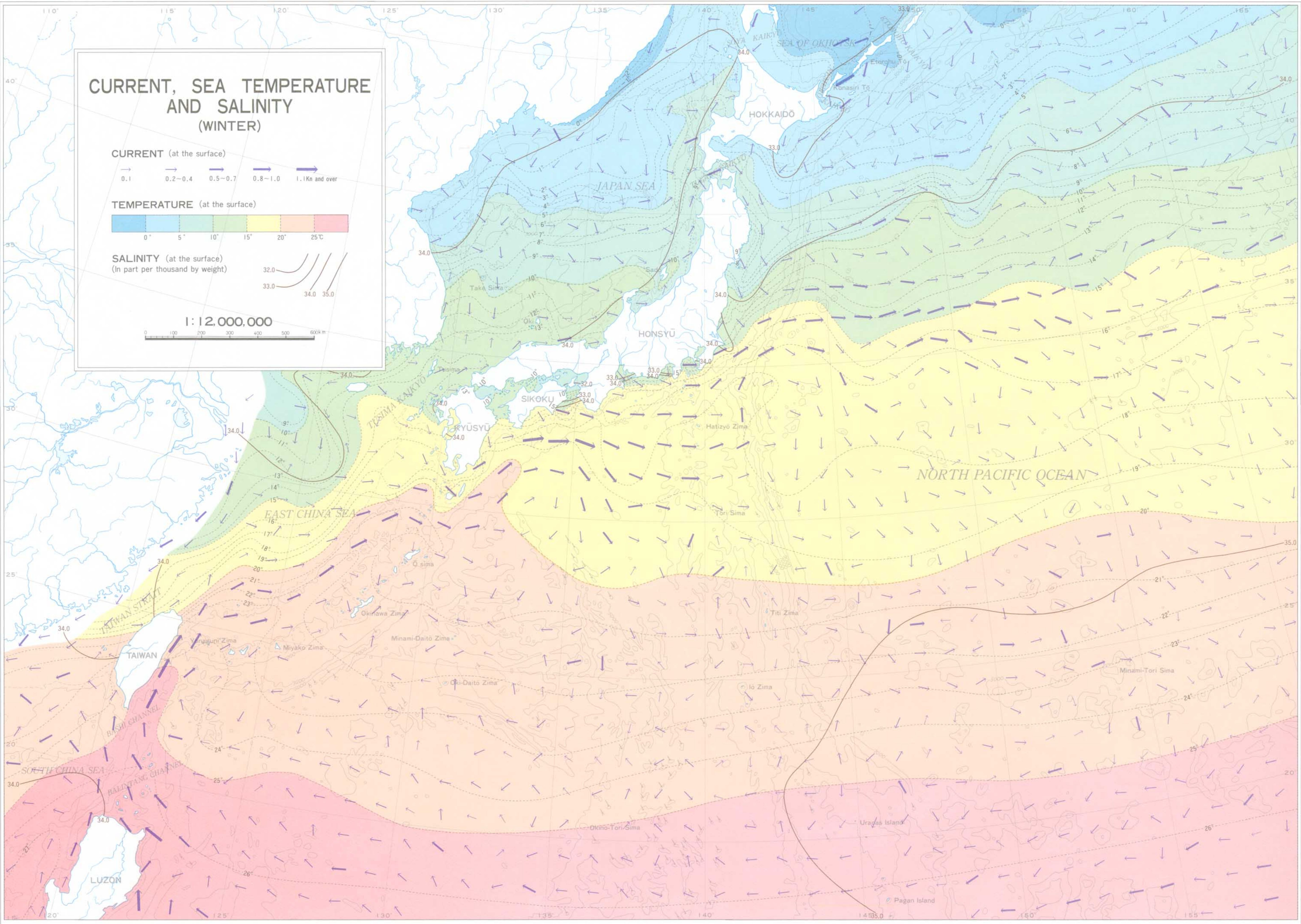
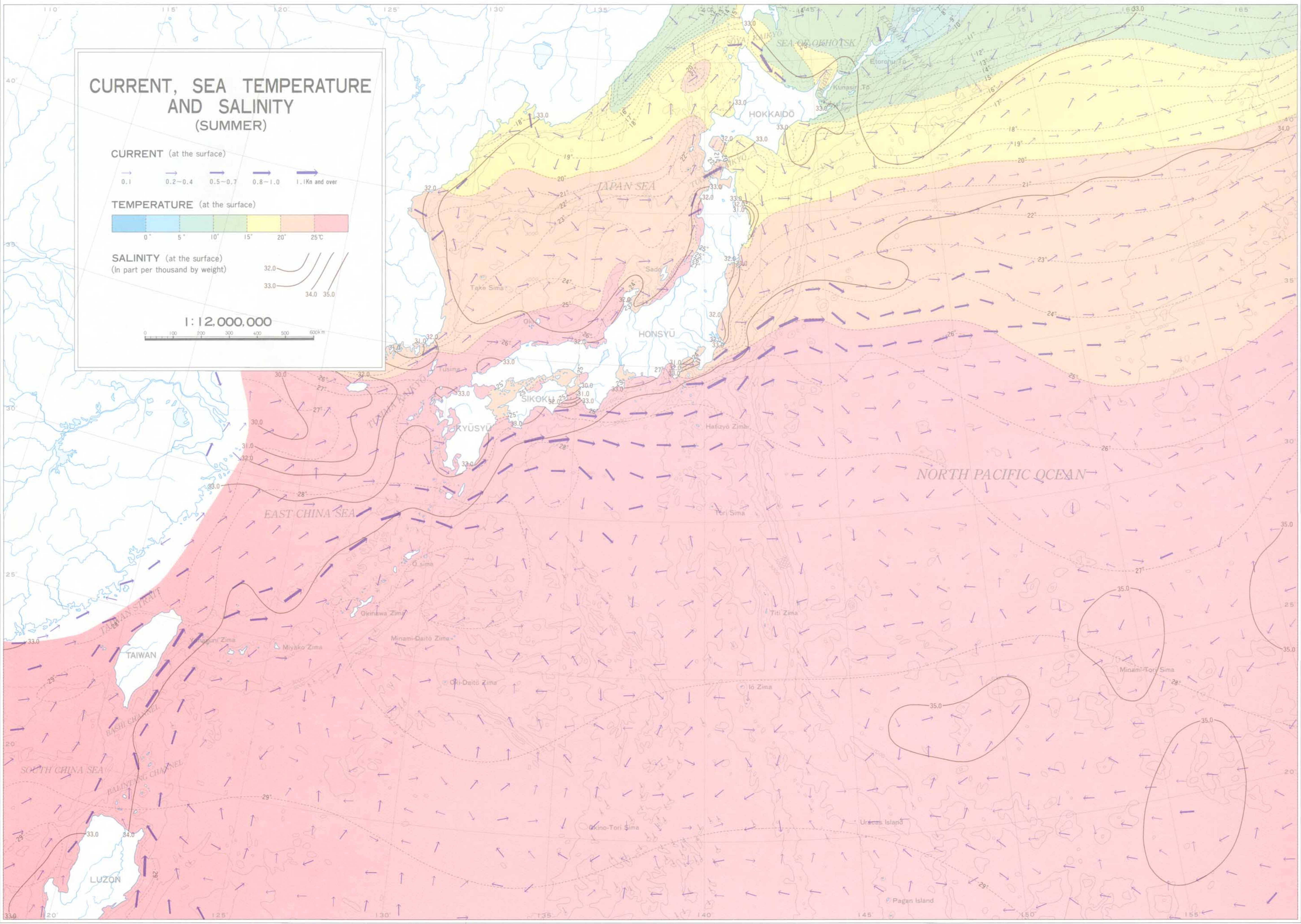

SUBMARINE TOPOGRAPHY
Spot depth
Depression
Submarine volcano
Coral reef
1:12.000.000
ALEUTIAN BASIN
BERING SEA
SHIRSHOV RIDGE
KAMCHATKA BASIN
ALEUTIAN
ISLANDS
ALEUTIAN TRENCH
NORTHWEST PACIFIC SEAMOUNT
EMPEROR SEAMOUNT CHAIN
TINRO BASIN
SEA OF OKHOTSK
DERYUGINA BASIN
INSTITUTA OKEANOLOGII RISE
AKADEMII NAUK RISE
SAKHALIN
GULF OF TARTARY
KURIL BASIN
KURIL-KAMCHATKA TRENCH
HOKKAIDO RISE
TATAR TROUGH
SOYA KAIKYO
Etorohu To
Kunasiri To
HOKKAIDO
JAPAN BASIN
JAPAN SEA
Takuyo-Daiiti Seamount
Erimo Seamount
Ryoho-Daini Seamount
YAMATO RIDGE
KOREAN PLATEAU
YAMATO BASIN
JAPAN TRENCH
Ryoho Seamount
NORTHWEST PACIFIC RISE (SHATSKY RISE)
YELLOW SEA
Take Sima
TUSIMA BASIN
OKI RIDGE
OKI TROUGH
Oki
Sado
HONSYU
Daiiti-Kasima Seamount
Daini-Kasima Seamount
NORTHWEST PACIFIC BASIN
Takuyo-Daini Seamount
Tusima
TUSIMA KAIKYO
SIKOKU
KYUSYU
NANKAI TROUGH
Hatizyo Zima
IZU SYOTO
IZU-OGASAWARA TRENCH
Kosyu Seamount
Myozin Syo
SIKOKU BASIN
KINAN SEAMOUNT CHAIN
Tori Sima
SITITO-IOZIMA RIDGE
Komahasi-Daini Seamount
Daini-Kinan Seamount
EAST CHINA SEA
NORTH PACIFIC OCEAN
NANSEI SYOTO
AMAMI PLATEAU
Komahasi Seamount
OGASAWARA TROUGH
OGASAWARA RIDGE
TAIWAN STRAIT
OKINAWA TROUGH
Okinawa Zima
Titi Zima
Yonaguni Zima
Miyako Zima
Minami-Daito Zima
DAITO RIDGE
RYUKYU TRENCH
KYUSYU-PALAU RIDGE
OGASAWARA SYOTO
OGASAWARA PLATEAU
TAIWAN
NANSEI-SYOTO TRENCH
Oki-Daito Zima
Io Zima
Minami-Tori Sima
MARCUS-WAKE SEAMOUNT GROUP
SOUTH CHINA SEA
OKI-DAITO RIDGE
Minami-Hiyosi Seamount
BASHI CHANNEL
BALINTANG CHANNEL
SOUTH CHINA BASIN
Hukutoku Seamount
Oki-no-Tori Sima
DAITO-LUZON RISE
Uracas Island
LUZON
Pagan Island
MAGELLAN SEAMOUNT GROUP
WEST MARIANA RIDGE
MARIANA TROUGH
MID MARIANA RIDGE
MARIANA ISLANDS
MARIANA TRENCH
Saipan Island
WEST MARIANA BASIN (PARECE VELA BASIN)
PHILIPPINE BASIN
Guam Island
EAST MARIANA BASIN
PHILIPPINE ISLANDS
PHILIPPINE TRENCH
SULU BASIN
MINDANAO
Yap Island
YAP TRENCH
CALORIN ISLANDS
CAROLINE SEAMOUNT GROUP
SULAWESI BASIN
PALAU ISLANDS
PALAU TRENCH


SUBMARINE GEOLOGY
Division
Sediments and sedimentary rocks
Acoustic basement
Geological Age
Cenozoic
Mesozoic
Cenozoic
Mesozoic
Palezoic
Quaternary
Neogene
Paleogene
Holocene and Pleistocene
Pliocene
Miocene
Continental Margin and Marginal Sea
Unconsolidated sediments
Semi-consolidated sediments and sedimentary rocks
Sedimentary rocks
Sedimentary rocks
Unknown aged rocks
Granitic rocks
Sedimentary rocks
Volcanic rocks
Volcano sediments
Volcanic rocks
Trench and Trench Slope
Unstratified sediments
Thin sediment cover
Sediments in trench bottom
Ocean Floor (North west Pacific Basin)
Pelagic sediments
Oceanic basalts
Sediments on seamounts
Acoustic basement stratified
Unmapped areas
Anticlinal axis and Buried anticlinal axis
Trench axis
Faults and Concealed or inferred faults
Synclinal axis and Buried synclinal axis
Active volcanic island and active submarine volcano
1:6,000,000
SEA OF OKHOTSK
JAPAN SEA
YELLOW SEA
EAST CHINA SEA
NORTH PACIFIC OCEAN
NORTHWEST PACIFIC BASIN
HOKKAIDO
HONSYU
SIKOKU
KYUSYU
TATAR TROUGH
SOYA KAIKYO
MUSASI TAI
KITAMI-YAMATO TAI
Etorohu Tô
Kunasiri Tô
KURIL-KAMCHATKA TRENCH
KUSIRO CANYON
HIDAKA BASIN
Takuyô-Daiiti Seamount
Erimo Seamount
Ryôhû-Daini Seamount
JAPAN BASIN
OKUSIRI RIDGE
OSIMA PLATEAU
Vityaz Seamount
TAKUYO TAI
YAMATO RIDGE
KITA-YAMATO TROUGH
YAMATO TAI
KITA-YAMATO TAI
YAMATO BASIN
HAKUSAN SE
TOYAMA TROUGH
SADO RIDGE
KITA-OKI TAI
OKI TAI
OKI RIDGE
OKI TROUGH
TUSIMA BASIN
JAPAN TRENCH
Ryôhû Seamount
Daini-Kasima Seamount
Daiiti-Kasima Seamount
Takuyô-Daini Seamount
SAGAMI TROUGH
SURUGA TROUGH
ENSYU BASIN
KUMANO TROUGH
MUROTO TROUGH
TOSA BAE
TOSA TELLACE
HYUGA TELLACE
NANKAI TROUGH
Kôsyû Seamount
SIKOKU BASIN
Daini-Kinan Seamount
IZU-OGASAWARA TRENCH
SITITO-IOZIMA RIDGE
OGASAWARA TROUGH
OGASAWARA RIDGE
OGASAWARA PLATEAU
MARIANA TRENCH
TUSIMA KAIKYO
GOTO CANYON
DANZYO BASIN
OSUMI SYOTO
Komahasi-daini Seamount
KYUSYU-PALAU RIDGE
Komahasi Seamount
AMAMI PLATEAU
AMAMI TROUGH
TOKARA
NANSEI SYOTO
OKINAWA TROUGH
OKINAWA SYOTO
Okinawa Zima
NANSEI-SYOTO TRENCH (RYUKYU TRENCH)
DAITO RIDGE
Kita-Daitô Zima
Minami-Daitô Zima
DAITÔ SYOTÔ
Oki-Daitô Zima
SENKAKU SYOTO
RYUKYU SYOTO
SAKISIMA SYOTO
Miyako Zima
Iriomote Zima
Isigaki Zima
Yonaguni Zima
Oki-no-Tori Sima

7.3


CURRENT, SEA TEMPERATURE AND SALINITY
(WINTER)
CURRENT (at the surface)
0.1
0.2~0.4
0.5~0.7
0.8~1.0
1.1Kn and over
TEMPERATURE (at the surface)
0°
5°
10°
15°
20°
25°C
SALINITY (at the surface)
(In part per thousand by weight)
32.0
33.0
34.0
35.0
1:12,000,000
SEA OF OKHOTSK
HOKKAIDO
JAPAN SEA
HONSYU
SIKOKU
KYUSYU
EAST CHINA SEA
NORTH PACIFIC OCEAN
TAIWAN
TAIWAN STRAIT
BASHI CHANNEL
SOUTH CHINA SEA
LUZON


CURRENT, SEA TEMPERATURE AND SALINITY
(SUMMER)
CURRENT (at the surface)
0.1
0.2~0.4
0.5~0.7
0.8~1.0
1.1Kn and over
TEMPERATURE (at the surface)
0°
5°
10°
15°
20°
25°C
SALINITY (at the surface)
(In part per thousand by weight)
32.0
33.0
34.0
35.0
1:12,000,000
SEA OF OKHOTSK
HOKKAIDO
JAPAN SEA
HONSYU
SIKOKU
KYUSYU
EAST CHINA SEA
NORTH PACIFIC OCEAN
TAIWAN
TAIWAN STRAIT
BASHI CHANNEL
SOUTH CHINA SEA
LUZON