



**Impact of the Great East Japan
Earthquake on *Zostera* meadows in
the coastal area close to the epicenter**

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Takehisa Yamakita and Hitoshi Tamaki**

***Tohoku National Fisheries Research Institute,
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Photo taken by an employee of Miyako City, Iwate Prefecture

Topics

- General review of the Great East Japan Earthquake → What happened on March 11th, 2011?
- Effects on *Zostera* meadows in an inland bay area (*Zostera marina* community)
- Summary and the future research

Photo taken by MAINICHI SHINBUN PUBLISHING CO.

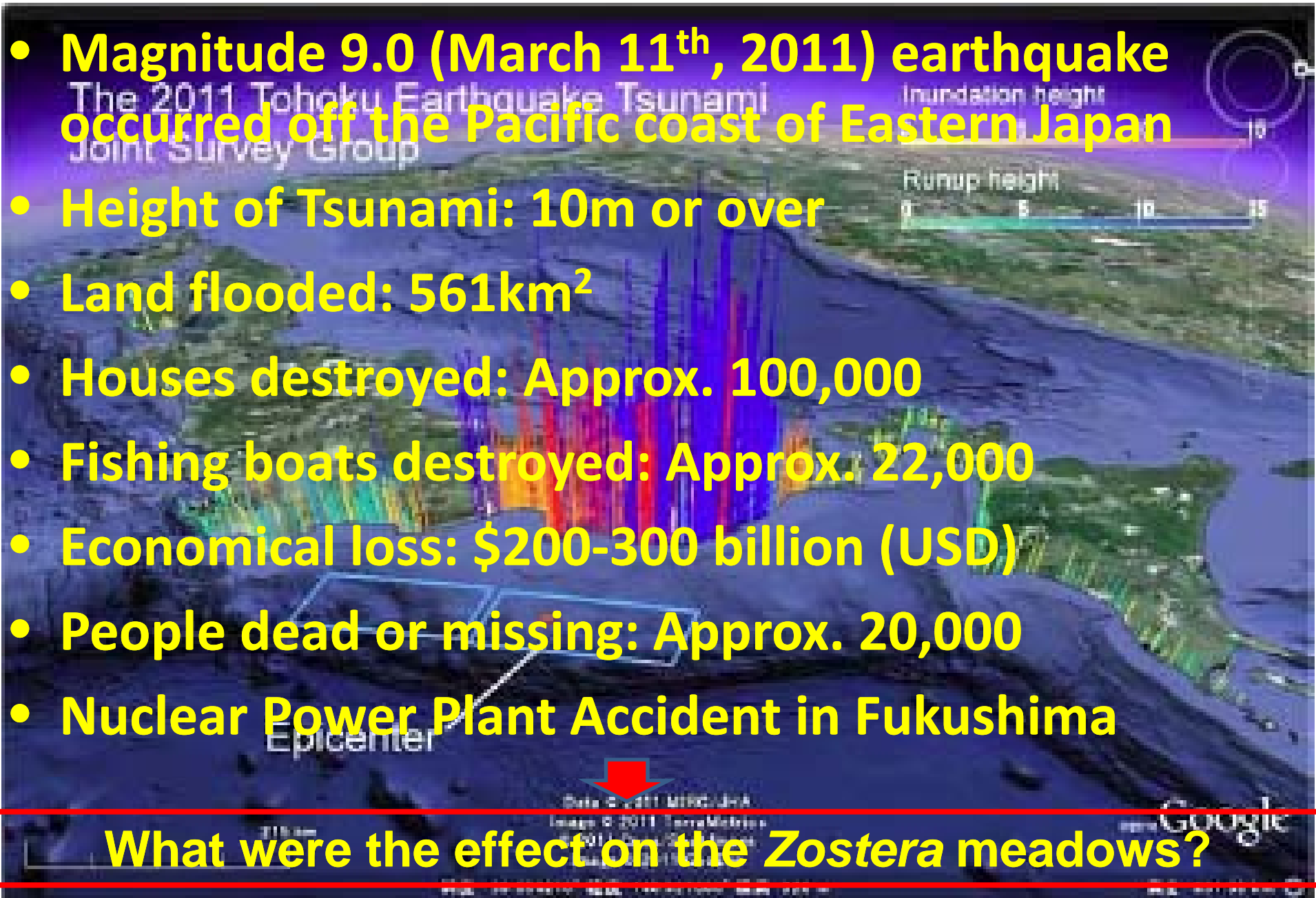
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Review of the Great East Japan Earthquake

- **Magnitude 9.0 (March 11th, 2011) earthquake occurred off the Pacific coast of Eastern Japan**
- **Height of Tsunami: 10m or over**
- **Land flooded: 561km²**
- **Houses destroyed: Approx. 100,000**
- **Fishing boats destroyed: Approx. 22,000**
- **Economical loss: \$200-300 billion (USD)**
- **People dead or missing: Approx. 20,000**
- **Nuclear Power Plant Accident in Fukushima**



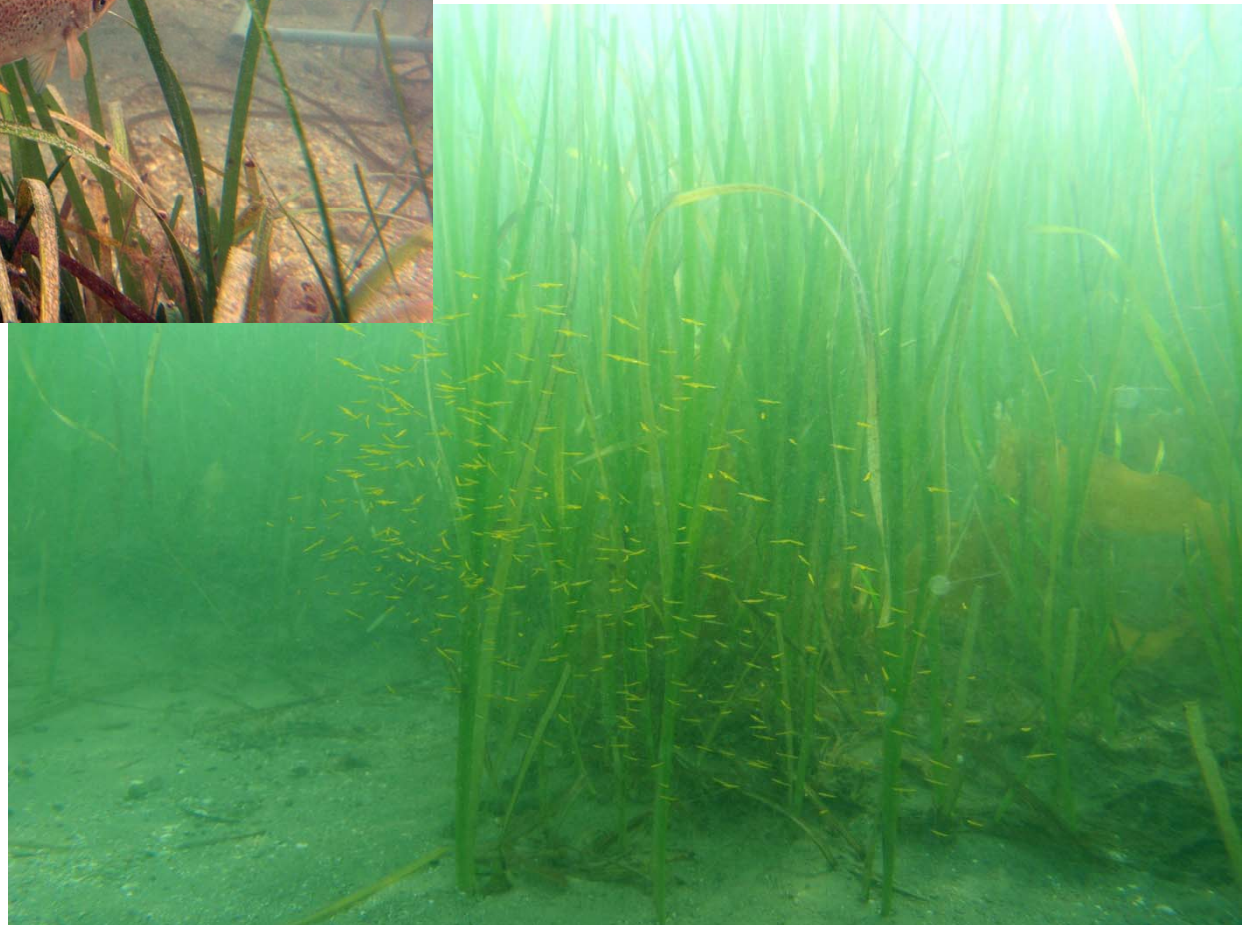
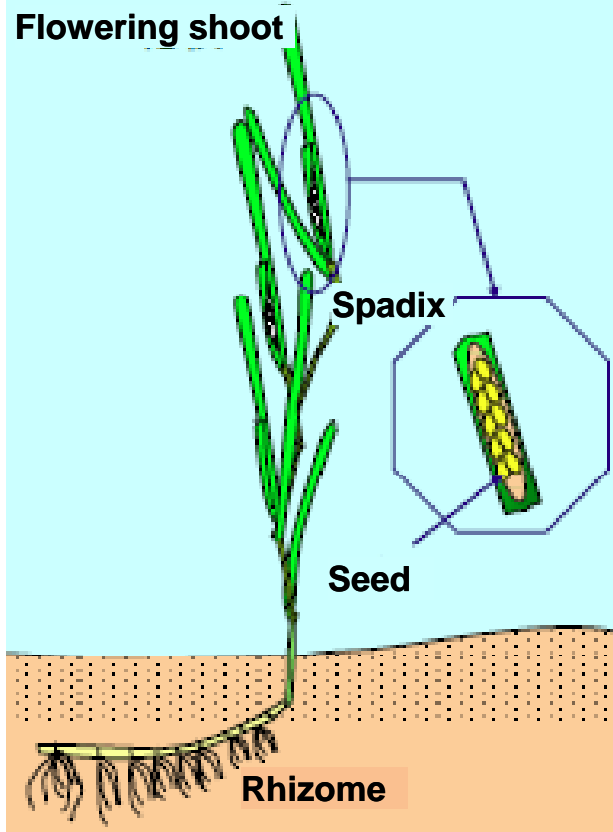
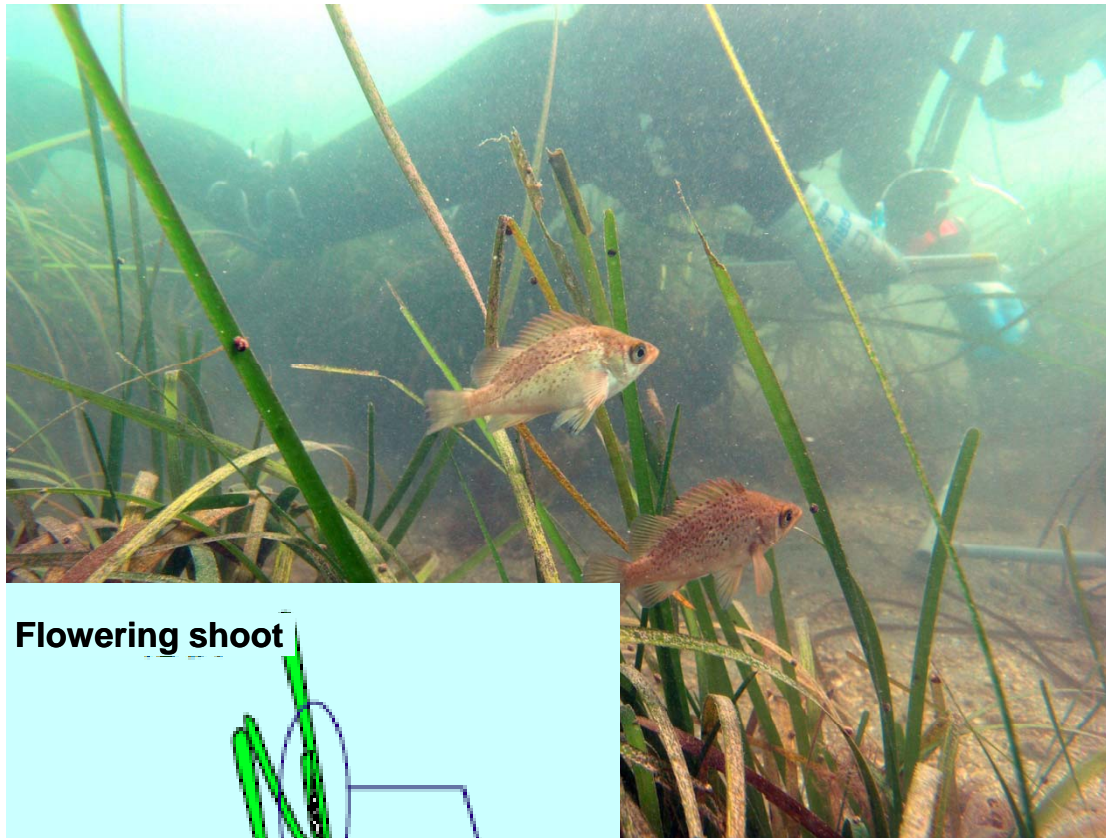
What were the effect on the *Zostera* meadows?

Topics

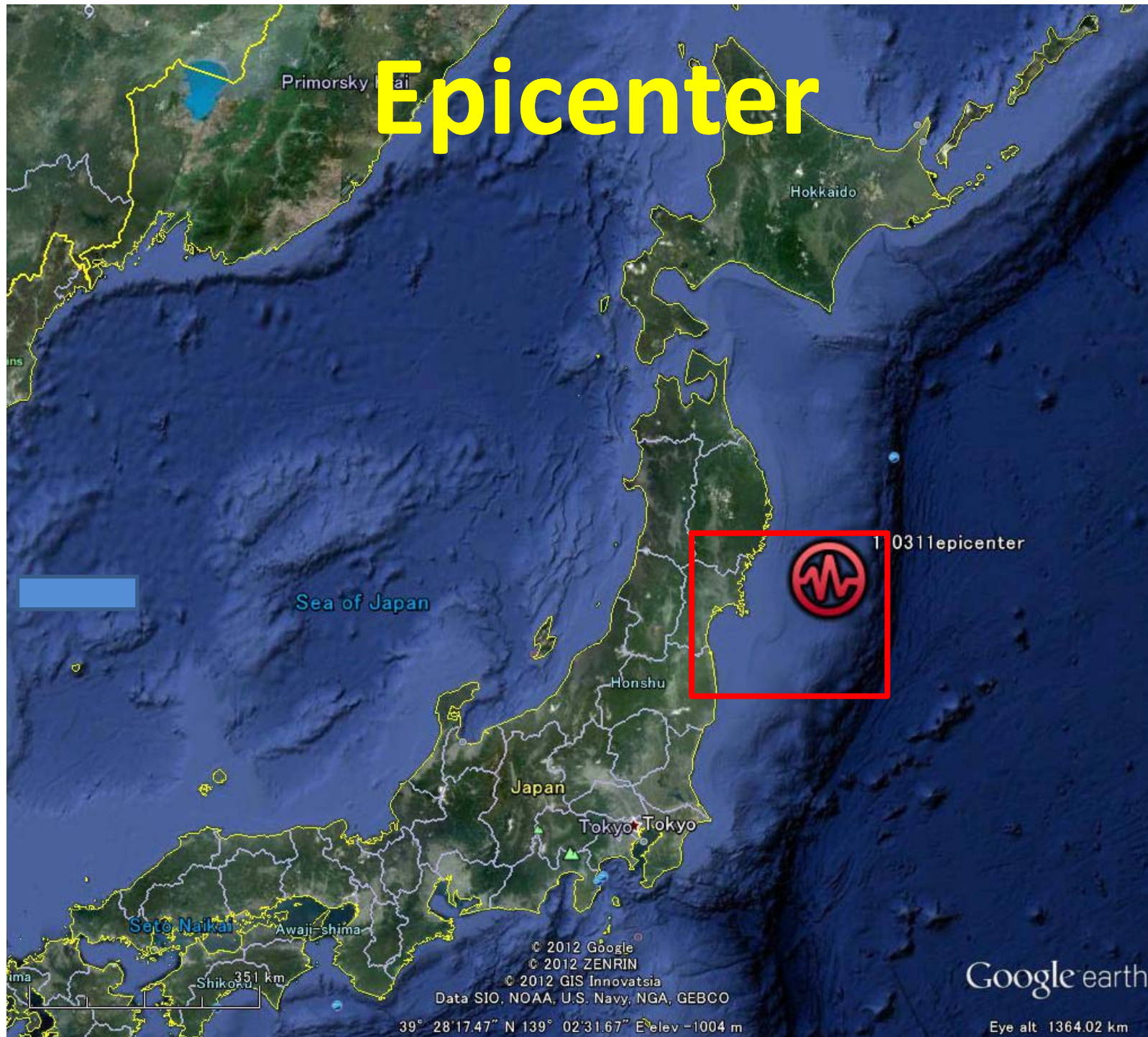
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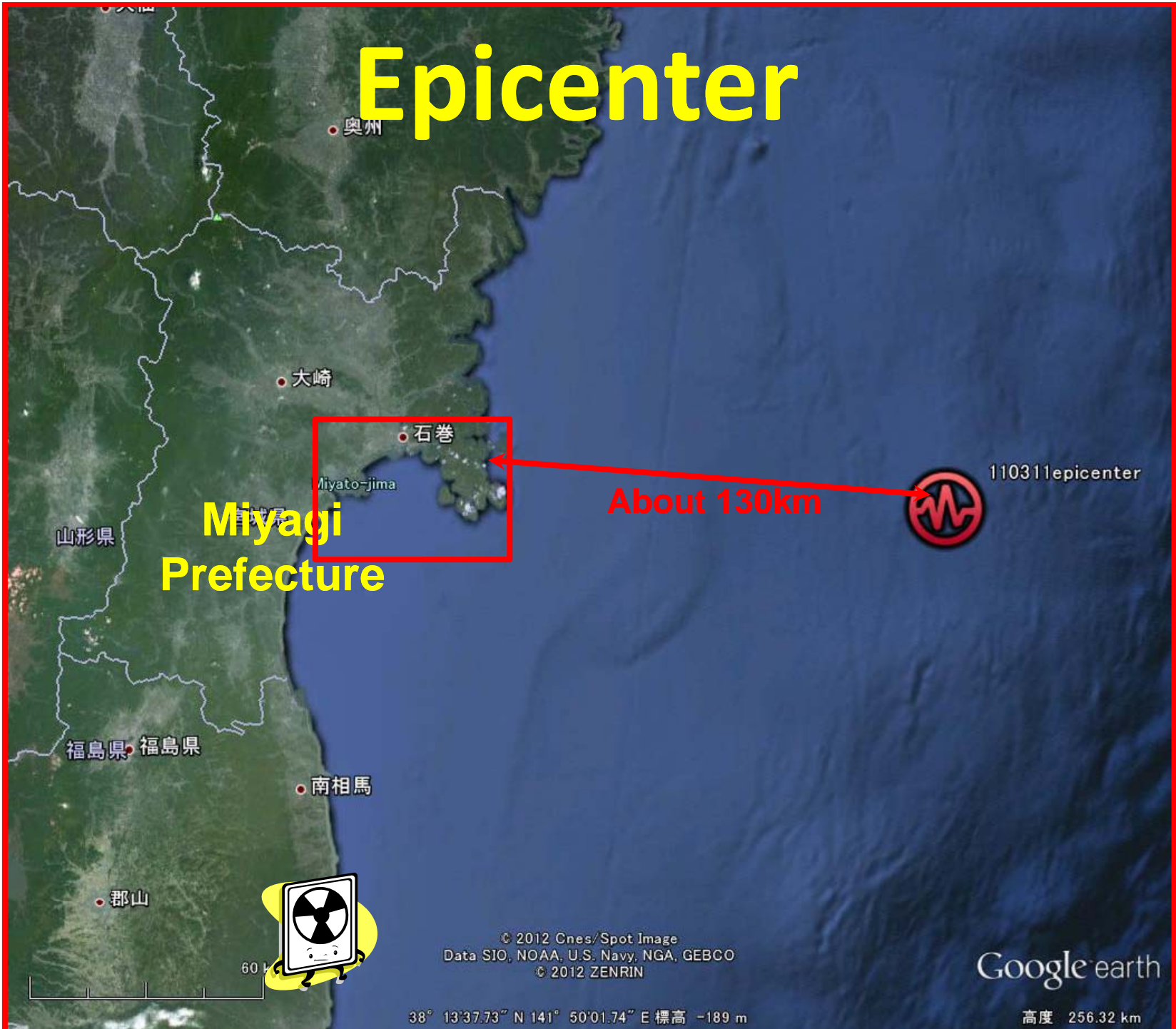
The function of *Zostera* meadows



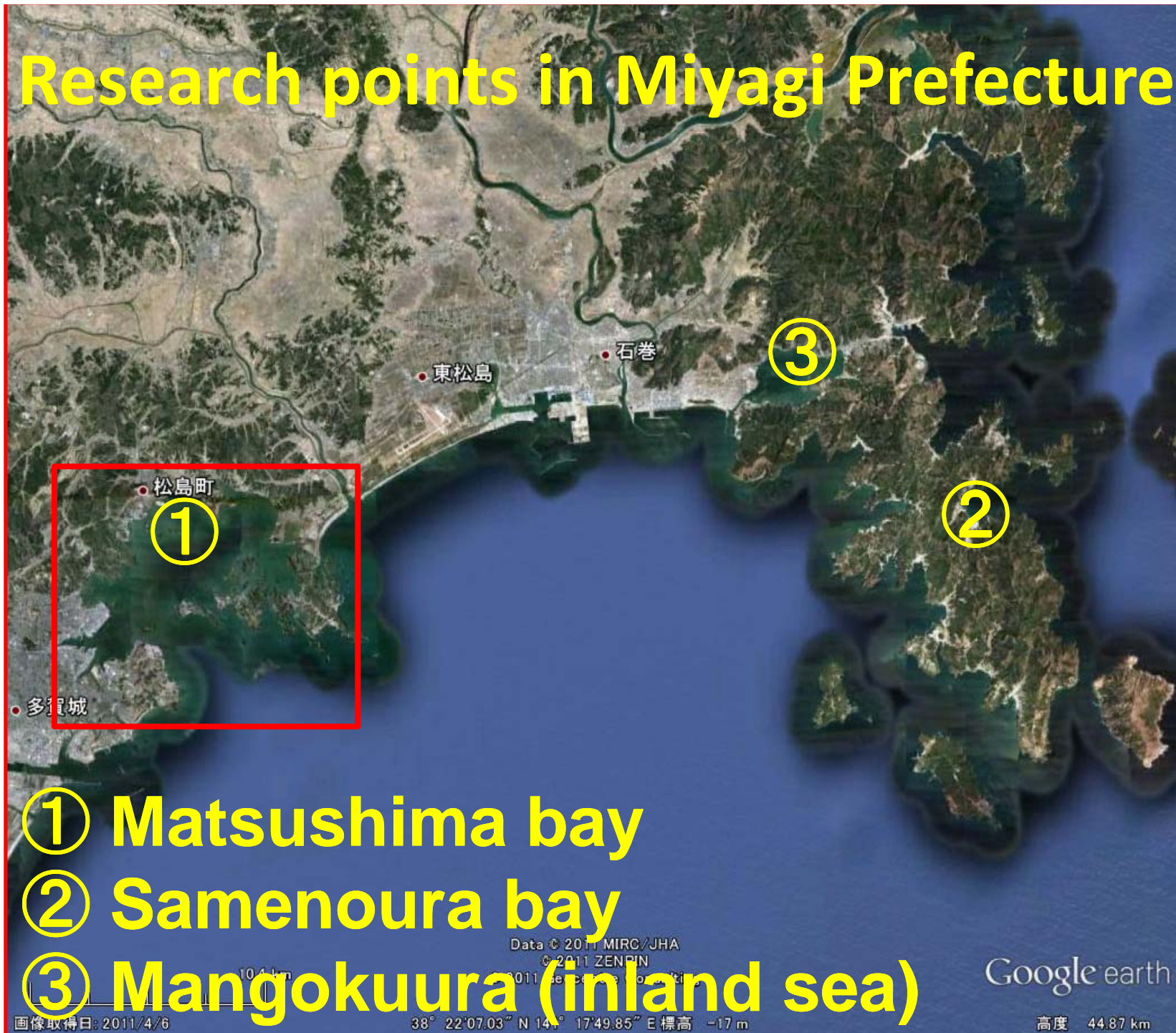
Epicenter



Epicenter



Research points in Miyagi Prefecture



① Matsushima bay

② Samenoura bay

③ Mangokuura (inland sea)

Data © 2011 MIRC/JHA

© 2011 ZENPIN

© 2011 GeoEye, GeoEye Inc.

Google earth

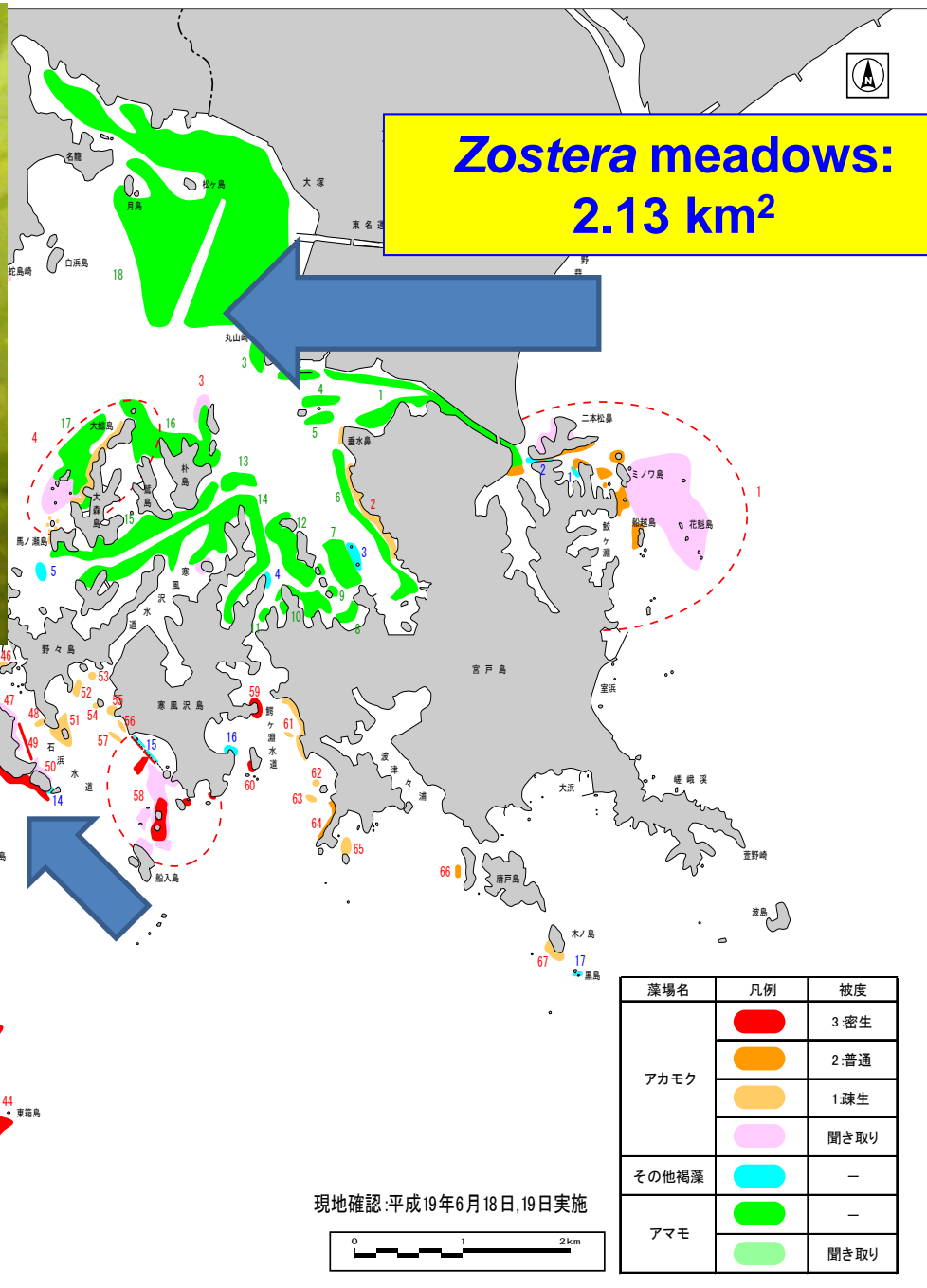
画像取得日: 2011/4/6

38° 22' 07.03" N 141° 17' 49.85" E 標高 -17 m

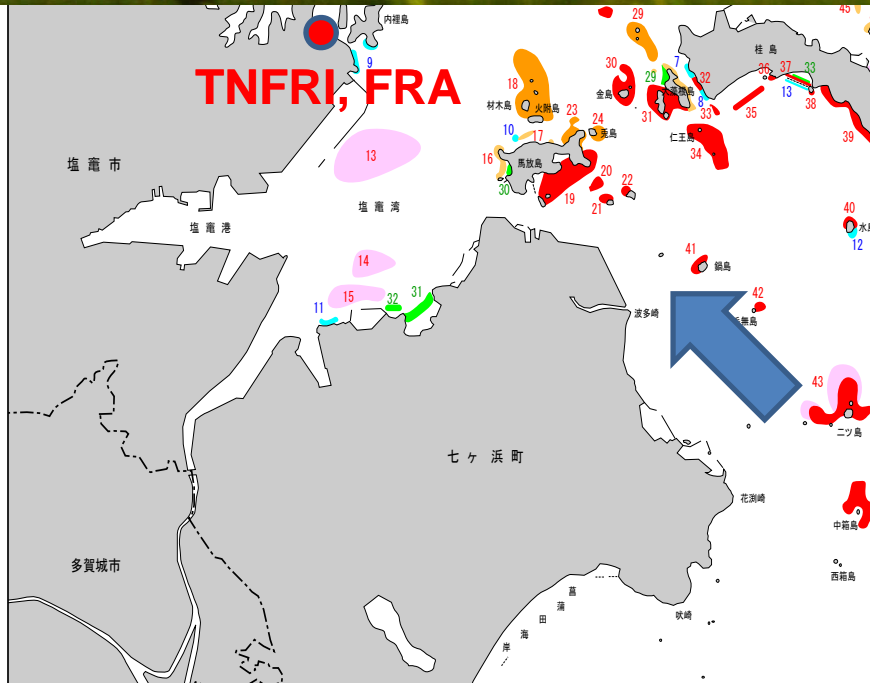
高度 44.87 km



August 12th, 2009



**Zostera meadows:
2.13 km²**



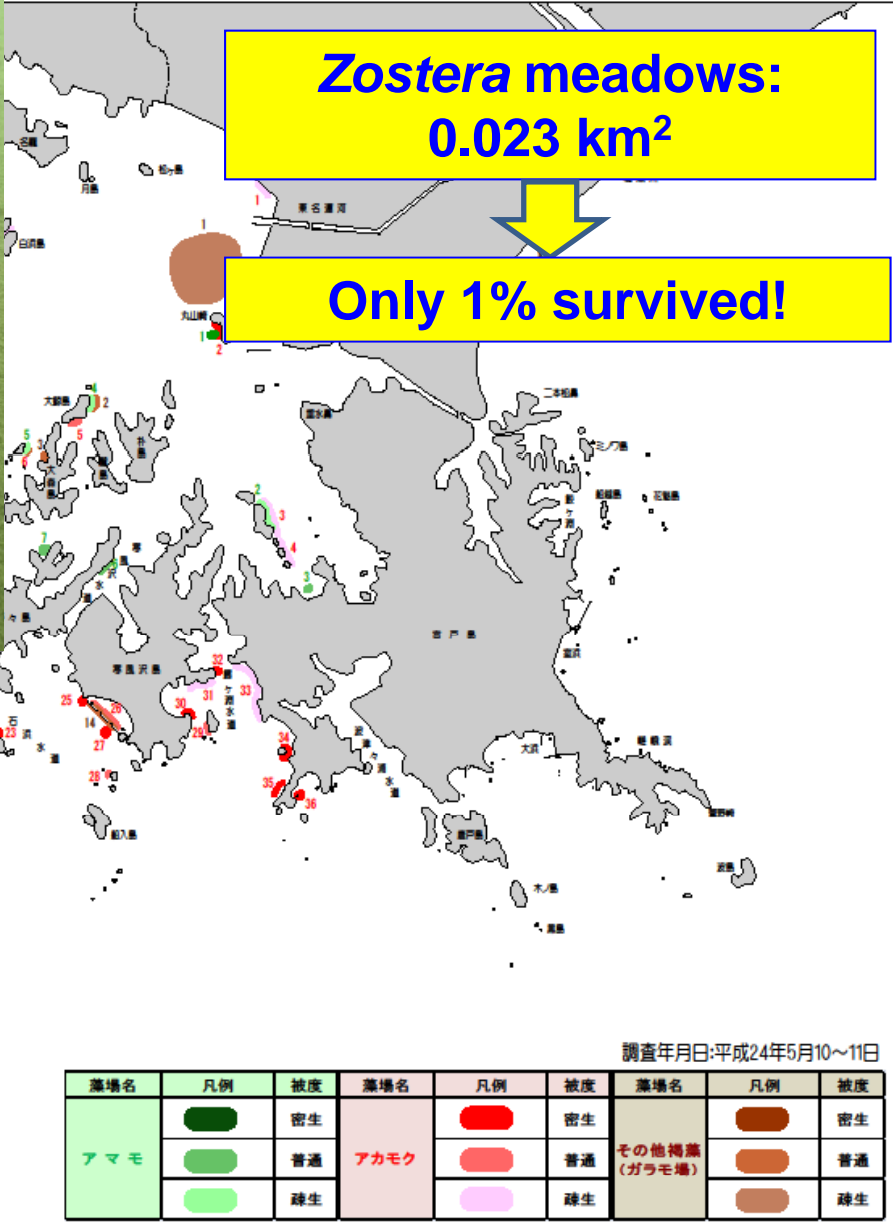
TNFRI, FRA

藻場名	凡例	被度
アカモク		3.密生
		2.普通
		1.疎生
		聞き取り
その他褐藻		-
アマモ		-
		聞き取り

現地確認:平成19年6月18日,19日実施



Distribution of Zostera meadows (before the earthquake, June 2007)



Distribution of Zostera meadows (after the earthquake, May 2012; by E-TEC)

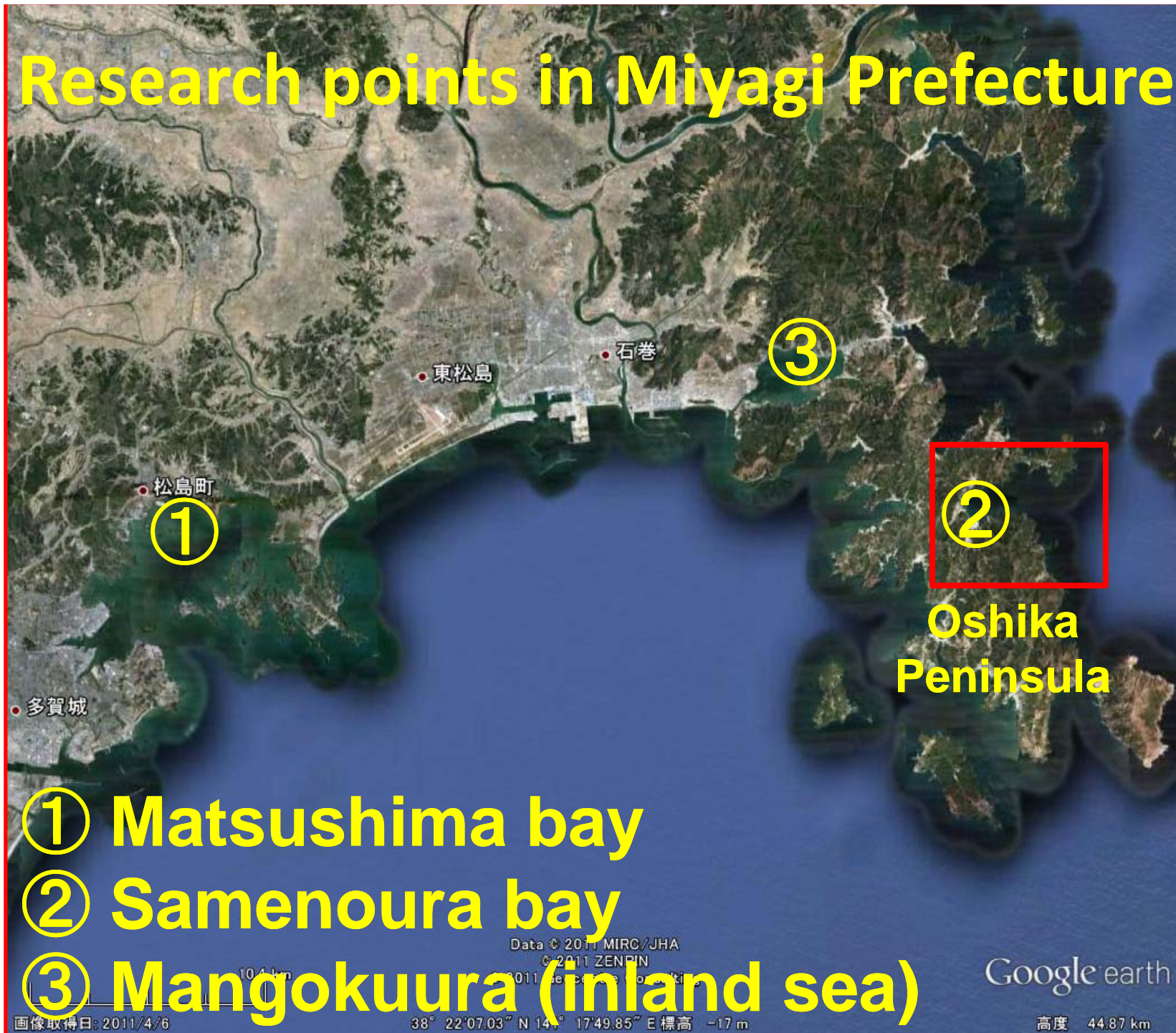
Seedlings in Matsushima bay

April 26th, 2012

***Zostera* meadow was
destroyed by the Tsunami
(1.6m depth)**



Research points in Miyagi Prefecture



① Matsushima bay

② Samenoura bay

③ Mangokuura (inland sea)

Data © 2011 MIRC/JHA

© 2011 ZENPIN

2011 Google Earth

Google earth

画像取得日: 2011/4/6

38° 22'07.03" N 141° 17'49.85" E 標高 -17 m

高度 44.87 km

本震(M9.0)に伴う地

基準期間 : 2011/03/01 21:00 - 2011/03/09 21:00
比較期間 : 2011/03/11 18:00 - 2011/03/11 21:00

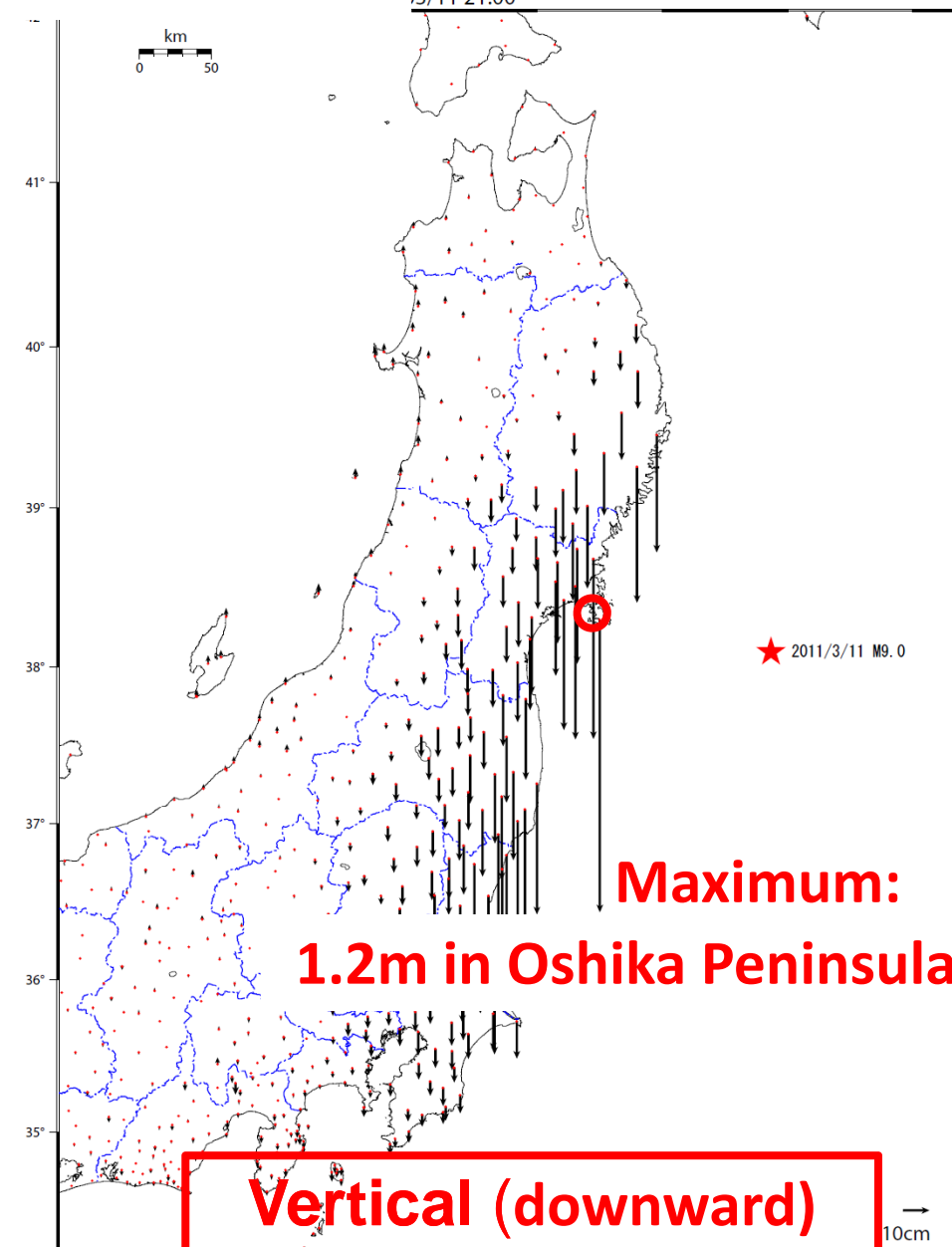
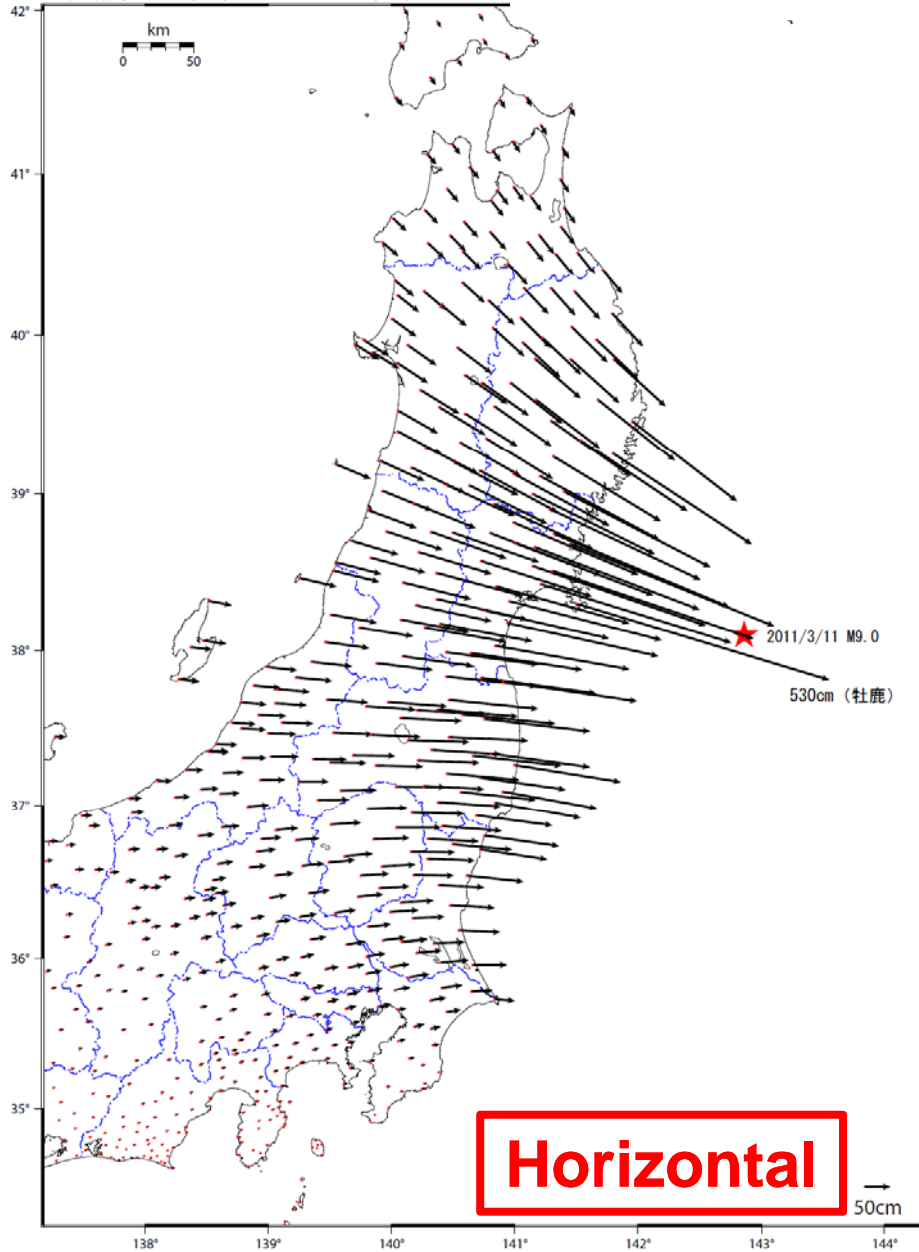
Crustal movement

))に伴う地殻変動(上下)

暫定

資料2

13/09 21:00
13/11 21:00



[基準 : R3速報解 比較 : Q3迅速解]

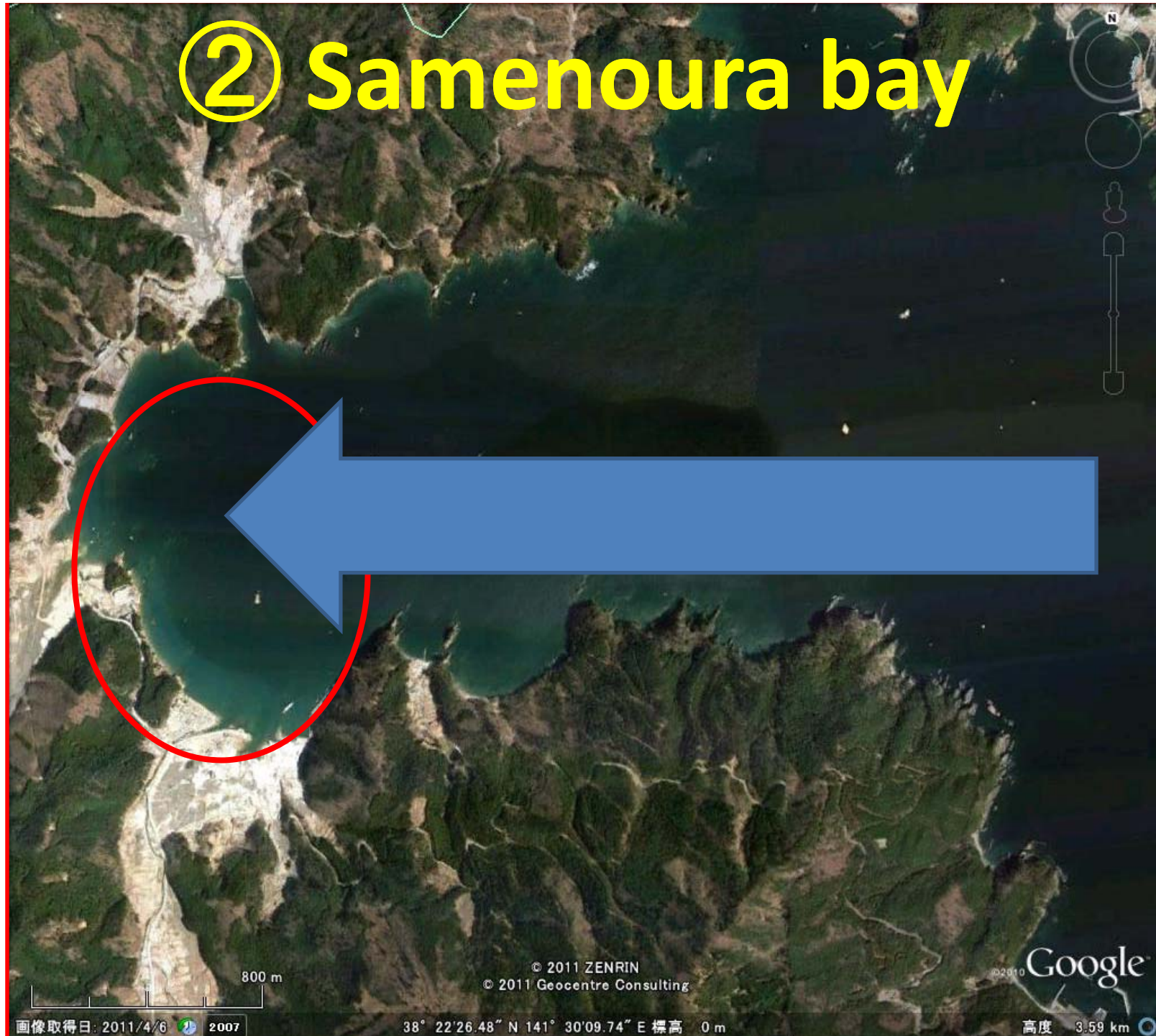
☆固定局 : 三隅 (95)

A port in Oshika peninsula

June 8th, 2011 (after the earthquake)



② Samenoura bay

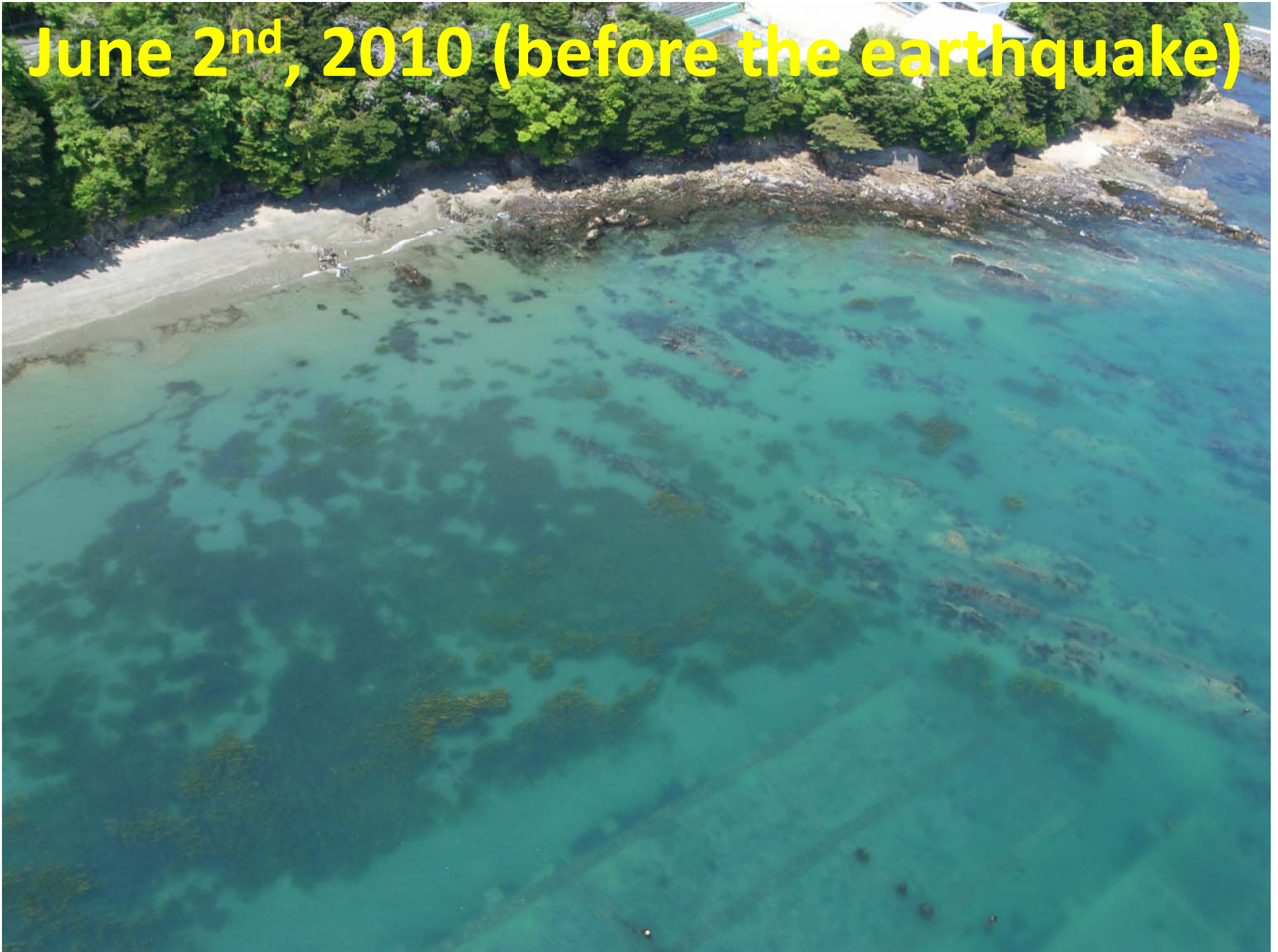


画像取得日: 2011/4/6 2007

38° 22'26.48" N 141° 30'09.74" E 標高 0 m

高度 3.59 km

June 2nd, 2010 (before the earthquake)



Sept. 8th, 2011 (after the earthquake)





**August 9th, 2011
(after the earthquake)**

本震(M9.0)に伴う地

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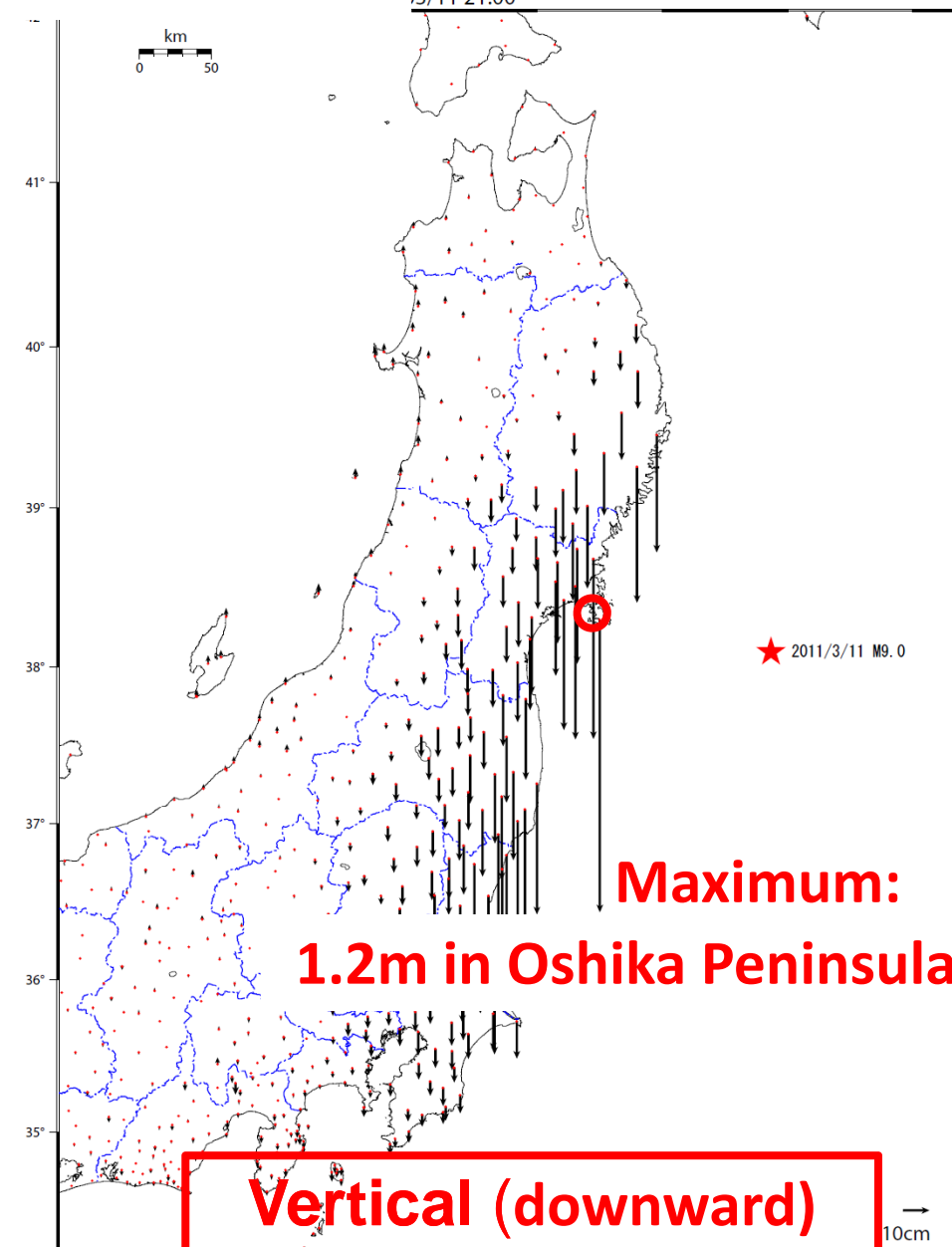
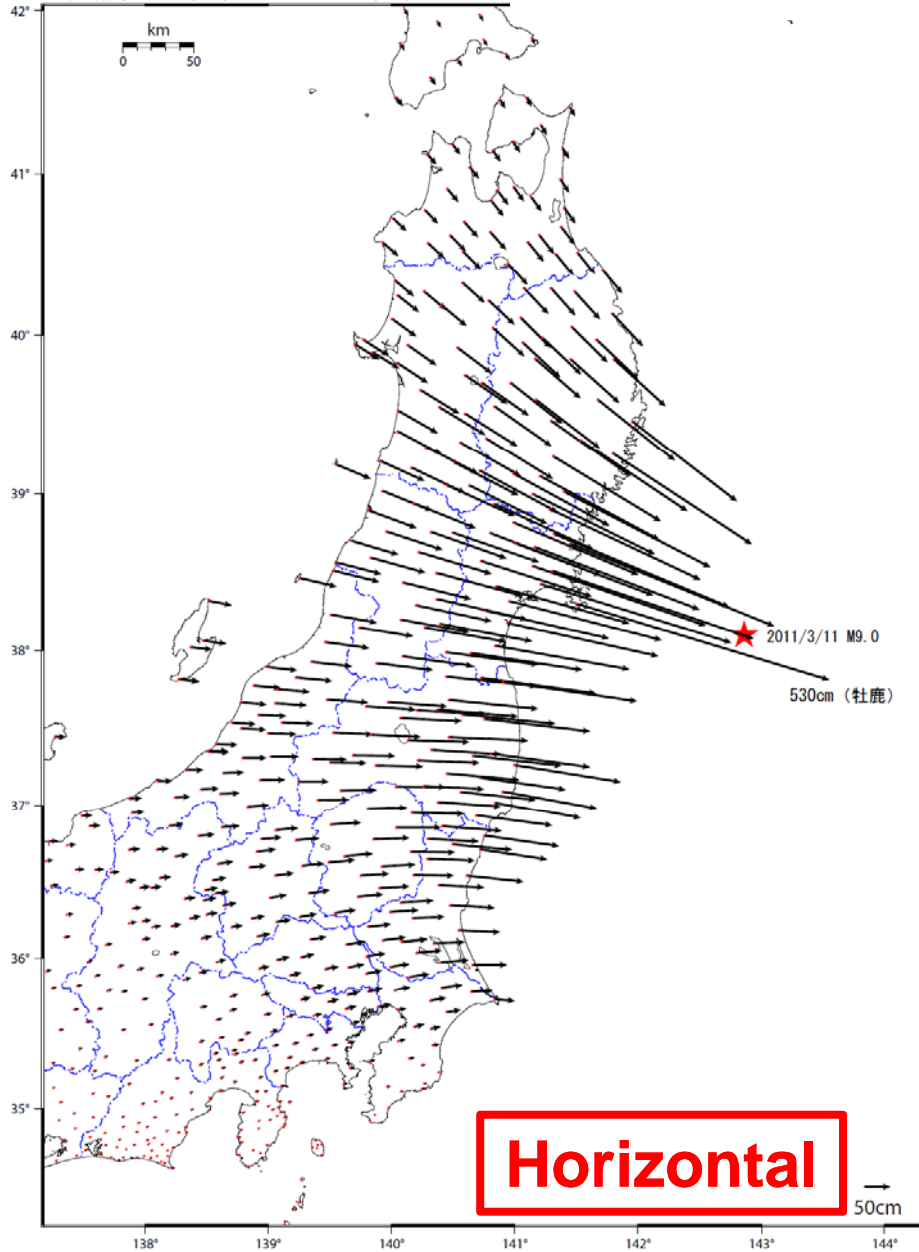
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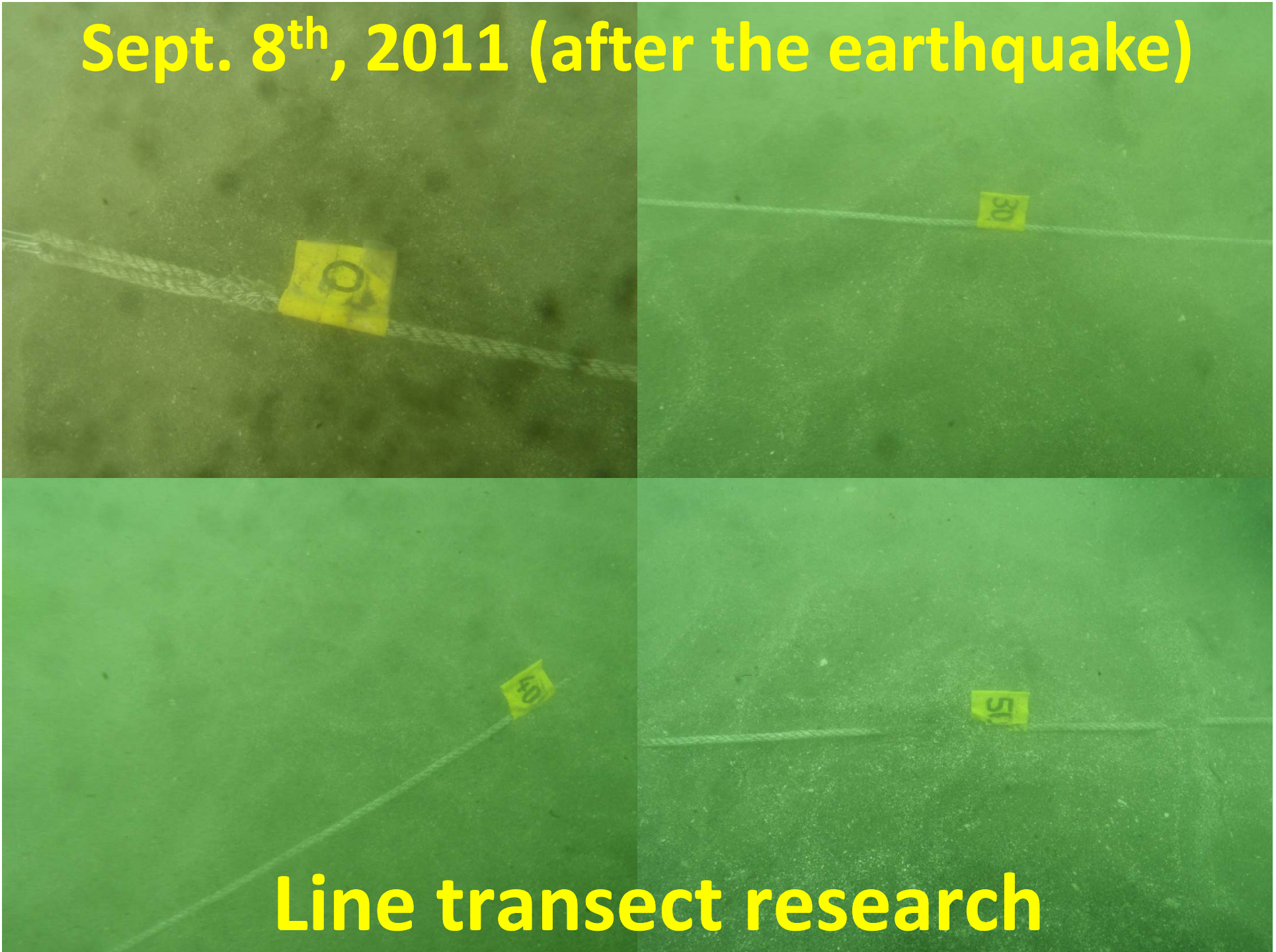
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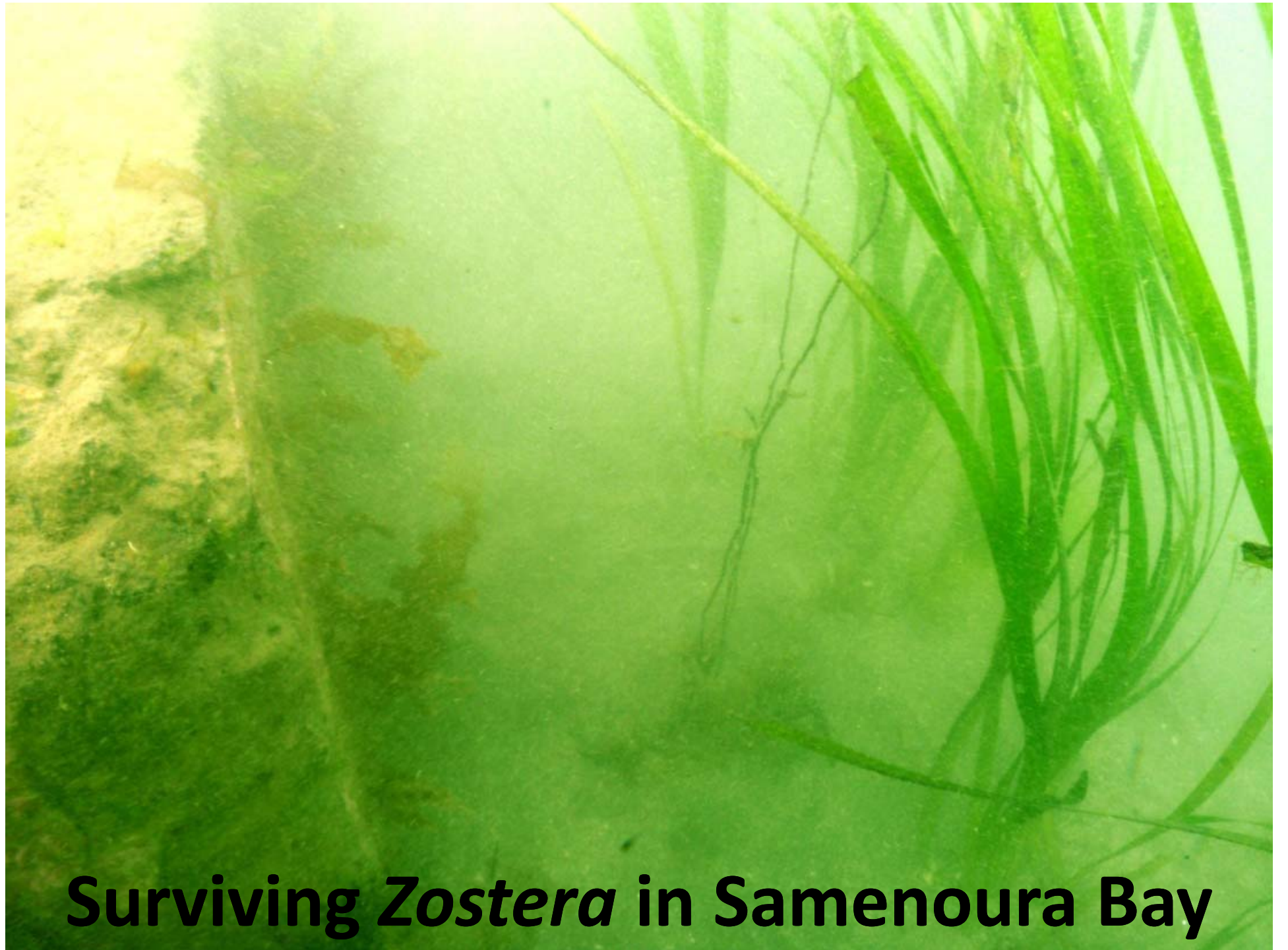


100m Line

Sept. 8th, 2011 (after the earthquake)

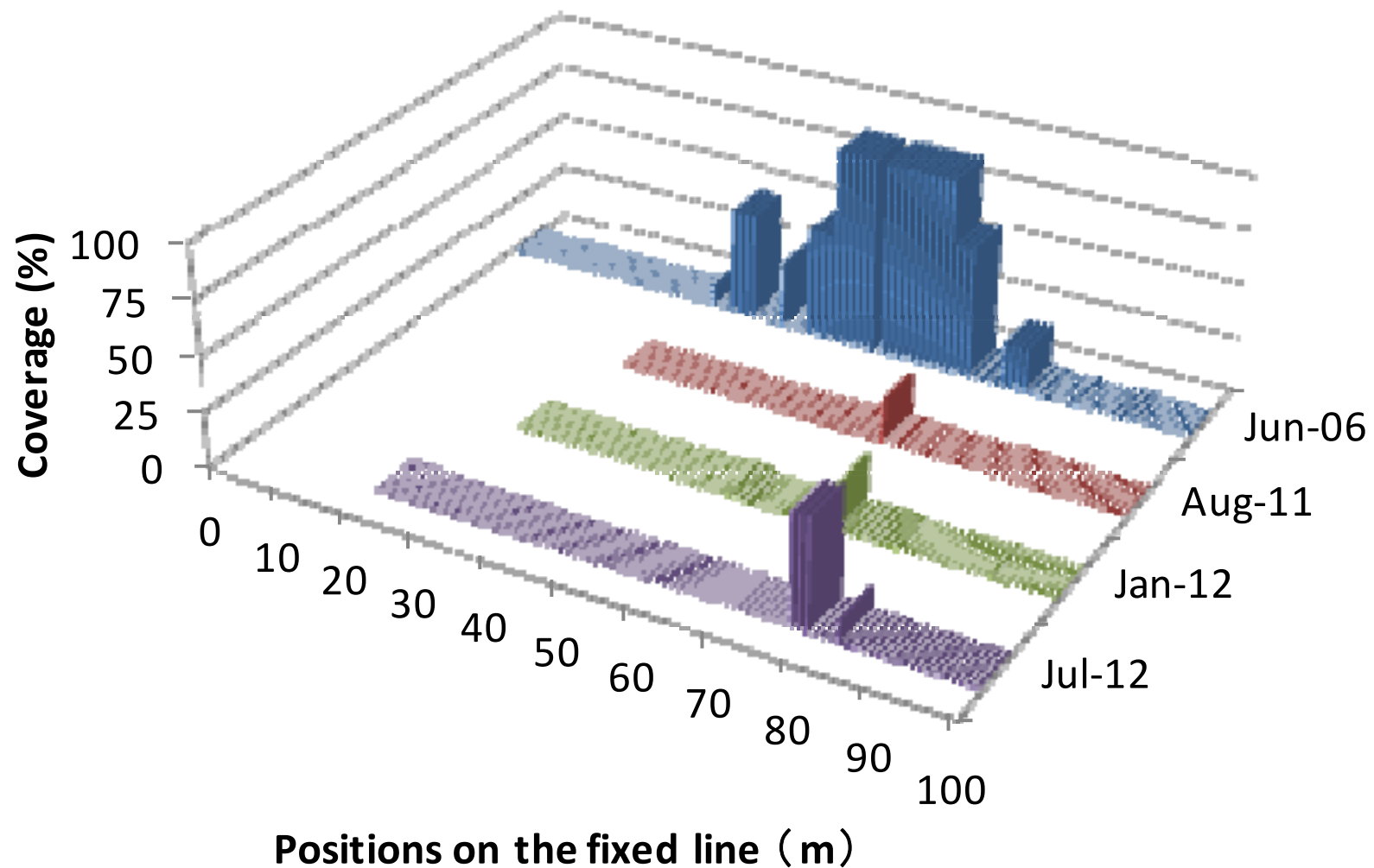


Line transect research

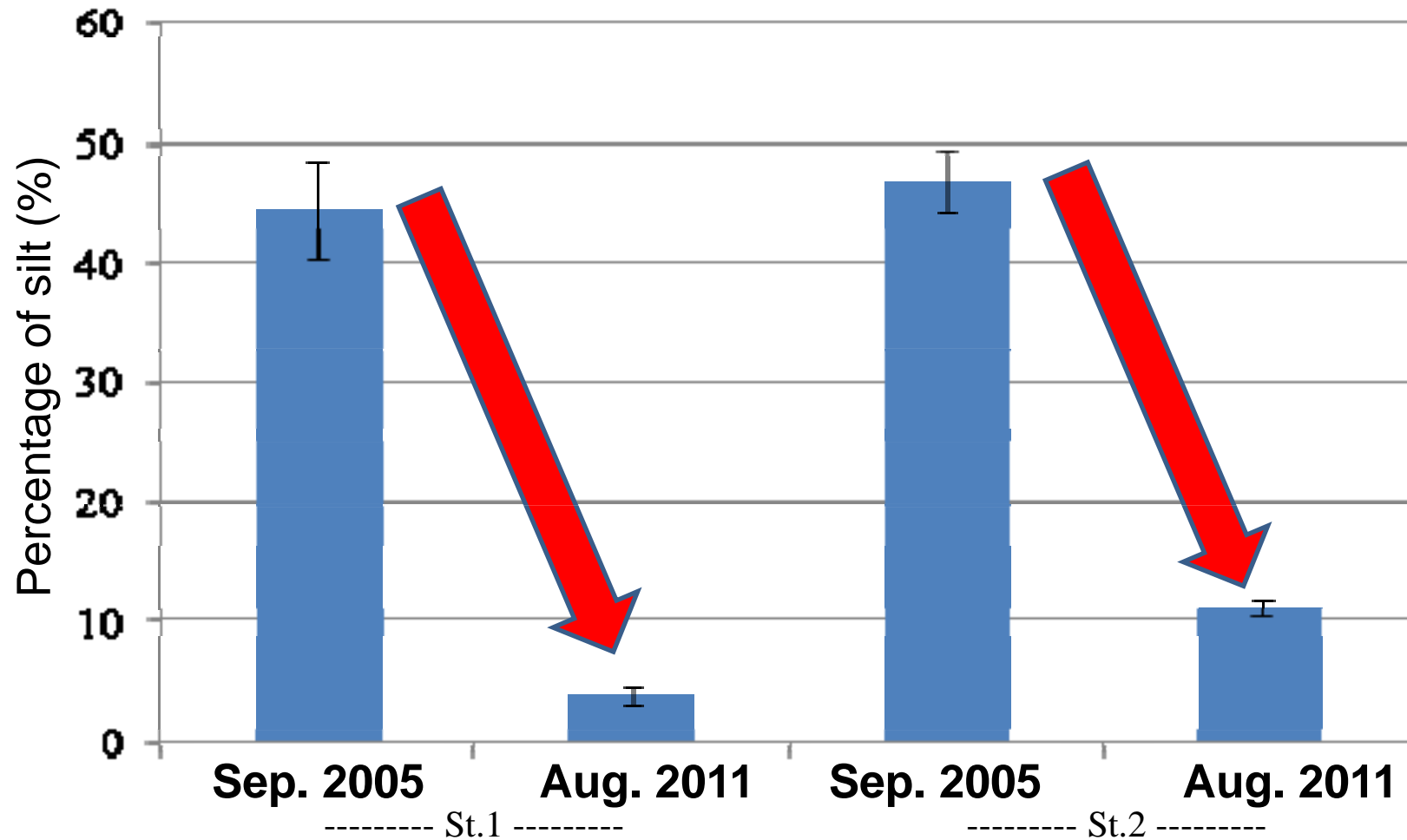


Surviving *Zostera* in Samenoura Bay

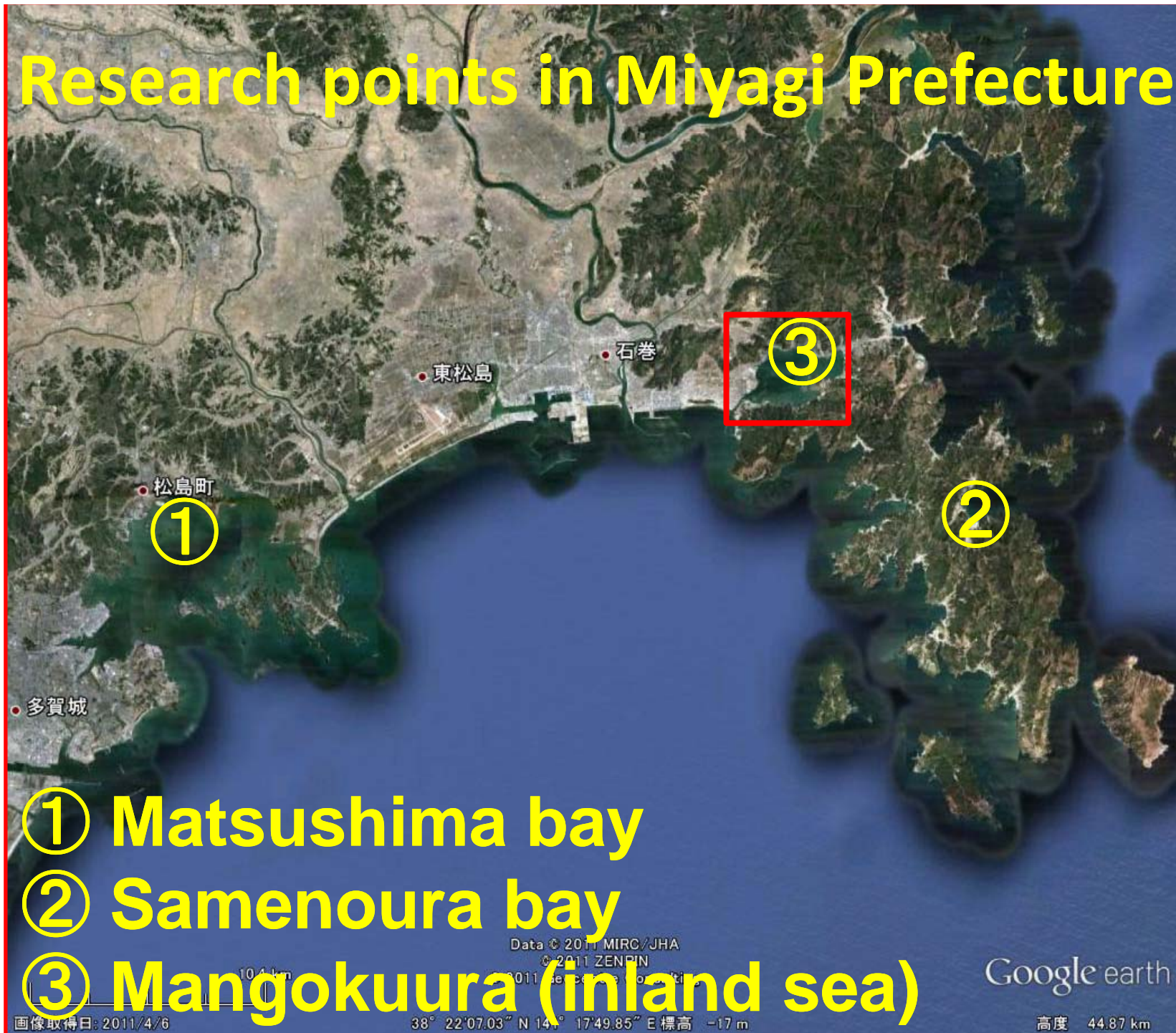
Coverage change of *Zostera* before and after the earthquake



Percentage of silt (<0.075mm) in the sediment before and after the earthquake



Research points in Miyagi Prefecture



① Matsushima bay

② Samenoura bay

③ Mangokuura (inland sea)



Mangokuura

M4 M5 M6

M1 M2 M3

1191 m

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Google earth

画像取得日: 2011/4/6

38° 25' 17.76" N 141° 23' 34.90" E 標高 0 m

高度 4.92 km

June 14th, 2011 (after the earthquake)

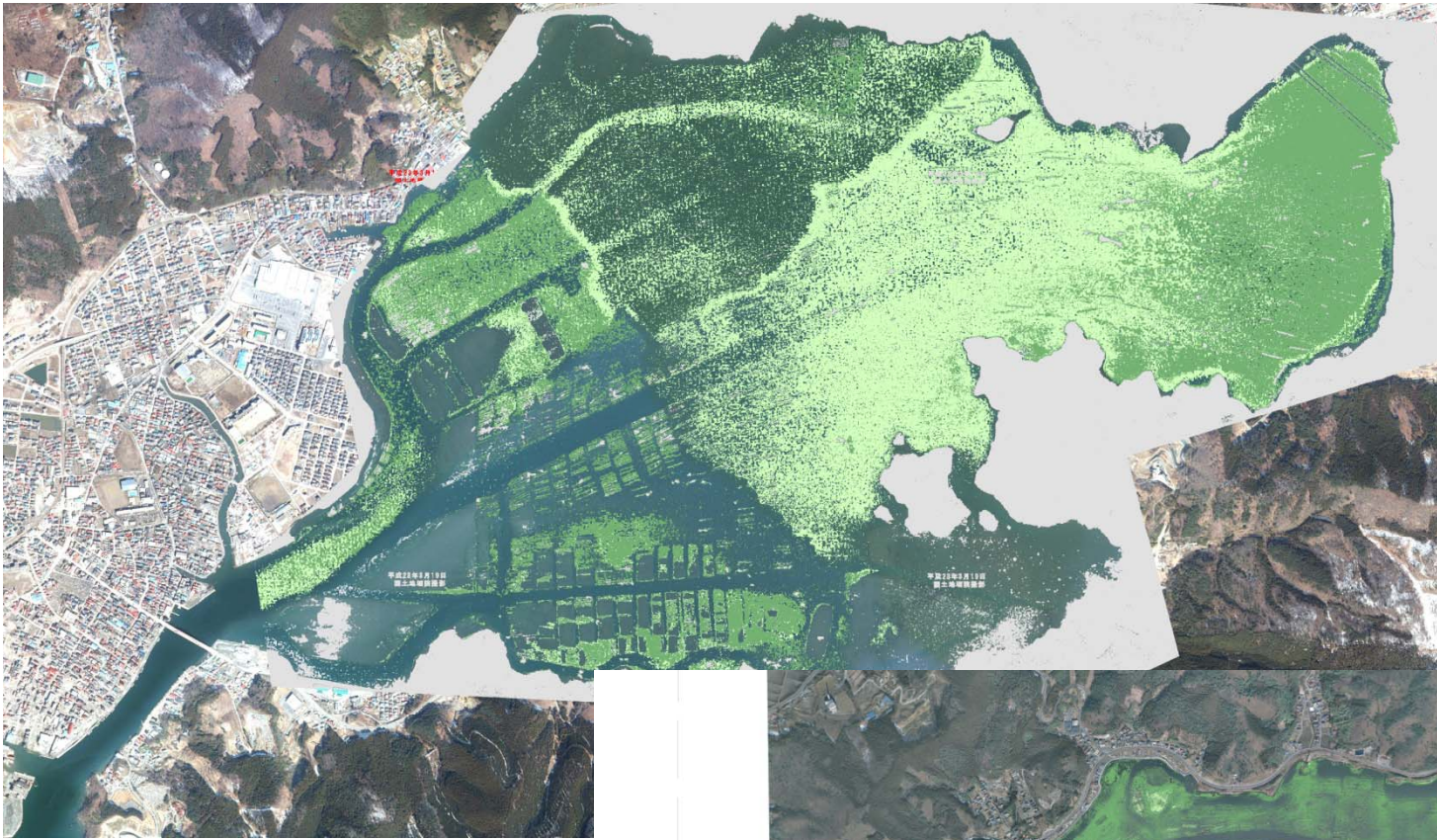


June 15th, 2011
Researched by SCUBA

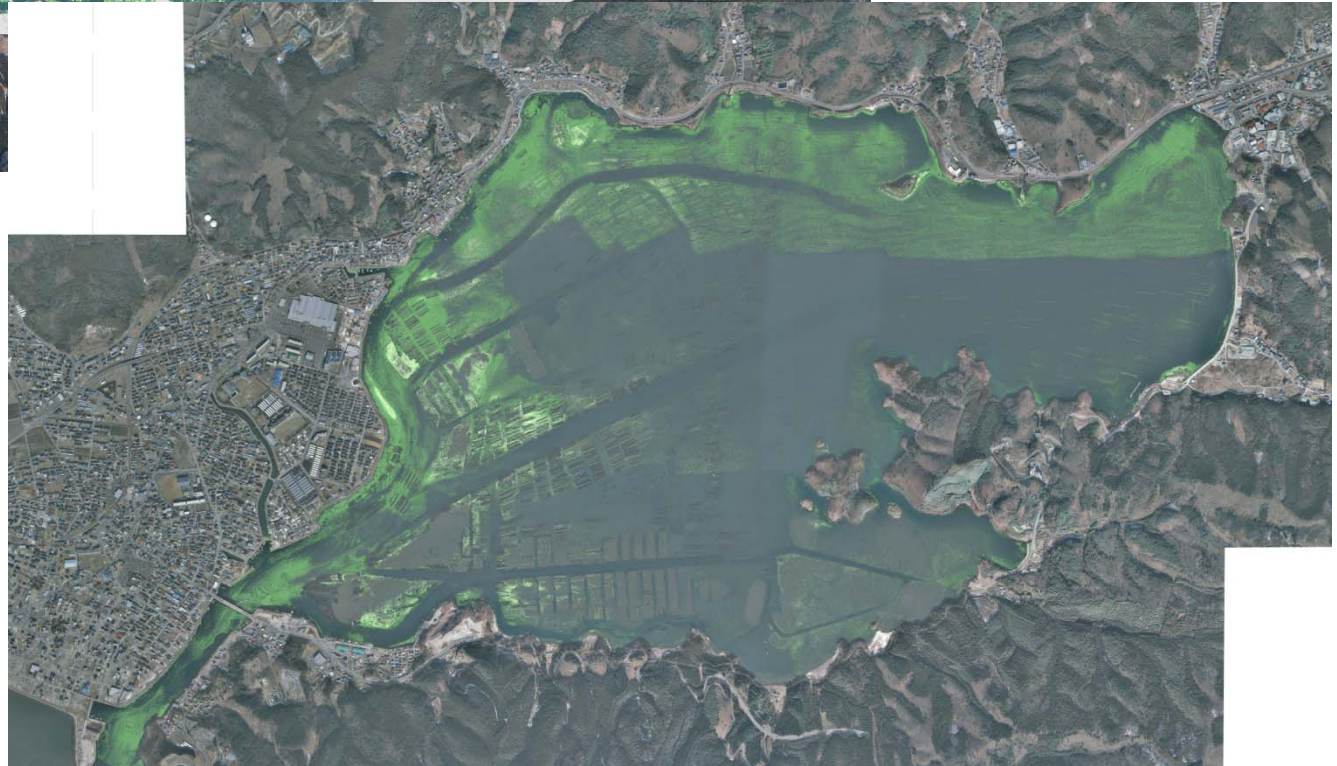


165 shoots/m²
in average

**March 19th,
2011
(right after
the disaster)**



**February 22th,
2012
(about one year
later)**



本震(M9.0)に伴う地

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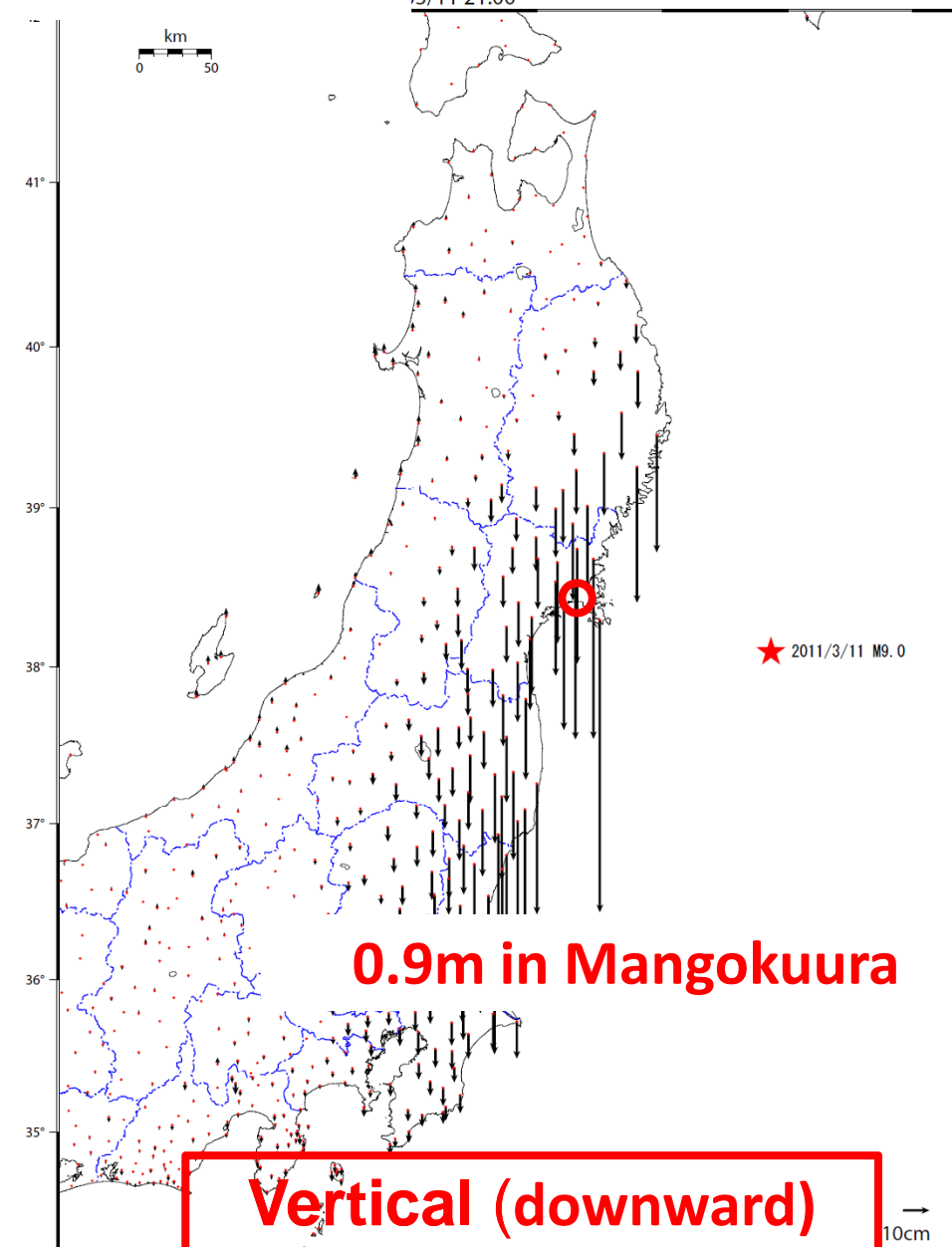
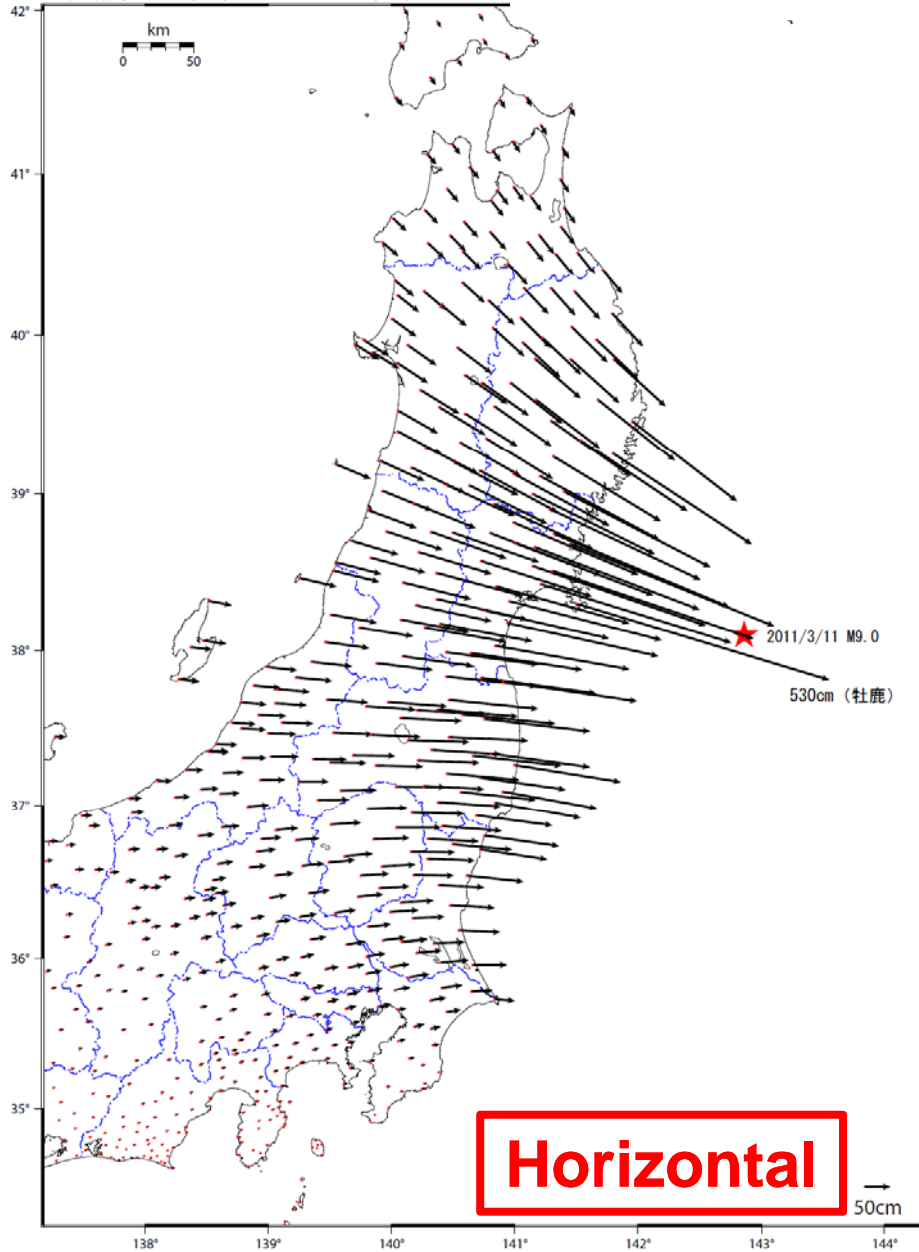
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Summary

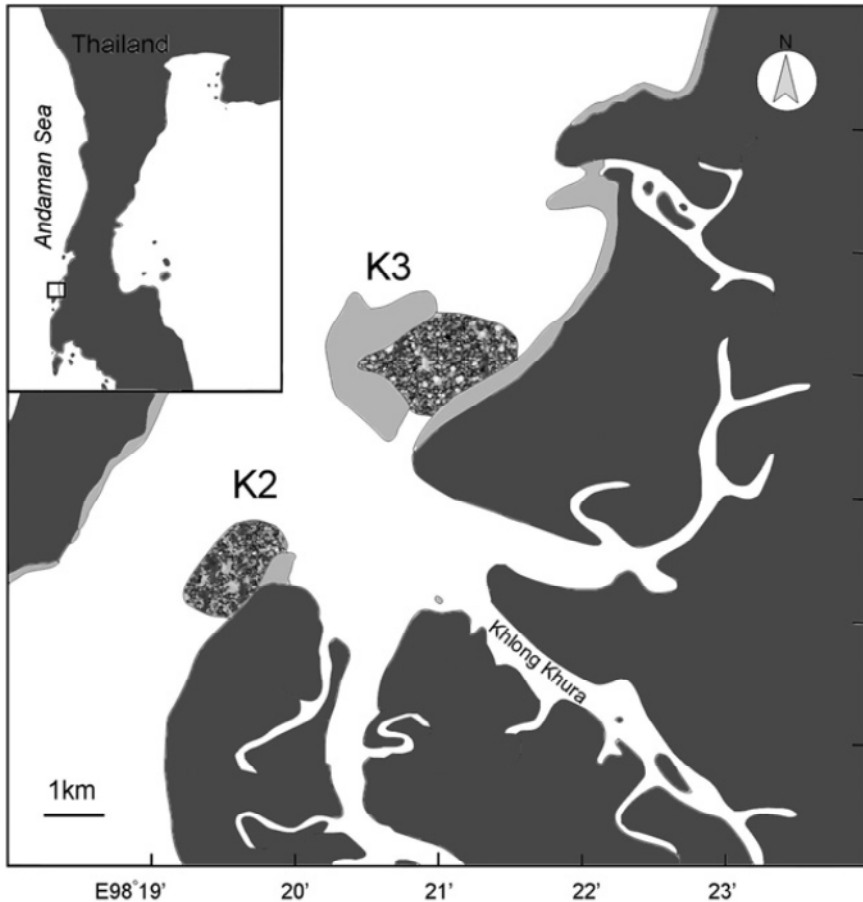
- ***Zostera* meadows: destroyed in most areas by Tsunami → self restoration (Seedlings in Matsushima bay etc.)**



Environmental changes: downward of the basement, landslide, etc.



Long-term observation is necessary!



消失したアマモ群落 は回復するか？

Whanpetch *et al.* (2010)
スマトラ沖地震(2004)に
伴うタイの海草群落変遷



壊滅した海草群落(K3)は6
年で2-3割回復(著者談)

○ K2
■ K3

- 破壊された海草群落は、全体の約7%(多く残存)
- 南方の海草種は成長が早い



今回の震災による被害はより深刻(?)

