

# Response to Tsunami Disaster -the Great East Japan Earthquake 2011-

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**I. Response to Tsunami Disaster 2011**

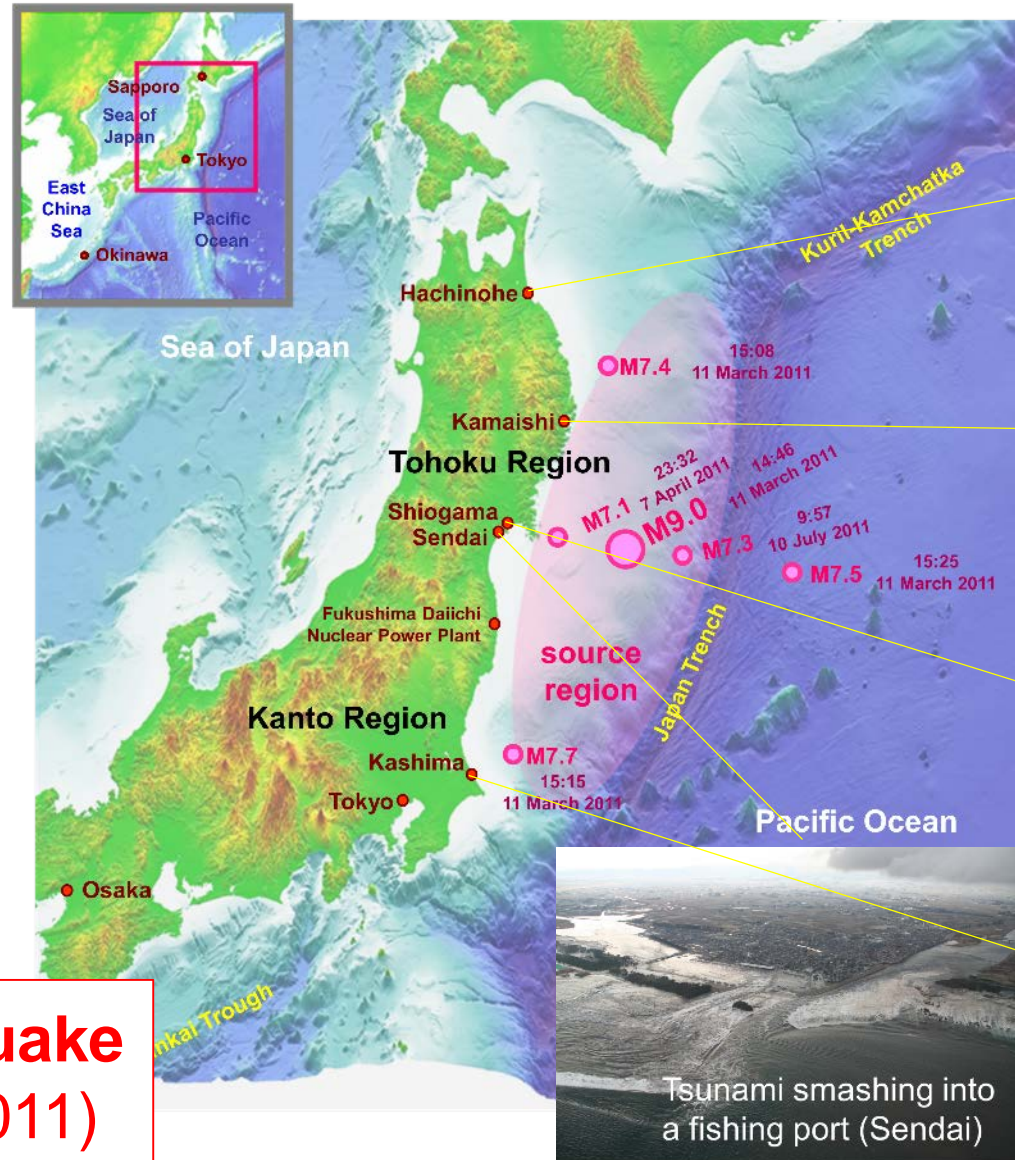
**II. International meeting for Disaster Risk Reduction**

**III. Proposal for the 1<sup>st</sup> IHO Assembly**

# The Great East Japan Earthquake

A huge earthquake of magnitude 9.0, the epicenter of which was located off east coast of northeastern Japan, occurred at **2:46 p.m. on 11 March 2011** and caused strong ground shake in wide area of the Tohoku and the Kanto regions. Many aftershocks, some of which were larger than magnitude 7, also occurred.

**M9.0 Earthquake  
(11 March 2011)**



Damage by Tsunami



Port of Hachinohe



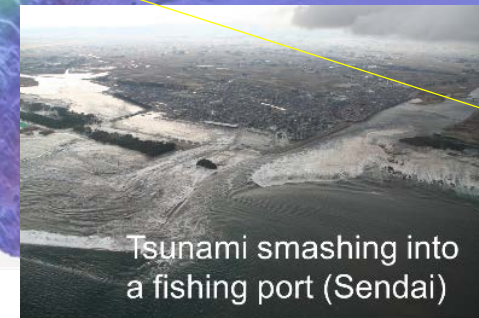
Port of Kamaishi



Port of Shiogama



Port of Kashima

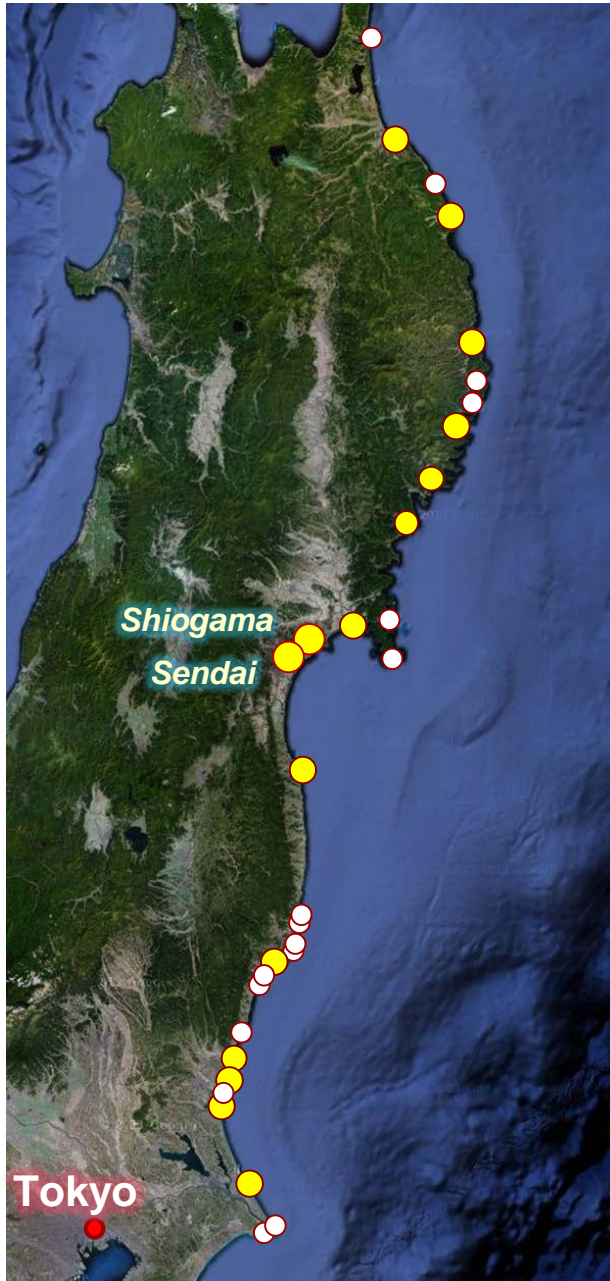




# Kamaishi City

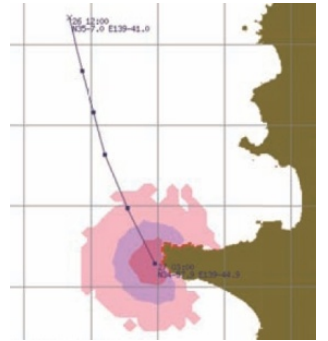






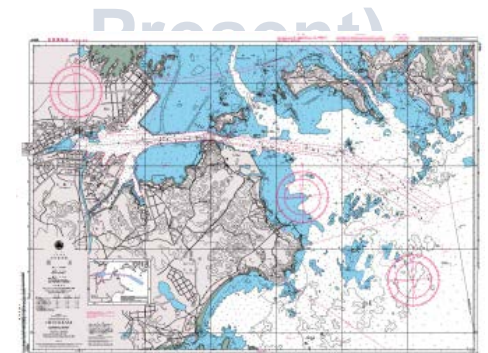
## ■ Emergency actions (March – April 2011)

- Navigational warning
- Drift trajectory prediction
- Preliminary survey in major ports to search for undersea obstacles to ensure the safety of the port entrance



## ■ Secondary actions (May 2011 – Present)

- Revision of nautical charts  
Re-determination of vertical datum  
Hydrographic Survey

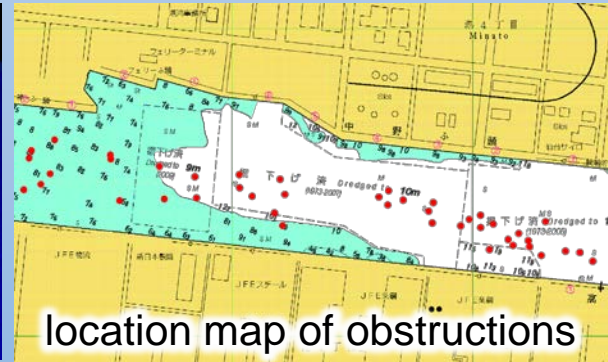
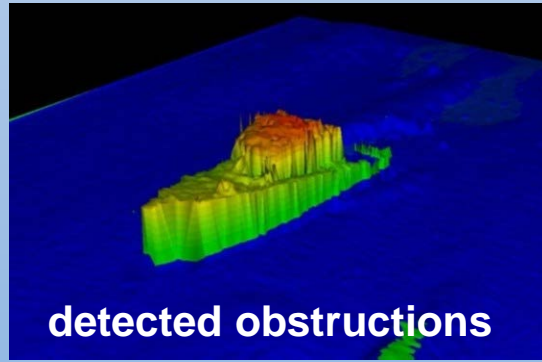


# Emergency actions

JHOD surveyed major ports in cooperation with port authorities.

## JHOD etc.

Survey to identify sea-bottom obstructions



obstruction report

## Port Authorities

Clearing operation of obstructions



## Obstruction Survey

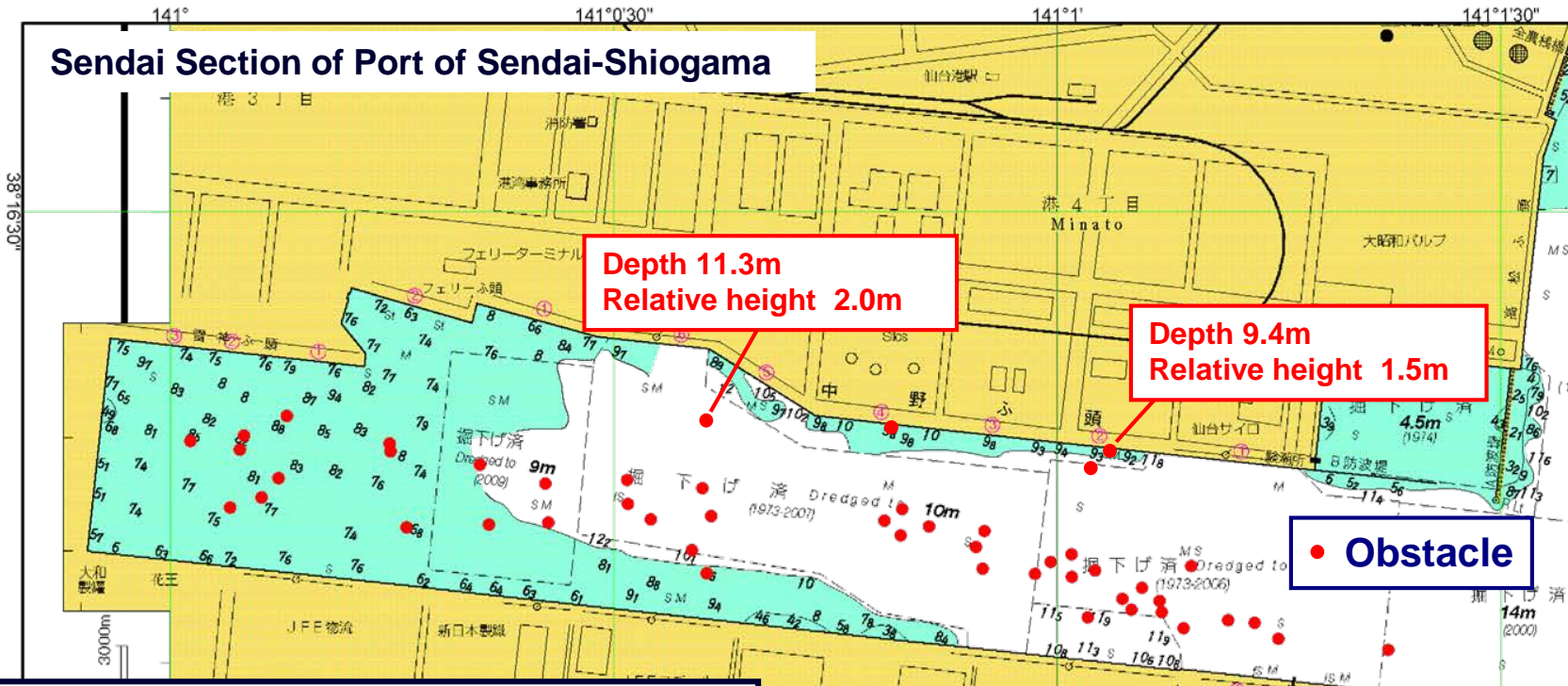
- to help port authorities for their clearing operation,
- to ensure the navigational safety

## Initial Target

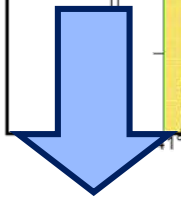
- One quay
- One route to it



# Emergency actions -example of result



Plotting the detected sea-bottom obstacles on a nautical chart

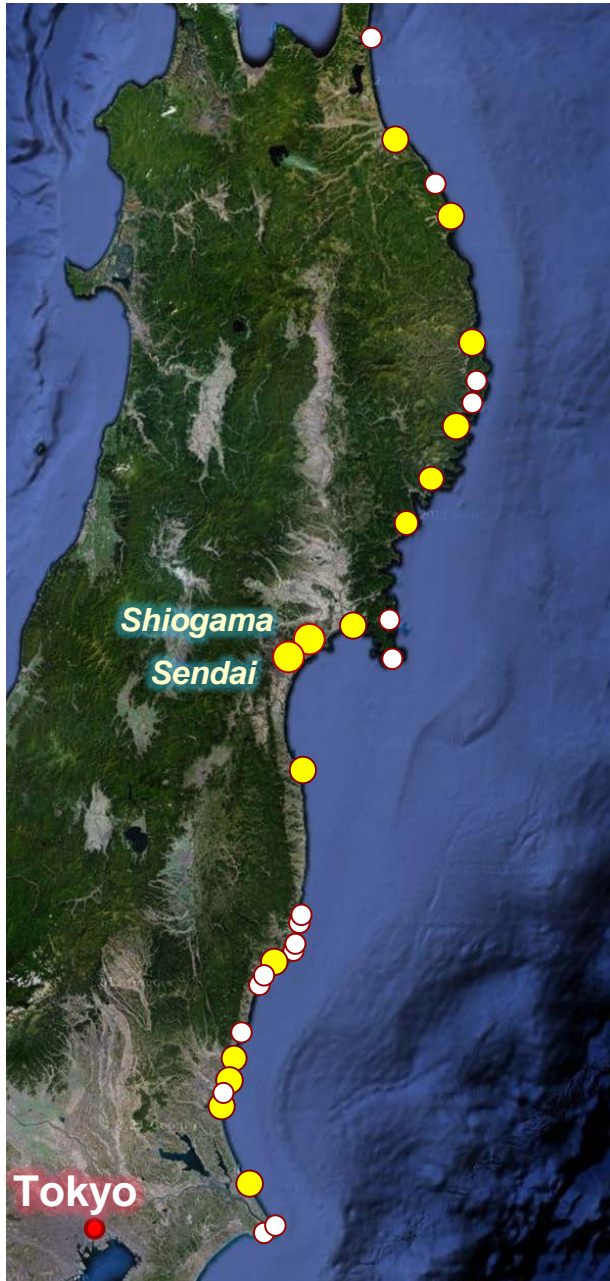


Informing the results to the port authority

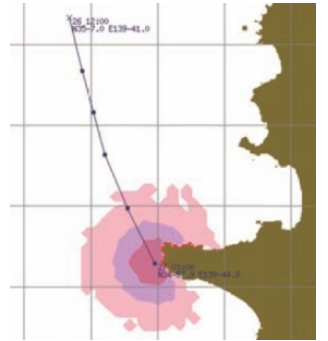
Find them and clear a channel



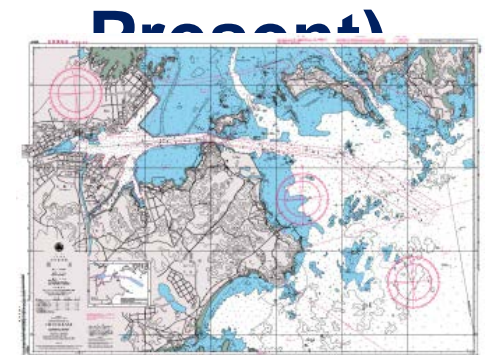
All the major ports were re-opened within 15 days after the earthquake.



- **Emergency actions (March – April 2011)**
  - Navigational warning
  - Drift trajectory prediction
  - Preliminary survey in major ports to search for undersea obstacles to ensure the safety of the port entrance



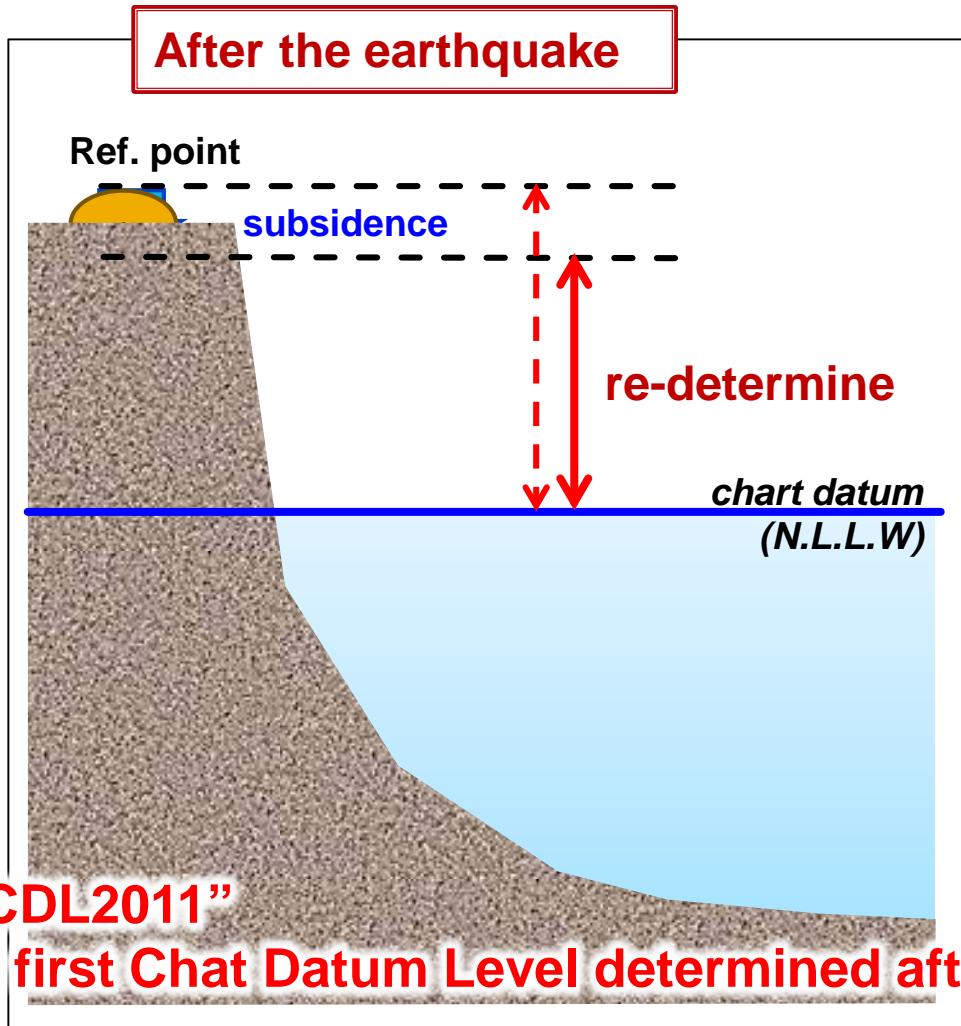
- **Secondary actions (May 2011 – Present)**
  - **Revision of nautical charts**
    - Re-determination of vertical datum
    - Hydrographic Survey





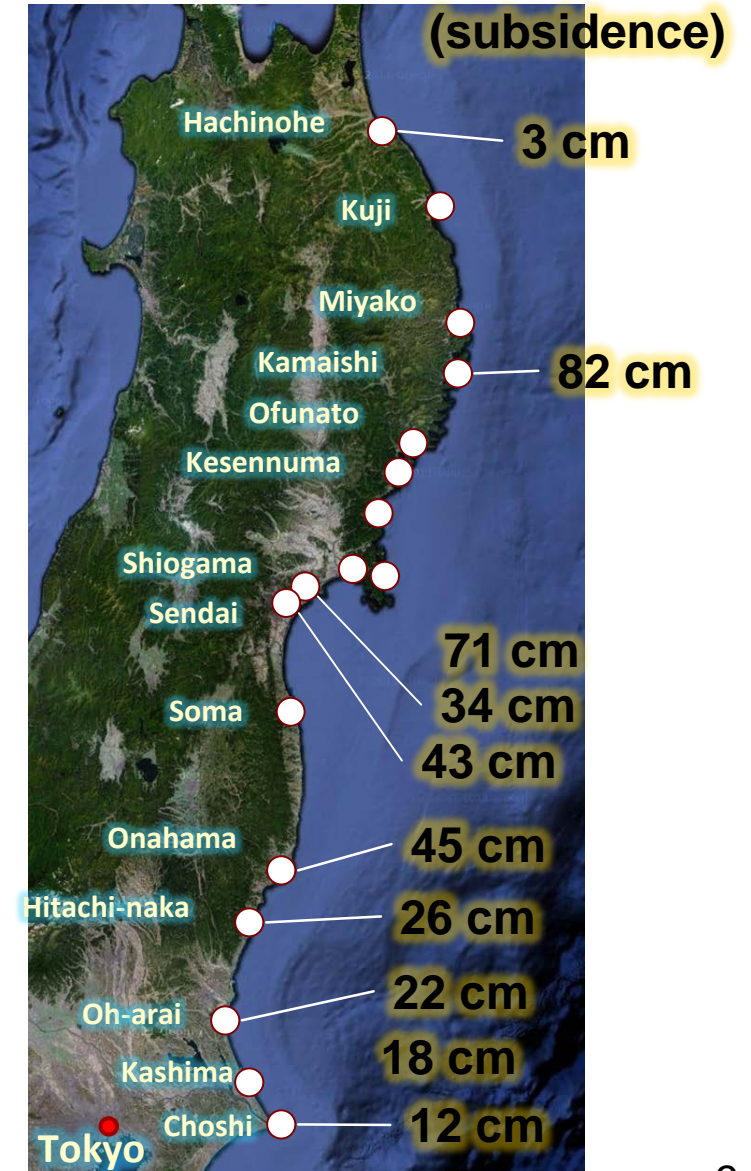
# Secondary action

## 1. Establish chart datum levels



**“CDL2011”**  
= first Chart Datum Level determined after the earthquake

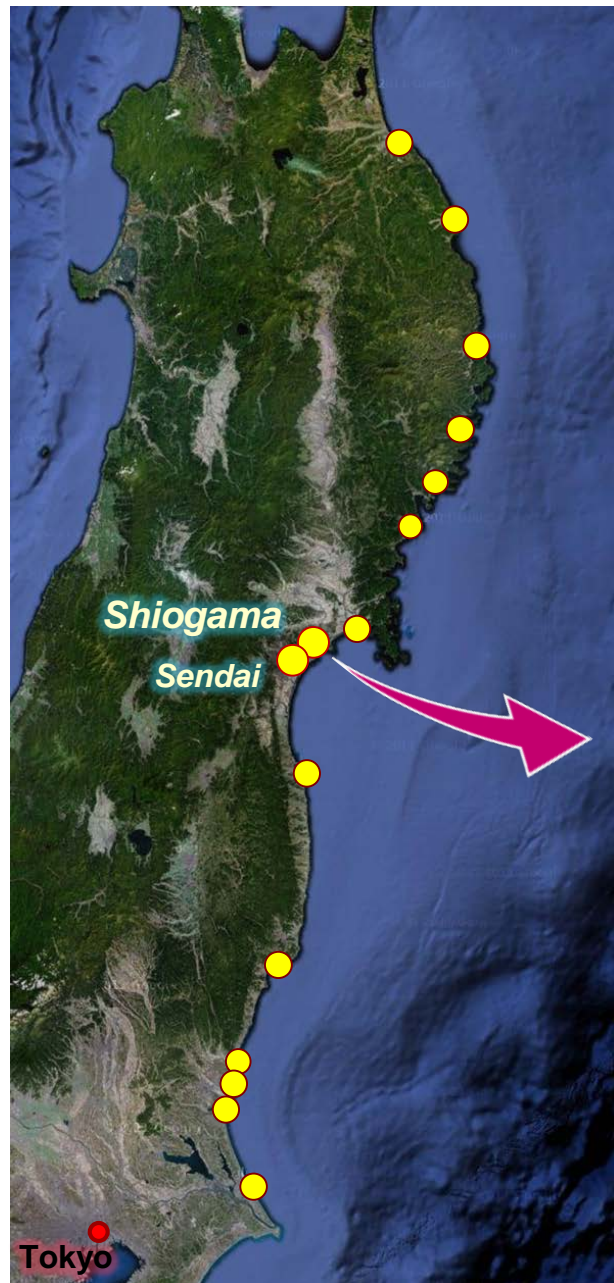
Determination of chart datum level





# Secondary action

## 2. Carry out bathymetric surveys



**15 major ports was completed by April 2012.**



# Secondary action

3. Compile and publish new charts

Shiogama port

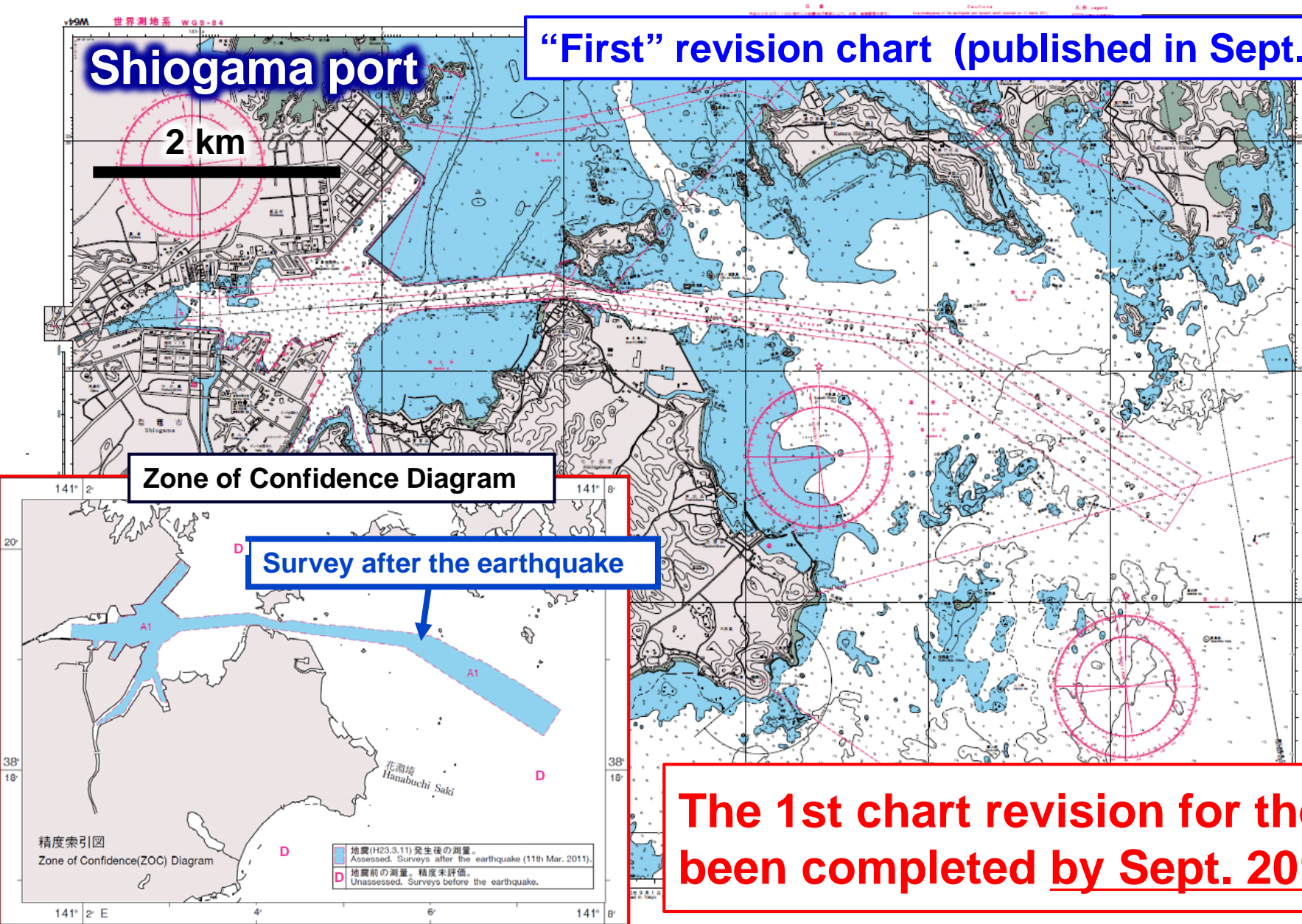
“First” revision chart (published in Sept. 2011)

2 km

Zone of Confidence Diagram

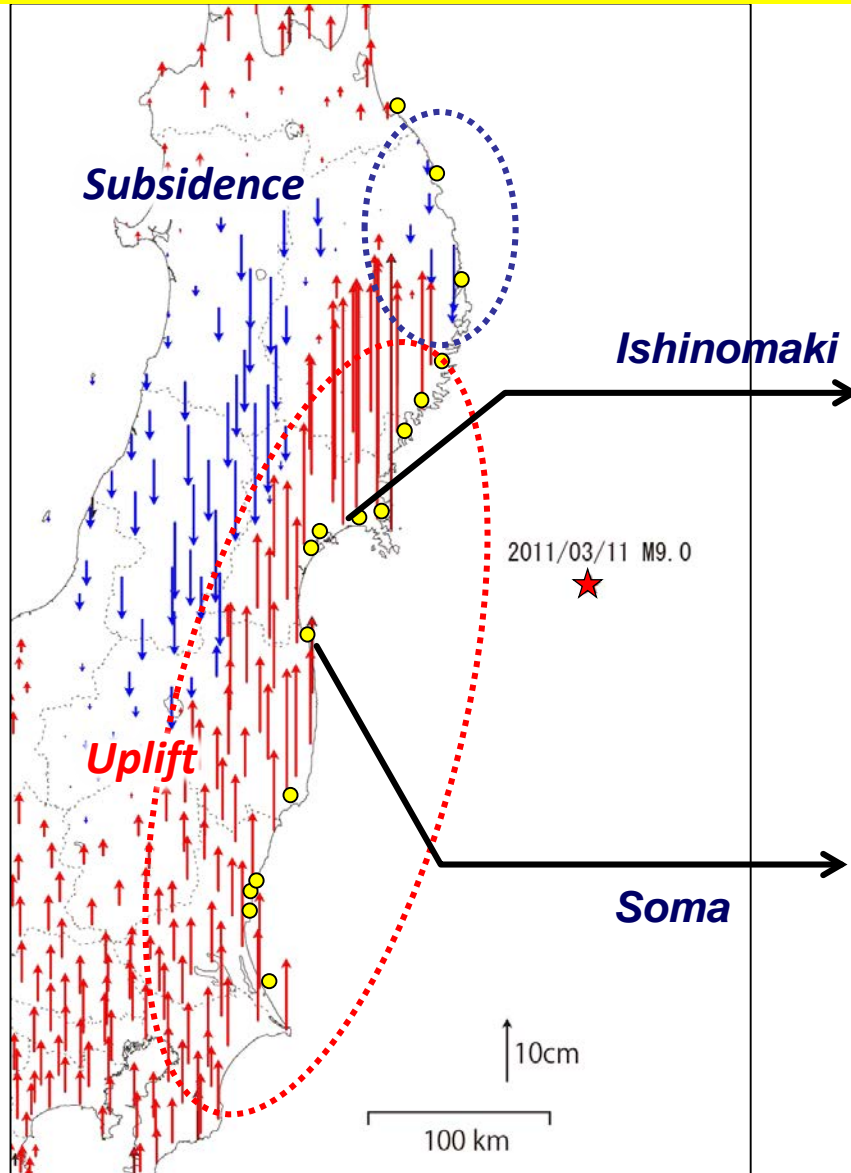
Survey after the earthquake

The 1st chart revision for the 15 major ports had been completed by Sept. 2012.

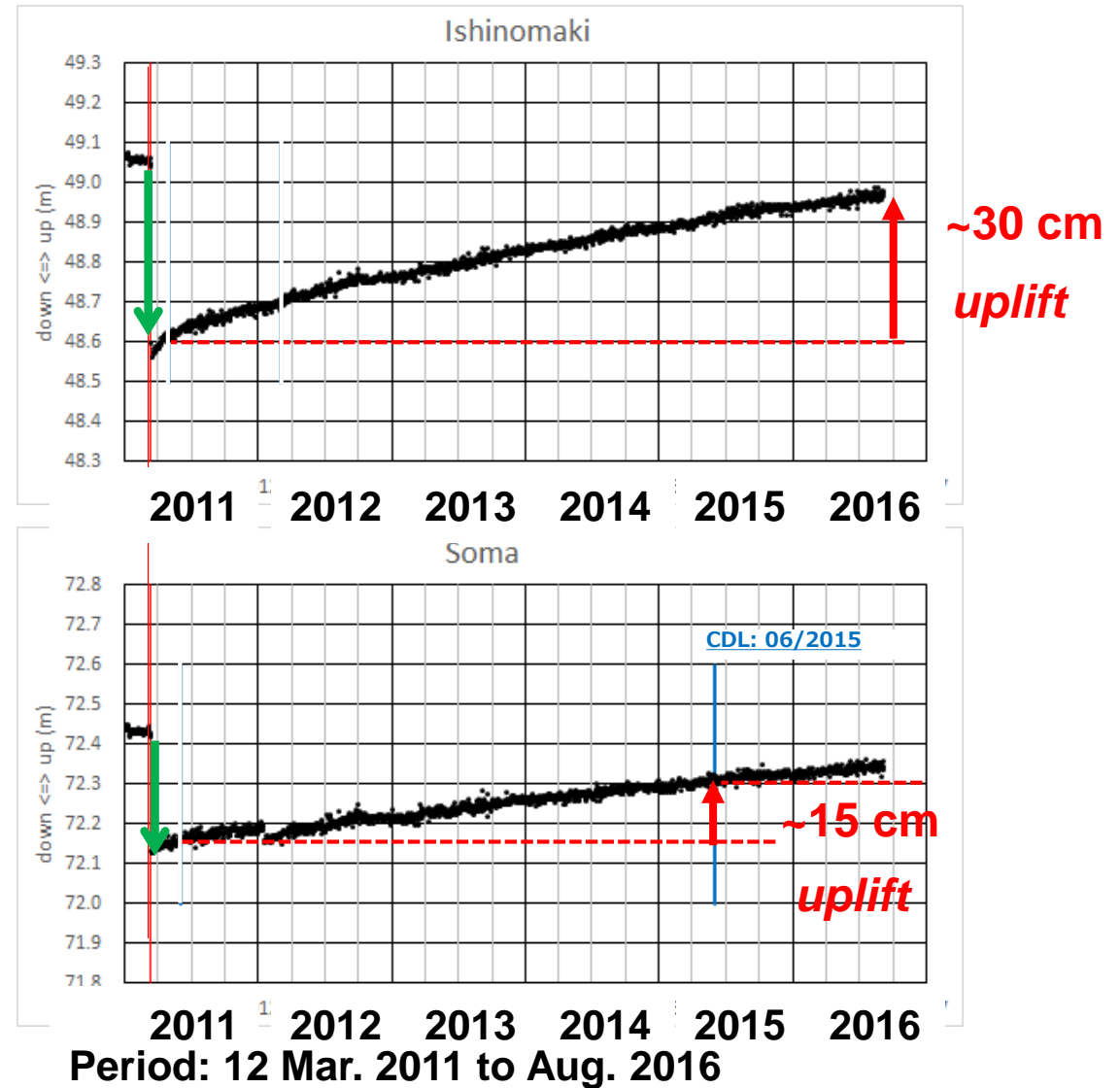


## Time series of vertical crustal movement

March 11, 2011

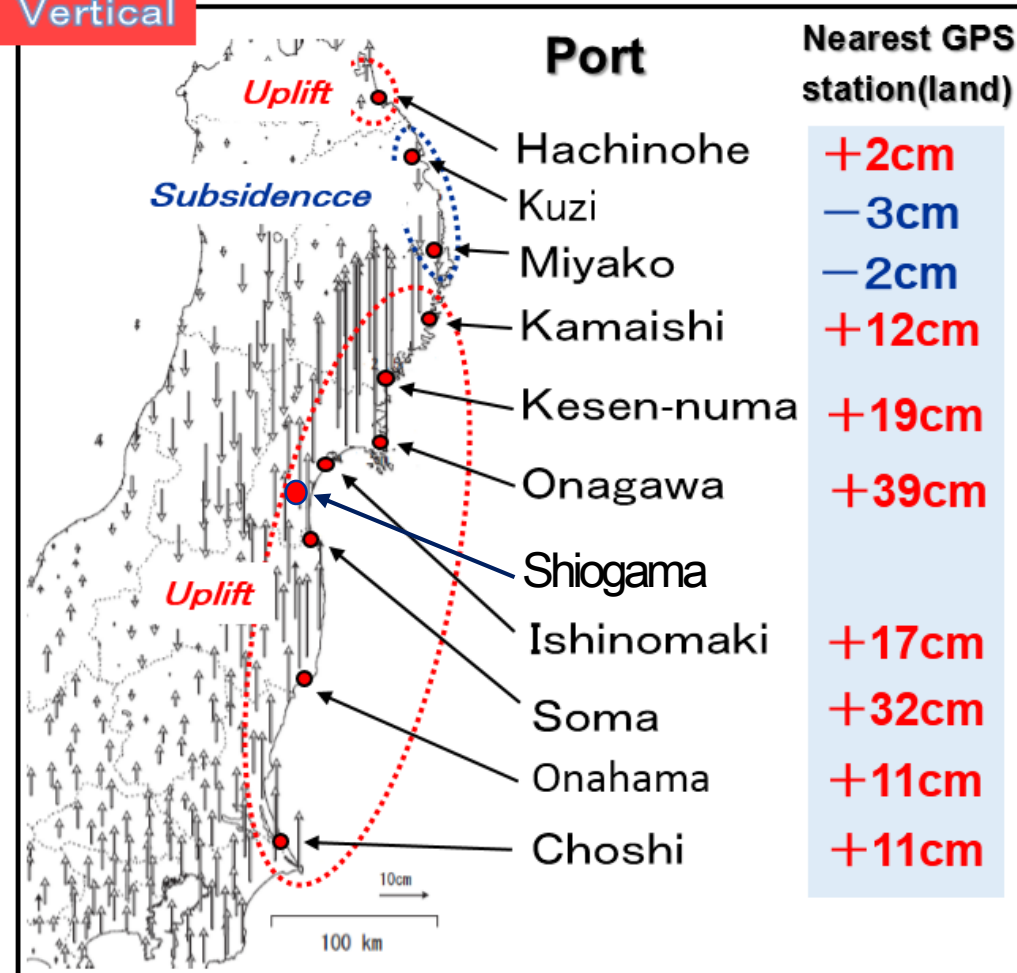


Data: GNSS network "GEONET" (by GSI)

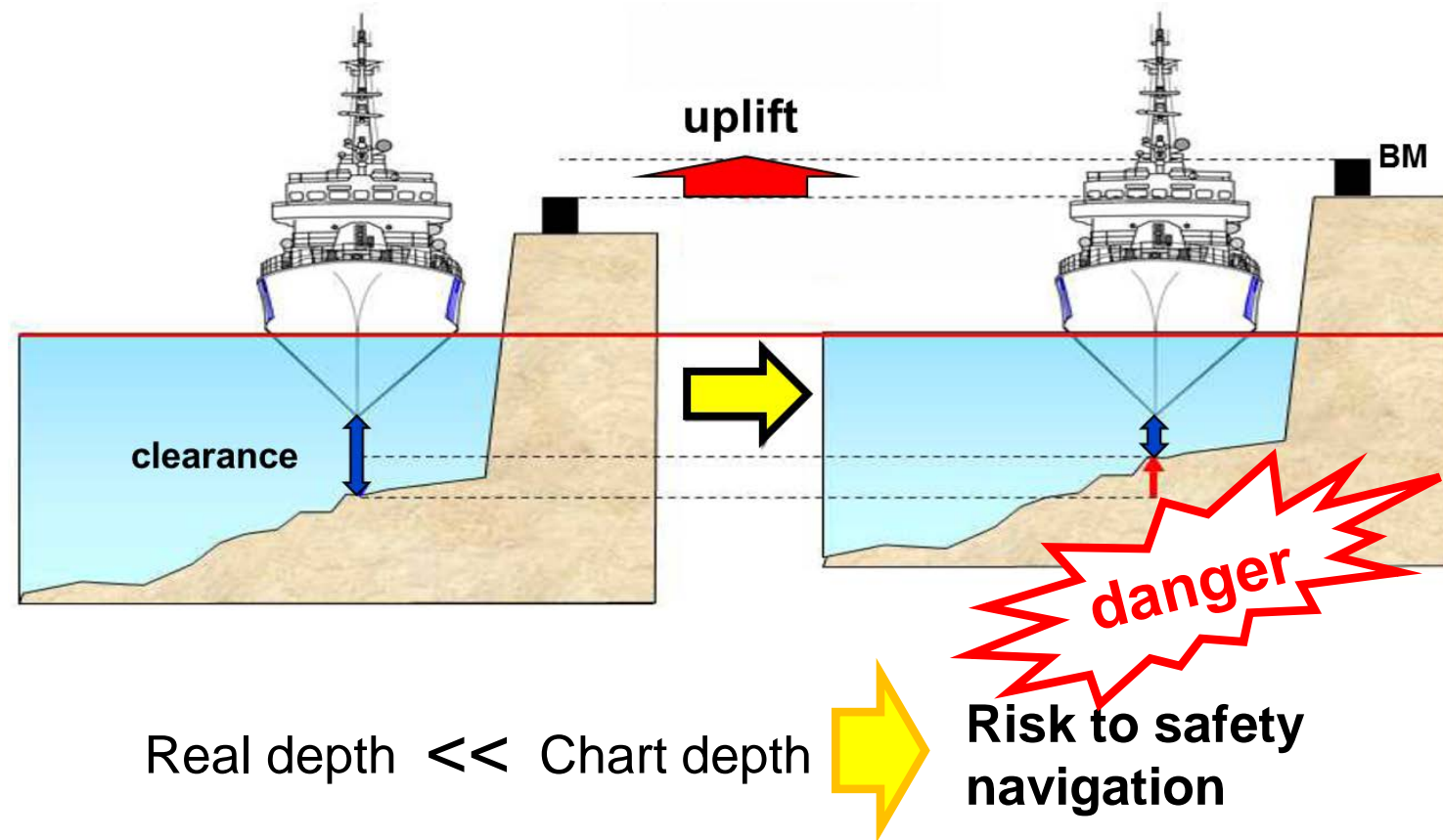




Vertical



Vertical Displacement (12 Mar. 2011 – 28 Apr. 2015)



Post-seismic movement is anticipated to continue for further several years.

- Uniform correction to the soundings

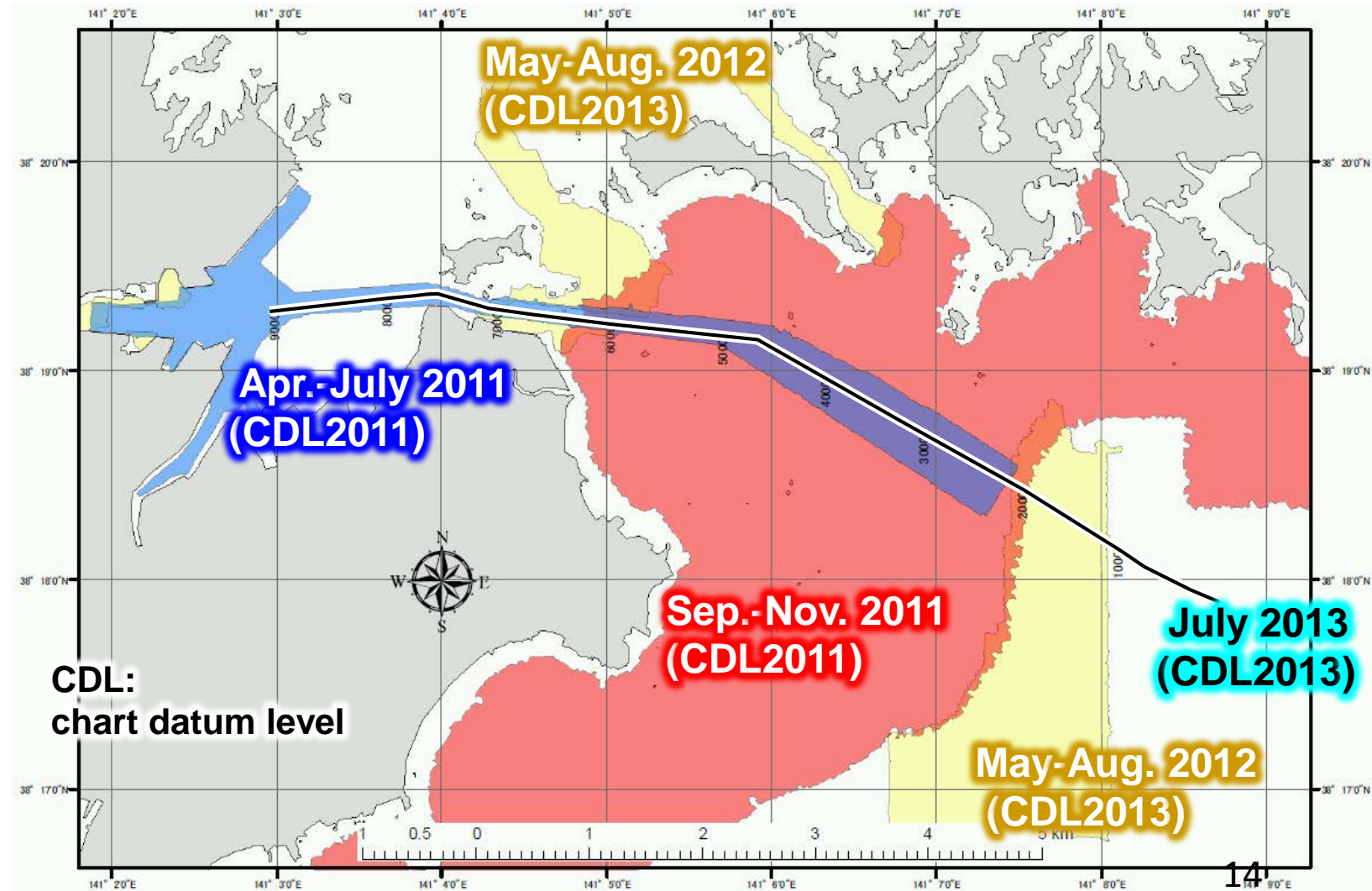
CDL Revision



Test Survey



Depth correction applied to existing sounding data in 2013. (from CDL2011 to CDL2013)

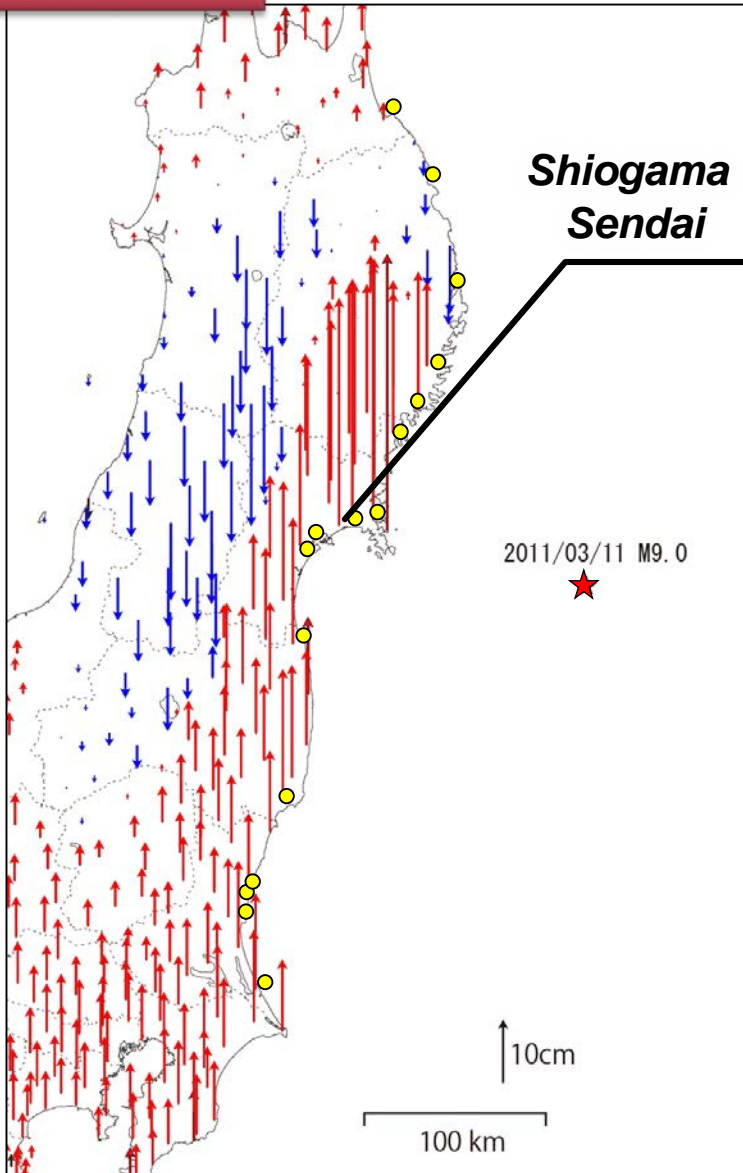


Test survey in July 2013

(Shiohama port)

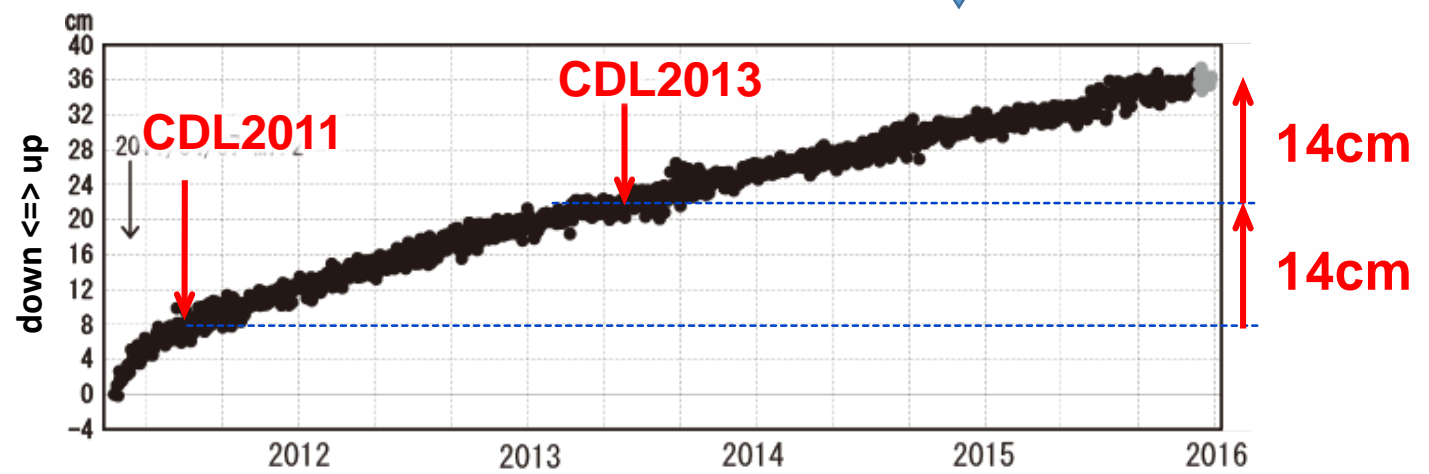
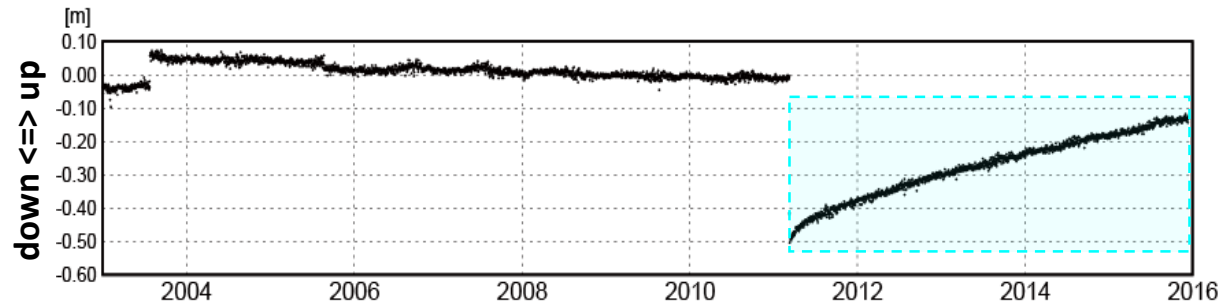


## Vertical



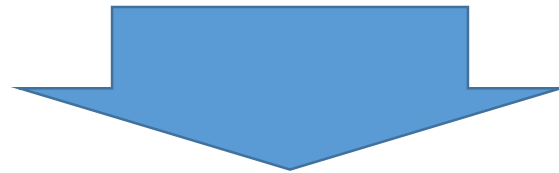
Data: GNSS network "GEONET" (by GSI)

## Current Situation on CDL Revision



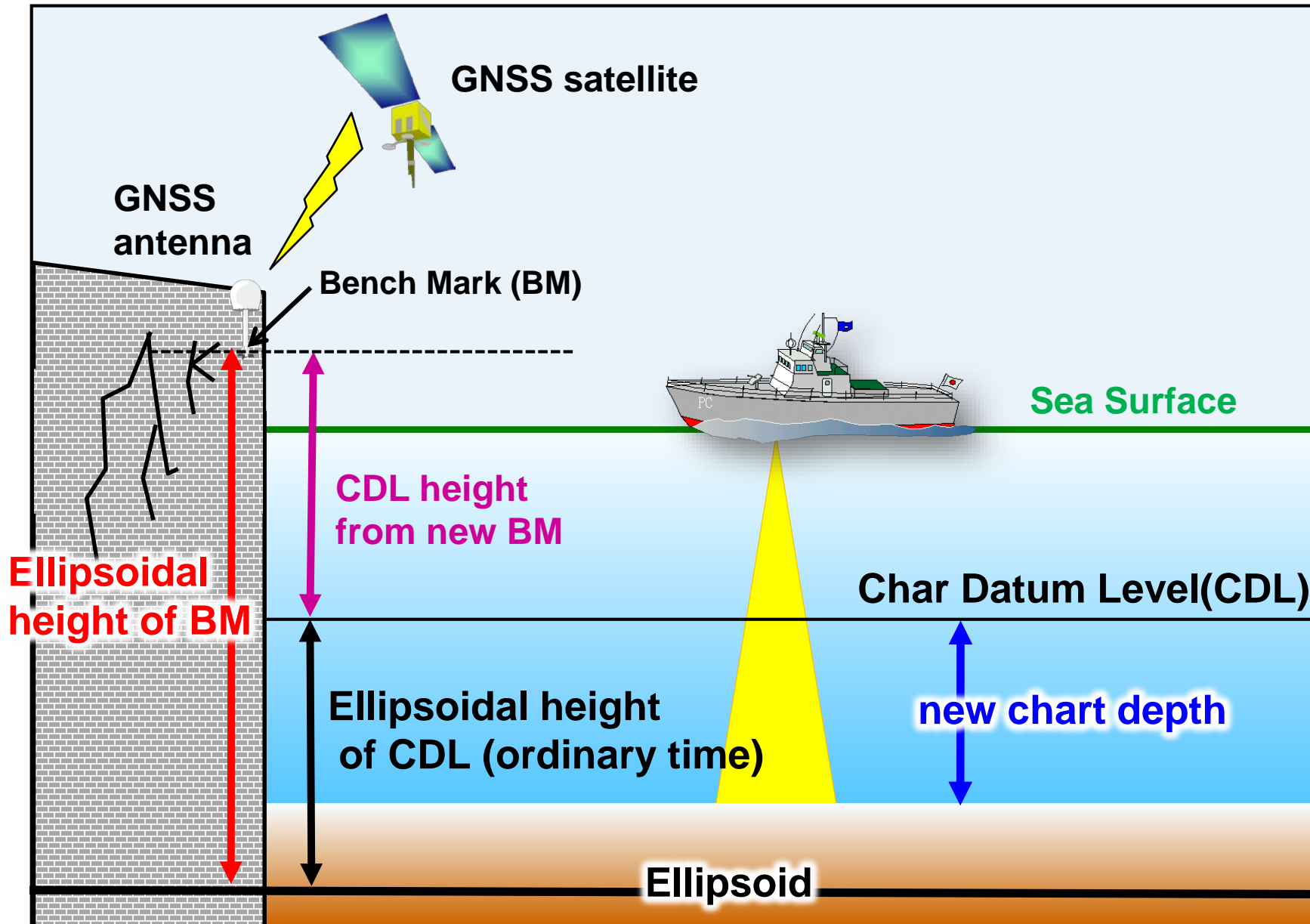
## Experience of the 2011 disaster

- CDL were lost because many tide stations or BMs were destroyed or missed, but
- CDL re-determination based on tide observation for the initial obstruction survey was not practical at the time of disaster in light of the quickness required, then
- We had to re-survey the same areas for chart revision.



**Geodetic survey project to determine ellipsoidal height of CDLs**





## CDL height from BM

Tide observation  
for 1 month

GNSS survey  
for 6 hours

speedy sounding  
data acquisition

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# 3rd UN World Conference on Disaster Risk Reduction (WCDRR3)

- Date** : 14-18 March 2015
- Venue** : Sendai, Japan
- Participants** :
- over 6,500 participants including 2,800 government representatives from 187 UN member states

## **Side Events :**

- over 143,000 visitors to;
- 150 intergovernmental and multi-stakeholder events,
- over 350 side events in the public forum.

## **Action by IHO:**

Statement of IHO was given by JHOD as a representative of IHO

## **Outcomes of WCDRR3:**

Sendai Framework for Disaster Risk Reduction 2015-2030 including key activities under 4 priority areas;

1. Understanding disaster risk,
2. Strengthening disaster risk governance,
3. Investigating in disaster risk reduction and,
4. Enhancing disaster preparedness



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## JAPAN's PROPOSAL:

### Amendment of IHO Resolution

**“ IHO RESPONSE TO MARINE DISASTERS AND CONSTRUCTION TO PREVENTION AND ALERT SYSTEMS “ on Response to Disasters**



Based on experiences after the Great East Japan Earthquake 2011 and new perspectives by the Sendai Framework adopted in the WCDRR3 in 2015.

- I. To cooperate in development and implementation of the restoration plans for the damaged coastal areas and the strategies for disaster risk reduction at ordinary times**
- II. To plan and organize capacity building activities to enhance disaster management**
- III. To beforehand consider and prepare a support to the damaged country by future huge disasters**
- IV. To consider impacts on the change of the ground level by post-seismic crustal deformation in the case of the earthquake**
- V. To participate in monitoring disaster risk and research and development activities**
- VI. To promote the collection, analysis, management and use of relevant data for disaster risk reduction**



Thank you  
for your kind attention!

