
Coastal Bathymetry and its Application

Tsunami, Renewable Energy, ...

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Japan Coast Guard**

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Today's topics

JHOD's bathymetry derived products

- Tsunami hazard information maps
 - ✓ Bathymetric data is used as an essential input at the tsunami simulation
- Web-GIS marine information service
 - ✓ People can view bathymetric data and overlay various marine information

Tsunami hazard information maps

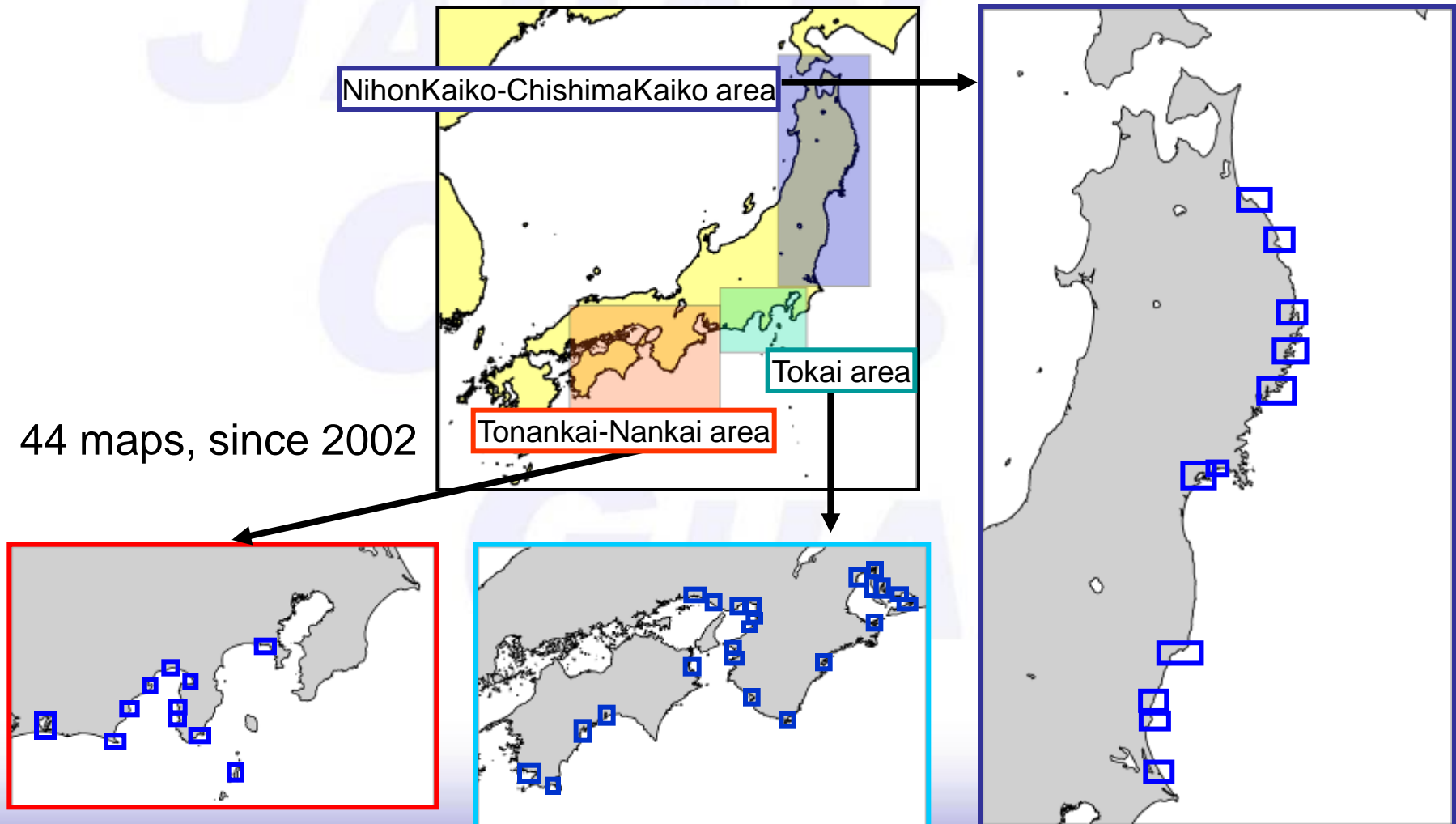


Development of tsunami evacuation plan

Information on tsunami's behaviors are necessary

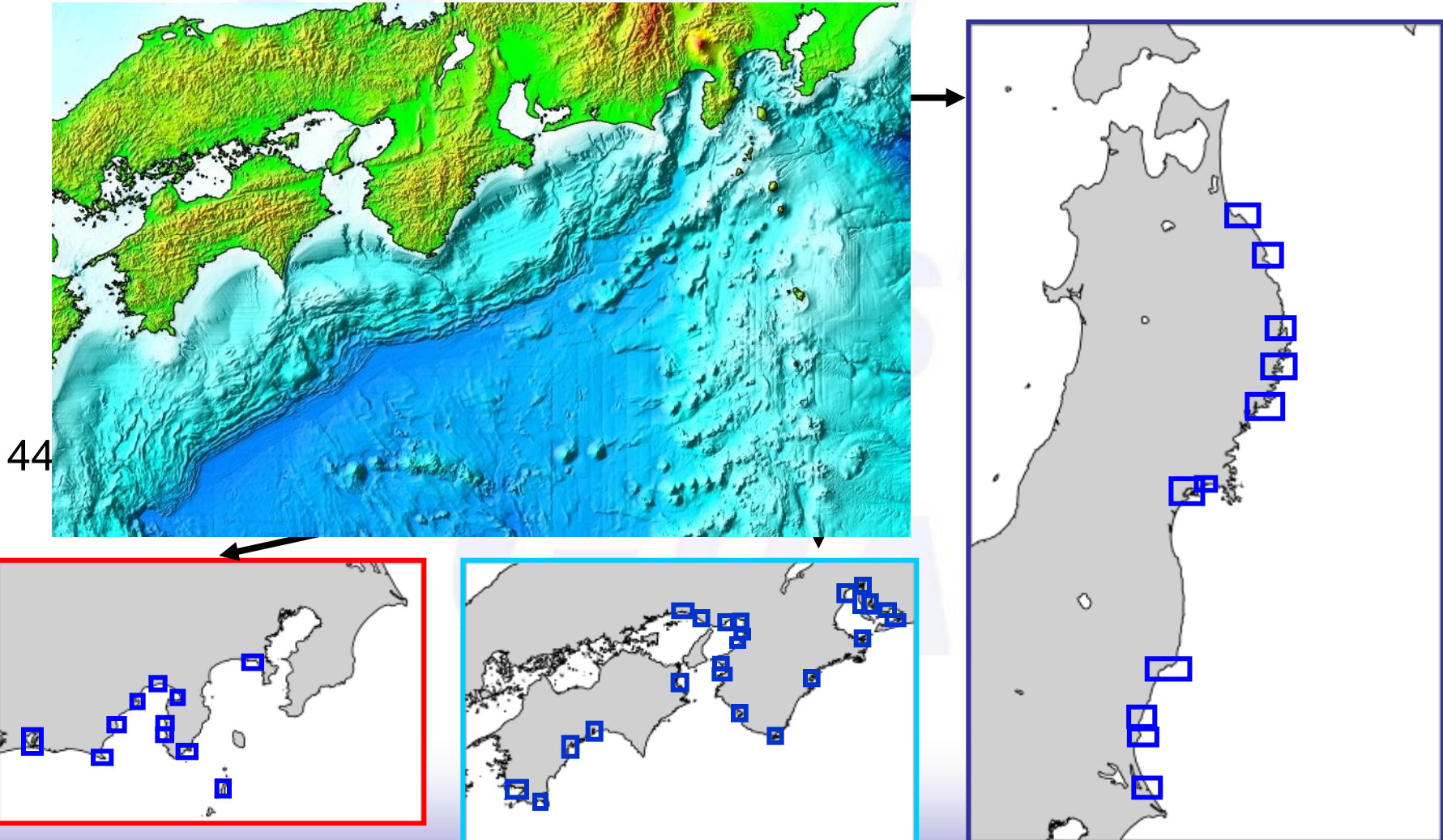
Tsunami hazard information maps

Coverage of the maps



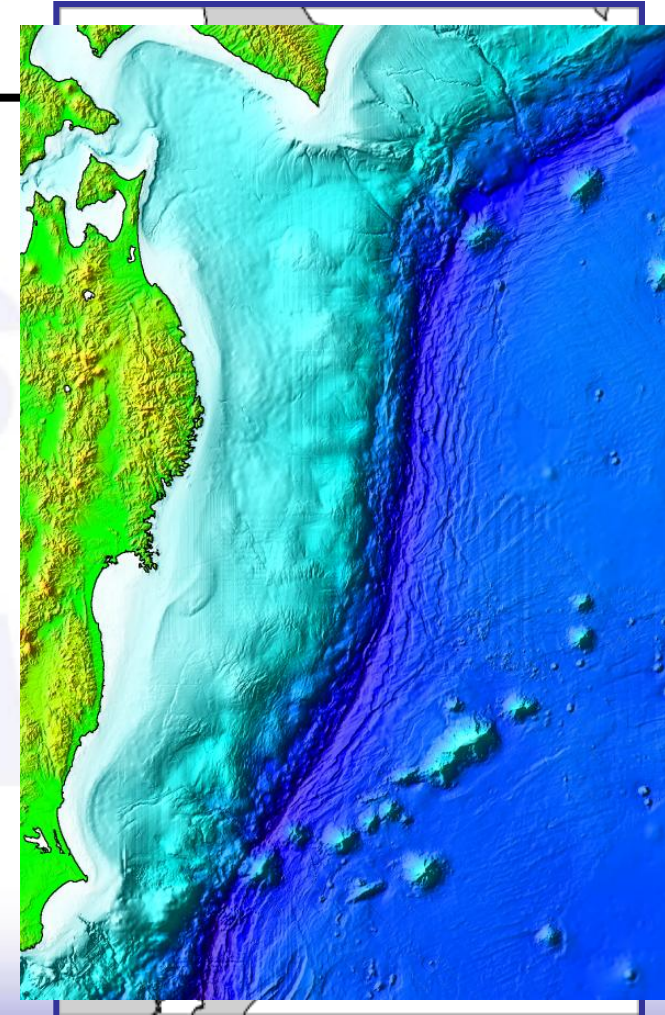
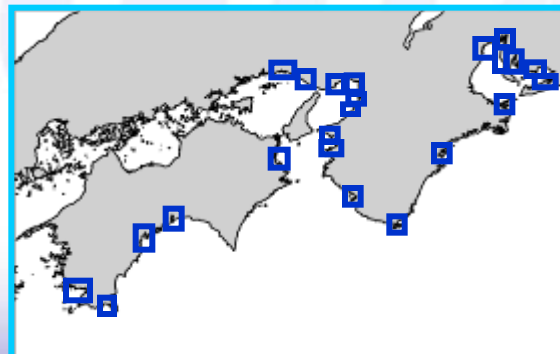
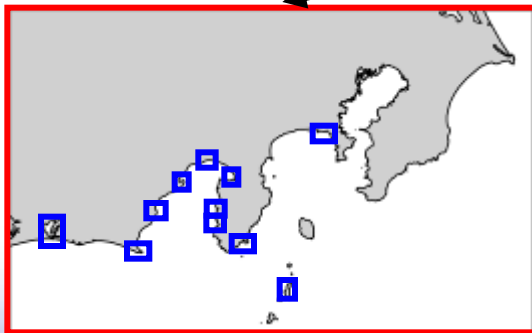
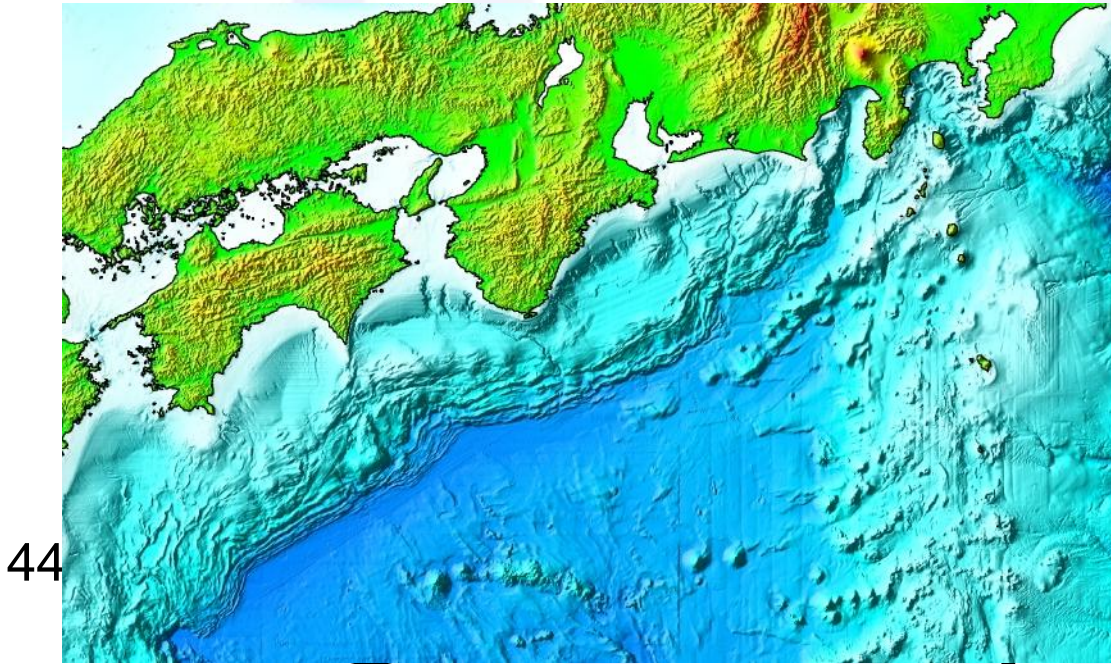
Tsunami hazard information maps

Coverage of the maps



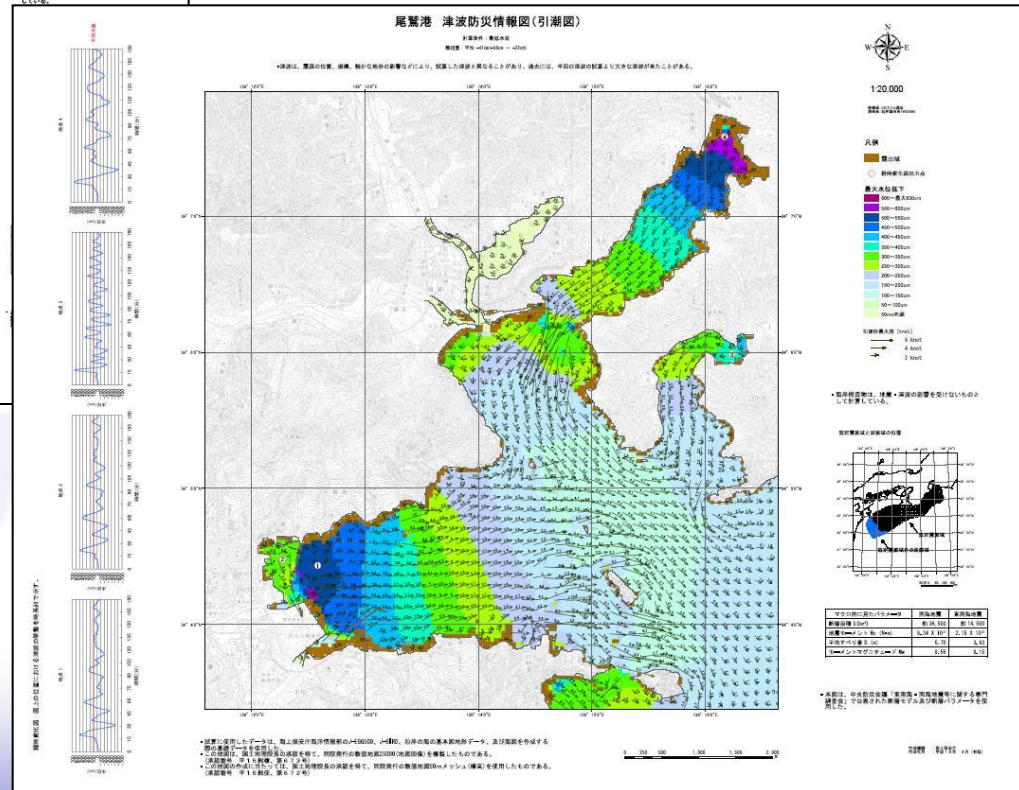
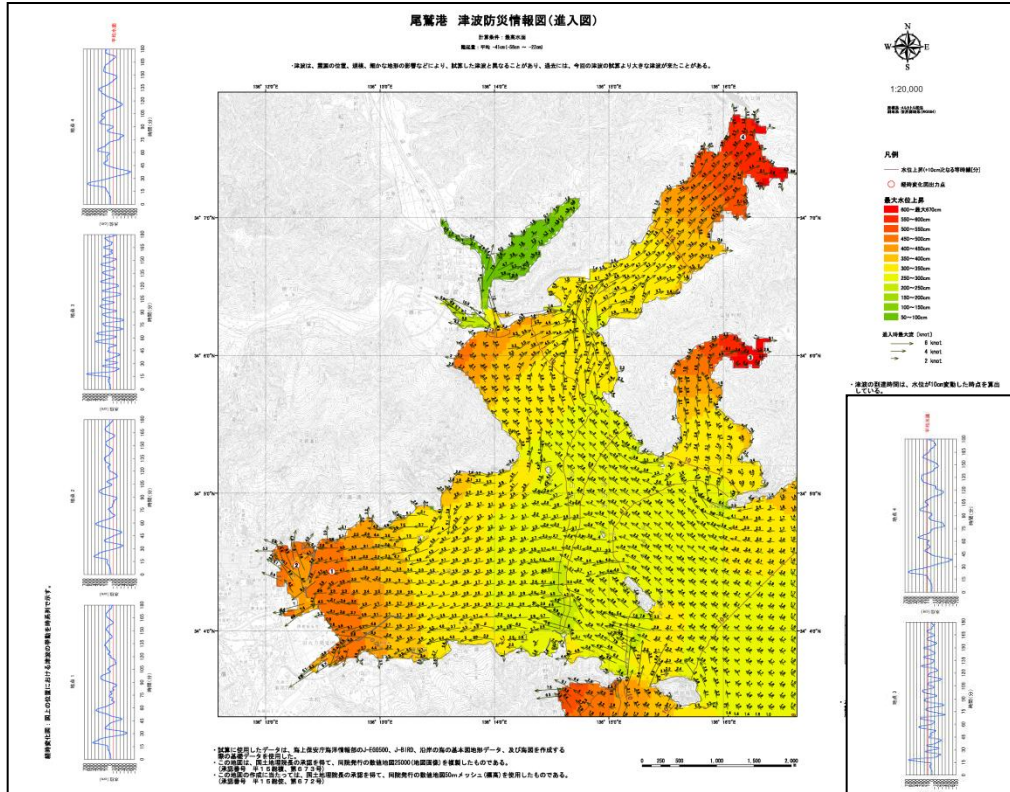
Tsunami hazard information maps

Coverage of the maps



Tsunami hazard information maps

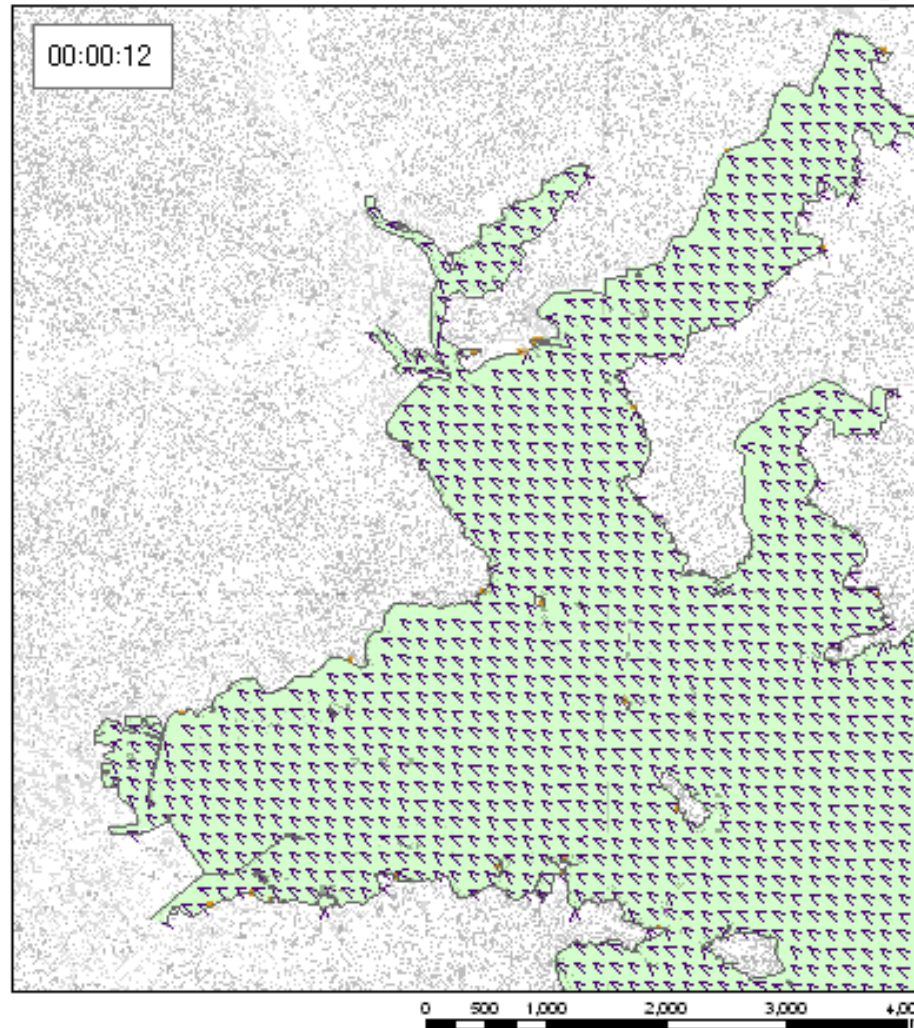
Inflow map



Outflow map

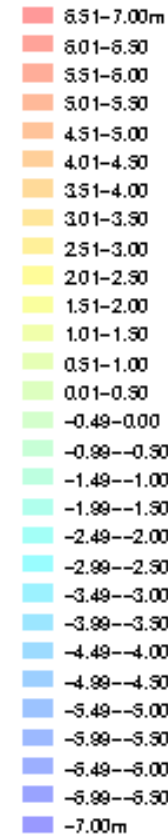
Tsunami hazard information maps

尾鷲港 津波防災情報図 (時系列図)
計算条件: 最高水面



凡例

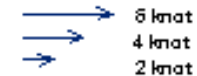
水位変動



— 流速ベクトル

■ 露出域

流速 (knot)



Simulation flow diagram

Bathymetric Data
(on sea)

**Compilation
Gridding**

Altitude Data
(on land)

Assumed Fault Models
(By Central Disaster Prevention Council, GOJ)

Gridded Data

Tidal Data
(inflow at H.W.L / outflow at L.W.L.)

input

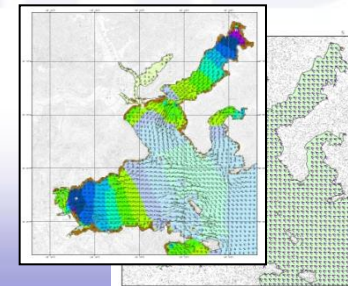
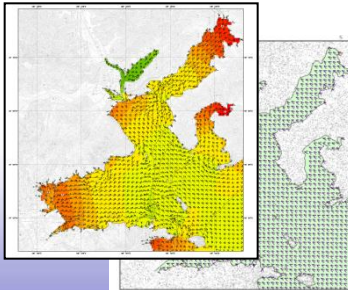
Simulation

input

output

GIS Database

output



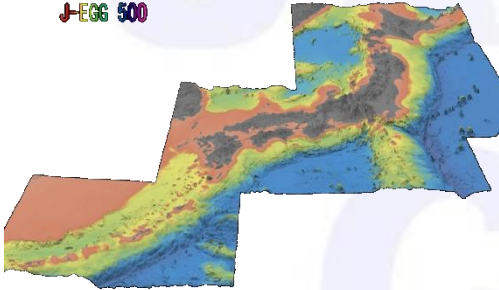
Data gridding

Bathymetric data for the simulation

J-EGG500

JODC-Expert Grid data for
Geography -500m

J-EGG 500



J - BIRD

JODC Bathymetry
Integrated Random Dataset

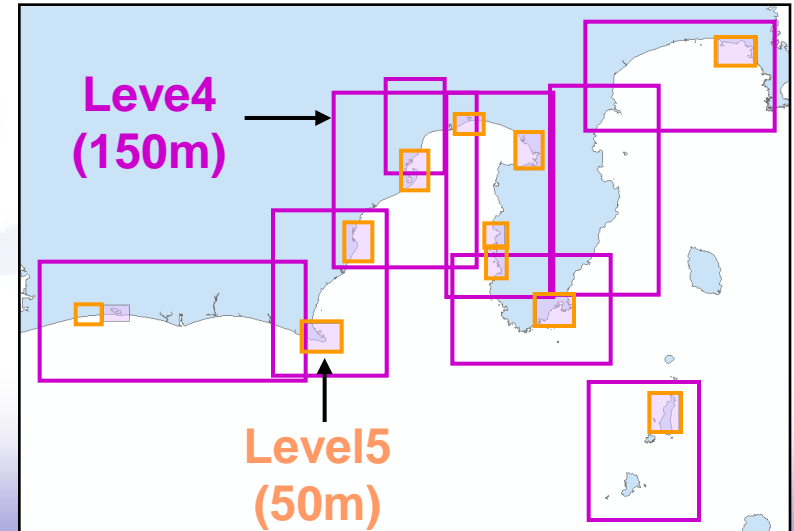
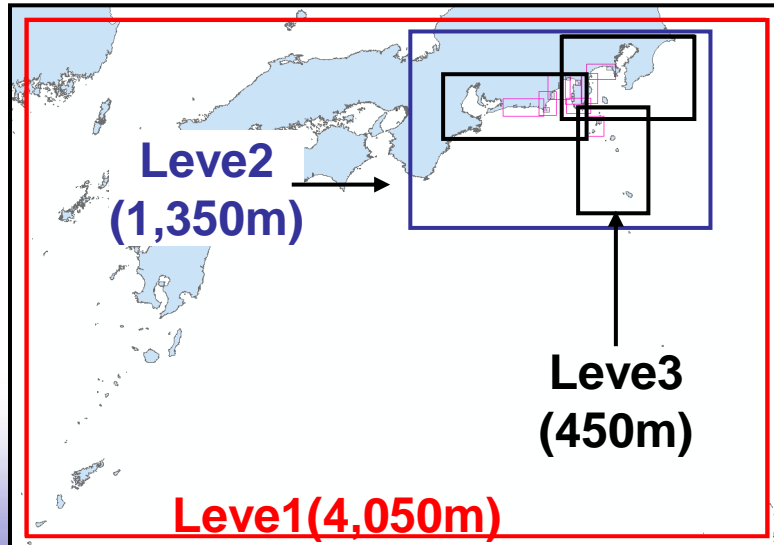


520 files, 2,102,202 soundings

Navigational Charts



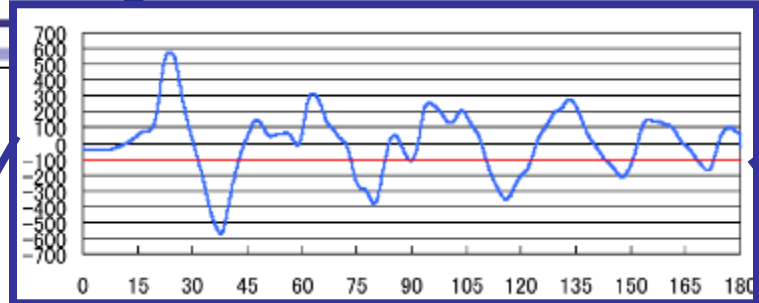
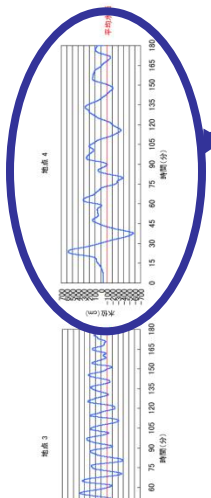
Compiling/Gridding



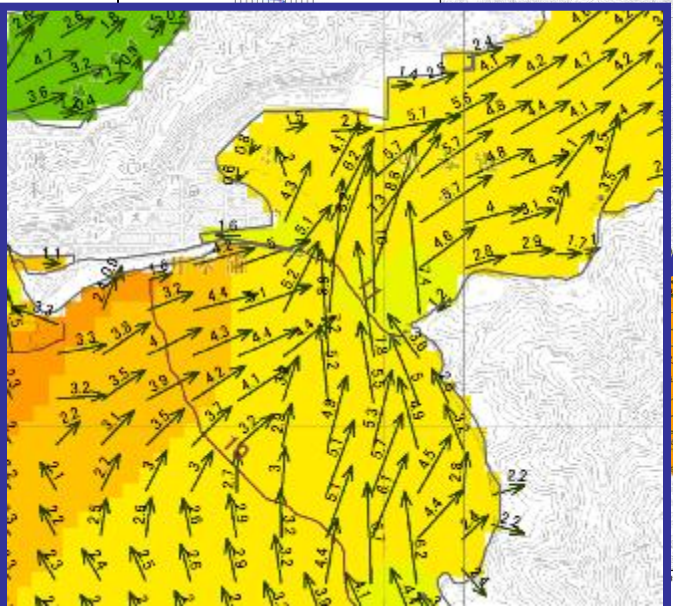
Example - Owase Port -



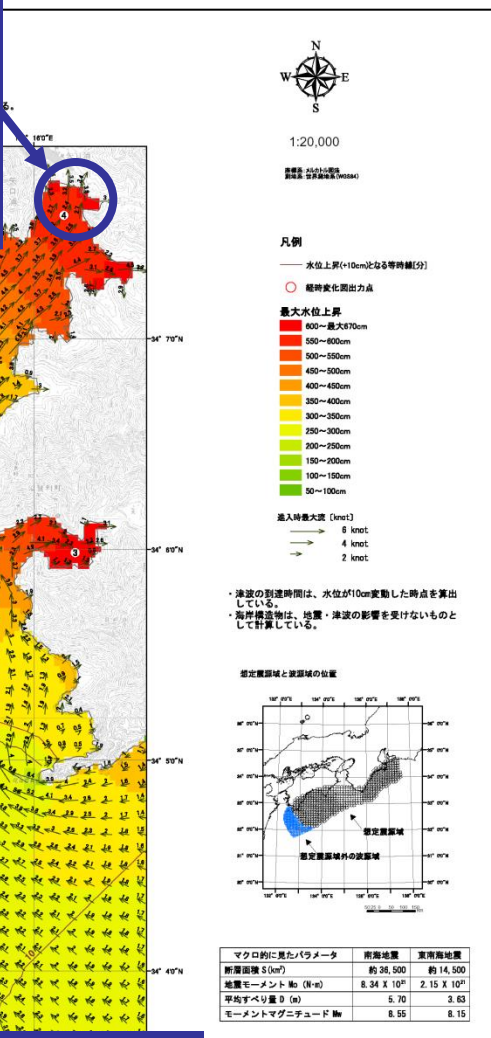
Example - Owase Port -



Water level rises to 6m after 24 minutes, and descends to -6m after 36 minutes



Water level starts to rise after 11 minutes. Maximum current speed reaches to 10 knot.



マクロ的に見たパラメータ	断層地震	東南海地震
断層面積 (km ²)	約 26,500	約 14,500
地震モーメント M_0 (N·m)	8.34×10^{21}	2.15×10^{21}
平均すべり量 \bar{u} (m)	5.70	3.63
モーメントマグニチュード M_w	8.55	8.15

・ 試算に使用したデータは、海上保安庁海洋情報部のJ-E08500、J-BIRD、沿岸の海の基本地形データ、及び海面を作成する際の添字データを使用した。
 ・ この地図は、国土地理院長の承認を得て、同院発行の数値地図25000(地図画像)を複製したものである。
 (承認番号 平15第2号、第673号)
 ・ この地図の作成に当たっては、国土地理院院長の承認を得て、同院発行の数値地図50mメッシュ(縮尺)を使用したものである。
 (承認番号 平16第2号、第672号)

・ 本図は、中央防災会議「東南海・南海地震に関する専門調査会」で公表された断層モデル及び断層パラメータを使用した。

Example - Owase Port -

尾鷲港 津波防災情報図(引潮図)

対象条件：最大津波
 時刻表：平均 41m-63m ~ -42m

今日の津波の被害より大きな津波があったことがある。



1:20,000

縮尺 1:20,000
 縮尺 1:20,000

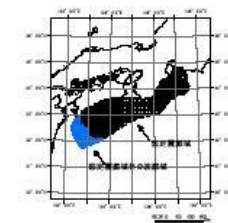
凡例
 ■ 陸地
 ○ 観測地点出力点

最大水位低下
 900~最大530cm
 500~450cm
 300~350cm
 100~150cm
 50~100cm
 50cm未満

引潮時最大流 (km/h)
 → 6 knot
 → 4 knot
 → 2 knot

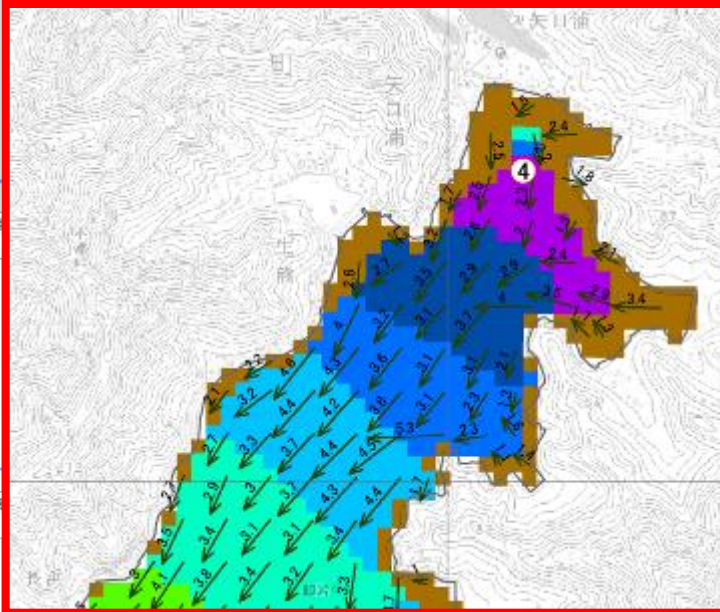
・観測地点は、陸地・深波の影響を受けないものとして計算している。

観測地点と津波の位置



マクロ的に見たパラメータ	断層位置	震源位置
断層長さ (km)	約 30	約 74
断層深さ (km)	0.04 × 10 ⁷	1.15 × 10 ⁷
断層すべり量 (m)	0.70	1.81
メメントマゲニチュード	0.55	0.75

・本図は、中央防災会議「南海海溝域地震等に関する専門調査会」で発表された断層モデル及び断層パラメータを採用した。



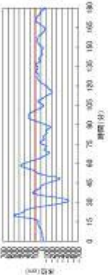
Seabed will be exposed at the brown area.
 Anchored ships may be capsized.

The fault model for the simulation

- ・図表に使用したデータは、海上保安庁海洋情報部のJ-EG0500、J-EG10、30岸の海の基本地形データ、及び海図を作成する際の基準データを利用した。
- ・この図表は、国土海洋院長の承認を得て、同院発行の数値地図25000(地形図表)を複製したものである。
- ・この図表の作成に当たっては、国土海洋院院長の承認を得て、同院発行の数値地図50メッシュ(簿業)を使用したものである。(簿業番号 平15航保、第672号)

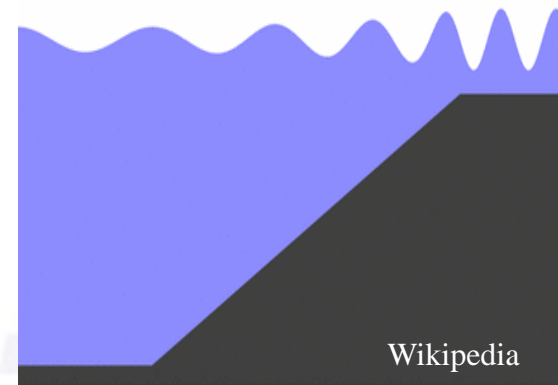
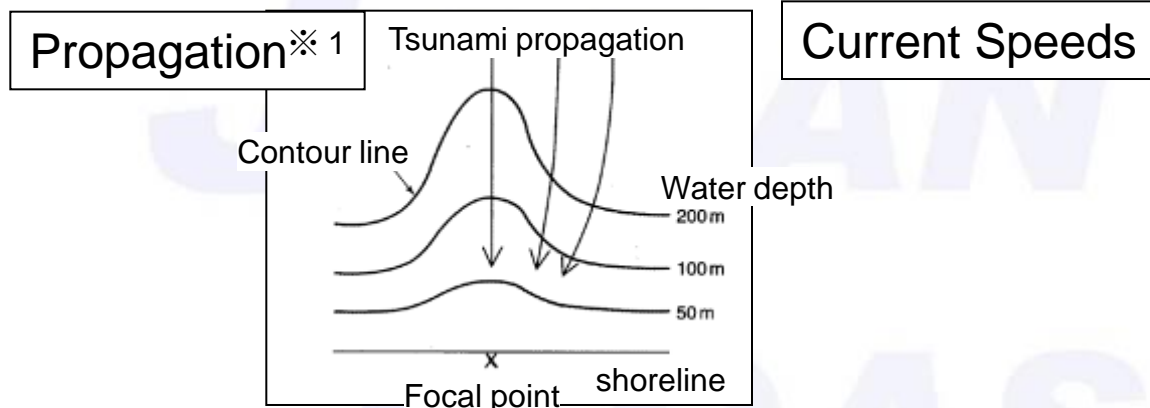
Data set for the simulation

地形図表 図上の位置における津波の被害を地形図表で示す。



Keys for accurate simulation

■ Bathymetric data



precise data is necessary

LIDAR bathymetry at assumed great earthquake areas



■ Fault model



A new fault model is under construction by the Central Disaster Prevention Council, GOJ

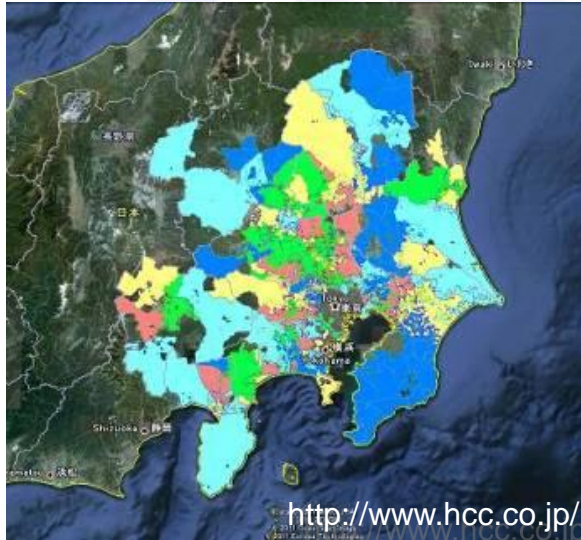
※ 1 <http://sakura1.higo.ed.jp/ws/kchigaku/seito/h22/kumataka/h22kumataka.htm>

Web-GIS marine information service

Accident at the Fukushima nuclear power plant



Jp.wsj.com



<http://www.hcc.co.jp/>



<http://on-the-way-to.cocolog-nifty.com/2011/03/post-25ff.html>

The national policy for energy sources was changed

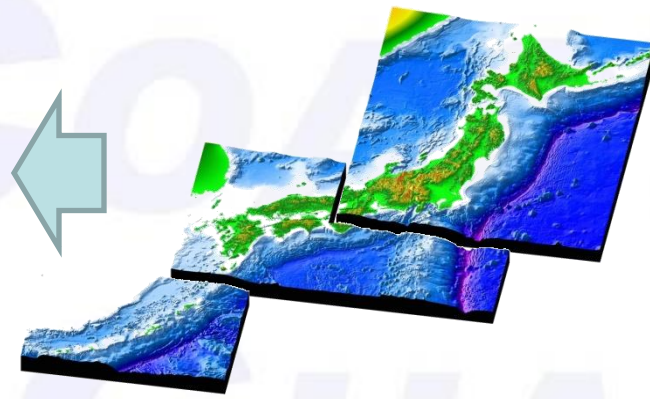
Web-GIS marine information service

Ocean as a promising source for renewable energy

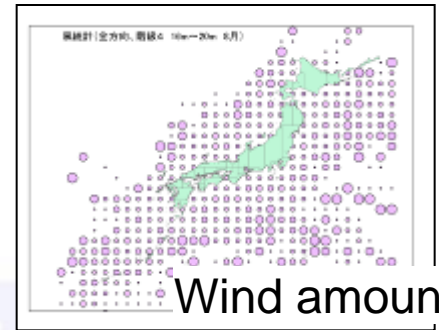
Constructing the offshore wind farm



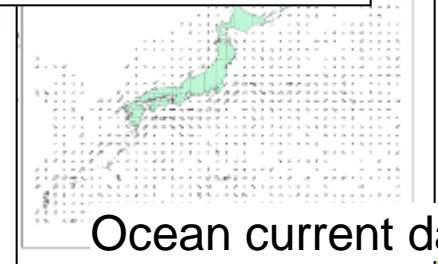
Offshore wind power has huge potential!



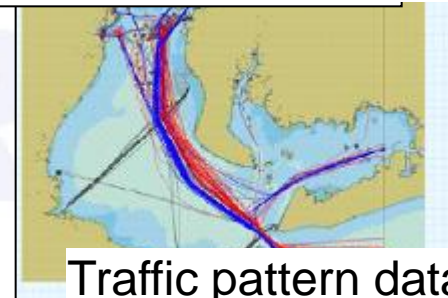
Bathymetric data



Wind amount data



Ocean current data



Traffic pattern data

...

Providing easy access to various marine information

Web-GIS marine information service

JHOD as a national oceanographic data center (JODC)

Social Information/Statistical data

Concerned Agencies
Local governments



Information on
nautical charts



Scientific Data

IODE network



Concerned Institutes

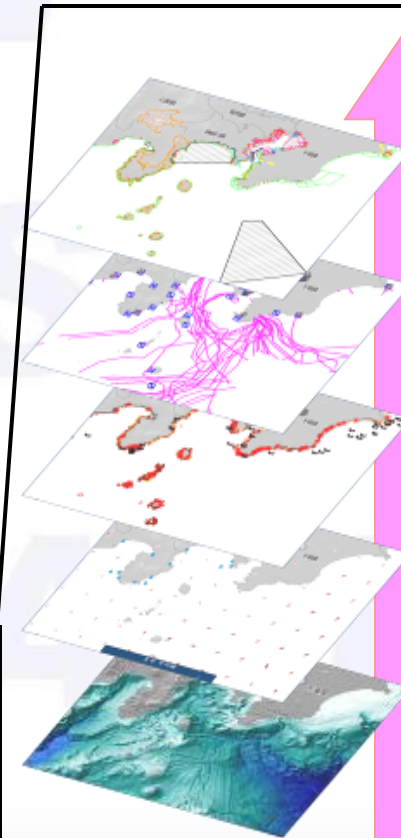
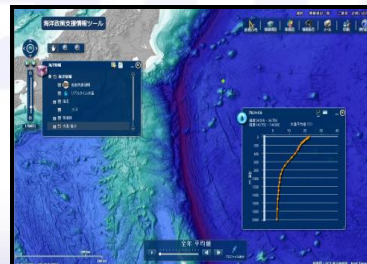


52 kinds of data are available

Spatial Information
Database



Web GIS server



Socio-economic info.
fishery rights,
port areas, ...

Infrastructure info.
undersea cables,
navigational aids, ...

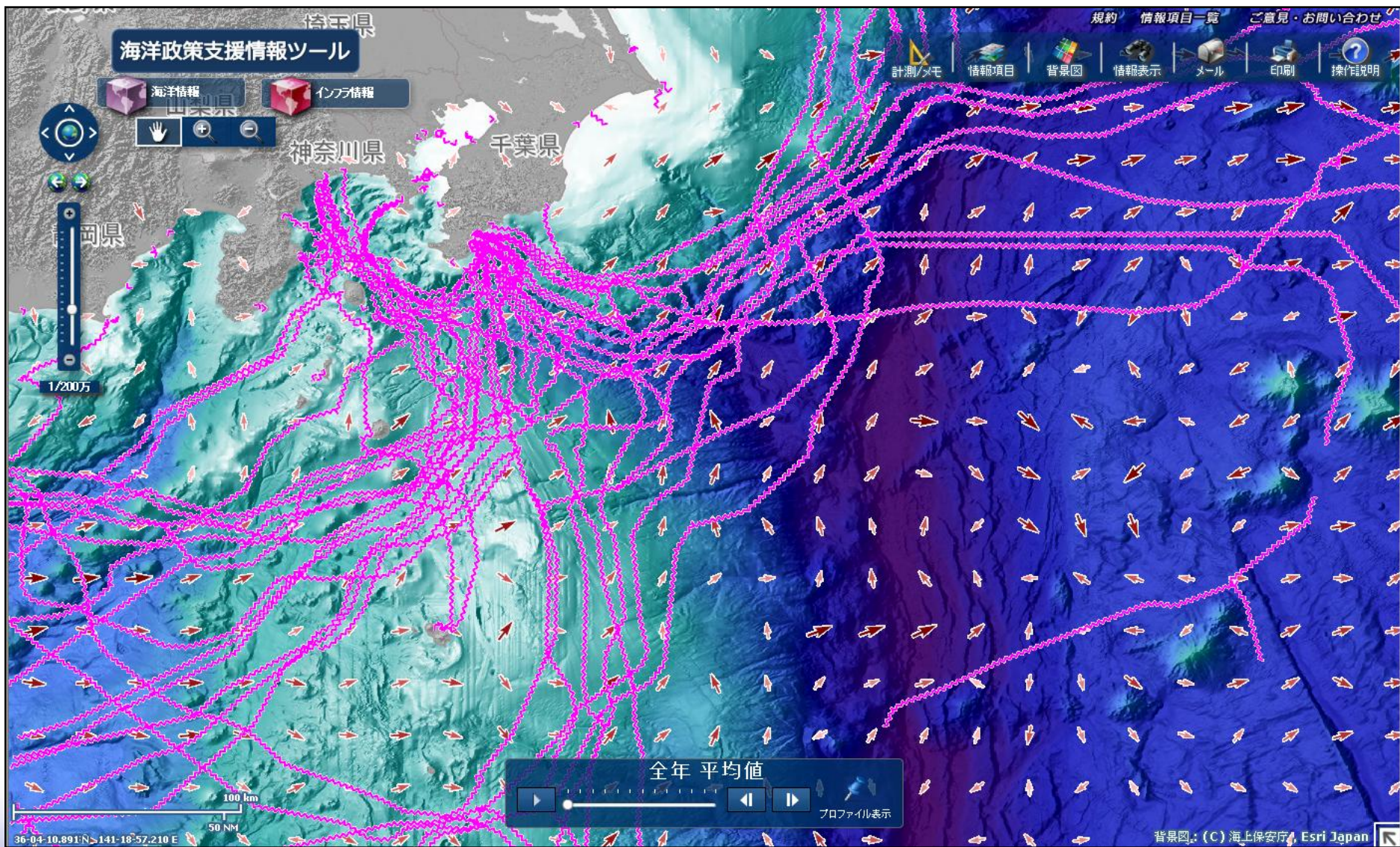
Environmental info.
wetlands, tidal flats,
sunken ship, ...

Marine data
depths, currents,
salinity, ...

Background data
Bathymetry,
Traffic patterns, ...

Web-GIS service

Web-GIS marine information service



Web-GIS marine information service

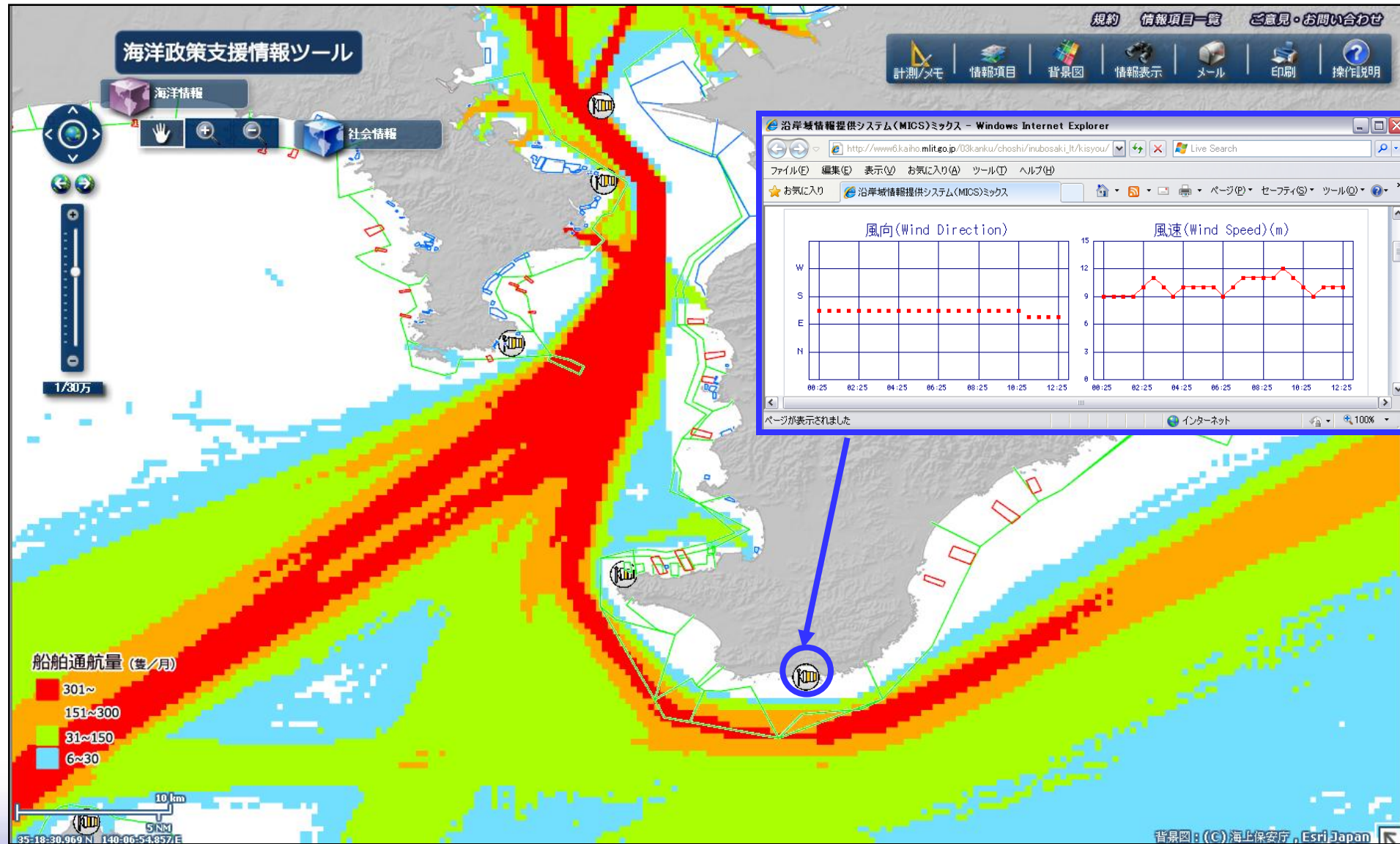
The screenshot displays a Web-GIS interface for marine information. The background is a map of the Kanto region, showing bathymetry and current vectors. Several tool panels are overlaid on the map:

- 海洋政策支援情報ツール (Marine Policy Support Information Tool):** Located in the top-left, it contains a sub-panel for "海洋情報" (Marine Information) with layers for "船舶気象通報" (Ship Weather Report), "リアルタイム水温" (Real-time Water Temperature), "海流" (Current), "水深" (Depth), "等値線" (Contour Lines), and "水温・塩分" (Temperature and Salinity).
- インフラ情報 (Infrastructure Information):** Located in the top-center, it lists layers such as "火力発電所" (Thermal Power Plant), "海底輸送管" (Submarine Pipeline), "海底ケーブル" (Submarine Cable), "灯" (Lighthouse), "海上構造物" (Offshore Structure), "海上保安部署等" (Maritime Security Deployment), "潮汐情報" (Tide Information), and "海底ケーブル区域" (Submarine Cable Area).
- 環境情報 (Environment Information):** Located in the bottom-left, it lists layers like "沈船(ポイント)" (Sinking Ship Point), "海底障害物(ポイント)" (Submarine Obstacle Point), "ウミガメ産卵地" (Sea Turtle Nesting Site), "海獣類生息地" (Marine Mammal Habitat), "哺乳類生息地" (Mammal Habitat), "鳥類生息地" (Bird Habitat), "海水浴場" (Swimming Beach), "潮干狩り場" (Tide Pooling Site), "海岸線種類" (Coastline Type), "沈船(エリア)" (Sinking Ship Area), "海底障害物(エリア)" (Submarine Obstacle Area), "マングローブ" (Mangrove), "湿地" (Wetland), and "藻場" (Algal Bed).
- 社会情報 (Social Information):** Located in the bottom-center, it lists layers such as "史跡" (Historical Site), "名勝" (Scenic Spot), "天然記念物" (Natural Monument), "指定漁地(ポイント)" (Designated Fishing Point), "漁業権(区画)" (Fishing Rights Area), "漁業権(定置)" (Fishing Rights Fixed), "漁業権(共同)" (Fishing Rights Common), "航路(港則法)" (Route Port Regulation), "航路(海交法)" (Route Maritime Law), "指定漁地(エリア)" (Designated Fishing Area), "検査漁地" (Inspection Fishing Area), and "投棄区域" (Disposal Area).
- 基本情報 (Basic Information):** Located in the bottom-right, it lists layers for "海域名称" (Sea Area Name), "島名" (Island Name), "市区町村界" (Municipality Boundary), and "経緯線" (Latitude/Longitude Line).

The interface includes a top navigation bar with "規約" (Terms), "情報項目一覧" (Information Item List), and "ご意見・お問い合わせ" (Feedback/Contact). A toolbar on the right contains "計測/メモ" (Measurement/Note), "情報項目" (Information Item), "背景図" (Background Map), "情報表示" (Information Display), "メール" (Email), "印刷" (Print), and "操作説明" (Operation Guide). A legend panel on the right shows a list of layers: "基本情報", "社会情報", "インフラ情報", "環境情報", and "海洋情報", with controls for "表示順を上へ" (Move Up) and "表示順を下へ" (Move Down), and a button for "全てのレイヤの表示状態を初期化する" (Reset All Layer Display Status).

At the bottom left, the coordinates "37-08-07.796 N" are displayed. At the bottom right, the copyright notice "背景図: (C) 海上保安庁, Esri Japan" is visible.

Web-GIS marine information service



Summary

- JHOD is creating tsunami hazard maps for mariners.
- Precise bathymetric data is essential for the accurate simulation.
- JHOD will conduct high-resolution LIDAR bathymetric surveys.
- JHOD has just started a new data providing service which provides various marine information in a visualized way.
- People can use this service for the purpose such as to locate suitable places for offshore wind farm,
- So we believe that this new service will accelerate development of renewable energy sources at the ocean around Japan.

JAPAN

Thank you for your attention!

*COAST
GUARD*