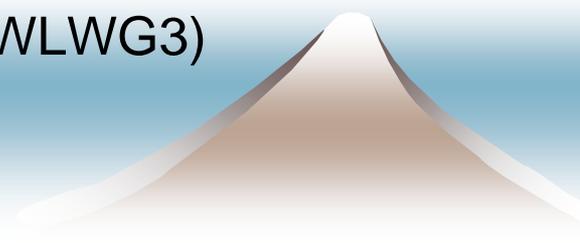


National Presentation
Tidal Observation in Japan
and
3.11 Earthquake

Yoshiharu Nagaya

Environmental and Oceanographic Research Division
Hydrographic and Oceanographic Department
Japan Coast Guard

Tidal and Water Level Working Group (TWLWG3)
5th Apr. 2011

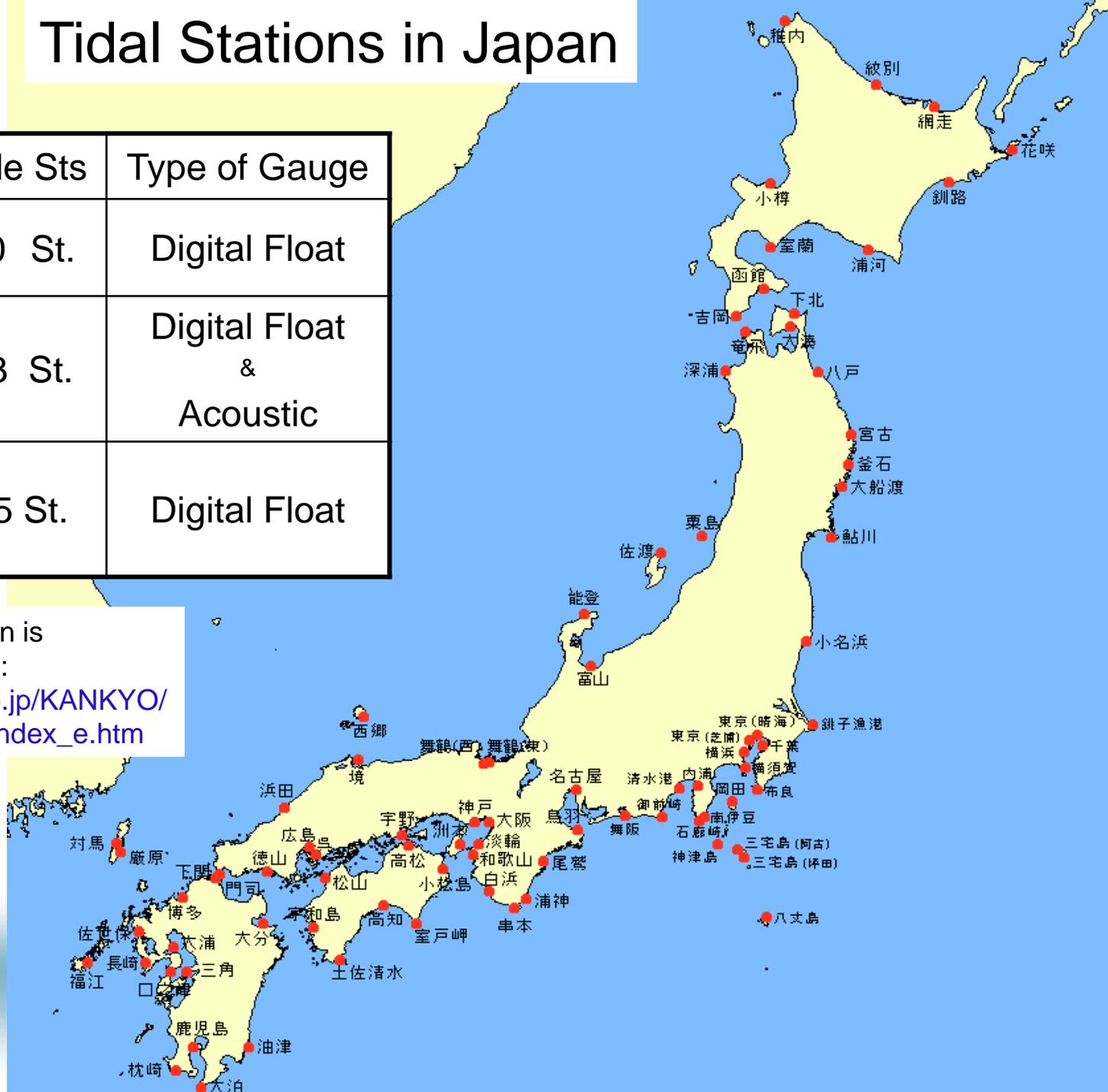


Tidal Stations in Japan

	Tide Sts	Type of Gauge
JCG Japan Coast Guard	20 St.	Digital Float
JMA Meteorological Agency	73 St.	Digital Float & Acoustic
GSI Geographical Survey Institute	25 St.	Digital Float

Real-time tidal information is available via the web site:

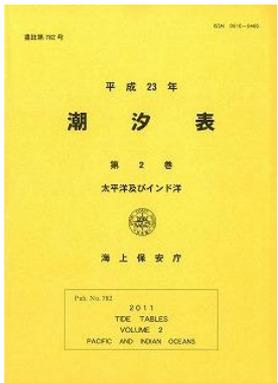
http://www1.kaiho.mlit.go.jp/KANKYO/TIDE/real_time_tide/sel/index_e.htm



Publication and Data Archive

“2012 Tide Tables Vol. 1, Japan and its vicinities” Mar. 2011
Tidal predictions for 71 major ports
Tidal current predictions for 20 major straits

“2011 Tide Tables Vol. 2, Pacific and Indian Oceans” Sep. 2010.
Tidal predictions for 53 major ports
Tidal current predictions for 5 major strait points.



“Tidal currents charts”

Current patterns for flood and ebb tides
in 12 major straits



Tidal data are archived
by Japan Oceanographic
Data Center (JODC)
and opened on the inter-
net.

International Project

- [NEAR-GOOS](#)
- [IOC/WESTPAC](#)
- [PICES](#)
- [CLIVAR](#)
- [GEOTRACES](#)
- [Others project](#)

About JODC

- [Introduction](#)
- [Organization](#)
- [Activities](#)
 - [Data](#)
 - [Information](#)
 - [International](#)
 - [Digital Publications](#)
- [Access to JODC](#)
- [Location map](#)

Online Data (J-DOSS)

[Go to J-DOSS.](#)

J-DOSS

Oceanographic Data and Information download service (Temperature, Current, Depth, Biology, Marine information)

NEWS

New Addition : Mar 31, 2011

[NEAR-GOOS RDMDB](#) was updated.
The 30sec. interval sea level data at tide station, Japan Coast Guard.

New Addition : Mar 31, 2011

Addition of [Ocean Current Data](#)

- observed by JCG from 2006 to 2008,
- observed by Mie prefecture from 2009 to 2010.

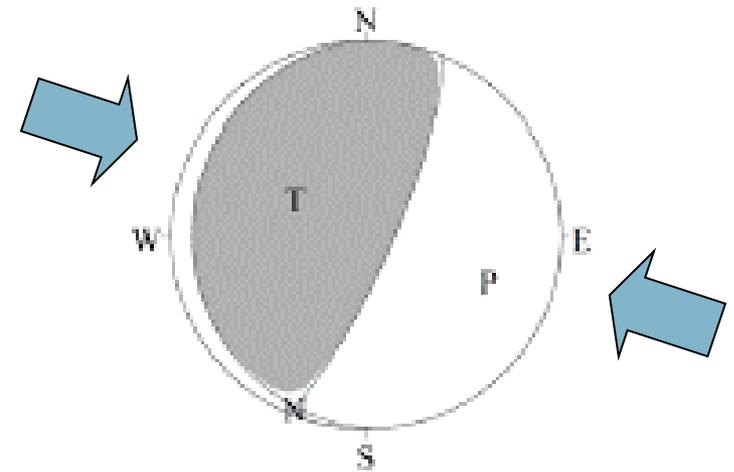
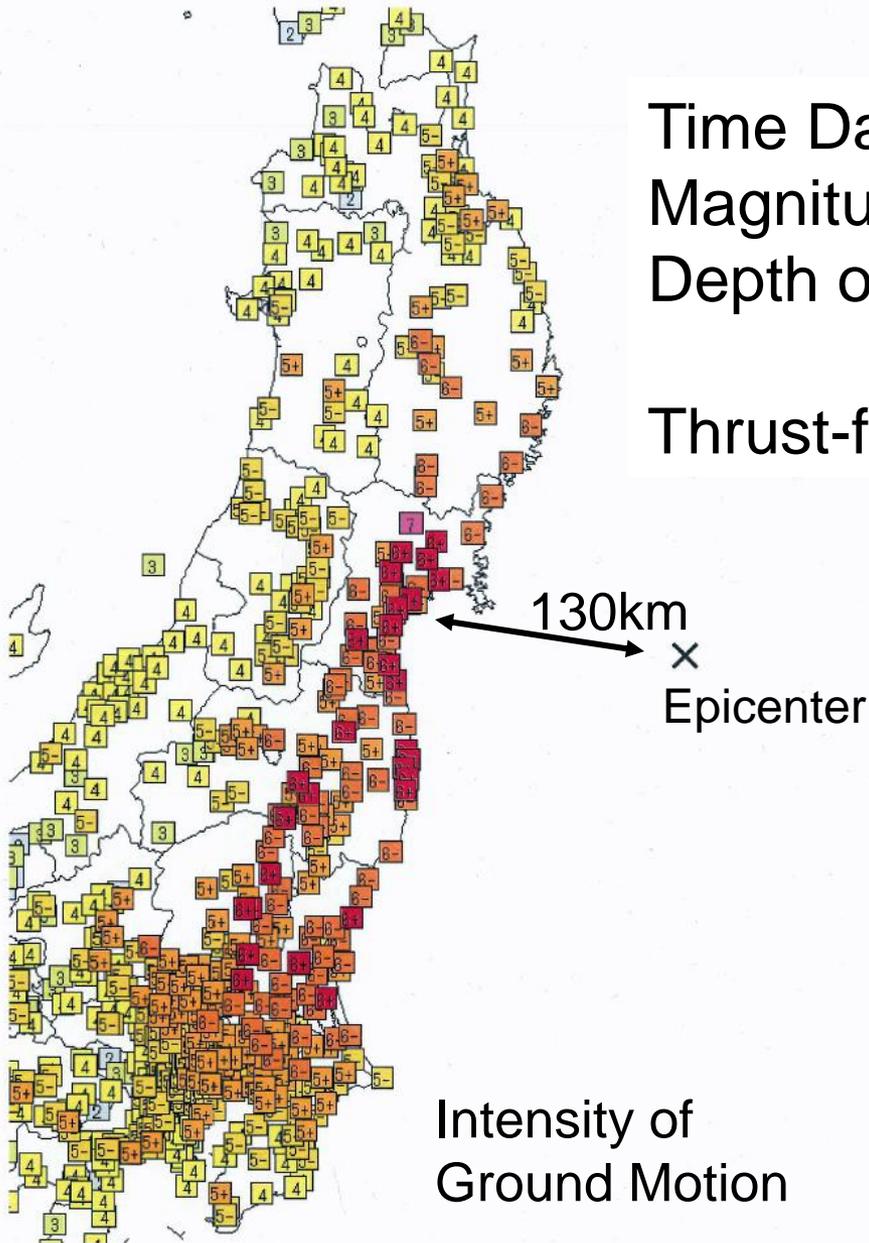
The 2011 Off the Pacific Coast of NE Japan Earthquake

Time Date 14:46 March 11, 2011 (Local T.)

Magnitude 9.0

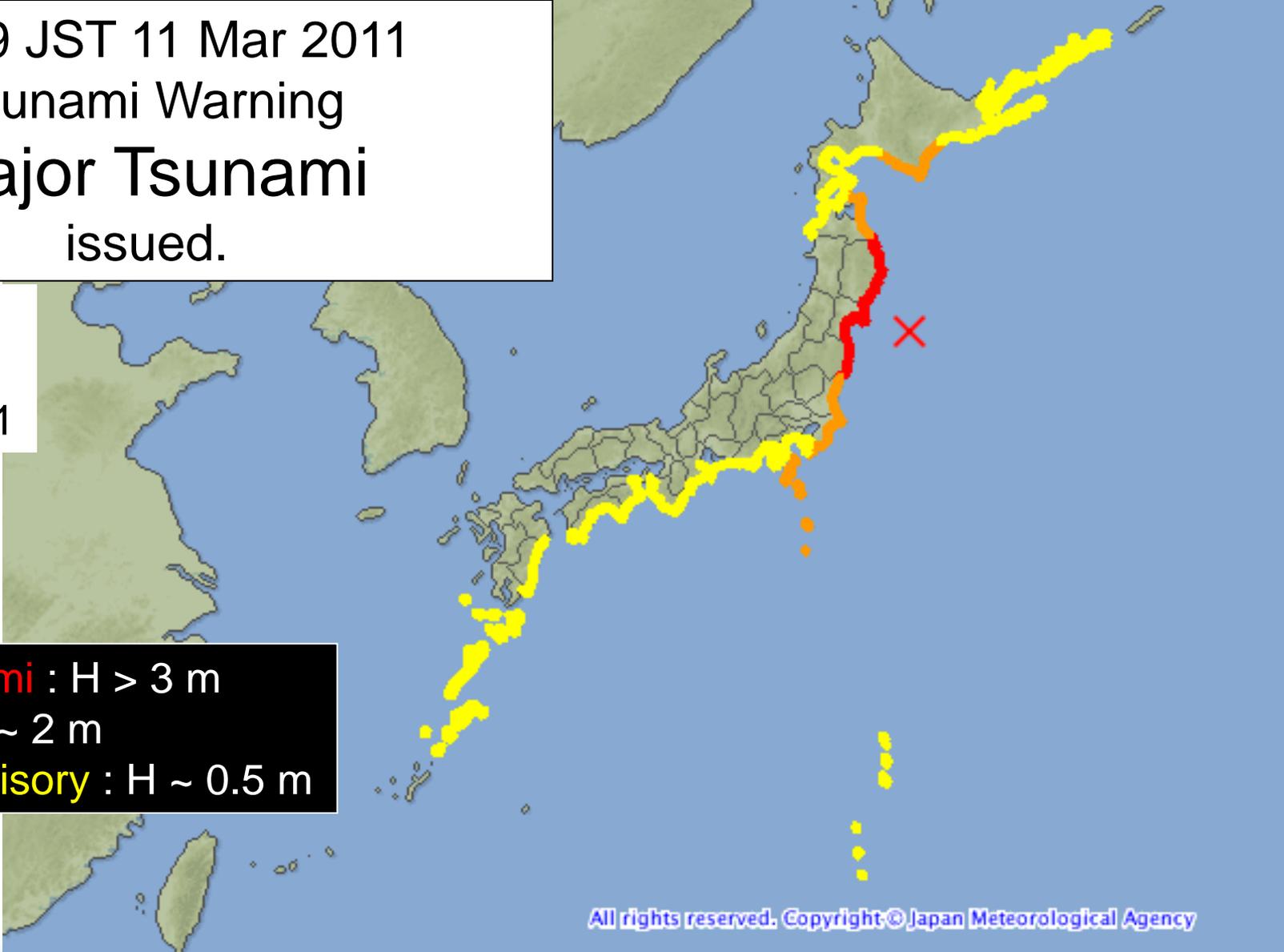
Depth of Epicenter: 25 km

Thrust-fault earthquake on plate boundary



14:49 JST 11 Mar 2011
Tsunami Warning
Major Tsunami
issued.

Earthquake
occurred at
14:46 Mar. 11



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Tsunami Warning

Tsunami Advisory

Notes

Major Tsunami

Tsunami height is estimated to be 3 meters or more

Yellow

Tsunami height is estimated to be about 0.5 meter

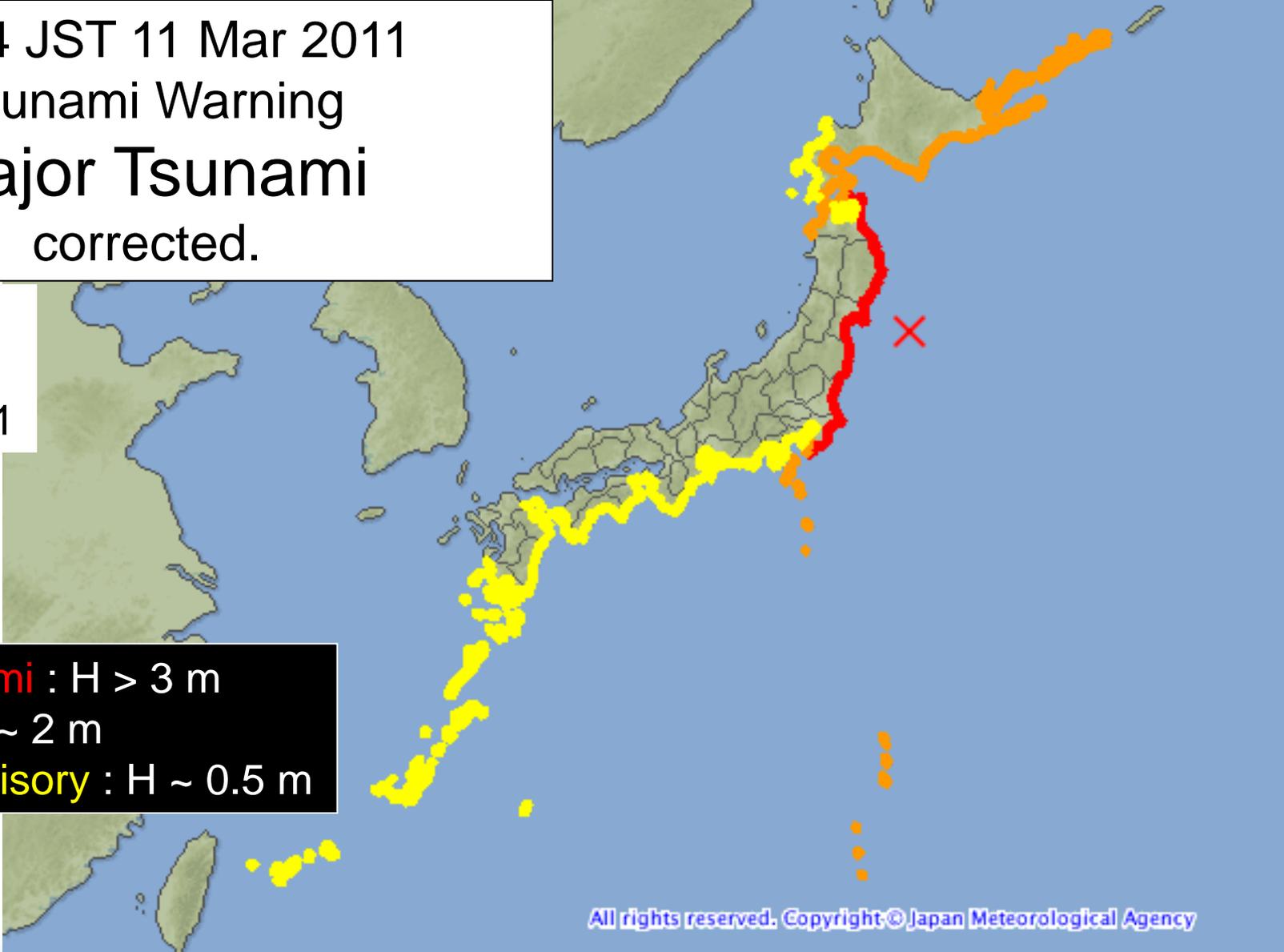
Tsunami

Tsunami height is estimated to be about 2 meters

Red X Epicenter

15:14 JST 11 Mar 2011
Tsunami Warning
Major Tsunami
corrected.

Earthquake
occurred at
14:46 Mar. 11



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Tsunami Warning

Tsunami Advisory

Notes

Major Tsunami

Tsunami height is estimated to be 3 meters or more

Tsunami

Tsunami height is estimated to be about 2 meters



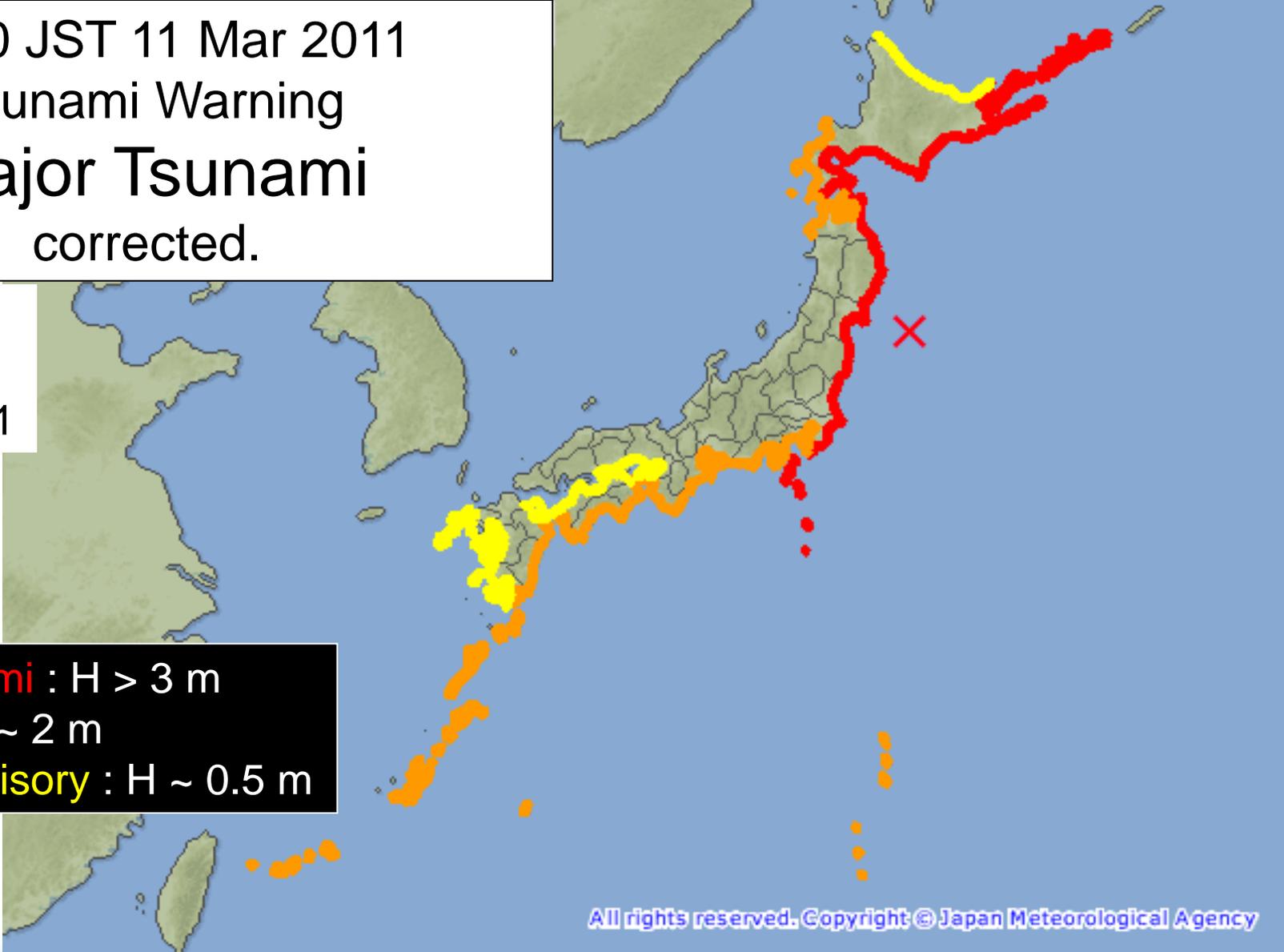
Tsunami height is estimated to be about 0.5 meter



Epicenter

15:30 JST 11 Mar 2011
Tsunami Warning
Major Tsunami
corrected.

Earthquake
occurred at
14:46 Mar. 11



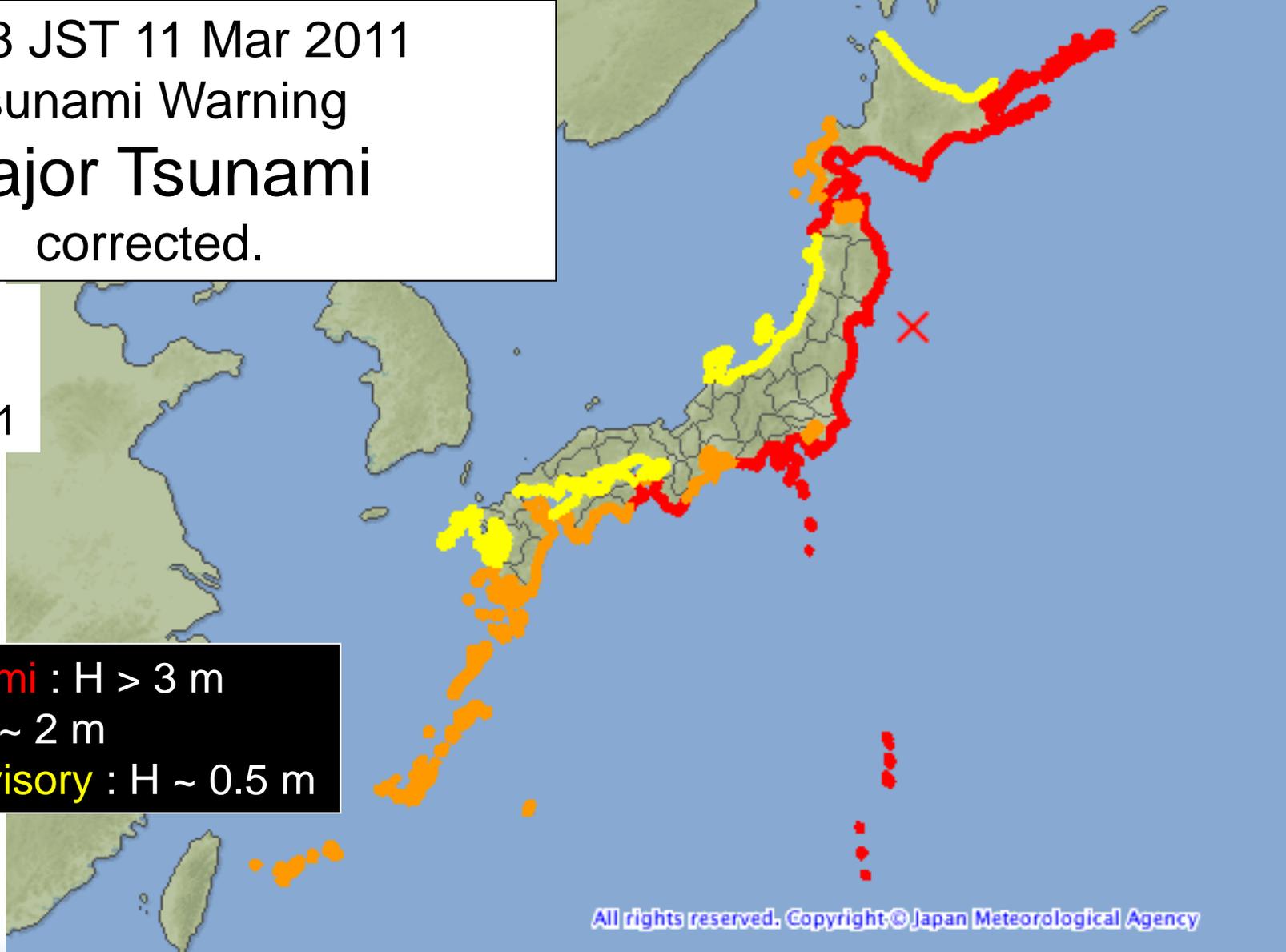
All rights reserved. Copyright © Japan Meteorological Agency

Major Tsunami : H > 3 m
Tsunami : H ~ 2 m
Tsunami Advisory : H ~ 0.5 m

Tsunami Warning		Tsunami Advisory	
Notes	Major Tsunami	Tsunami	Tsunami height is estimated to be about 0.5 meter
	Major Tsunami	Tsunami	Epicenter
		Tsunami	

16:08 JST 11 Mar 2011
Tsunami Warning
Major Tsunami
corrected.

Earthquake
occurred at
14:46 Mar. 11



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Tsunami Warning

Notes

Major Tsunami

Tsunami height is estimated to be 3 meters or more

Tsunami

Tsunami height is estimated to be about 2 meters

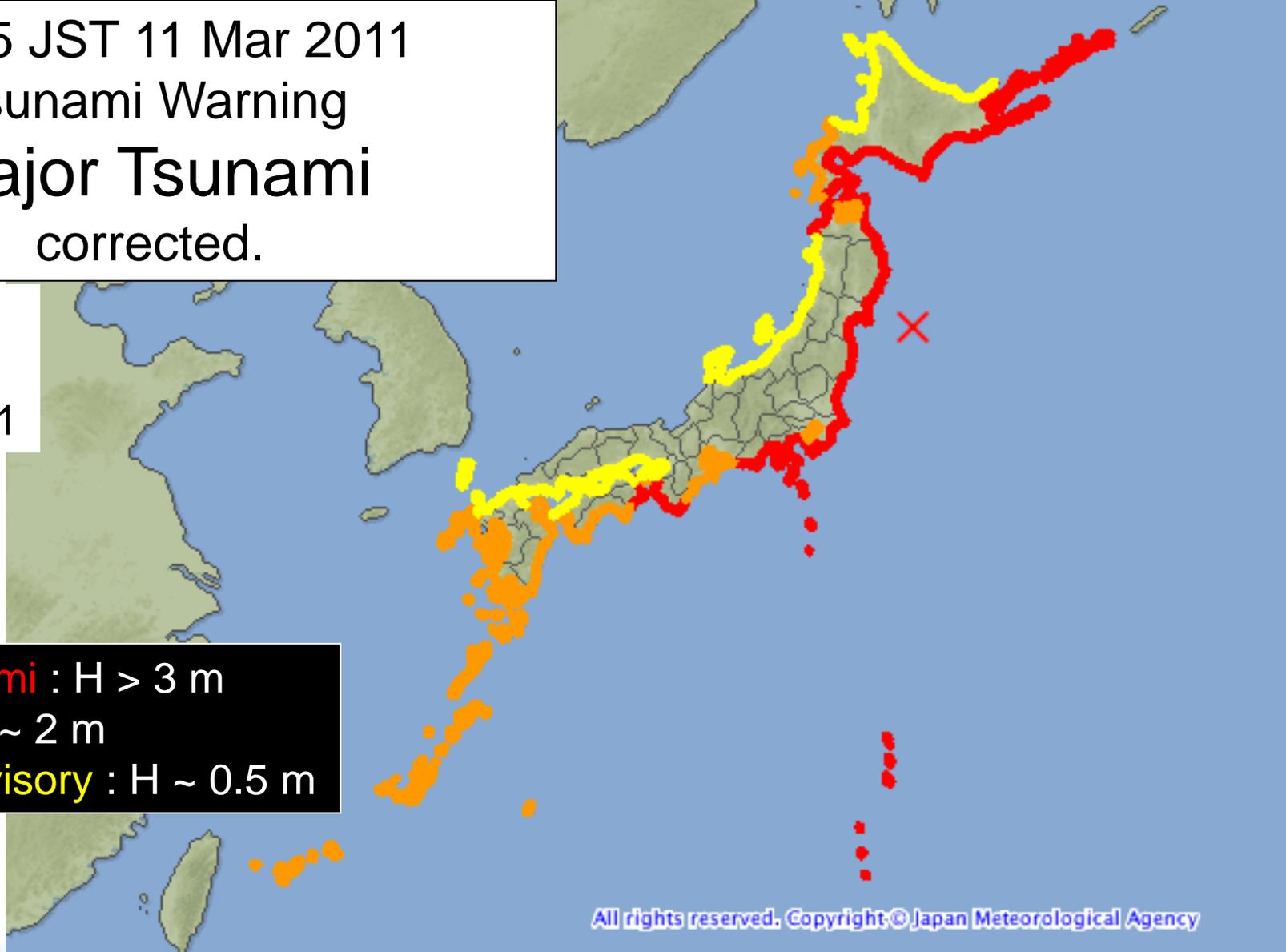
Tsunami Advisory

Tsunami Advisory
Tsunami height is estimated to be about 0.5 meter

X Epicenter

21:35 JST 11 Mar 2011
Tsunami Warning
Major Tsunami
corrected.

Earthquake
occurred at
14:46 Mar. 11



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Tsunami Warning

Major Tsunami Tsunami height is estimated to be 3 meters or more

Tsunami Tsunami height is estimated to be about 2 meters

Tsunami Advisory

Tsunami Advisory Tsunami height is estimated to be about 0.5 meter

X Epicenter

Notes

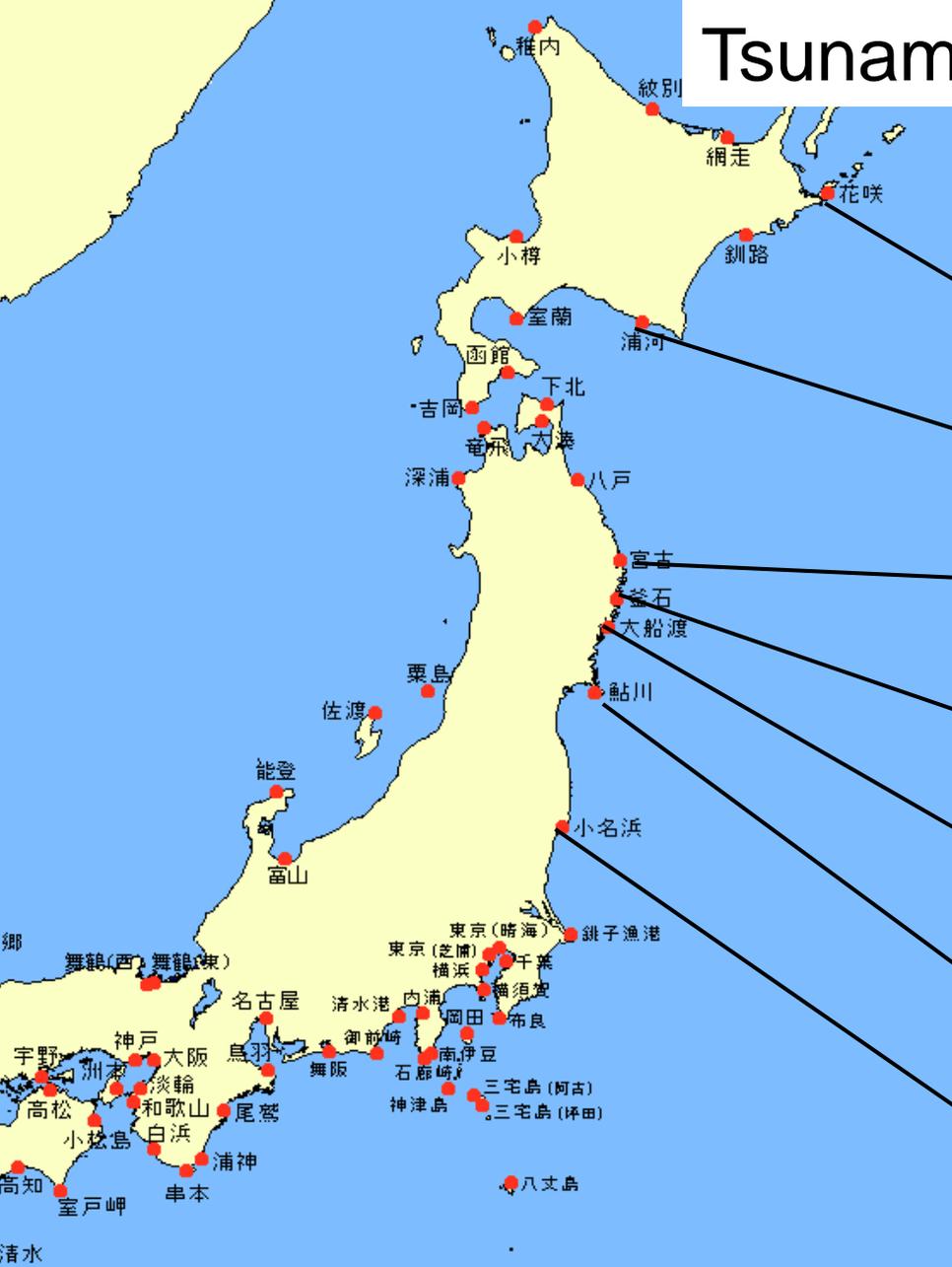
17:58 JST 13 Mar 2011

Tsunami Warnings and/or Advisories was cancelled.

Earthquake
occurred at
14:46 Mar. 11



Tsunami Observed at Tidal Stations



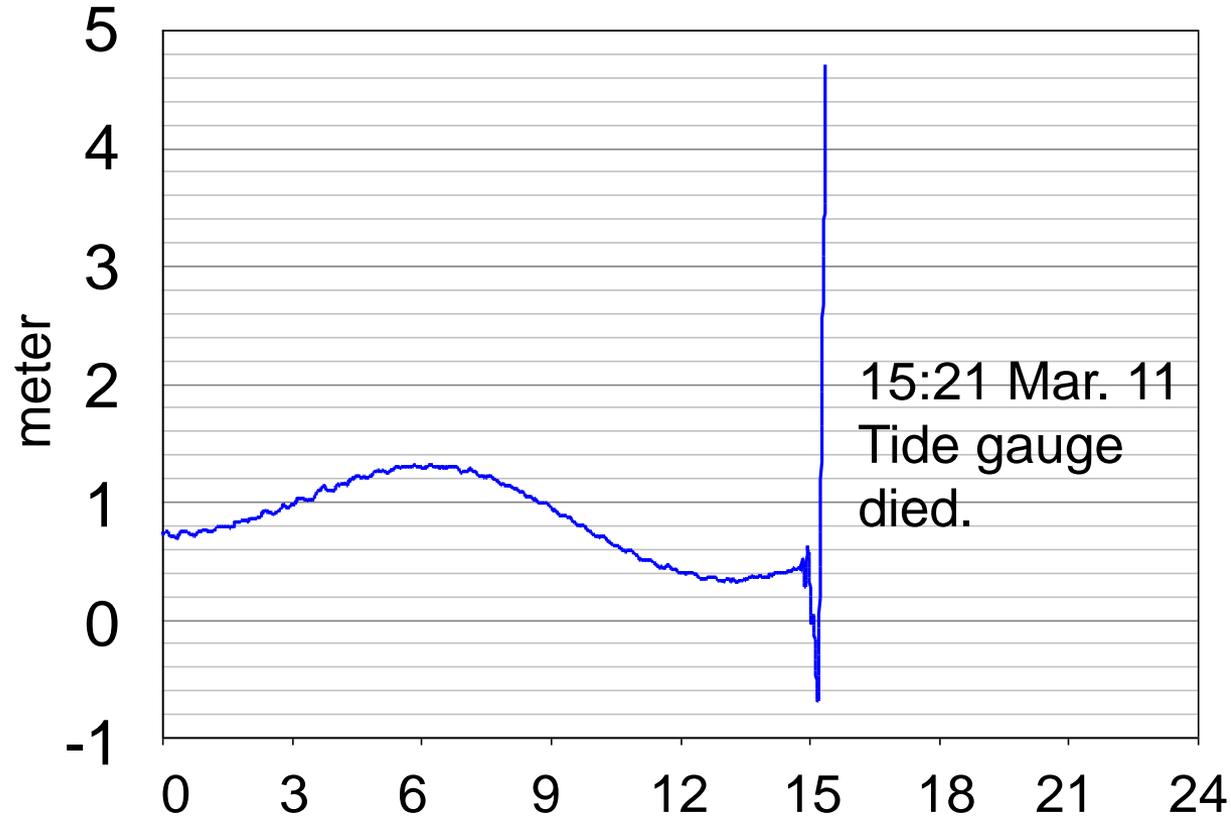
First Wave		Max. Wave	
15:54	0.1m	15:57	2.8m
15:19	0.2m	16:42	2.7m
14:48	0.2m	15:21	> 4.0m
14:46	0.1m	15:21	> 4.1m
14:46	0.2m	15:15	> 3.2m
14:46	0.1m	15:20	> 3.3m
14:55	1.8m	16:52	4.2m

Earthquake occurred at 14:46.

Tsunami Observed at Tidal Stations

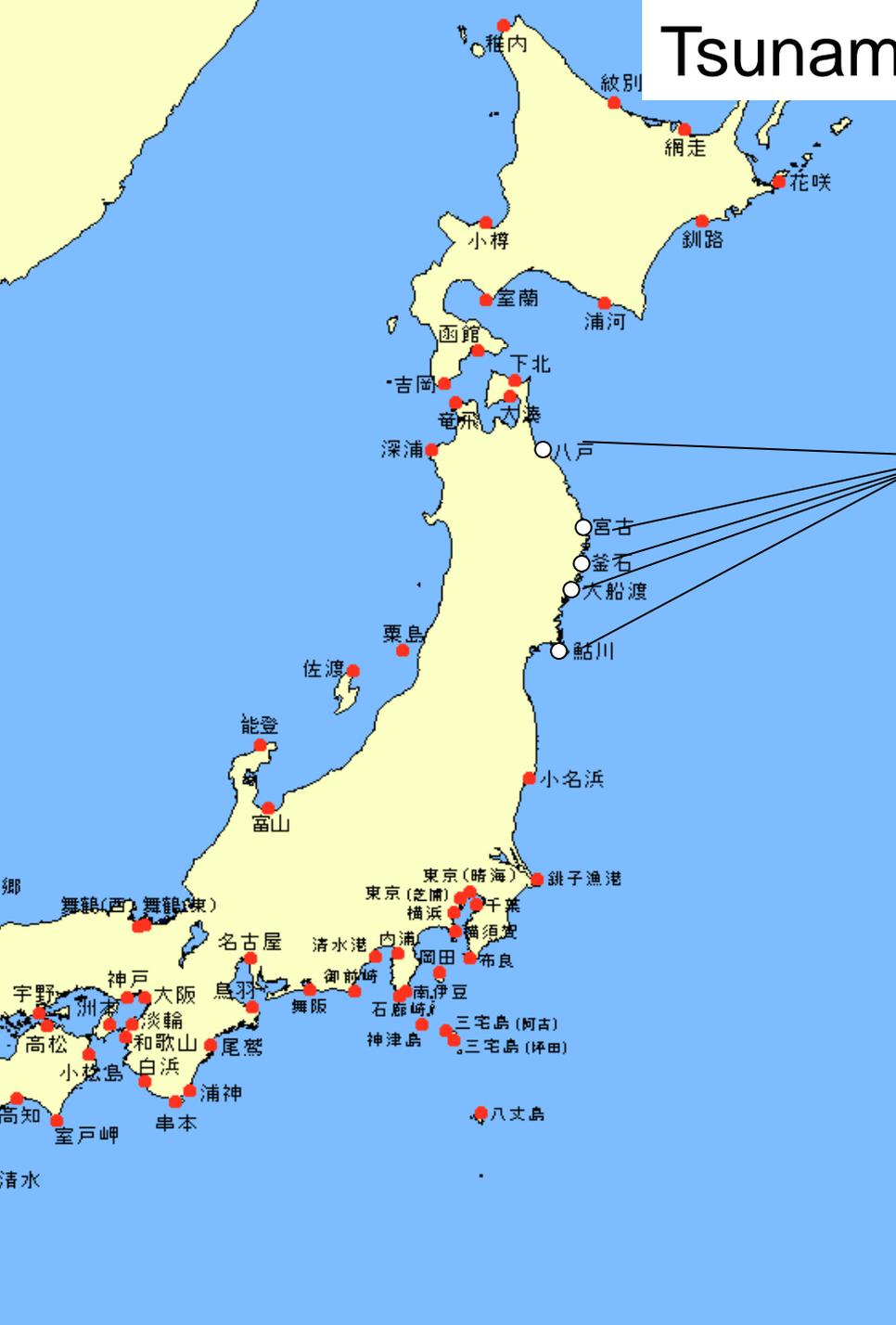


Tidal Records of Kamaishi St.

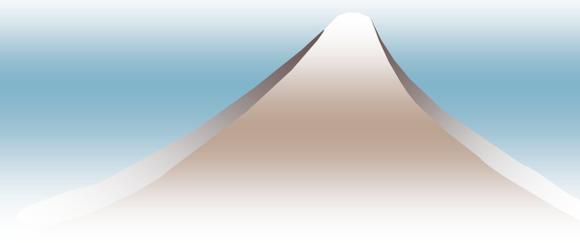


Earthquake occurred at 14:46.

Tsunami Observed at Tidal Stations



Function of these stations stopped due to the maximum wave.



Damaged Tidal Station (Kamaishi)

Before
the Eq.



After
the Eq.



Damaged Tidal Station (Kamaishi)

Before the Eq.

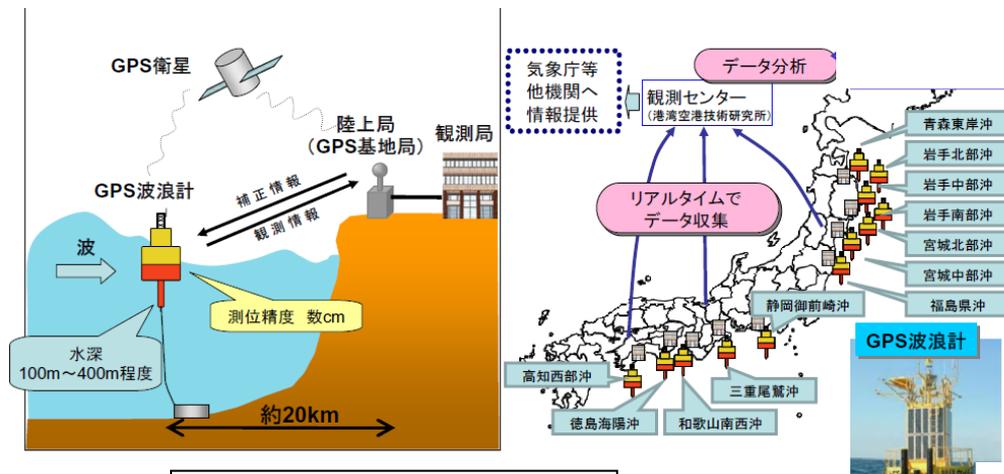


transmission real-time tide data

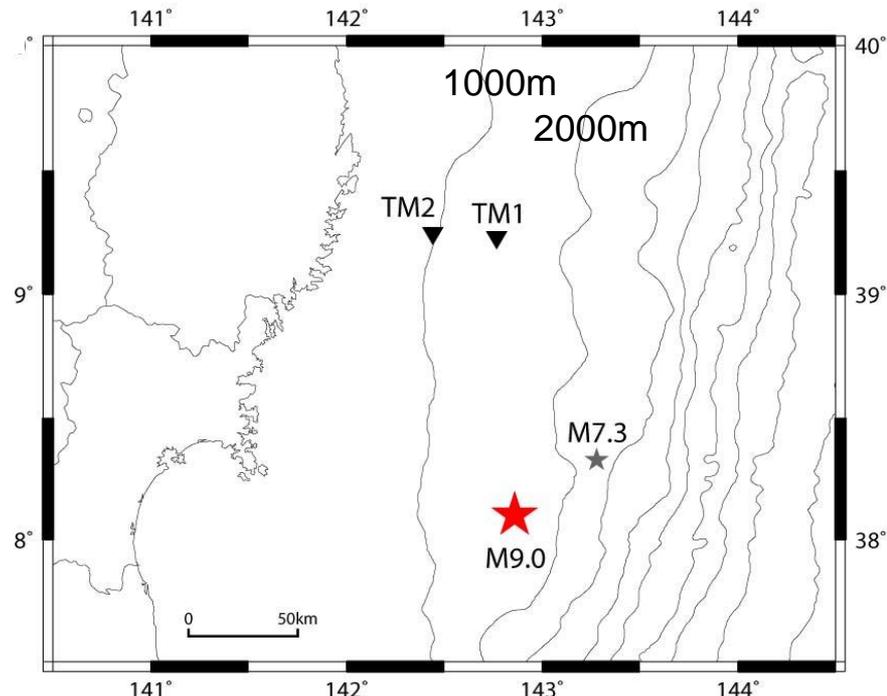
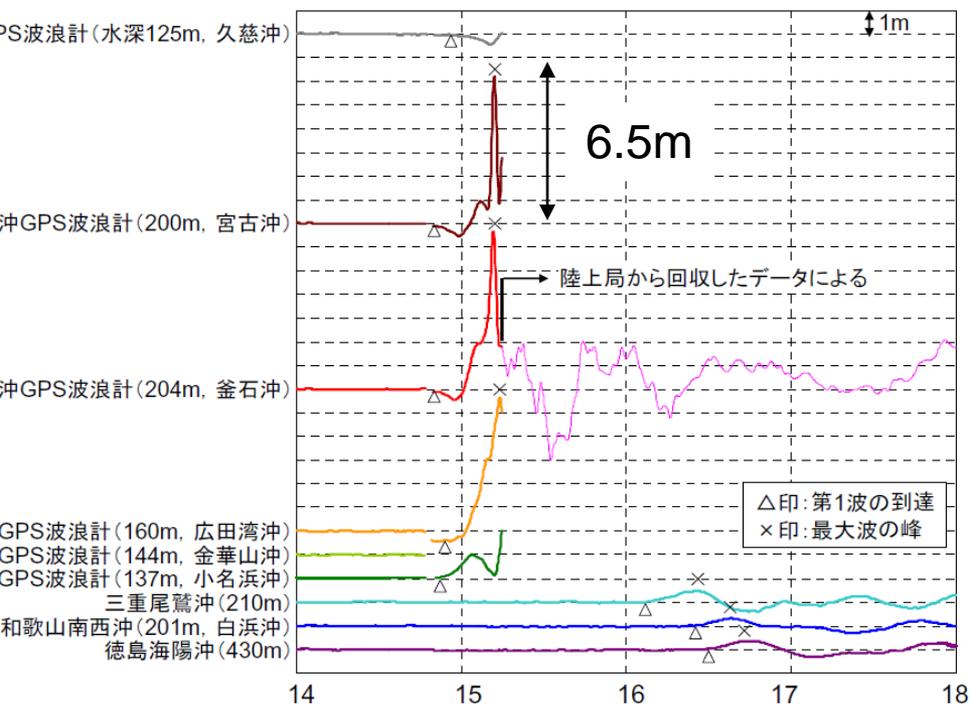
After the Eq.



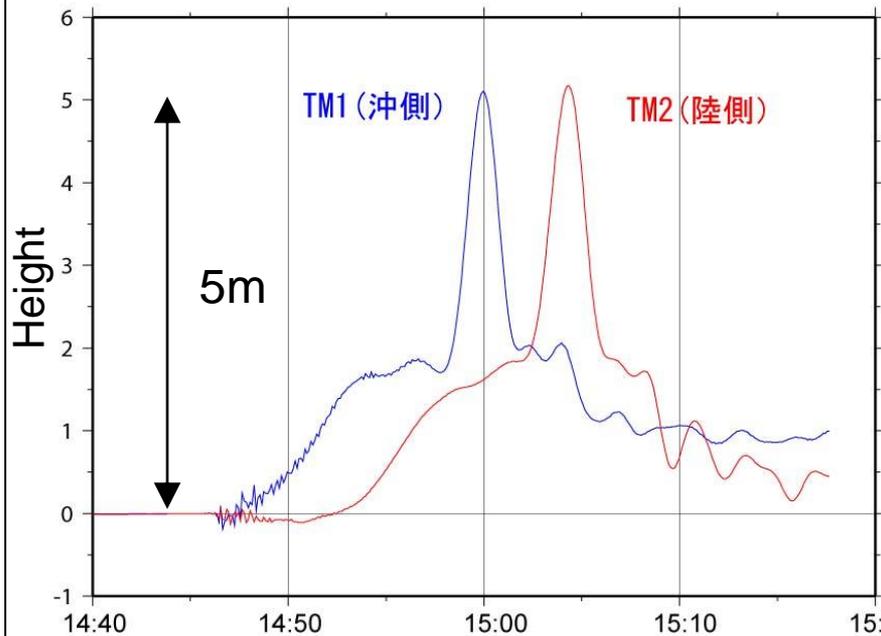
Offshore observations



1. GPS wavemeter



2. Submarine cabled pressure gauge



Many of major ports, local ports and fishery ports were largely damaged by this earthquake.

The earthquake also caused large ground deformation which amounted horizontally up to 5.3 m eastward and vertically up to 1.2 m downward.

For the recovery of the safe navigation, reproduction of relevant charts is the most urgent and important matter.

Now we are getting started with planning a hydrographic survey program including re-determination of level surface in these areas.

Although it would take several years to complete works, we do our best.

We sincerely thank you and your counties for helps and supports given to us quickly and extensively for this enormous disaster.

