GEOSPATIAL WORLD FORUM
23-25 JANUARY, 2017, HYDERABAD, INDIA

Research and business on the prediction of earthquakes using GNSS data in Japan

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Introduction

- 2002: started research on earthquake prediction with GNSS after retirement from University of Tokyo
- 2006: Japanese patent on EQ prediction with GNSS
- 2007~2009: validation for 162 EQ with larger than M6
- 2011/3/11: East Japan Great EQ occurred
- 2013/1/17: Japan Earthquake Science Exploration Agency (JESEA) was established
- 7 times exposure at Fuji TV program

Business Model

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+ The main task of JESEA is to provide “weekly MEGA earthquake prediction” to more than 50,000 customers (see: www.jesea.co.jp)
+ The member fee for individual member is only 2 US$ per month for mail magazine and 3.5 US$ for smart phone service
+ The member fee for sustaining member is 200 US$ per month
+ The contents include prediction summary, risky areas, weekly height changes, monthly horizontal changes, two year tendency of height, E-W and N-S changes
+ The first month of registration is free of charge
+ The main advertisement depends on TV programs and weekly magazines
+ So far highly evaluated ranking on internet has been maintained

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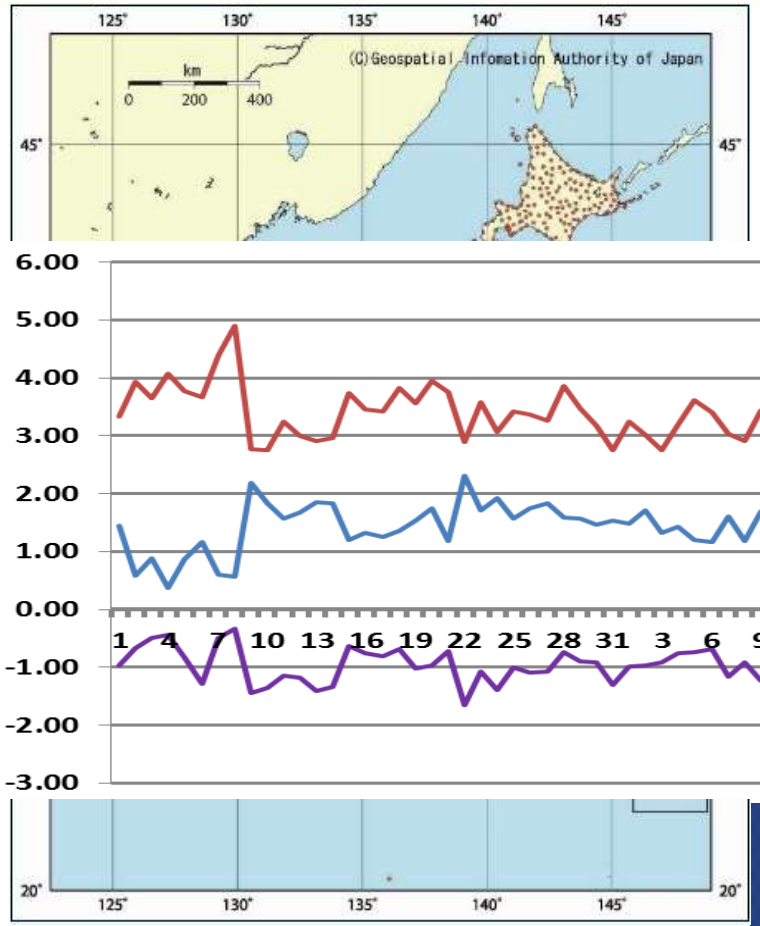
GNSS Stations in Japan



1300 stations in total in Japan
Daily data are free of charge

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The method of prediction

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Method 1: Analyze short-term changes of horizontal and vertical components

Method 2: Analyze long-term tendency of vertical changes for about 2 years

Method 3: Analyze long-term accumulated changes of vertical components

The final stage: Murai makes overall judgements

Validation of past EQ's

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1. East Japan Great EQ: 2011/3/11 M9.0, Depth 25km
   18,000 killed mainly by Tsunami
   Precursors was detected 6, 5 and 1 month before

2. Tokyo Area EQ : 2015/9/12, M5.2, 60km Depth
   Nobody killed but many elevaters stopped
   I announced in TV program about the risk just 6 days before

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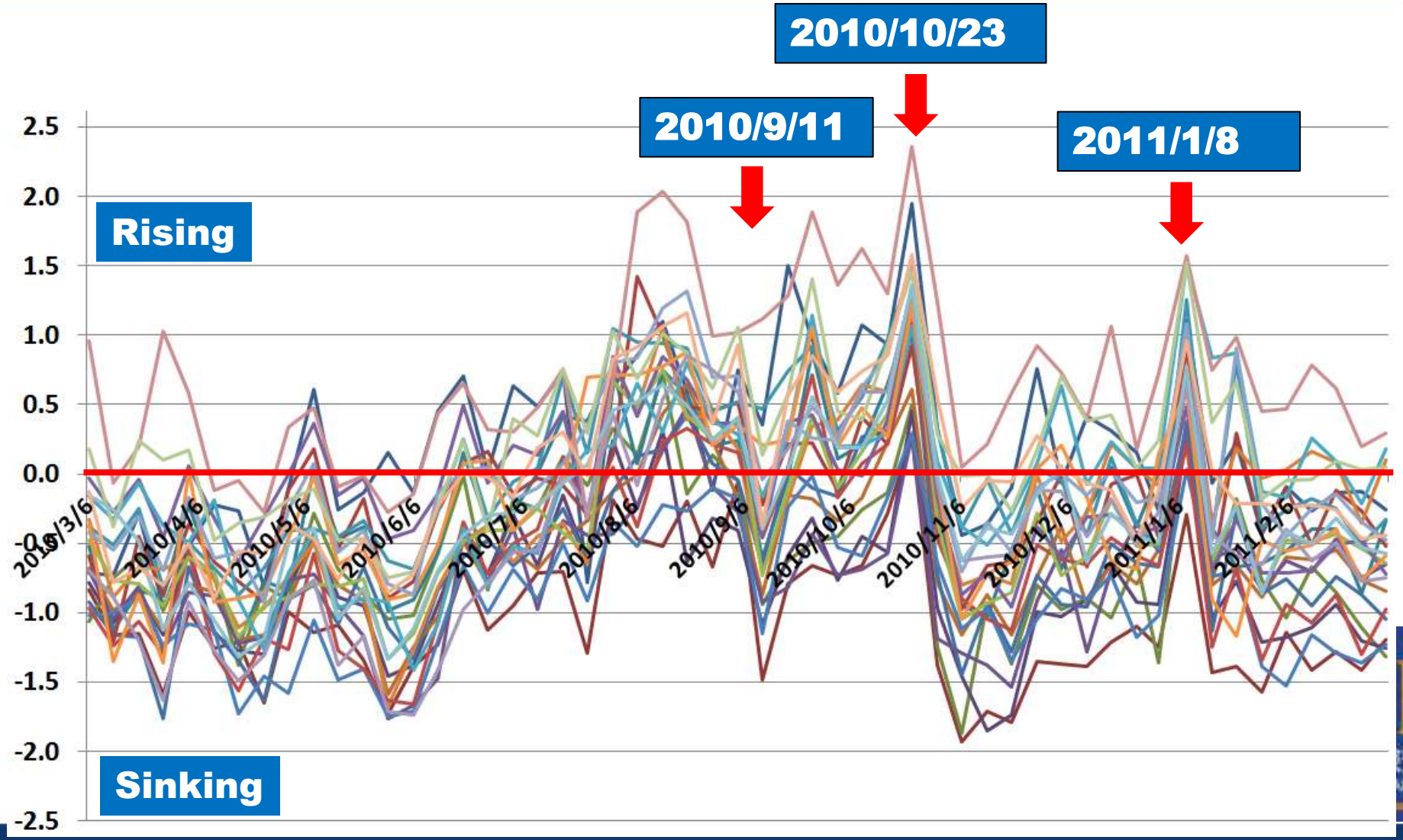
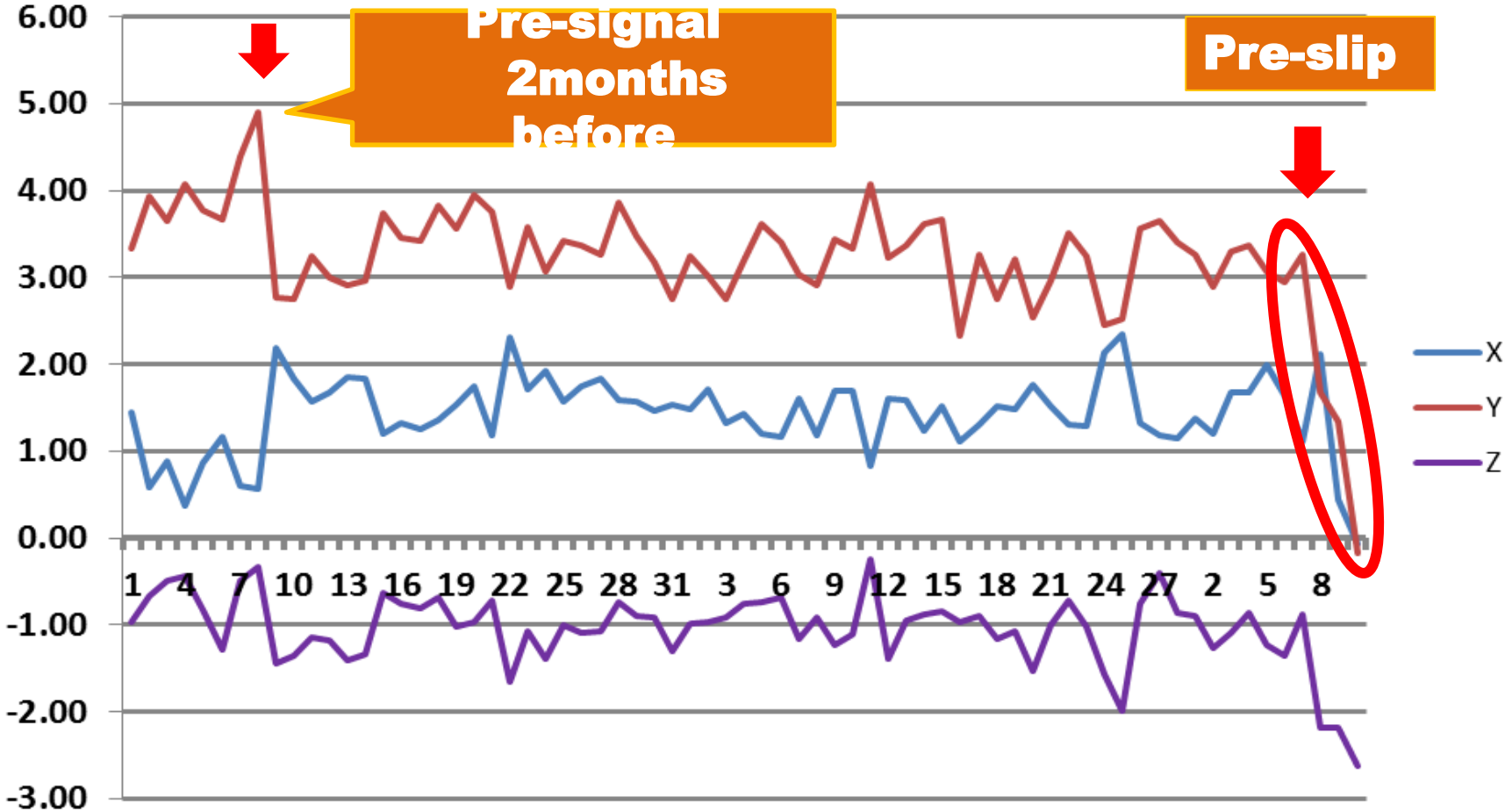
1. East Japan Great EQ

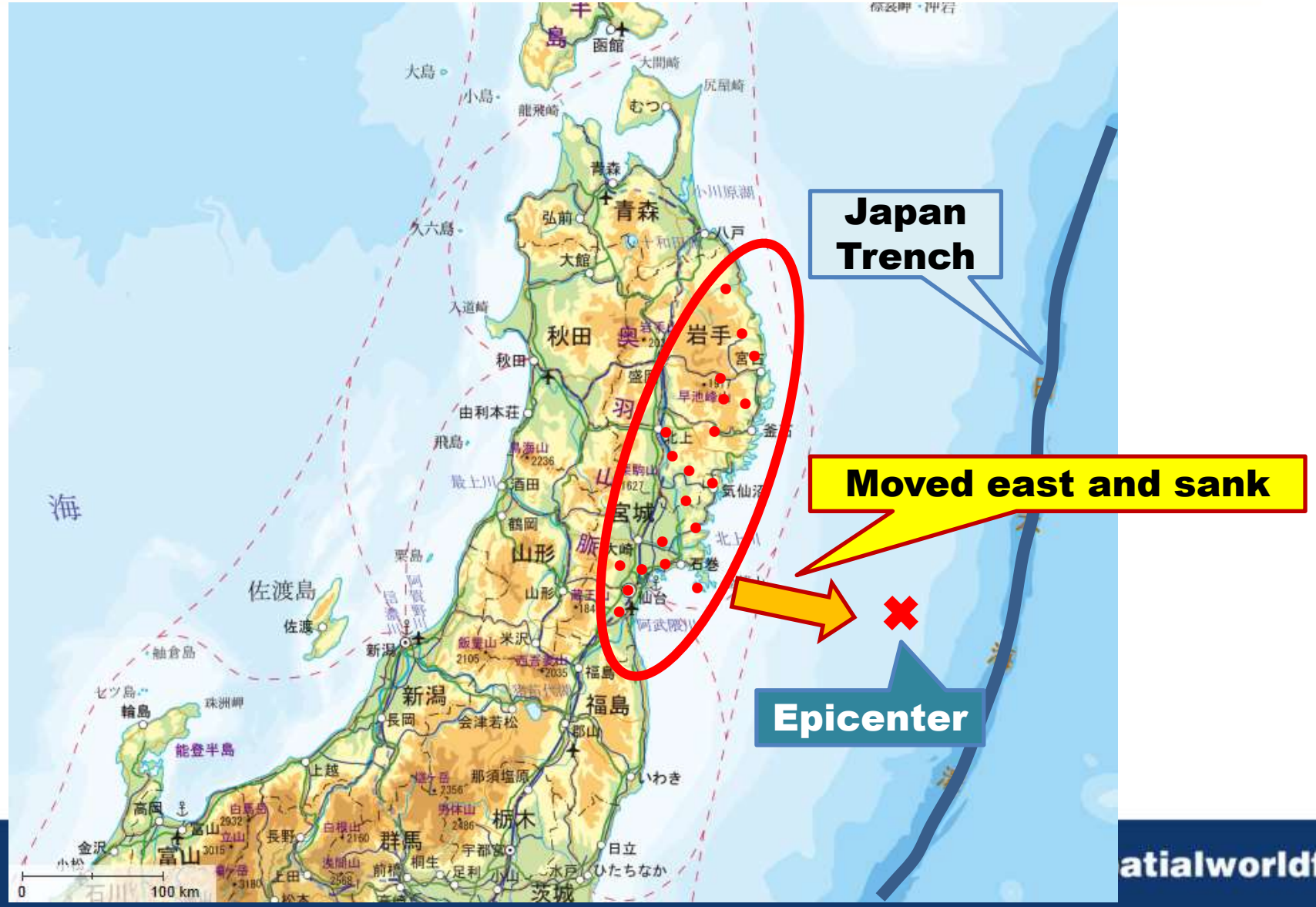


Pre-slips were found in Kesennuma



There were pre-slips 3 days before EQ

Tsunami hit areas showed pre-slip just before EQ



2. Tokyo Area EQ：2015/9/12, M5.2, 60km Depth

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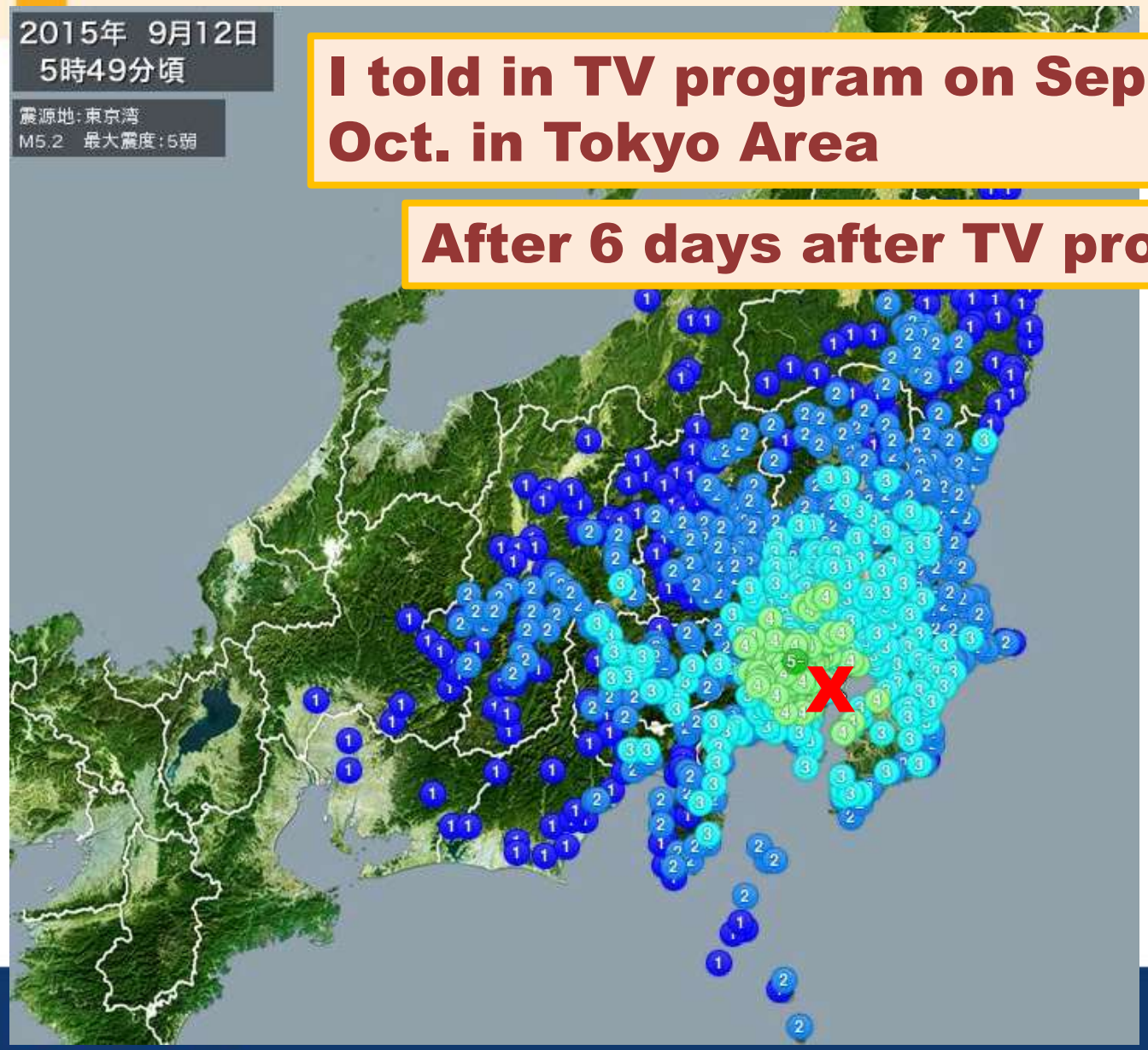
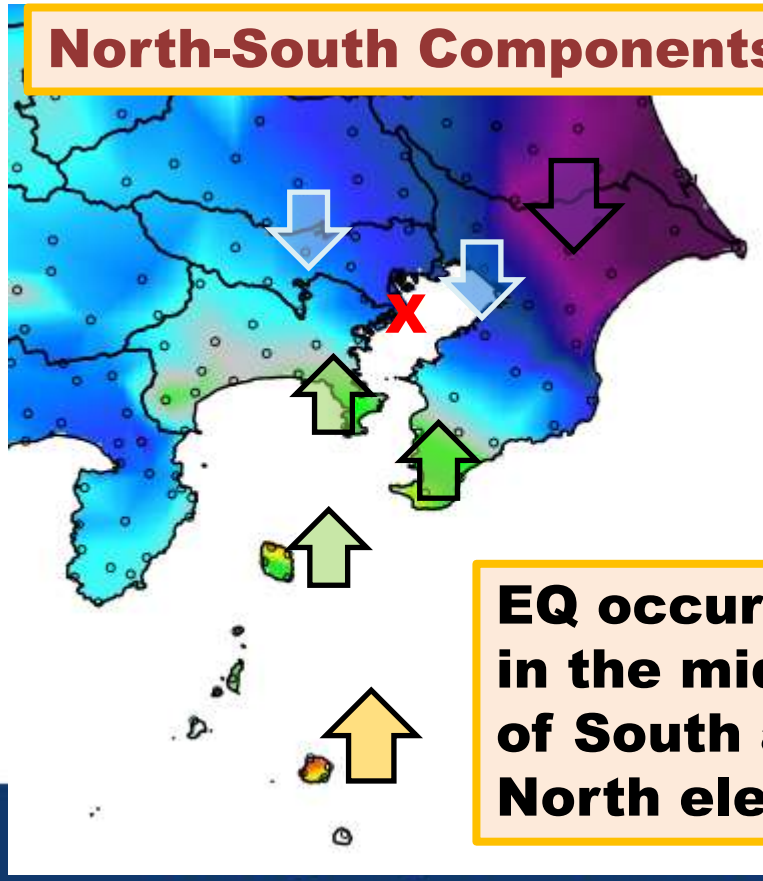


I told in TV program on Sep. 6 that EQ will come in Sep. or Oct. in Tokyo Area

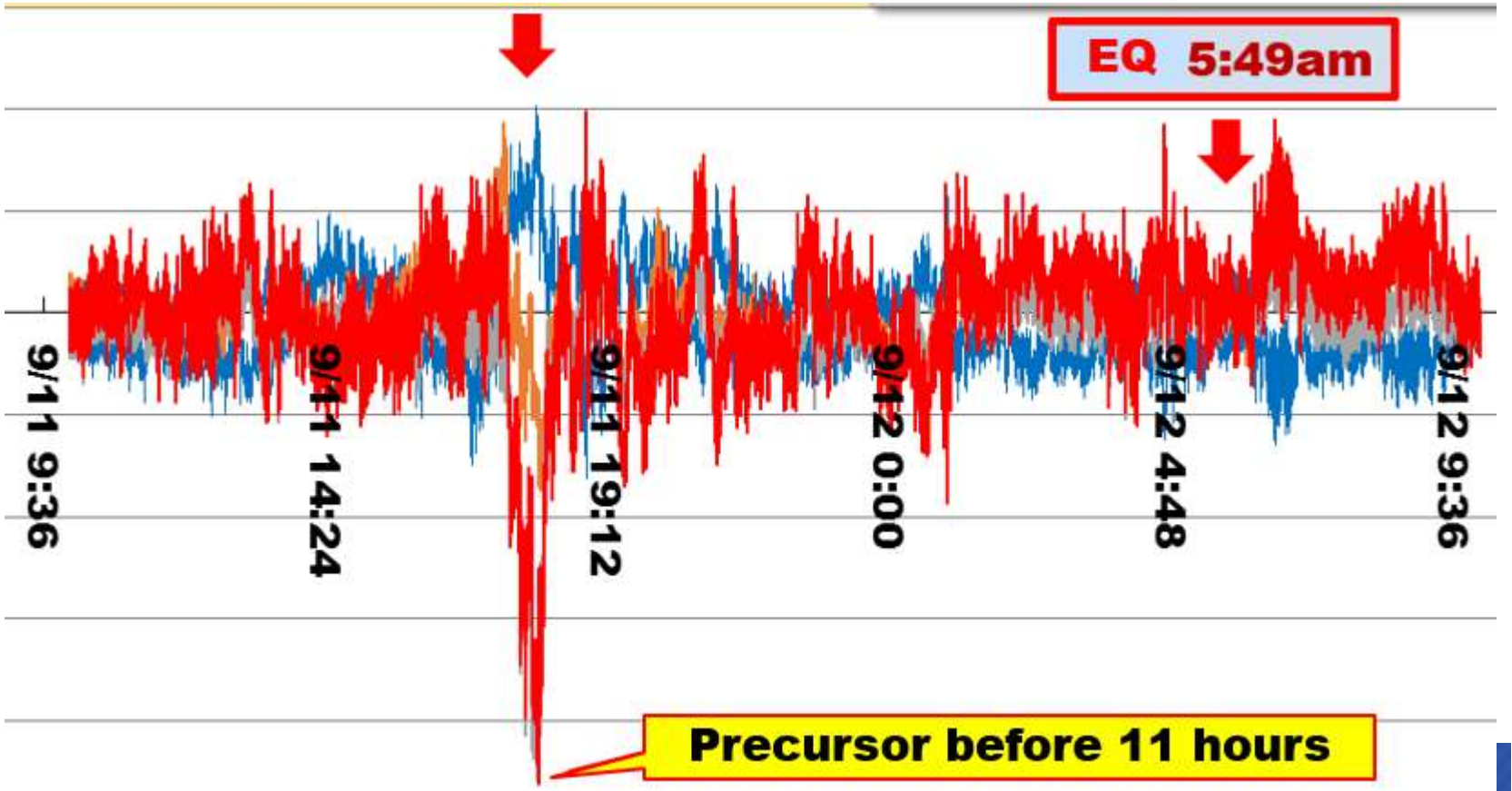
After 6 days after TV program EQ occurred on Sep. 12

North-South Components



EQ occurred in the middle of South and North elements

Self constructed GNSS stations



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Conclusions

- The prediction method proved correct with high score more than 80%
- The cause can be explained scientifically
- However the time accuracy is not yet high, say a few months
- The prediction business is so far successful with a number of customers
- The prediction techniques are being developed by accumulating experience and evidences

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Thank you for your attention

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