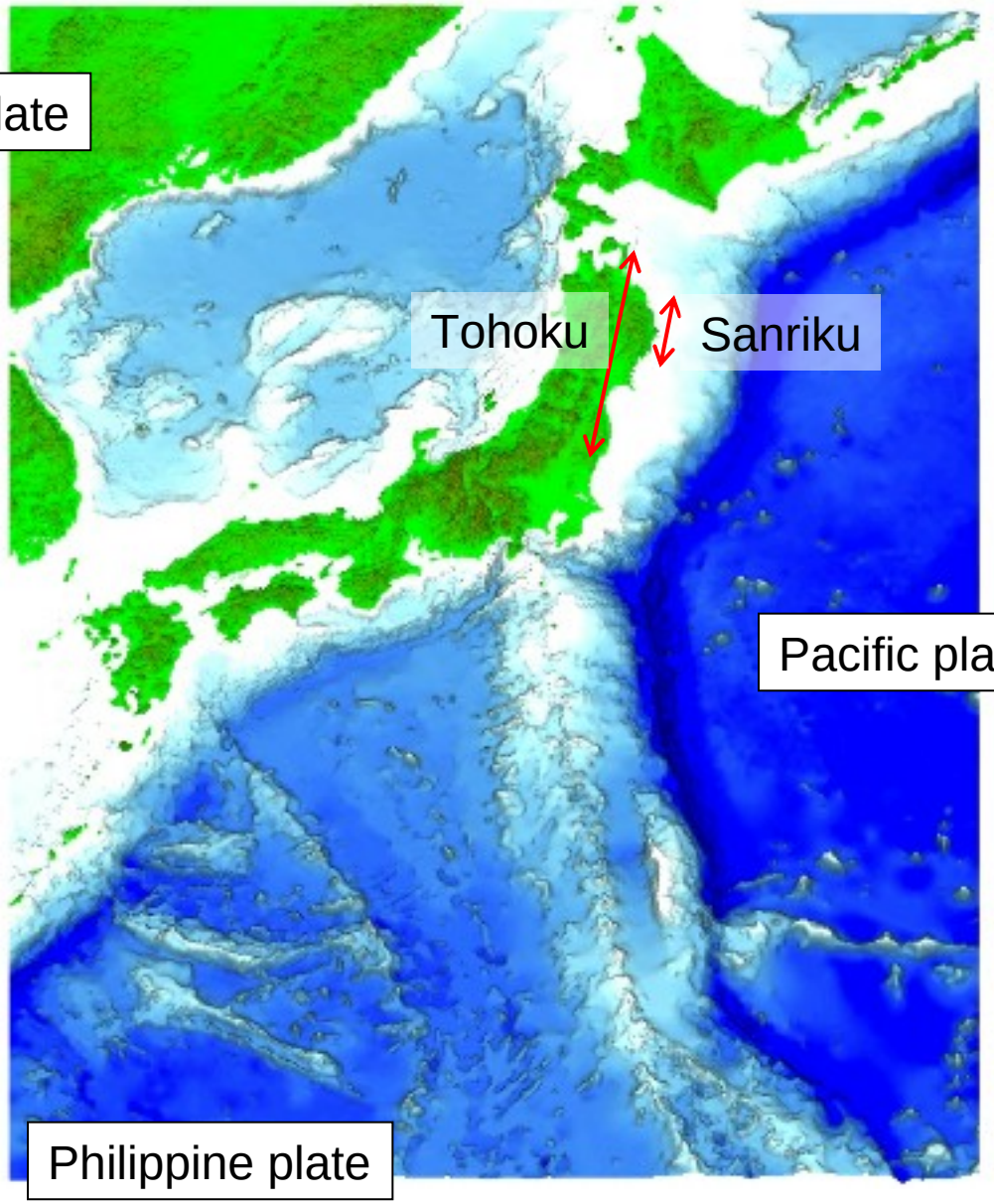
Tsunami around Japan

North American plate

Eurasian plate

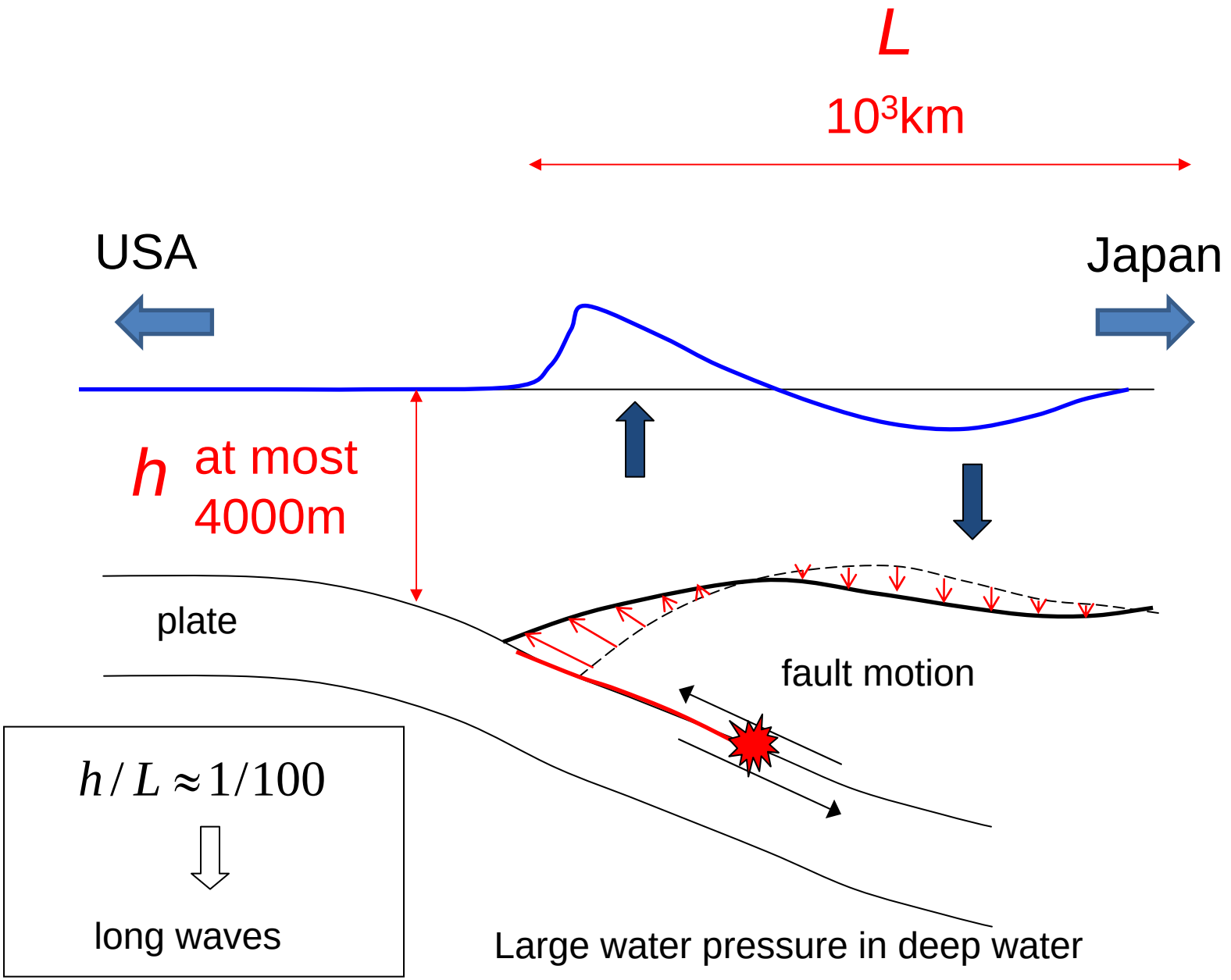


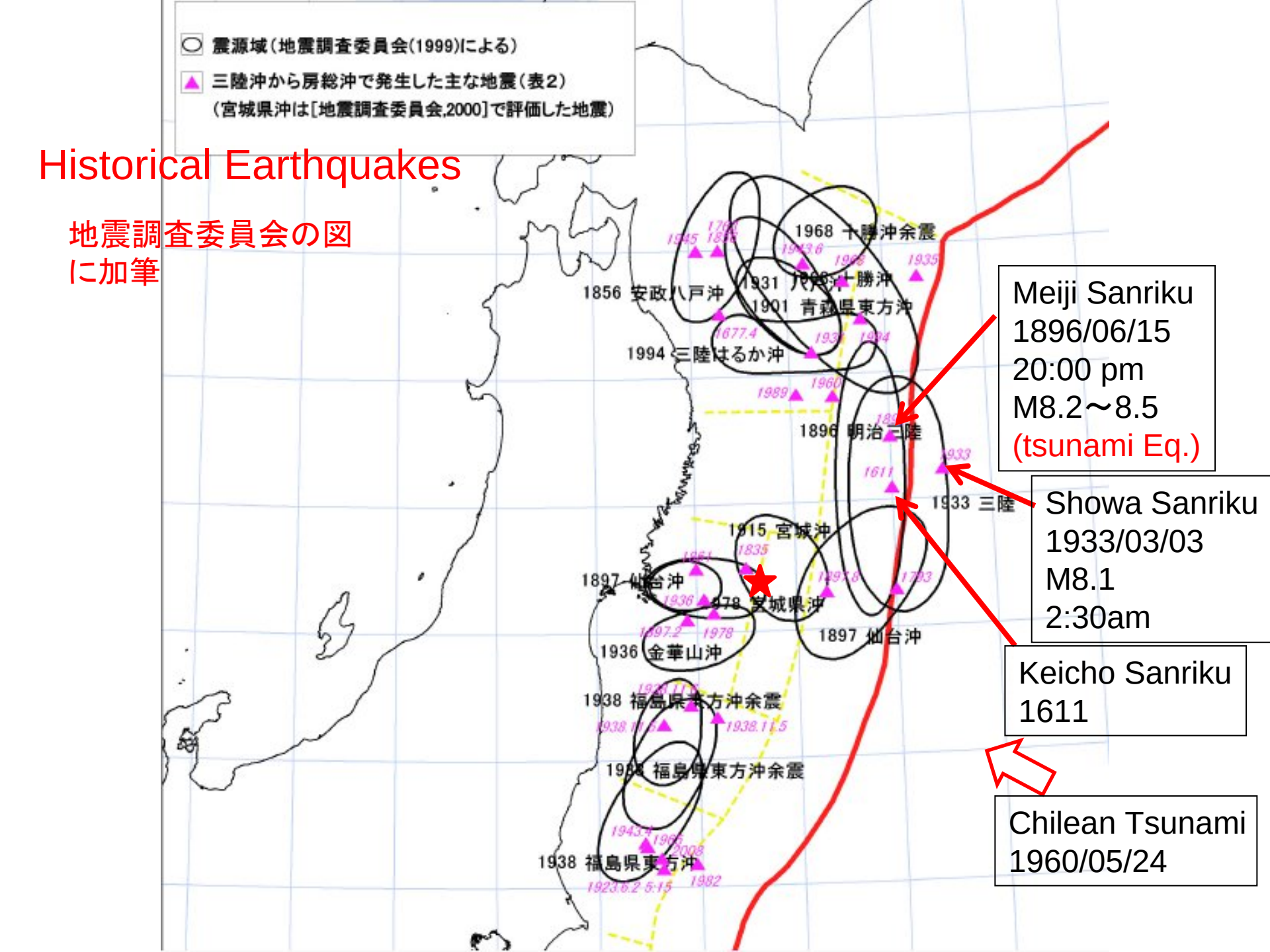
Ria coast
V-shape bay

1611 Keichou Sanriku

1854 Toukai, Nankai
1896 Meiji Sanriku
1933 Showa Sanriku
1944 Tounankai
1946 Nankai
1960 Chile
1983 Japan Sea
1993 Okushiri
2011 Tohoku

Tsunami generated at subduction zone

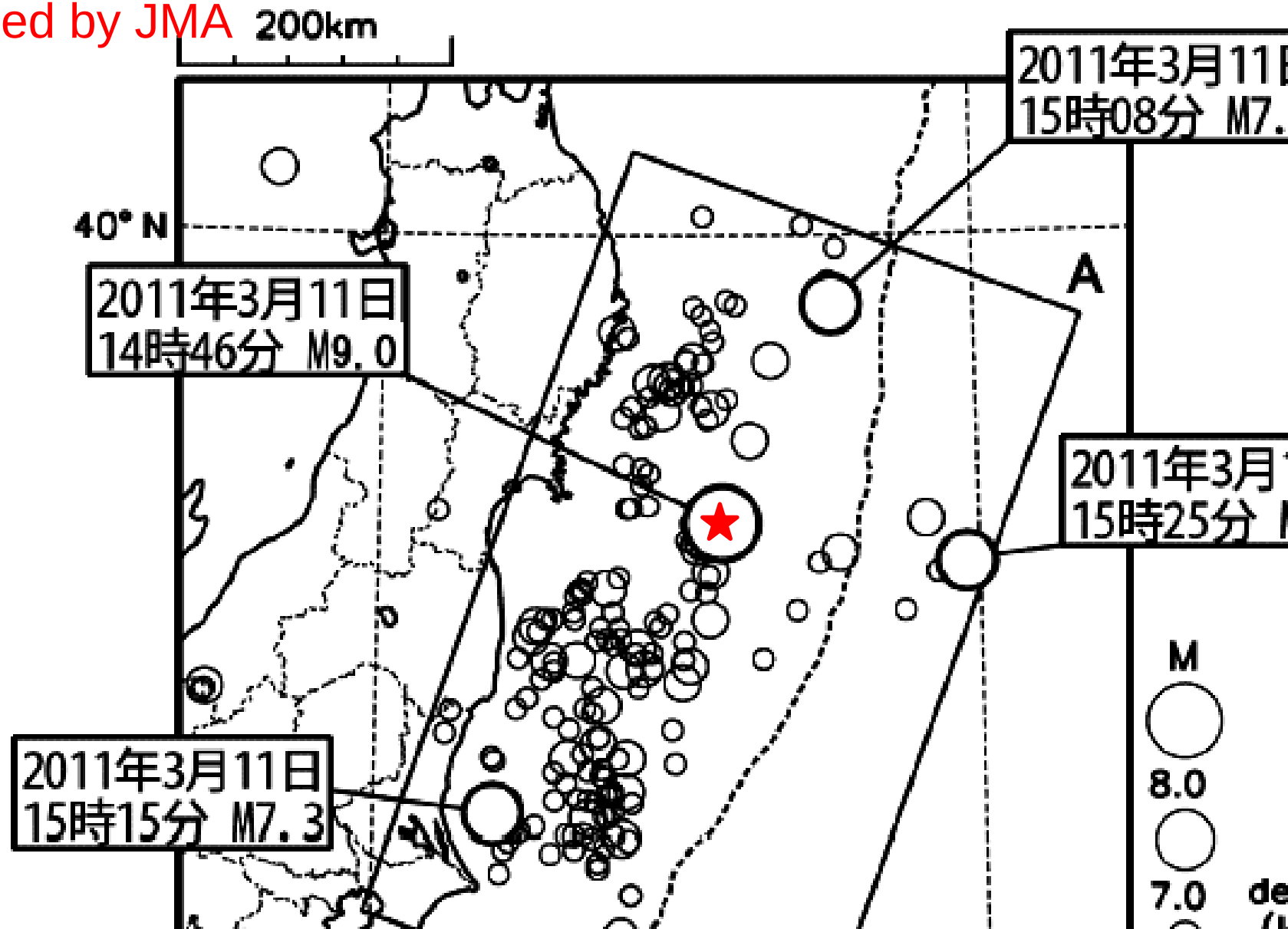


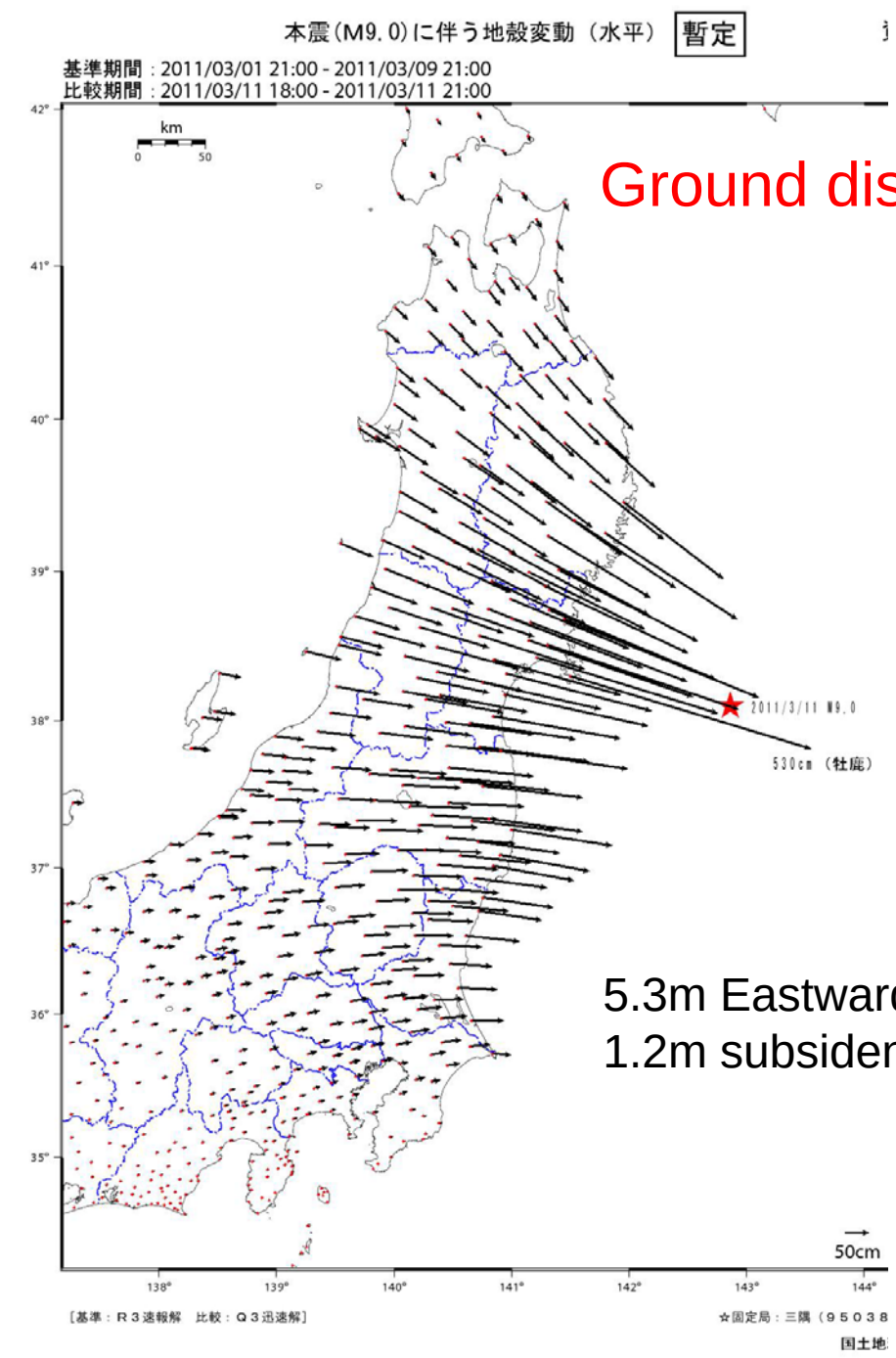

震源域（地震調査委員会(1999)による）
三陸沖から房総沖で発生した主な地震（表2）
（宮城県沖は[地震調査委員会,2000]で評価した地震）
Historical Earthquakes
地震調査委員会の図
に加筆
1968 十勝沖余震
1856 安政八戸沖
1931
1901 青森県東方沖
1994 三陸はるか沖
1896 明治三陸
1933 三陸
1915 宮城沖
1897 仙台沖
1978 宮城県沖
1936 金華山沖
1897 仙台沖
1938 福島県東方沖余震
1938 福島県東方沖
Meiji Sanriku
1896/06/15
20:00 pm
M8.2～8.5
(tsunami Eq.)
Showa Sanriku
1933/03/03
M8.1
2:30am
Keicho Sanriku
1611
Chilean Tsunami
1960/05/24

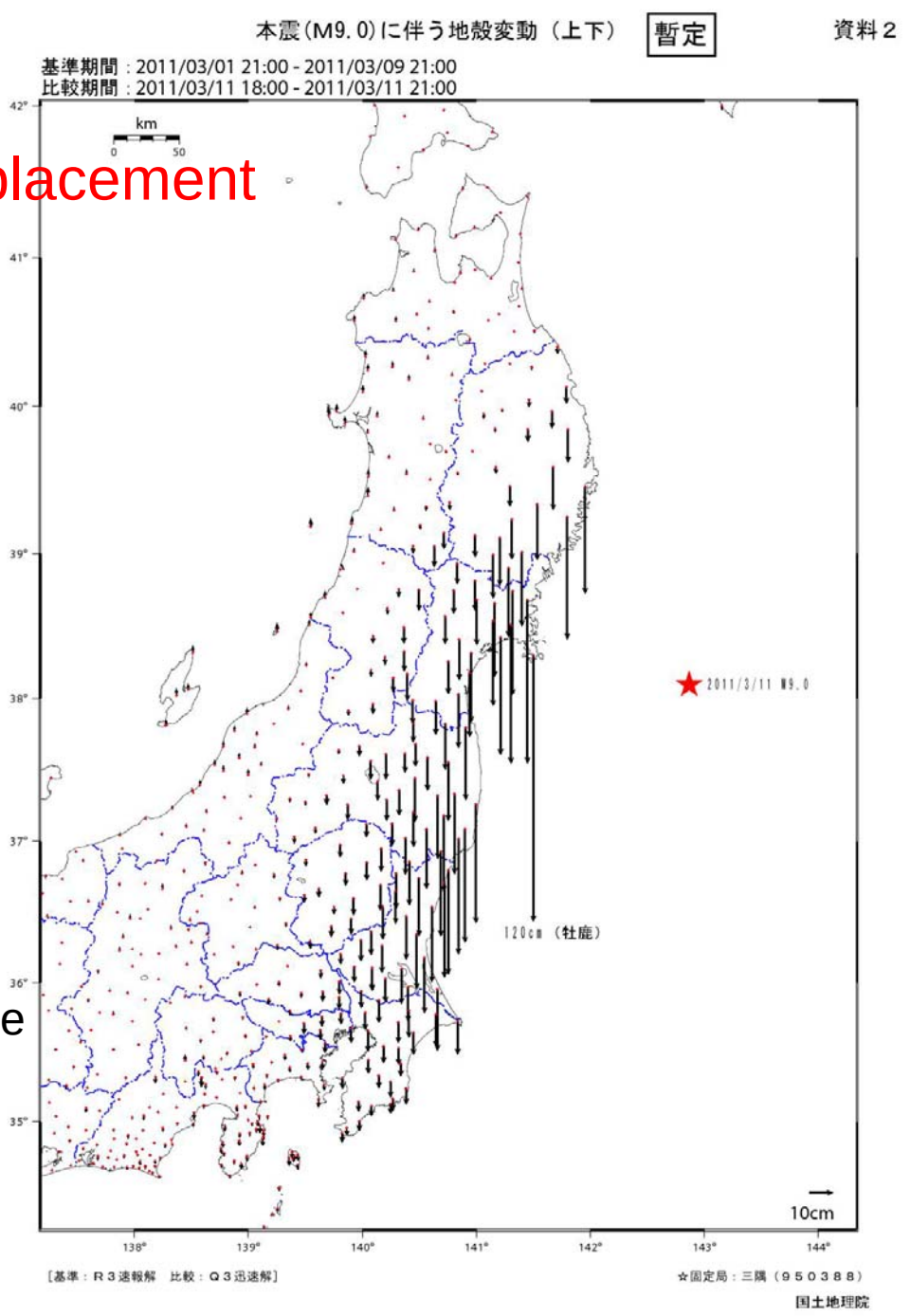
震央分布図

（2011 年3月 11 日 12 時 00 分～13 日 07 時 00 分、深さ 90km 以浅、M≧

Aftershocks
compiled by JMA





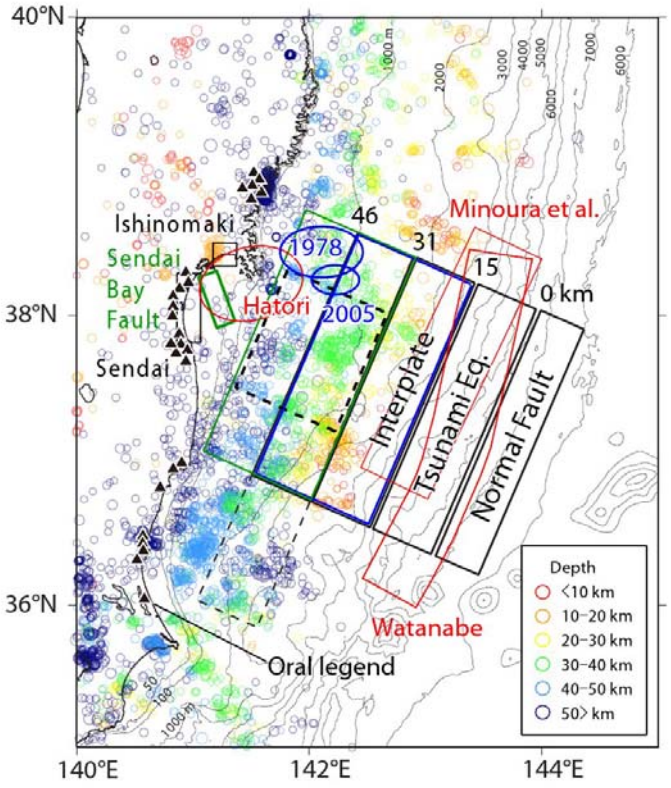


Ground displacement

5.3m Eastward
1.2m subsidence

Jougan Tsunami（869）

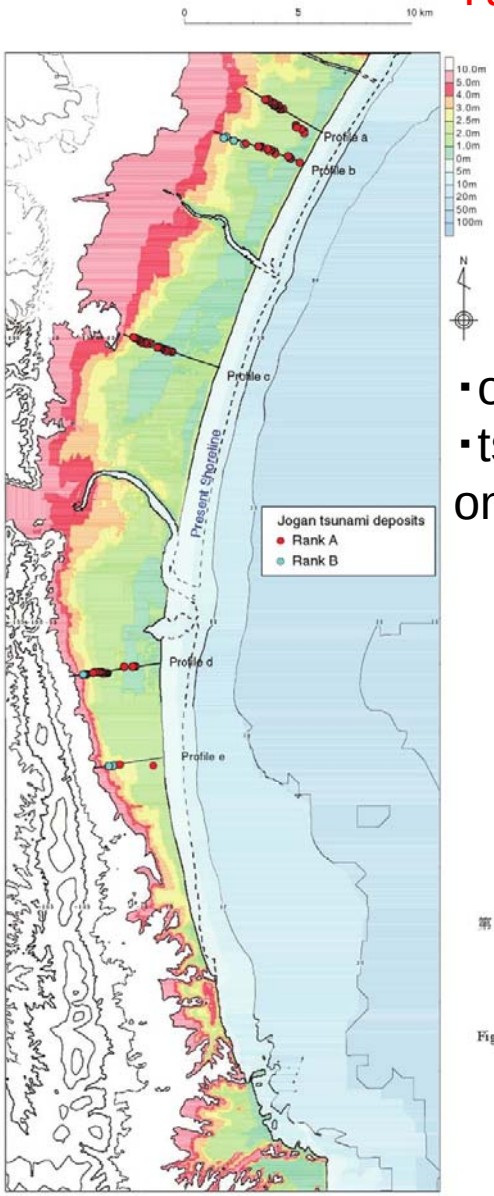
Satake, Namegaya, Yamaki（2008）



第 1 図．貞観津波の断層モデル．本研究で検討するのは，正断層モデル，津波地震モデル，断層幅 50 km のプレート間地震モデル（黒実線）のほか，プレート間地震の断層の長さを 300 km，100 km に変えたもの（黒破線），幅を 100 km に変えたもの（青，緑）及び仙台湾の活断層（深緑）．これらのほか，羽鳥（1998），Minoura *et al.*（2001），渡邊（2000）による推定波源域，1978 年，2005 年の宮城県沖地震の震源域も示す．カラーの小丸はこの地域の地震活動（1997 年 10 月～2007 年 3 月；気象庁一元化震源による）を示す．各断層の上に書かれた数字（0 km, 15, 31, および 41）は断層上端の深さを示す．三角印は貞観地震・津波によるものと推定される伝承が残る場所を示す（渡邊，2000）．

Fig. 1. Fault models of the Jogan tsunami. The fault models tested in this study are the normal fault, tsunami earthquake and interplate earthquake models (widths: 50 km) (shown by black solid lines), interplate models with different fault length (shown by black dashed lines), with different fault widths (green and blue lines), and an active fault in Sendai Bay (dark green). In addition, those proposed by Hatori (1998), Watanabe (2000) and Minoura *et al.* (2001) are shown. The source areas of 1978 and 2005 Miyagi-oki earthquakes are also shown. Color circles indicate seismicity in this region between October 1997 and March 2007, according to Japan Meteorological Agency data. Numerals beside the faults (0 km, 15, 31, and 46) indicate upper depth of the faults. Triangles show locations where oral legends of the 869 Jogan earthquake and tsunami were reported (Watanabe, 2000).

阿部・菅野・千釜（1990）
Minoura・Nakaya(1991)

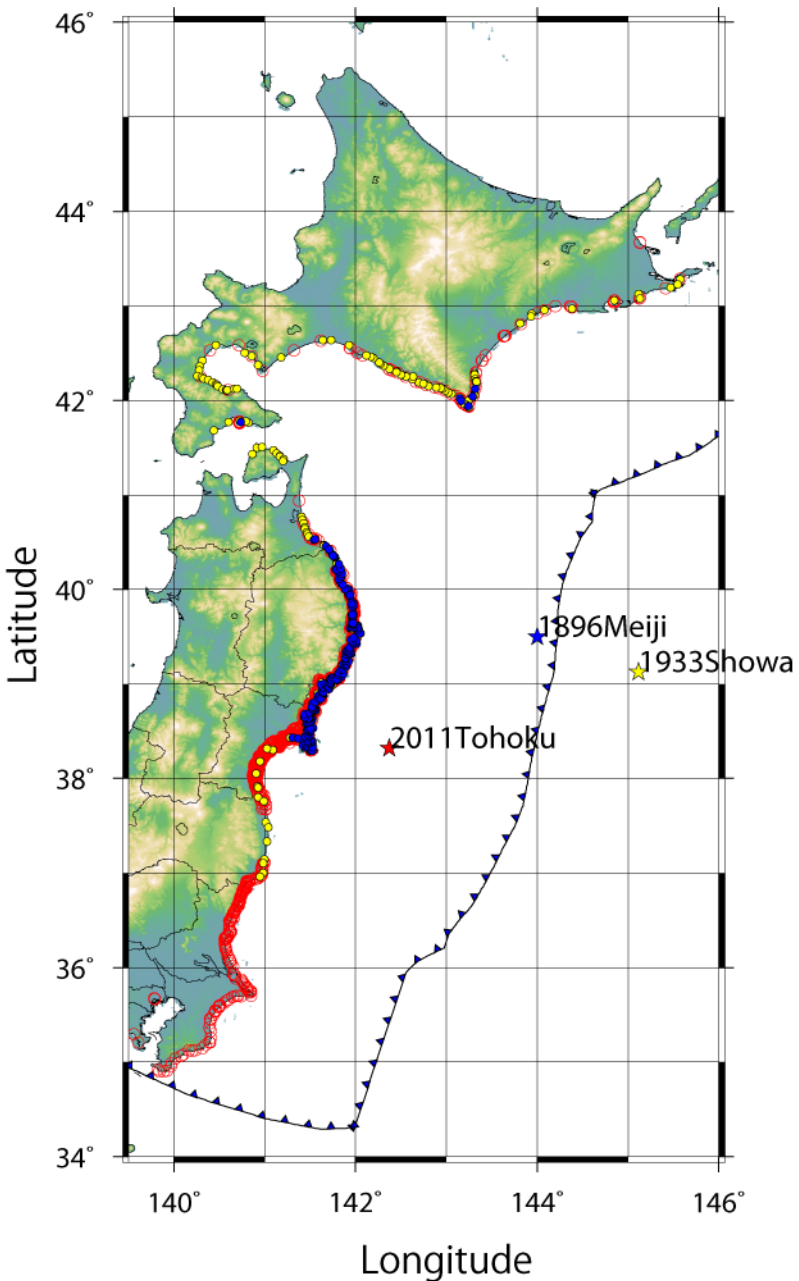


- old document
- tsunami sediments once in 1000yrs

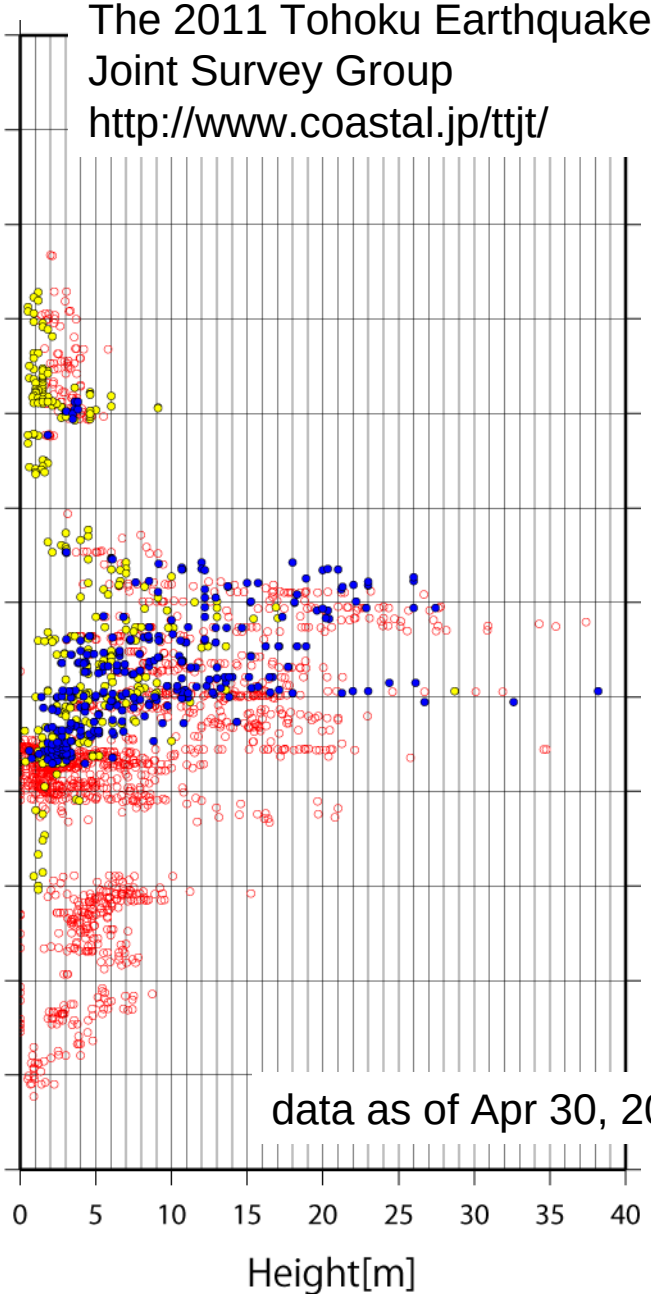
第 4b 図．仙台平野の貞観当時の推定地形（格子間隔 25 m）．津波堆積物が見つかった位置（澤井・他，2007; 2008）ならびに津波シミュレーションと堆積物の比較を行う 5 測線の位置も示す．津波堆積物は貞観津波である可能性の高低によりランク A, B に分けた．

Fig. 4b. Estimated topography around Sendai plain at the time of AD 869 Jogan tsunami. This area is gridded into 25 m interval for inundation modeling. Locations of the tsunami deposits (Sawai *et al.*, 2007; 2008) and five profiles on which simulation results are compared with the deposits are shown. Ranks A and B refer to probability of the Jogan tsunami deposits.

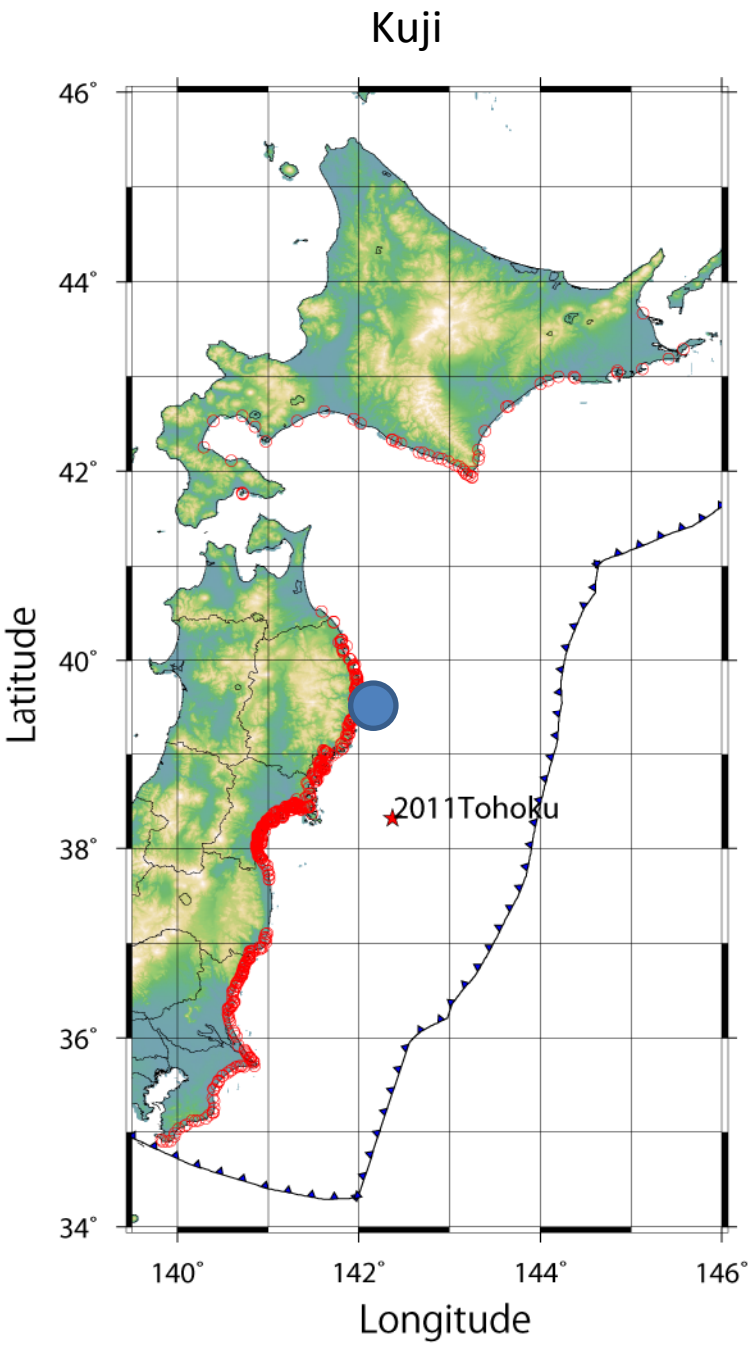
All data plotted with the past events



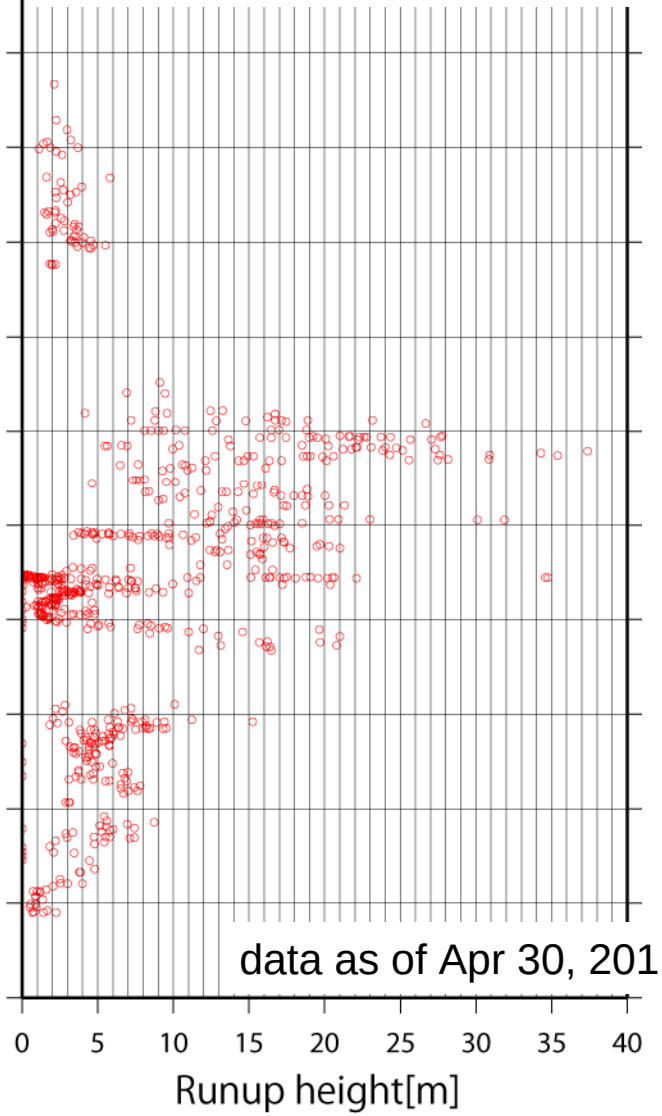
The 2011 Tohoku Earthquake Tsunami Joint Survey Group
http://www.coastal.jp/ttjt/



data as of Apr 30, 2011



The 2011 Tohoku Earthquake Tsunami Joint Survey Group
http://www.coastal.jp/ttjt/



Kuji by Japan Self-Defence Force

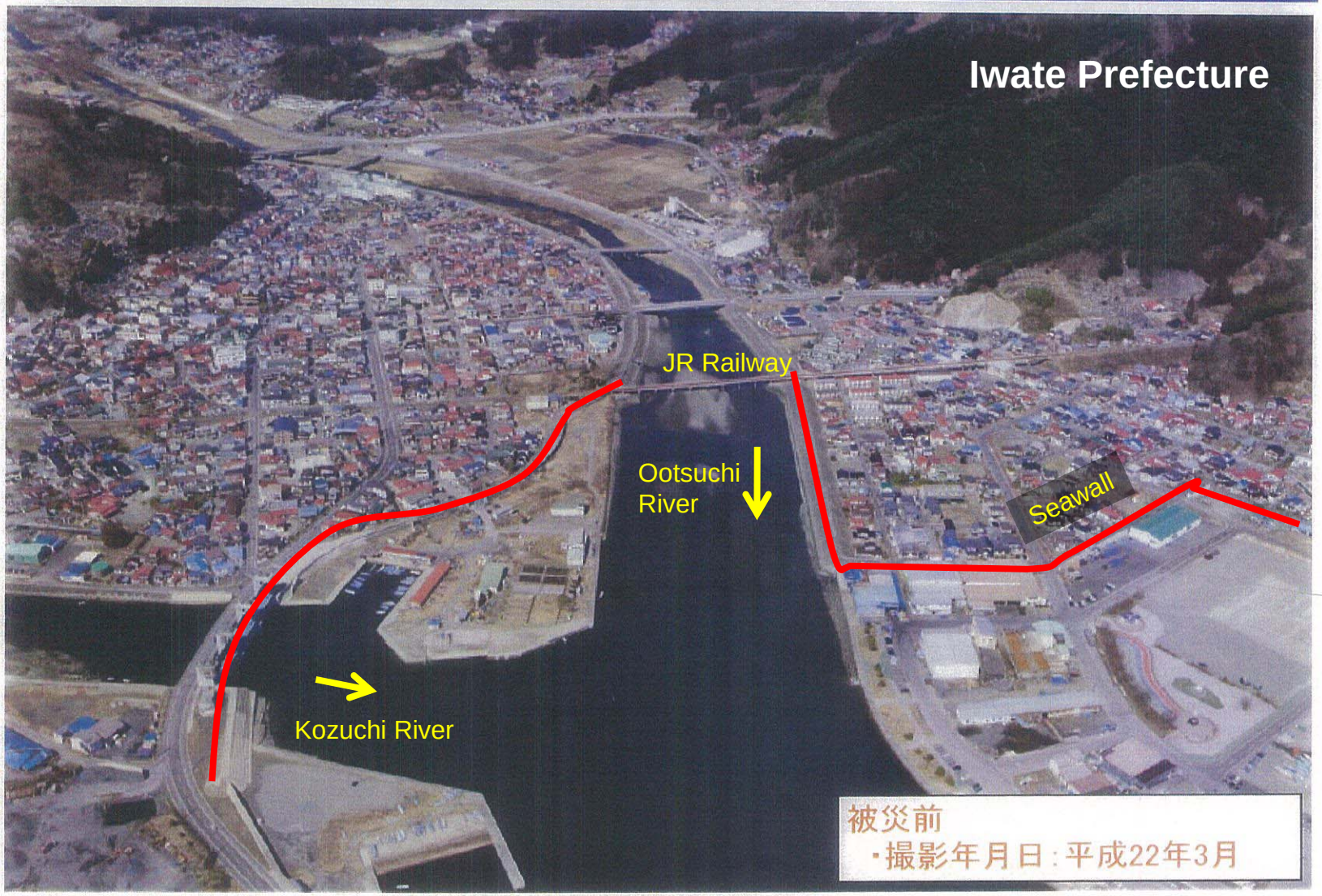
Taro

	居住者	死者	行方不明者	割合
A地区（二重堤に守られている地域）	1610	63	9	4.5%
B地区	566	19	36	9.7%
C地区	278	12	5	6.1%

Mainichi News Paper（15/May）

Taken by Japan Self-Defence Force

⑩岩手県　大槌町　大槌川



津波襲来！！

津波襲来！！

Death 726, Missing 978, as of May 1, 2011

Collapsed Seawalls

Kamaishi

1km far from coast line

Rikuzentakada

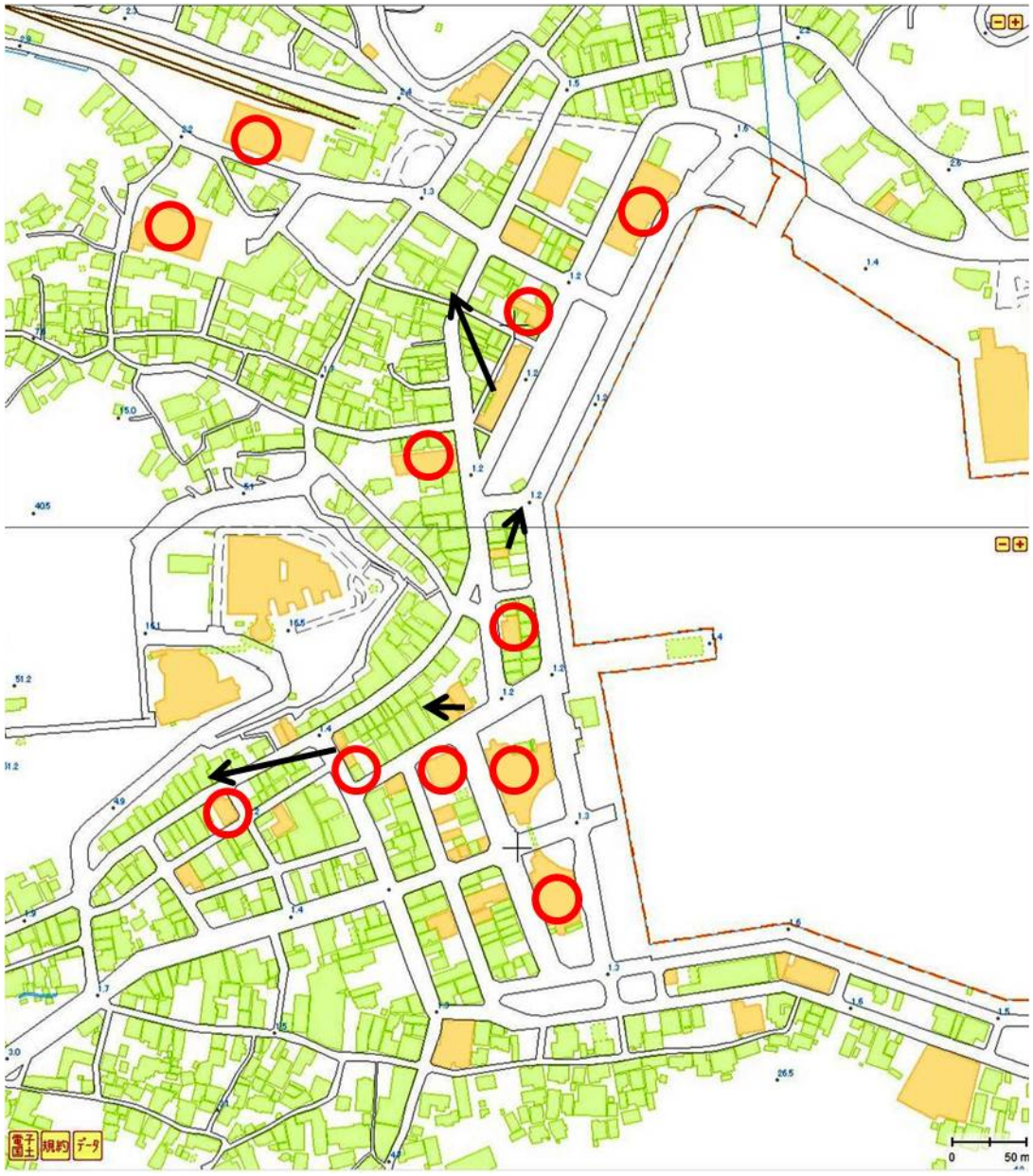
Rikuzentakada

Kesennuma

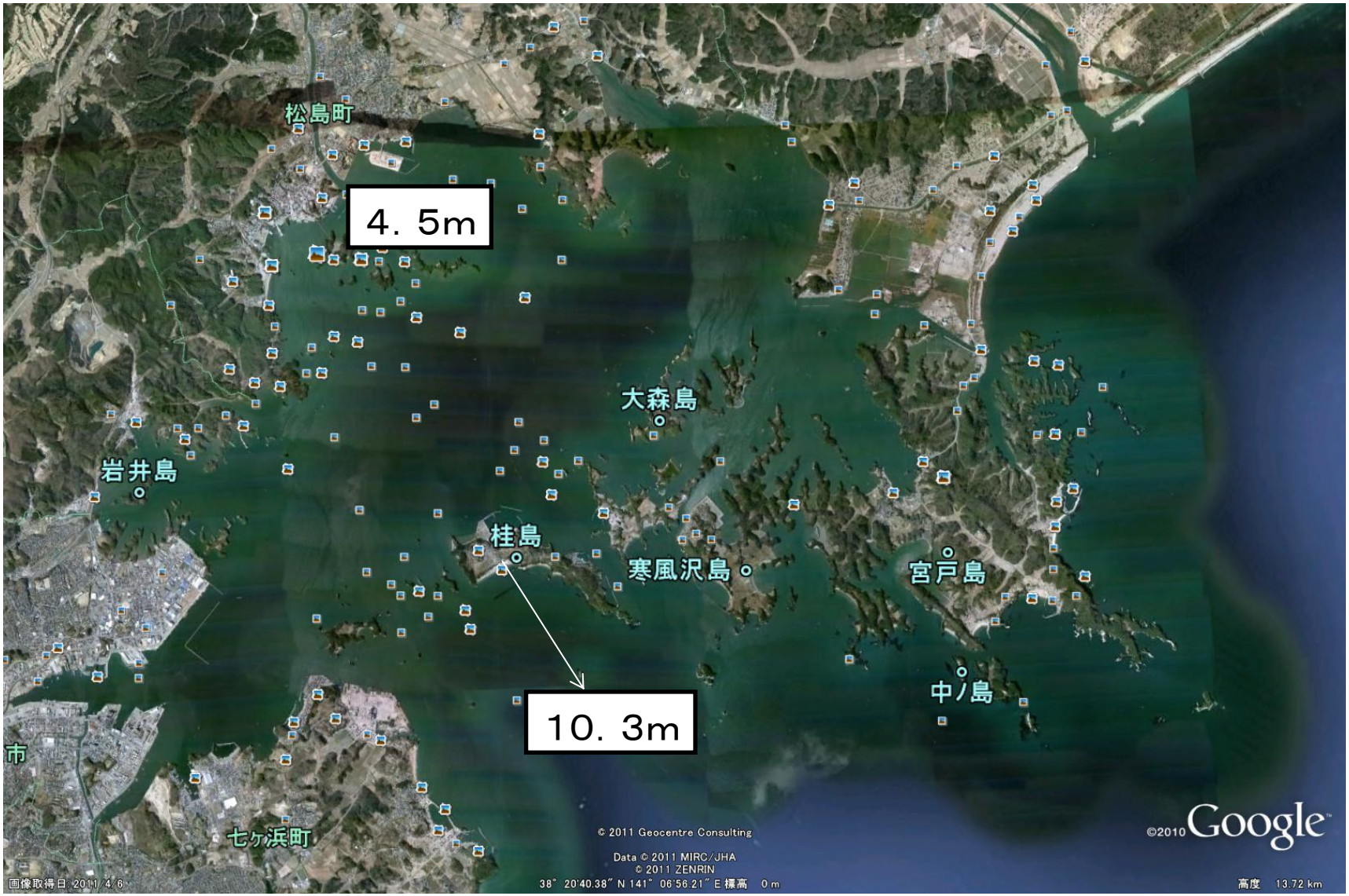
Onagawa

No.2

No.3


電子国土
規約
データ
0
50 m

Natural Breakwaters Matsushima



Failure of Katsura Island at the Ocean Side

2011 Tohoku Tsunami

■ Huge Tsunami in Sanriku Coast

Larger than Meiji & Showa events

■ Attack in wide subsided areas in short time

Once in 100 to 1000 years

■ Damages on flat plain formed around rivermouth

Tsu-nami affected not only ‘tsu’, ports and harbors, but also flat plains

津波