

EARTHQUAKE PREDICTION BY SEVERAL METHODS TO OBSERVE DIRECT EMISSION FROM EPICENTER AND MEASURING EQUIPMENT

**INTERNATIONAL CONFERENCE "HAZARDS-
DETECTION AND MANAGEMENT"**

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What I Speak today

- ★ Significant method to predict Earthquake (EQ)
 1. Tree Bio-electric Potential (TBP) observation method
 2. Adjacent dual frequency Observation at several frequency bands
 3. Ionosphere Perturbation Observation by VLF/LF propagation anomaly
 4. Air Ion Concentration Observation
 5. Air Radon Concentration Observation
 6. Ocean Tidal Level Deviation
- ★ Low cost Data Processor which can be a world standard for EQ prediction

Behaviors of small animals before huge earthquake



Alignment to one direction of
earthworm before Taiwan Chi-Chi EQ
M=7.6 1999/09/21
© NPO e-PISCO



Plenty of frogs appeared on the
road 2 days before a China EQ
© NPO e-PISCO

Cats, Dogs, Cat fish, and so on

Plants shows anomalous action

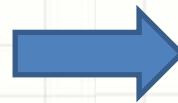
Plants feel external stimulation

Mimosa Pudica reacts when it is touched by hand, vent down before typhoon and anomalous action before EQ

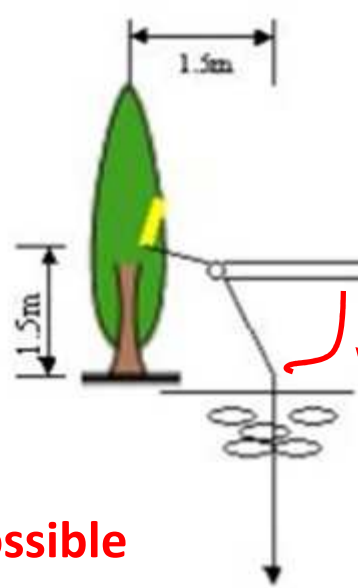
Plants have instinct to catch precursor from huge earthquake, too



touch



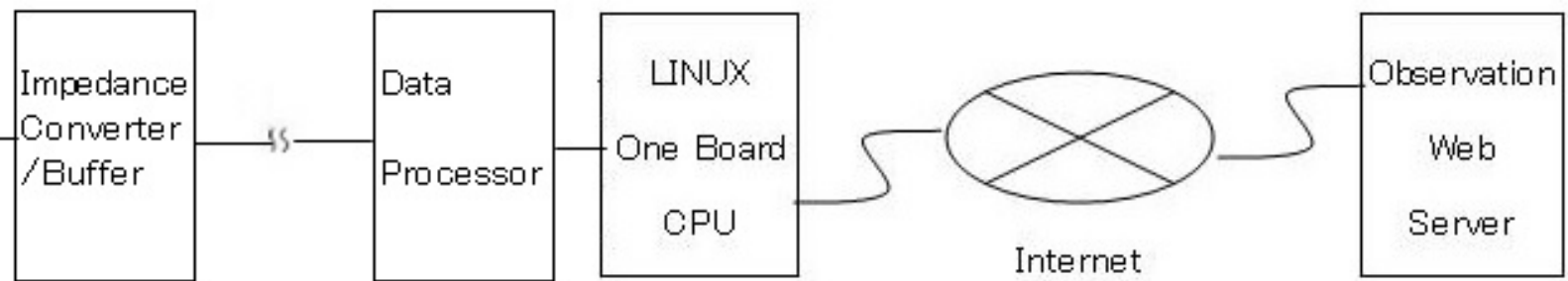
Tree Bio-electric Potential Observation System



Tree Bio-electric Potential (TBP)



As short as possible



Adequate kind of Trees for observation

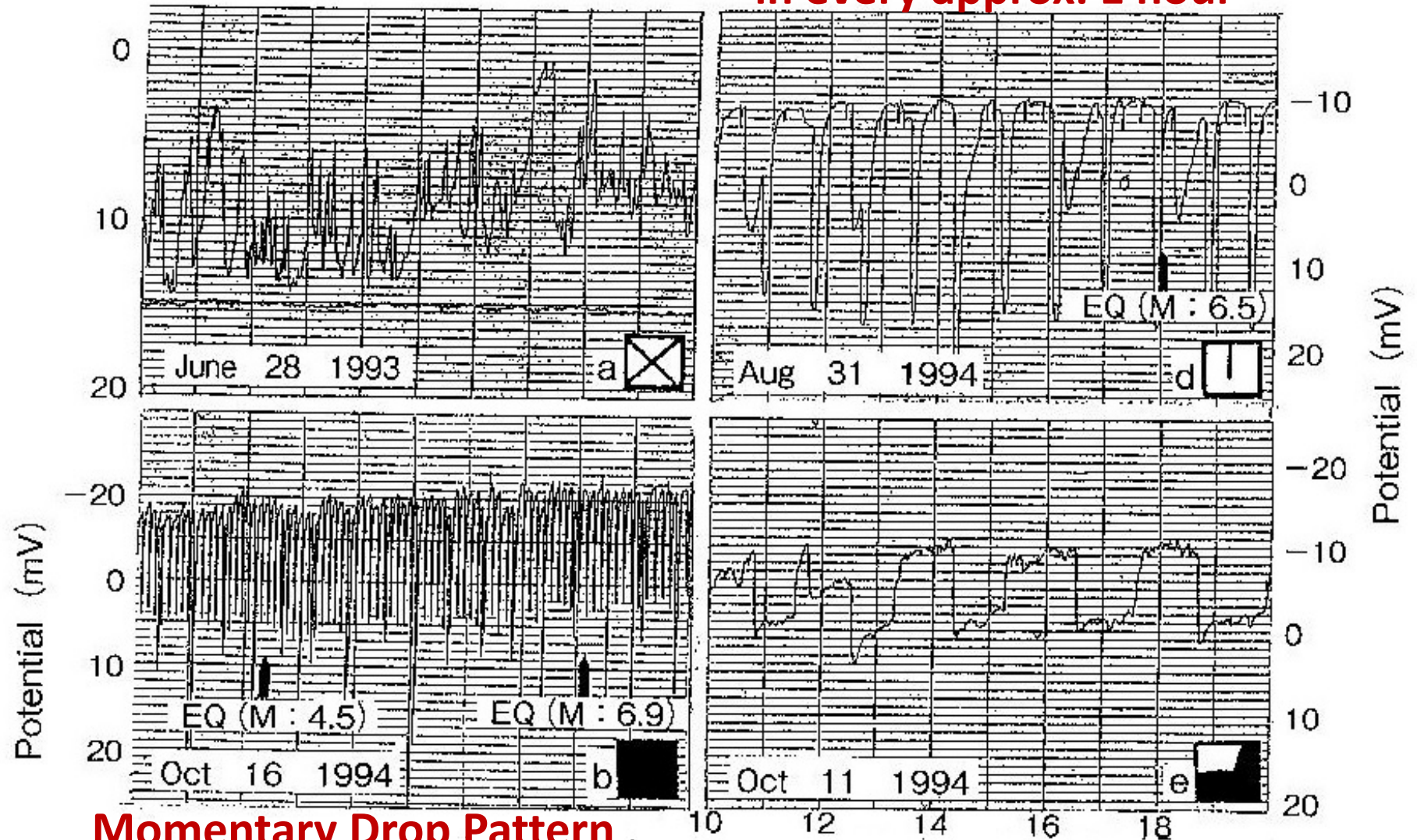
- Evergreen broad-leaved trees
- Smooth bark
- The age of tree is several years or more
- Silk tree, Zelkova tree, Fragrant olive, Camellia, and so on



Anomalous patterns

Noisy Pattern

Momentary Drop Pattern
in every approx. 1 hour

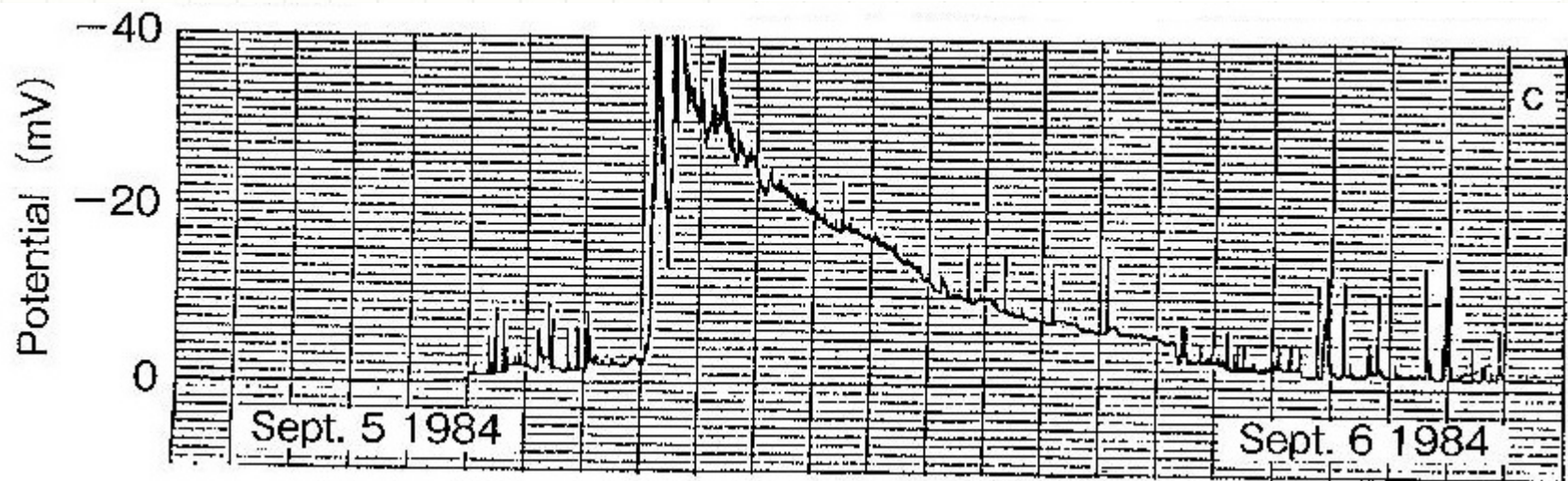
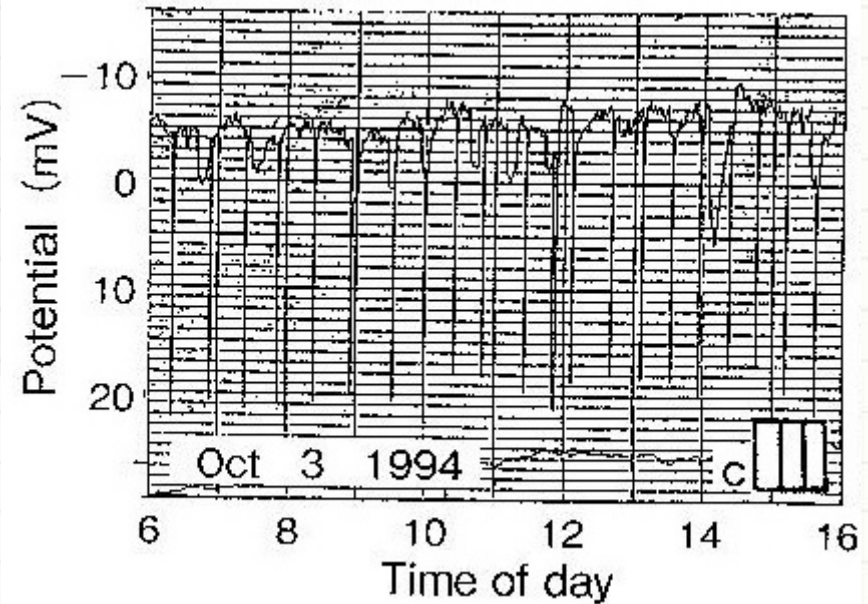


Momentary Drop Pattern
in every approx. 10 minutes

Rectangular Pattern

Anomalous patterns

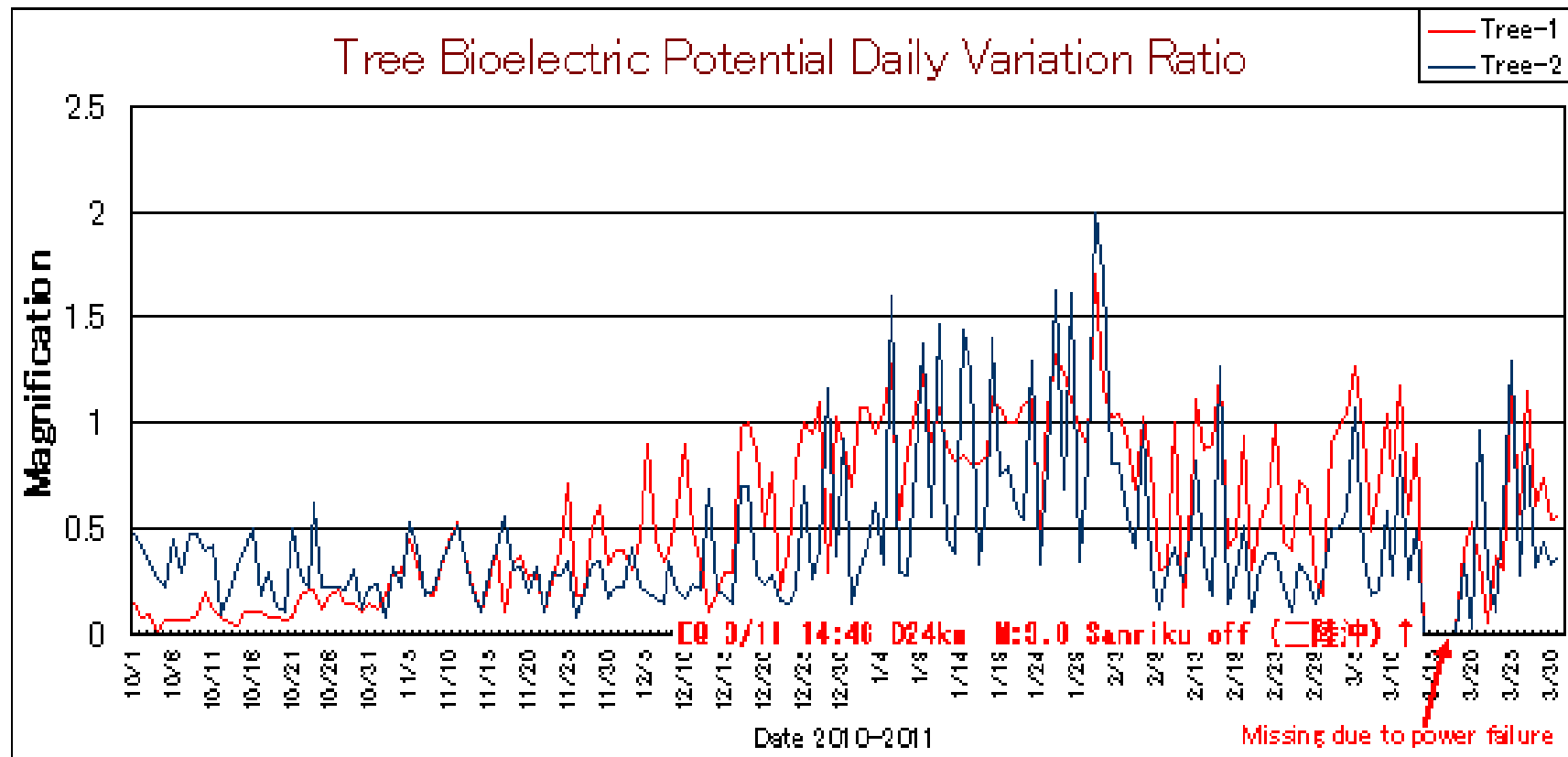
**Momentary Drop Pattern
in every 30-40 minutes**



Charge-Discharge Pattern

Anomalous patterns

Long Term Pattern



1.5 Months before EQ

3 Months before EQ

Examples of Anomalous signal 1

4 days before

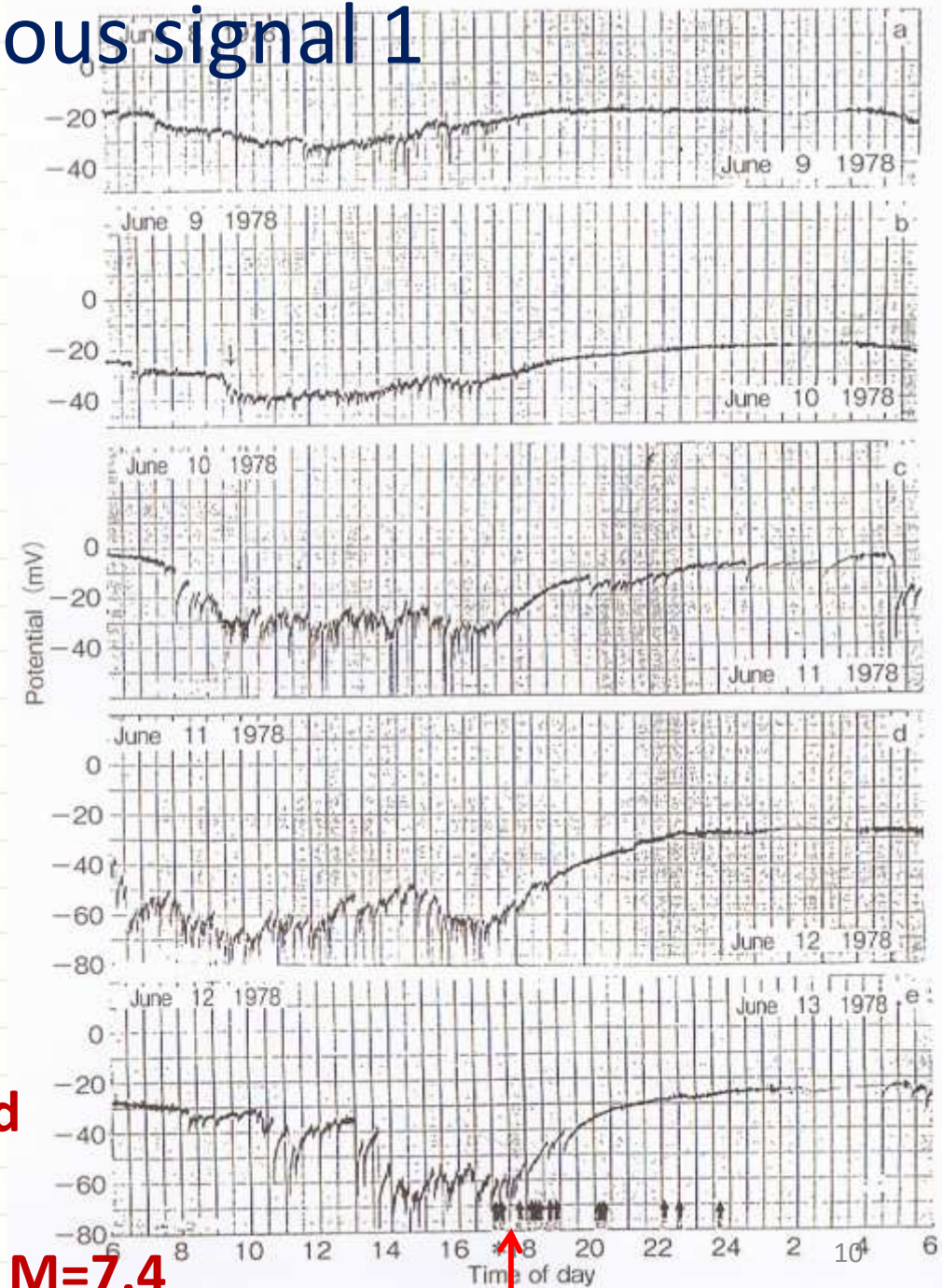
3 days before

2 days before

1 day before

The day EQ occurred

1978/06/12 17:14 Miyagi off M=7.4

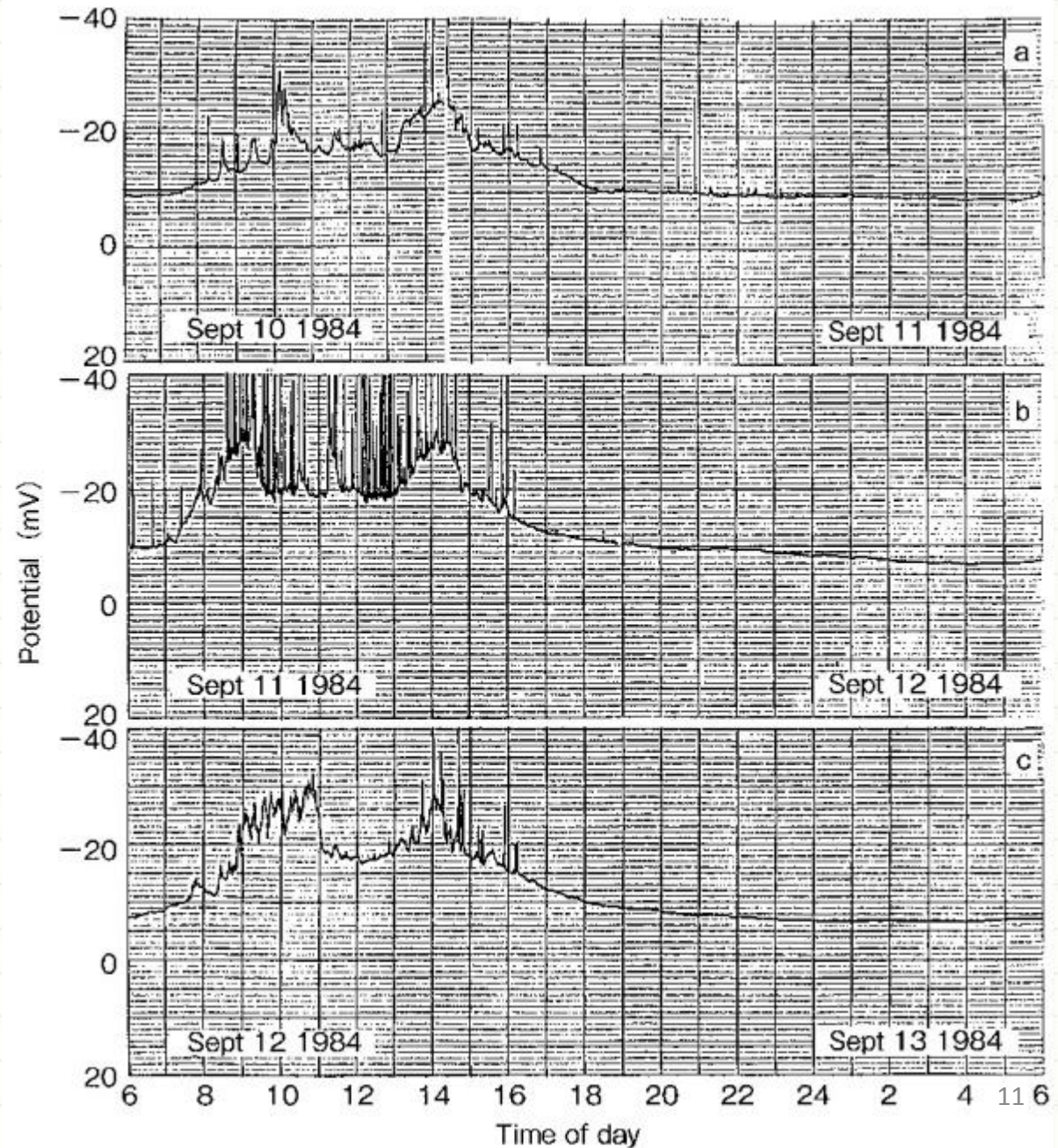


Examples of Anomalous signal 2A

4 days before

3 days before

2 days before



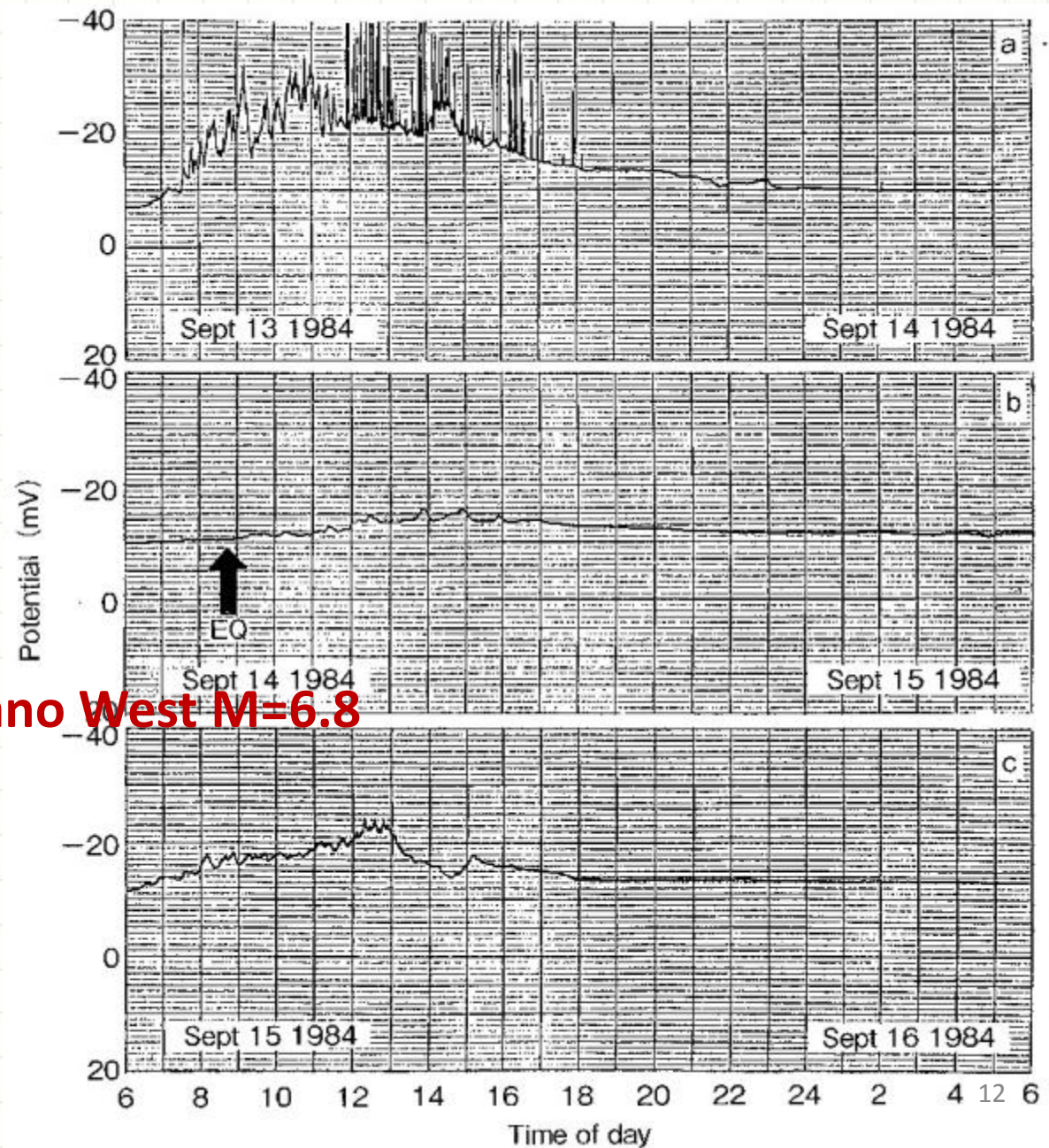
Examples of Anomalous signal 2B

1 day before

The day EQ occurred

1984/09/14 8:49 Nagano West M=6.8

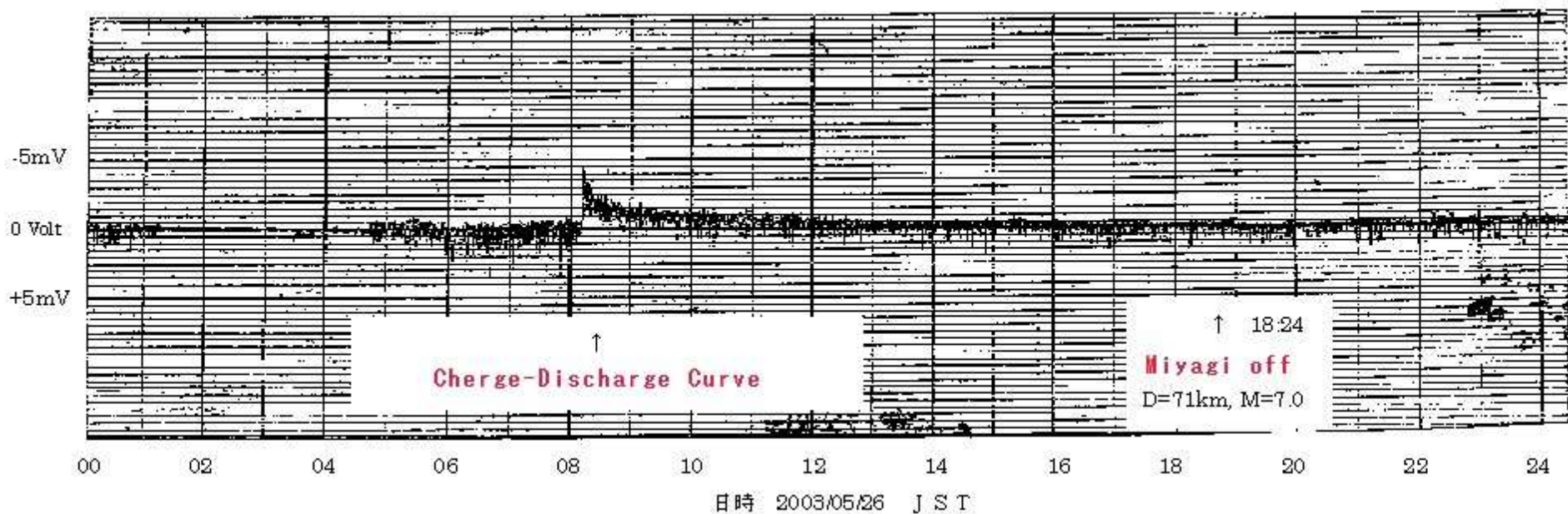
1 day after



Examples of Anomalous signal 4

Charge-Discharge Curve observed 10 hours prior to a huge earthquake

TBP at Sagamihara



T B P 法 : Toriyama Bioelectric Potential Method

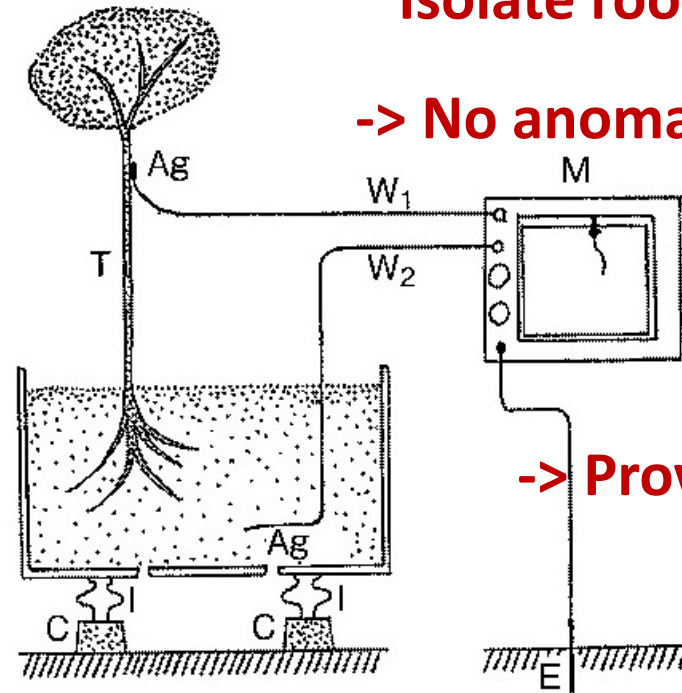
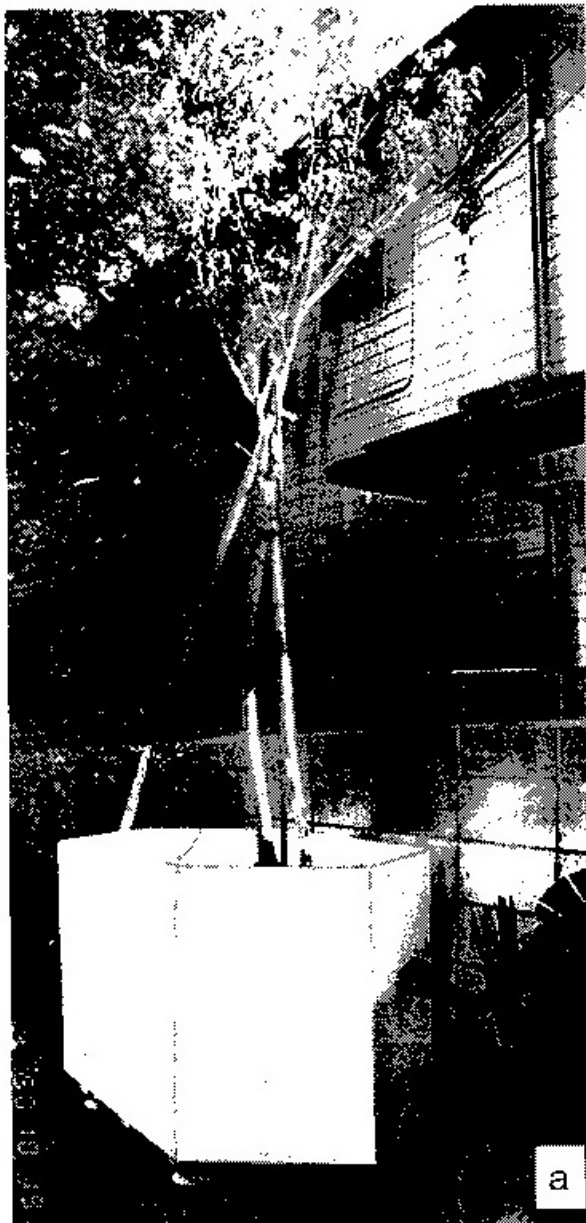
© SAITO Yoshiharu

Where anomaly signal comes from?

Isolate root from ground

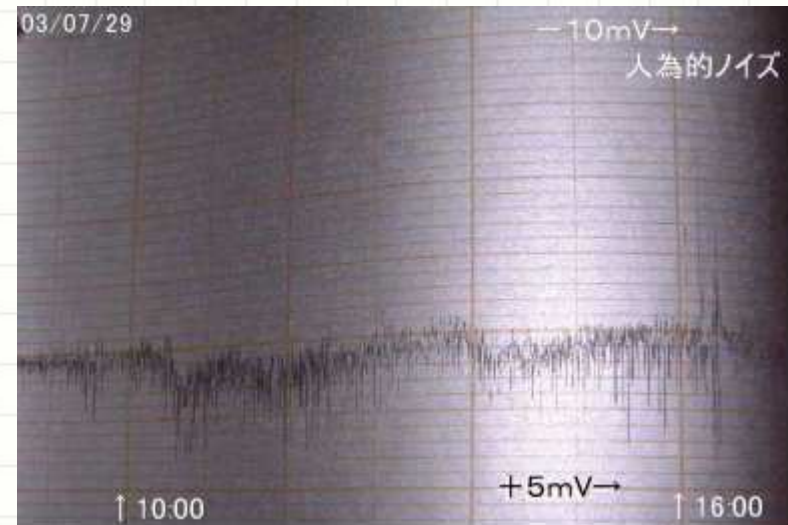
-> No anomaly was observed

-> Provably thru root

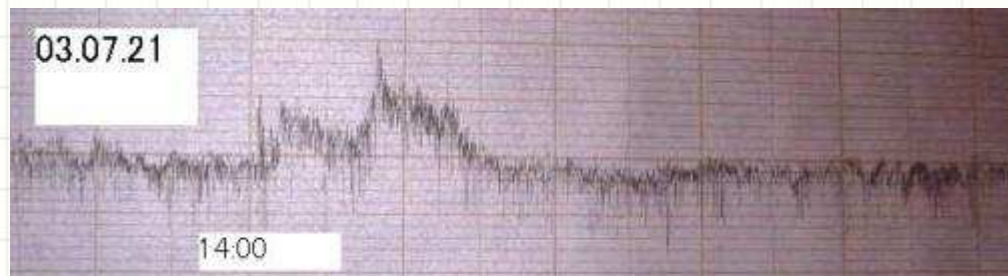


Non seismic signal

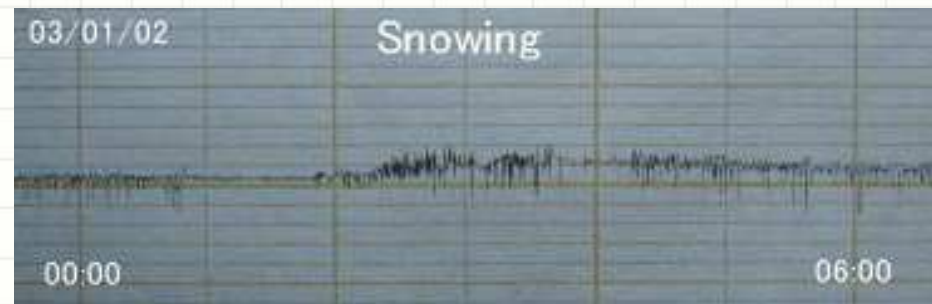
Felling of a branch
Hitting tree by baseball bat



Lightning



Snow
Electric train



EQ prediction by TBP

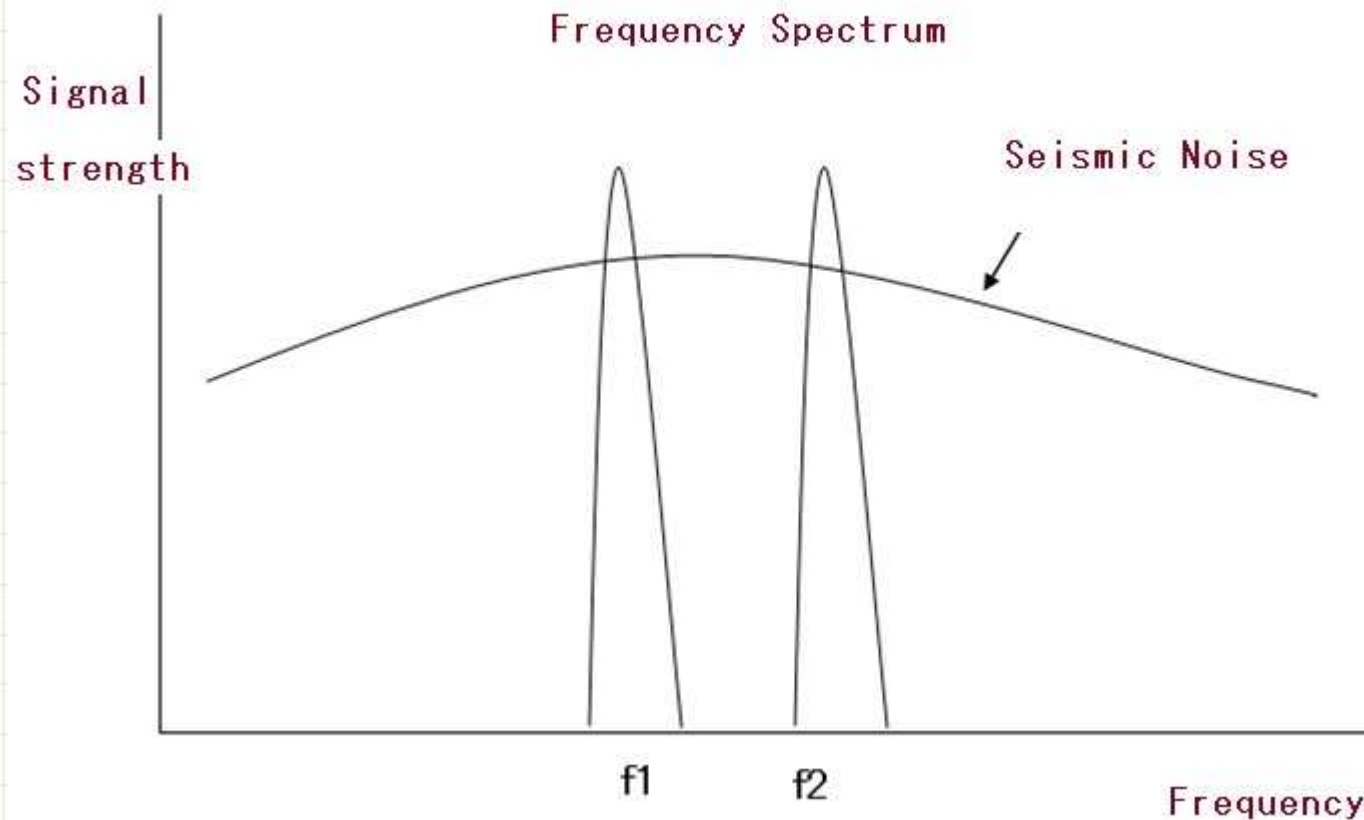
1. Tree is a sensor of EQ precursor
2. There is individuality for each EQ
3. These anomalous actions may be caused by receiving electric magnetic (EM) signal through ground via root
4. As mechanism is not solved yet, to predict the 3 elements of earthquake occurrence i.e. when, where and magnitude is very difficult
5. however, it is possible to predict occurrence of huge earthquake soon

Observation of Direct Emission of EM at several frequency bands with adjacent dual frequency

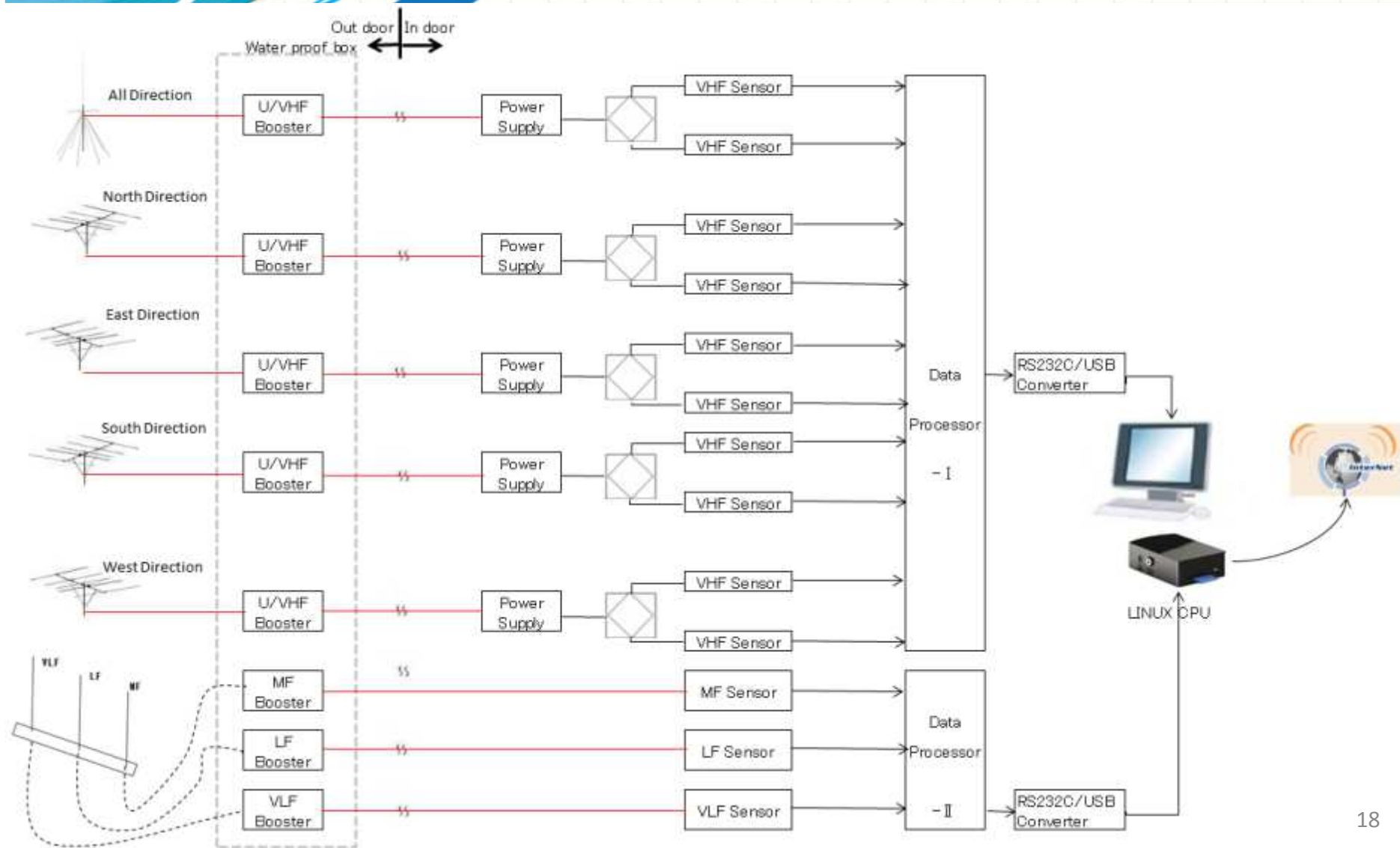
Seismic signal contains some frequency band width

→ Signal appear at both channels: may be seismic

→ Signal appear at one channel: may be not seismic



Observation System

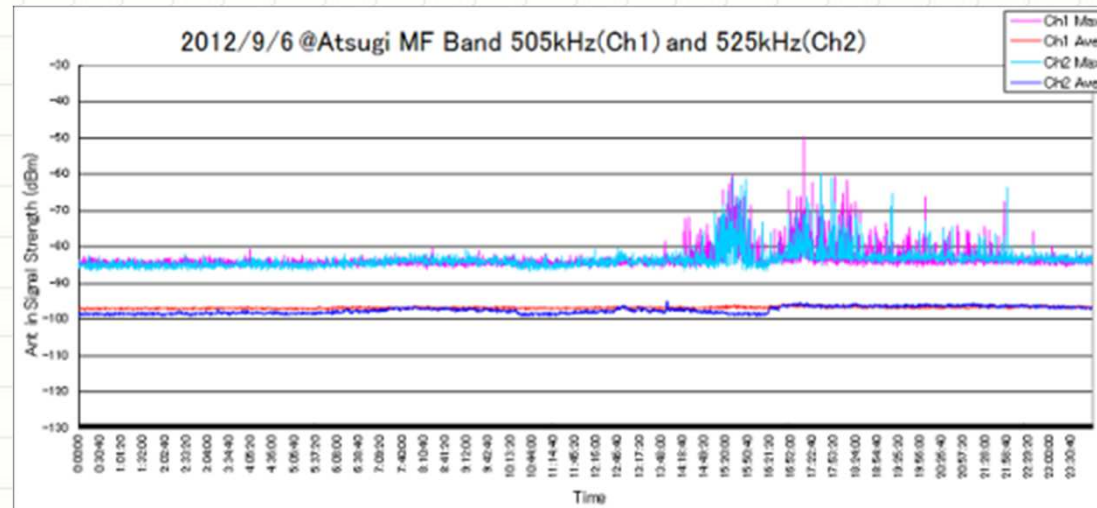


EM Anomalous signal prior to 2012/09/14

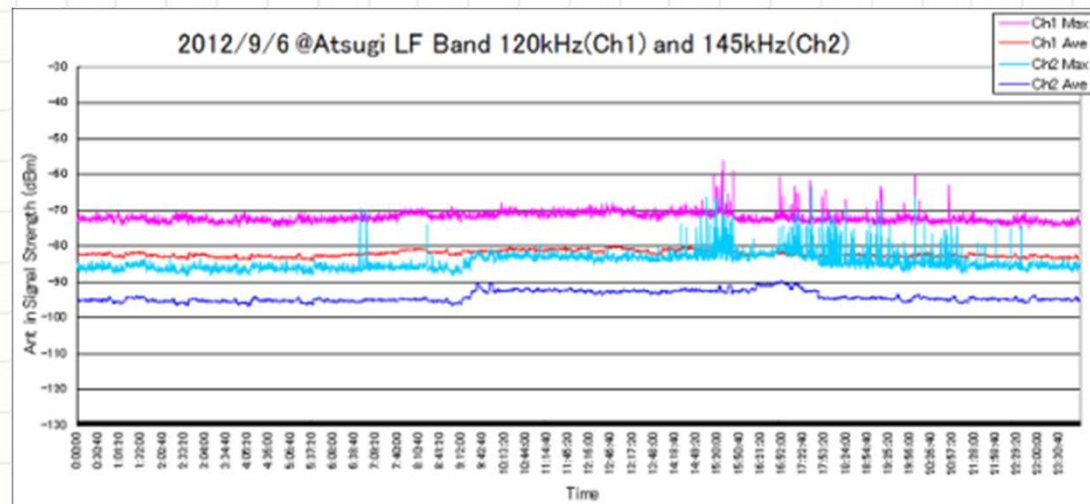
02:22 Chiba North-East M5.1

Synchronous at various freq. band and observation posts

**1 week before at
Atsugi MF Band**



**1 week before at
Atsugi LF Band**

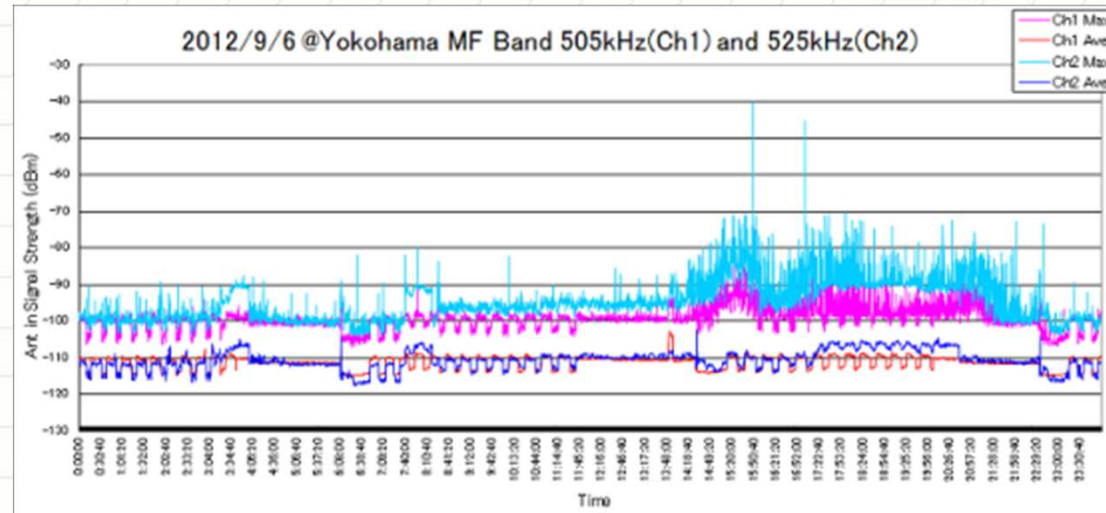


EM Anomalous signal prior to 2012/09/14

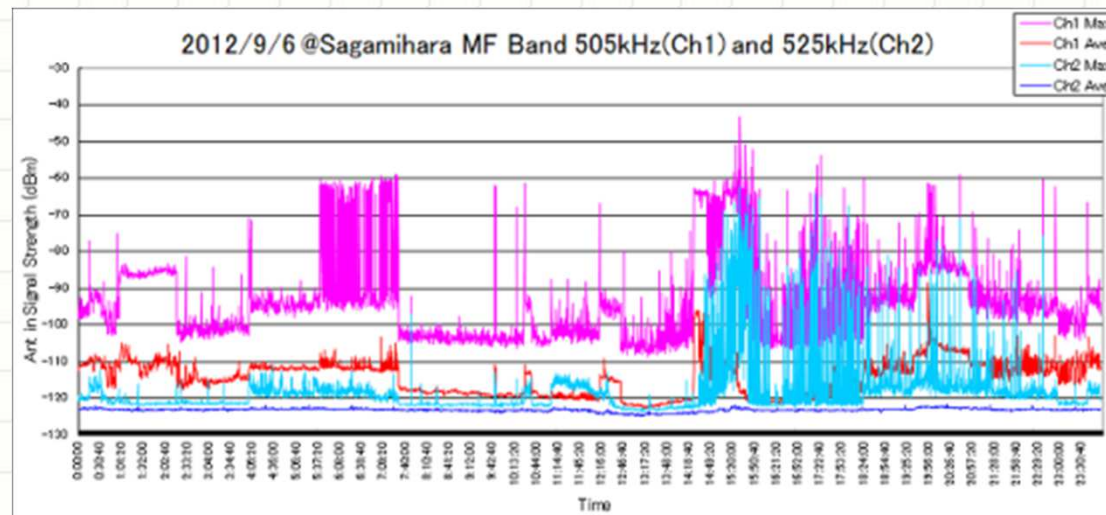
02:22 Chiba North-East M5.1

Synchronous at various freq. band and observation posts

**1 week before at
Yokohama
MF Band**



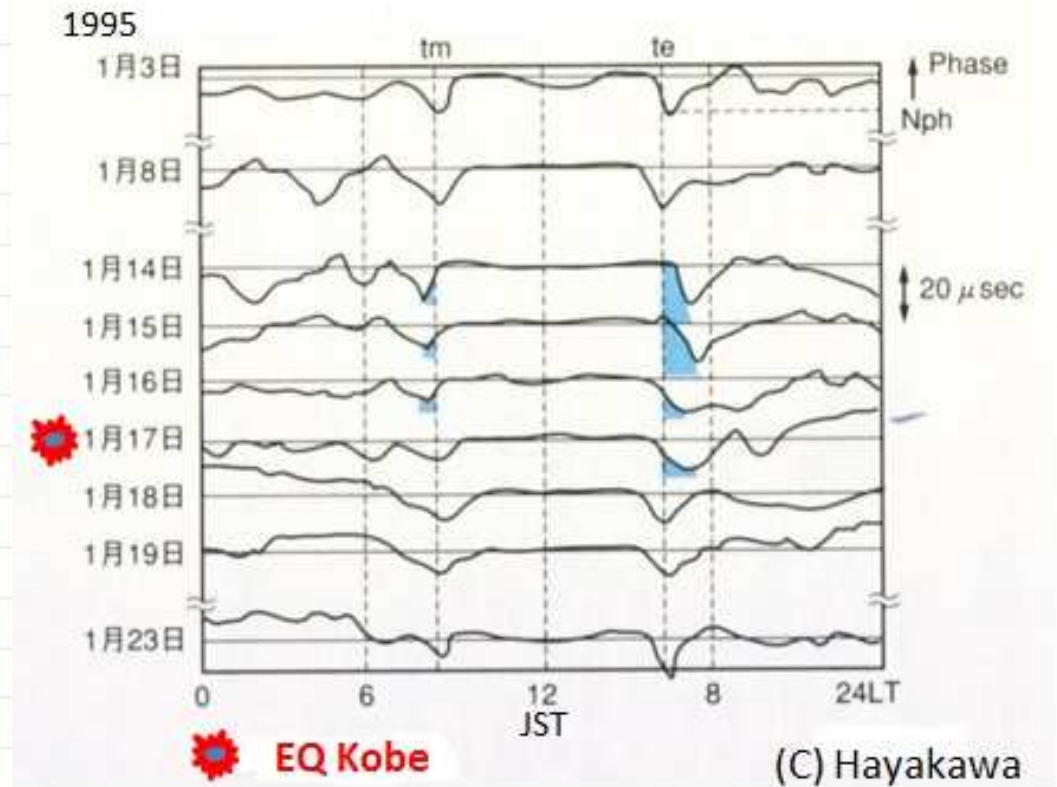
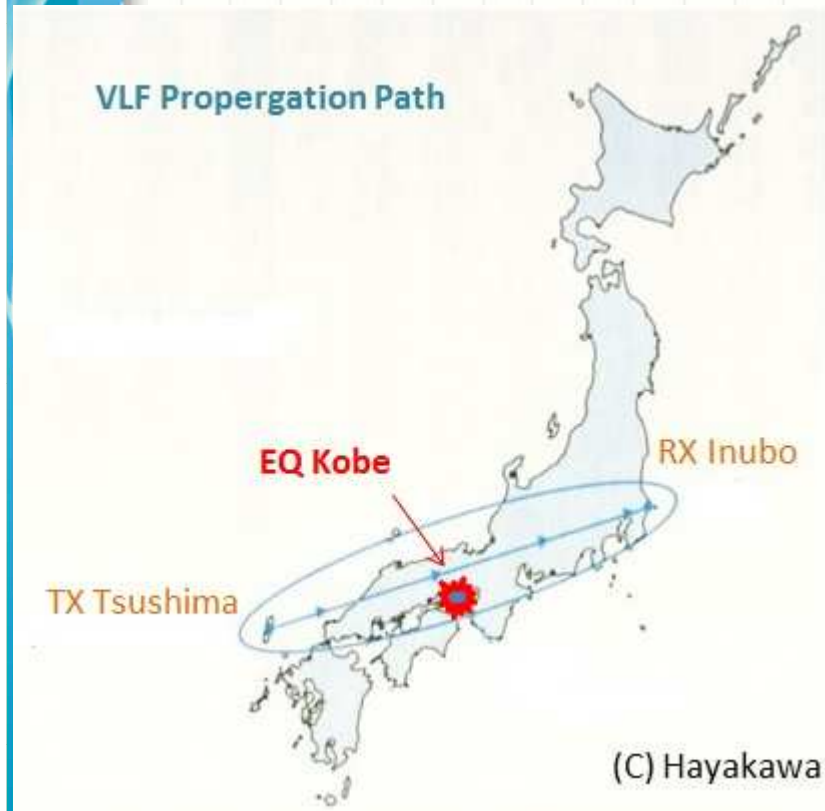
**1 week before at
Sagamihara
MF Band**



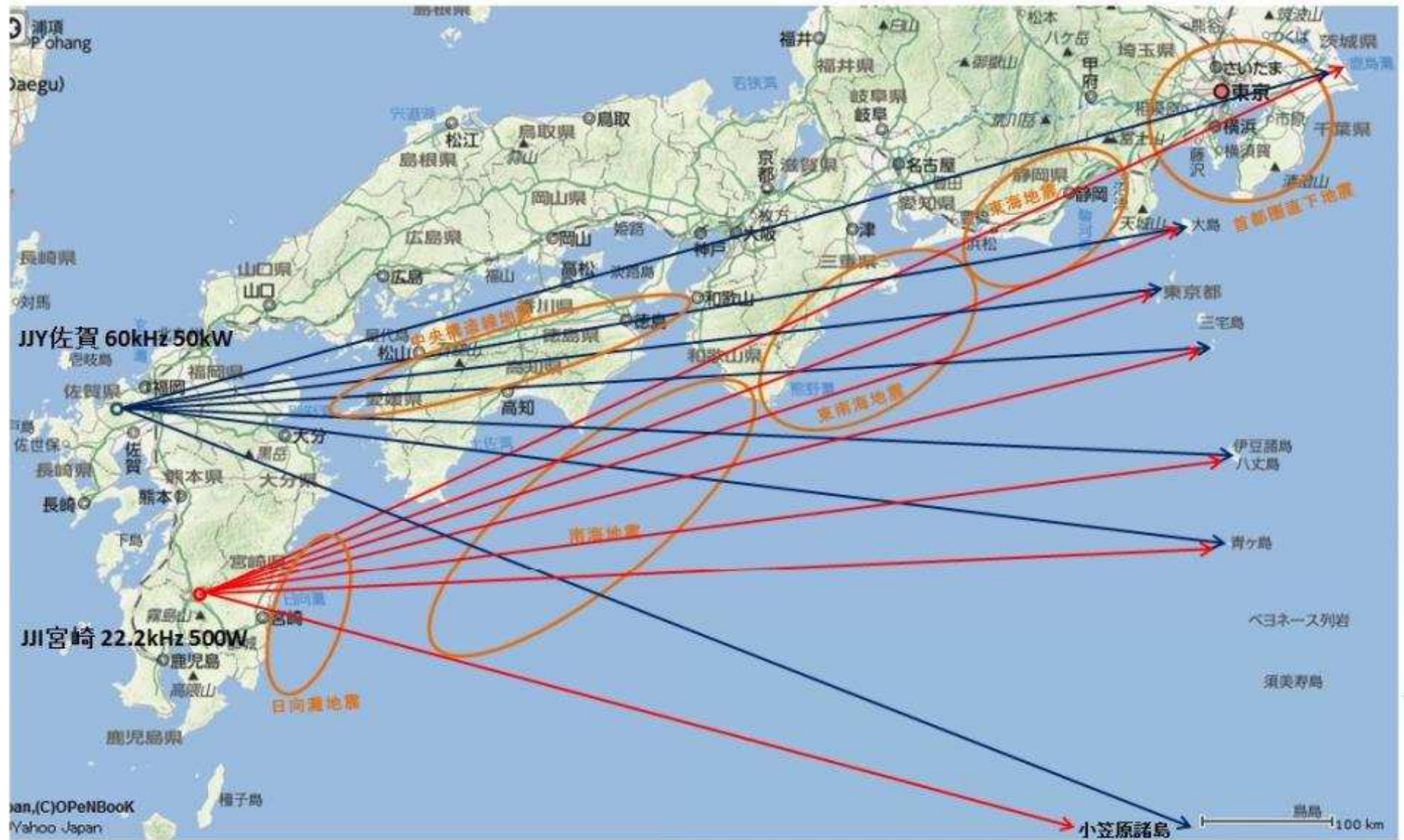
Location of Epicenter and Observation Post



Ionosphere Perturbation Observation by VLF/LF propagation anomaly



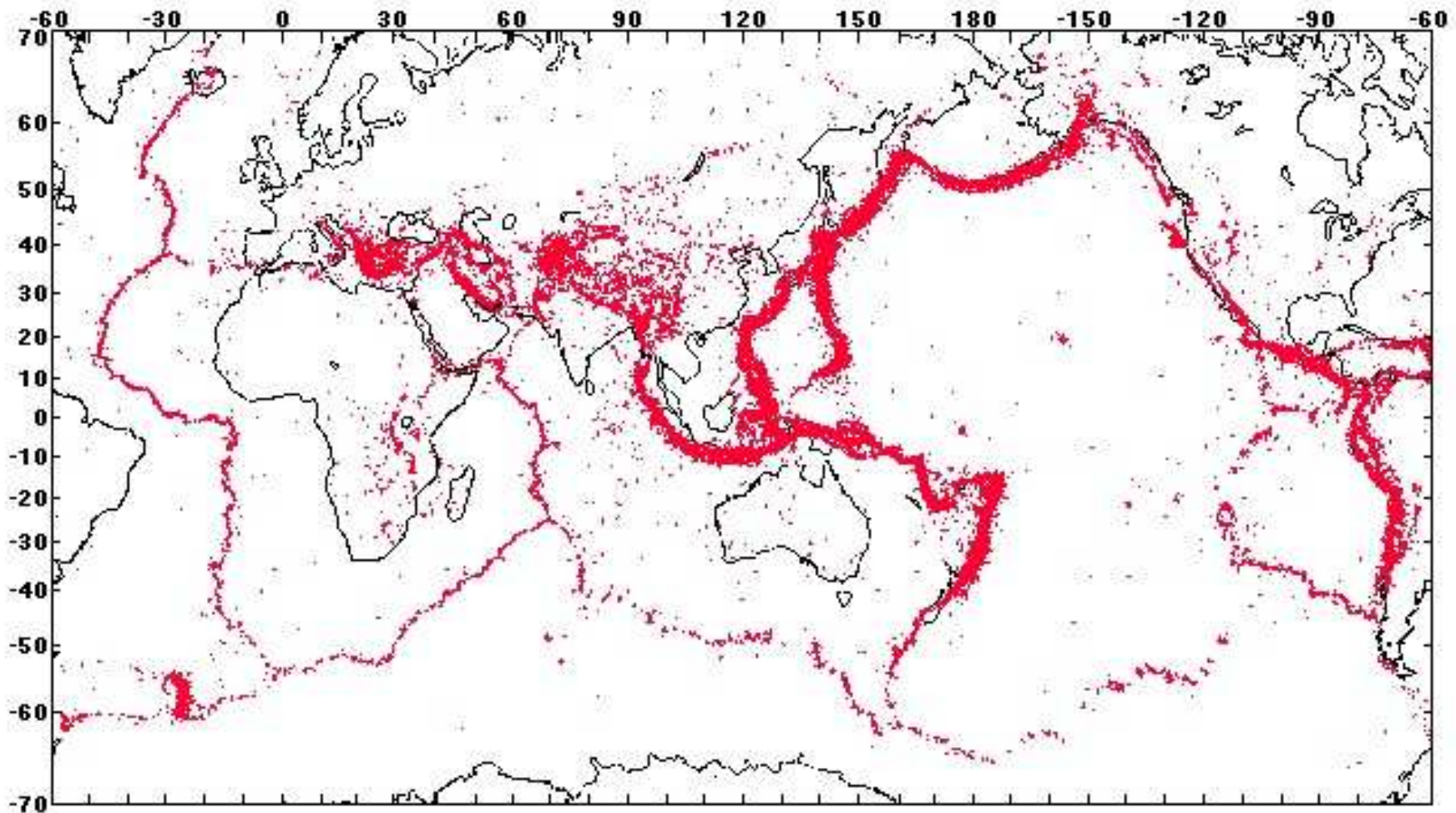
Observation Plan-1 in Japan



Observation Plan-2 in Japan



Observation Plan in the world



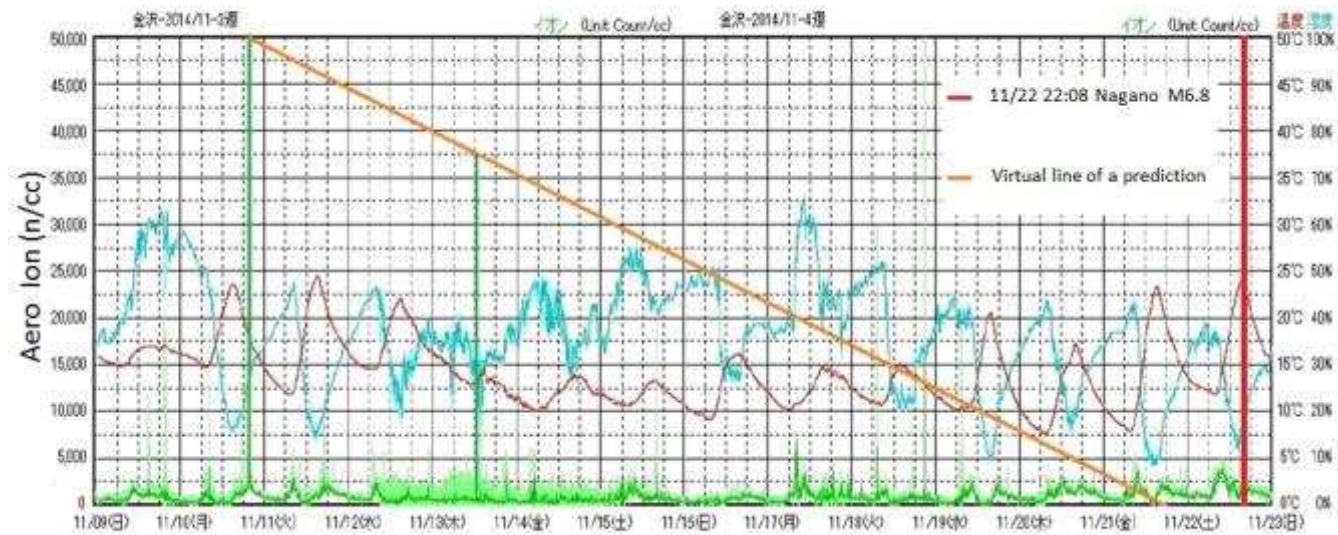
Aero Ion Observation

Atmospheric Ion
Concentration
Measuring
Instrument

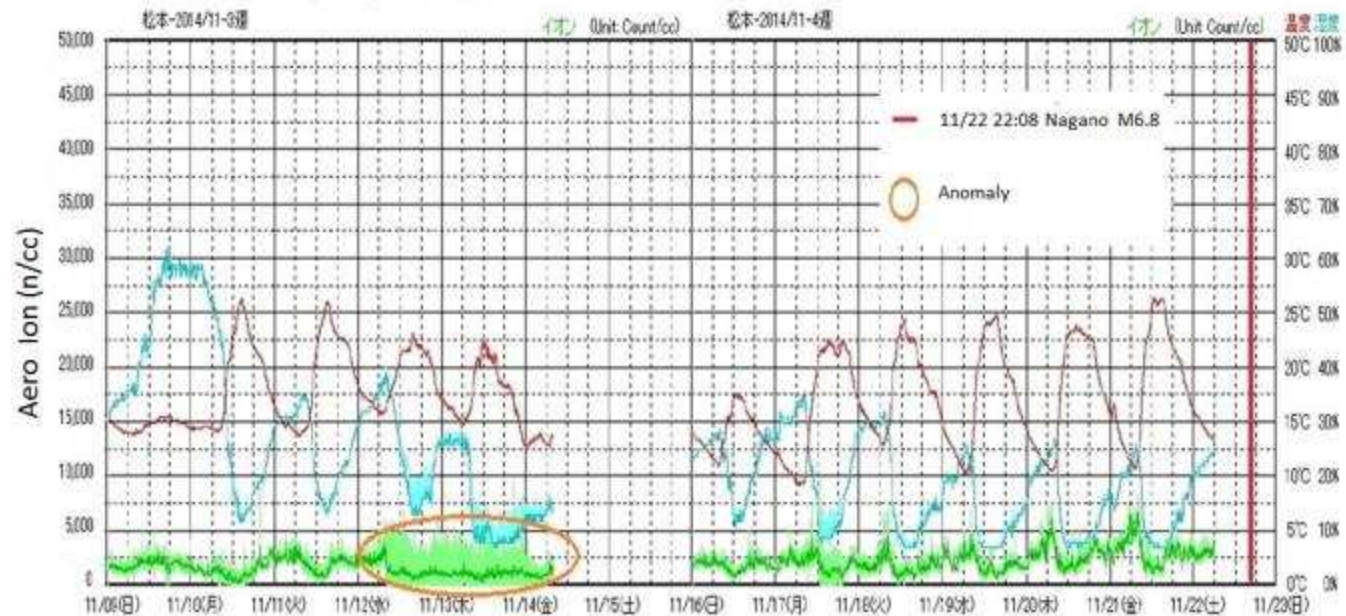


Aero Ion Observation

Kanazawa city Ishikawa Pref.

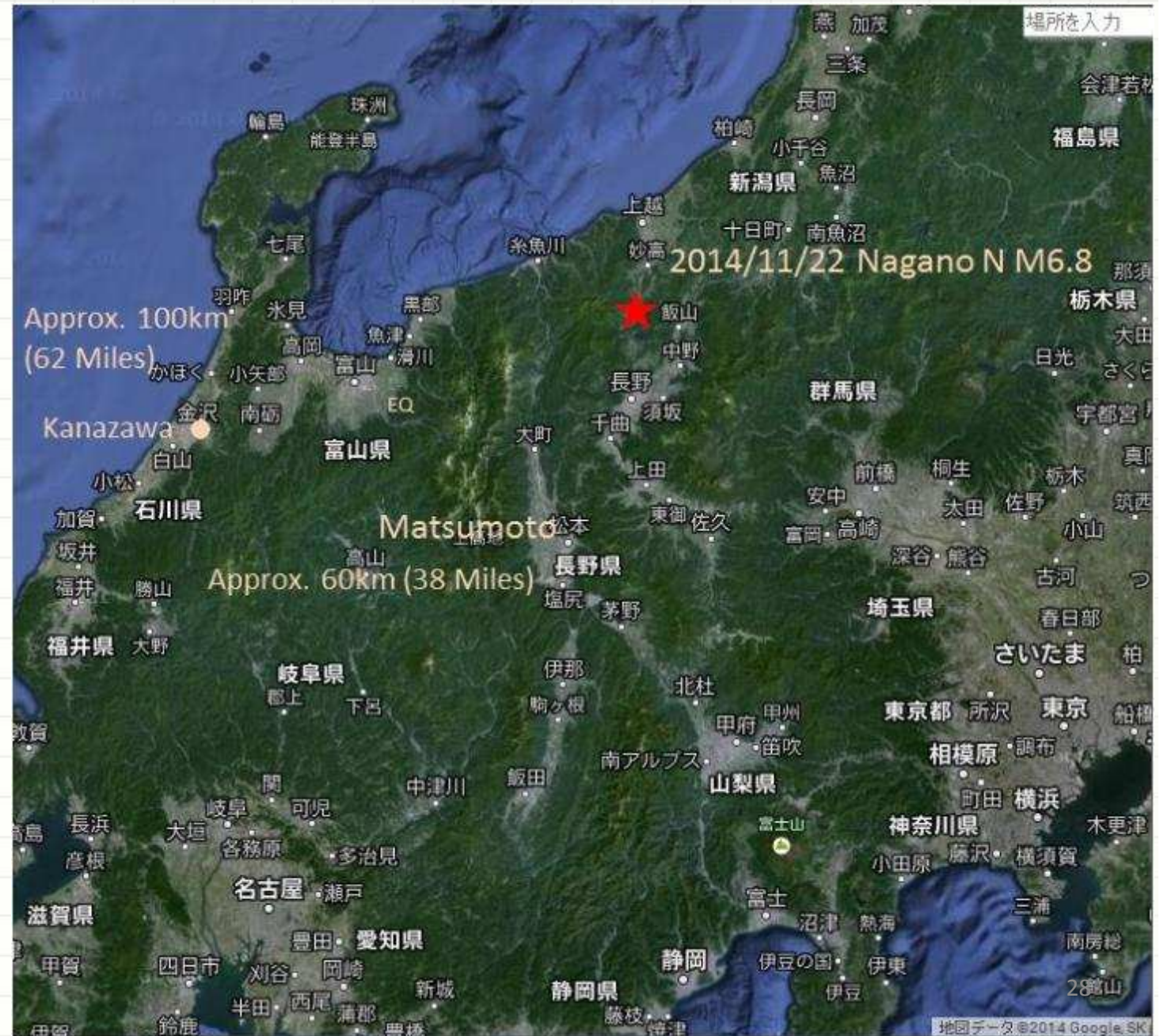


Matsumoto city Nagano Pref.

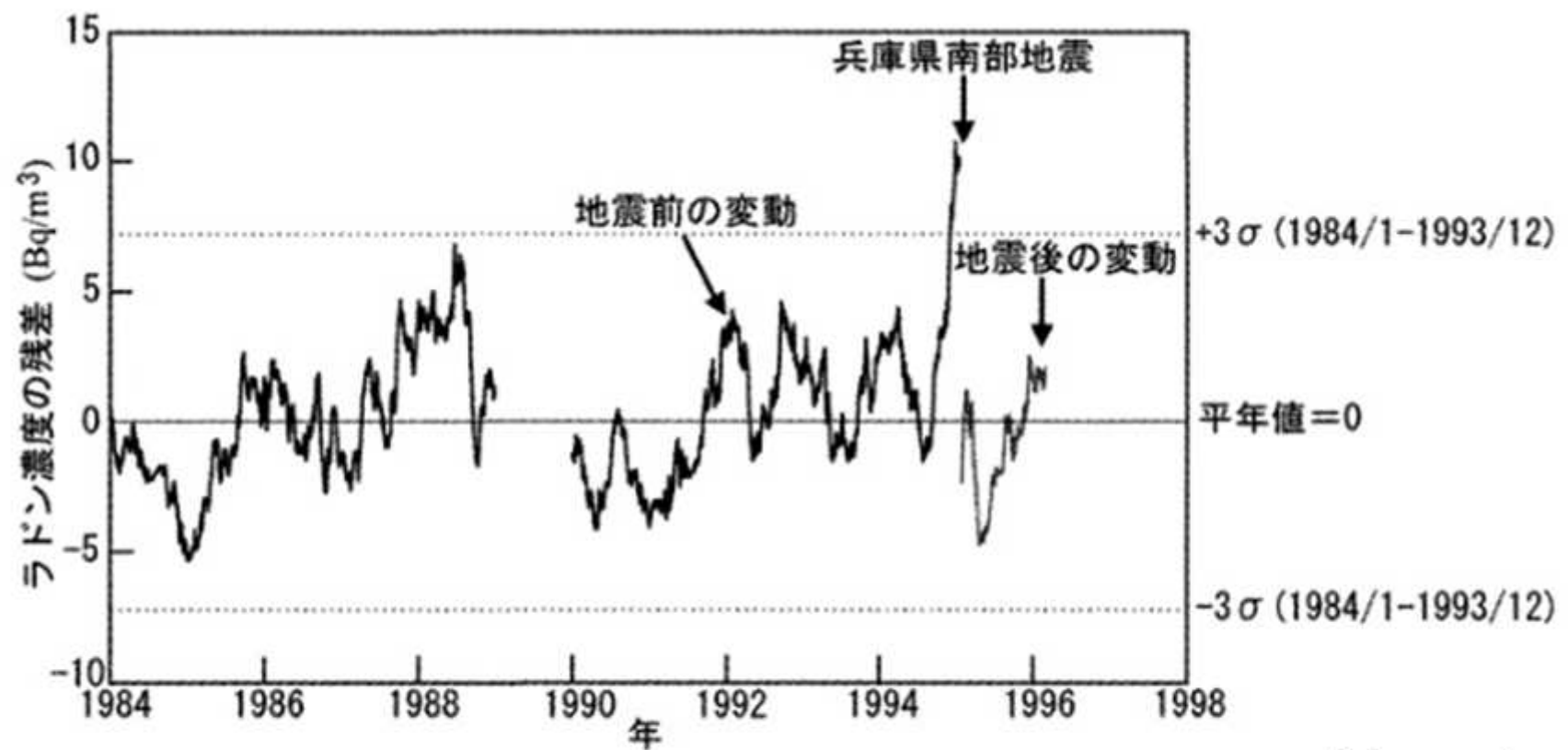


Date in 2014

Location of Epicenter and Observation Post



Aero Radon Observation



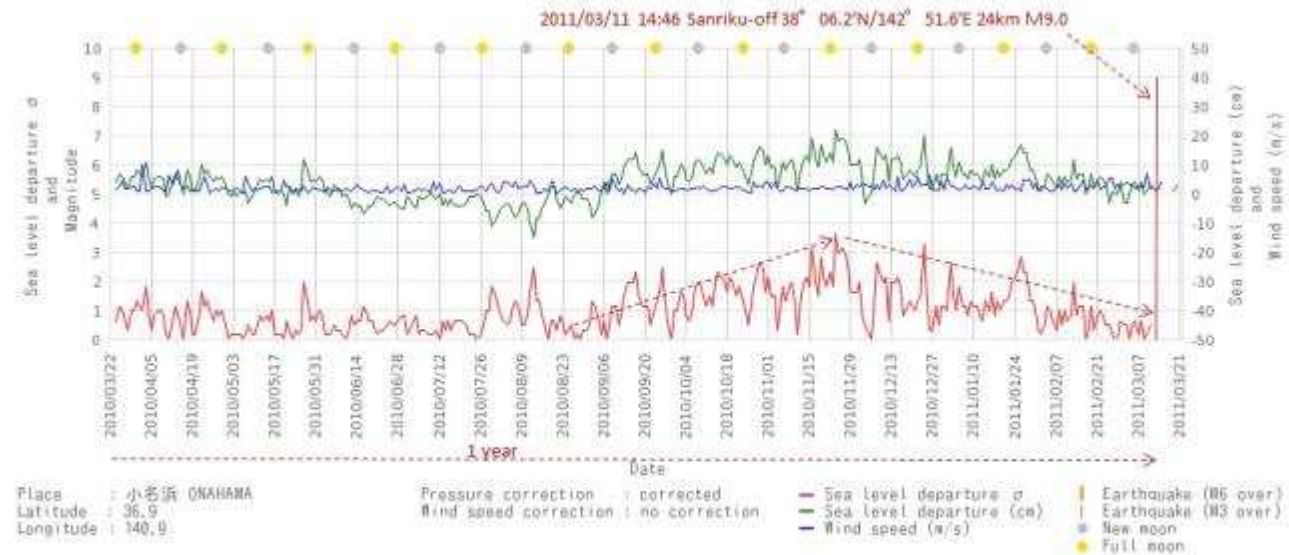
(C) Yasuoka

第4図 大気中ラドン濃度の日最低値の残差（測定データと平年値との差）の変動

Tidal Level Deviation

Before 2011/03/11
M9 Tohoku EQ

1 year before the
EQ

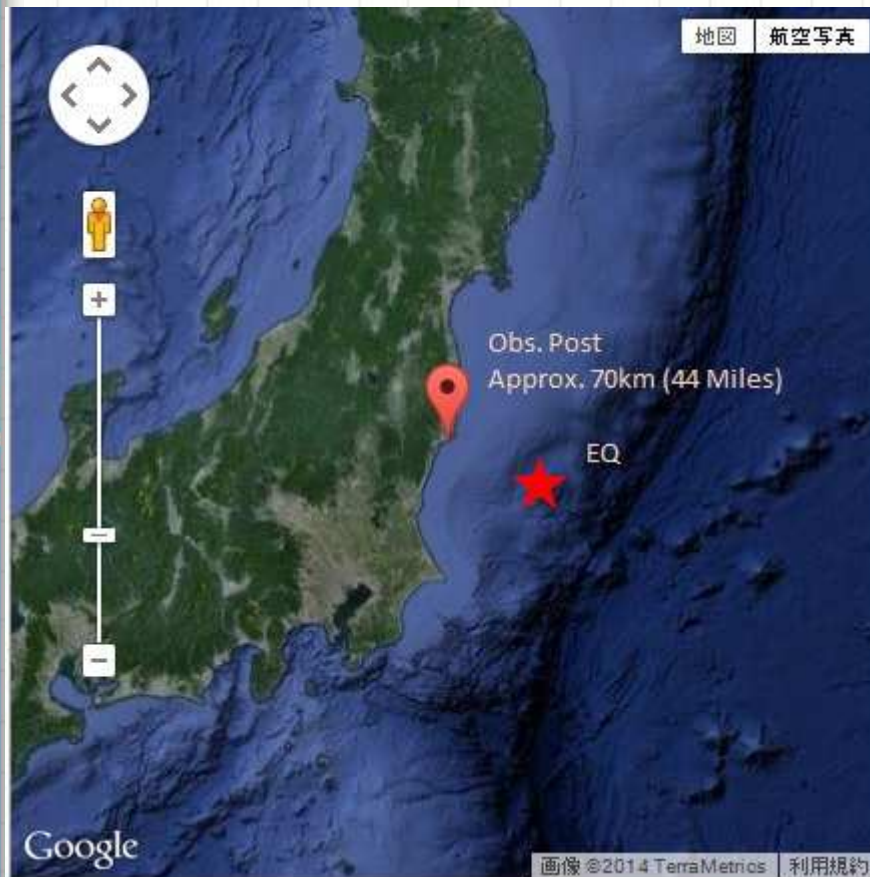


1 day on the day
of EQ



Tidal Level Deviation

**Before 2011/03/11 M9
Tohoku EQ**



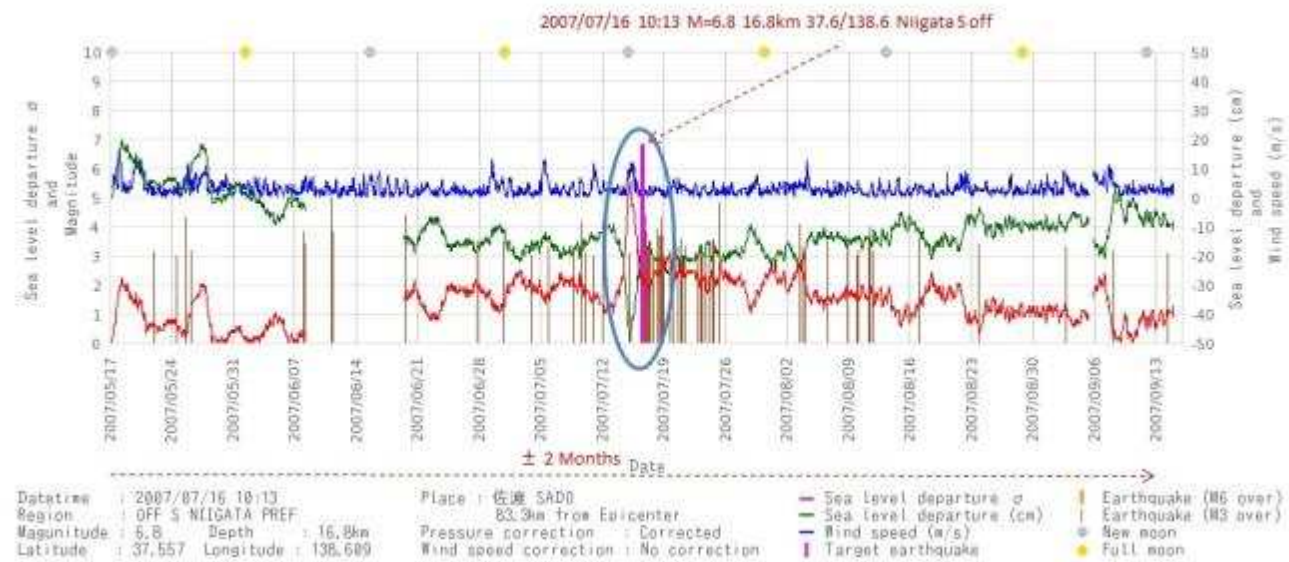
**Before 2007/07/16 M=6.8
Niigata S off EQ**



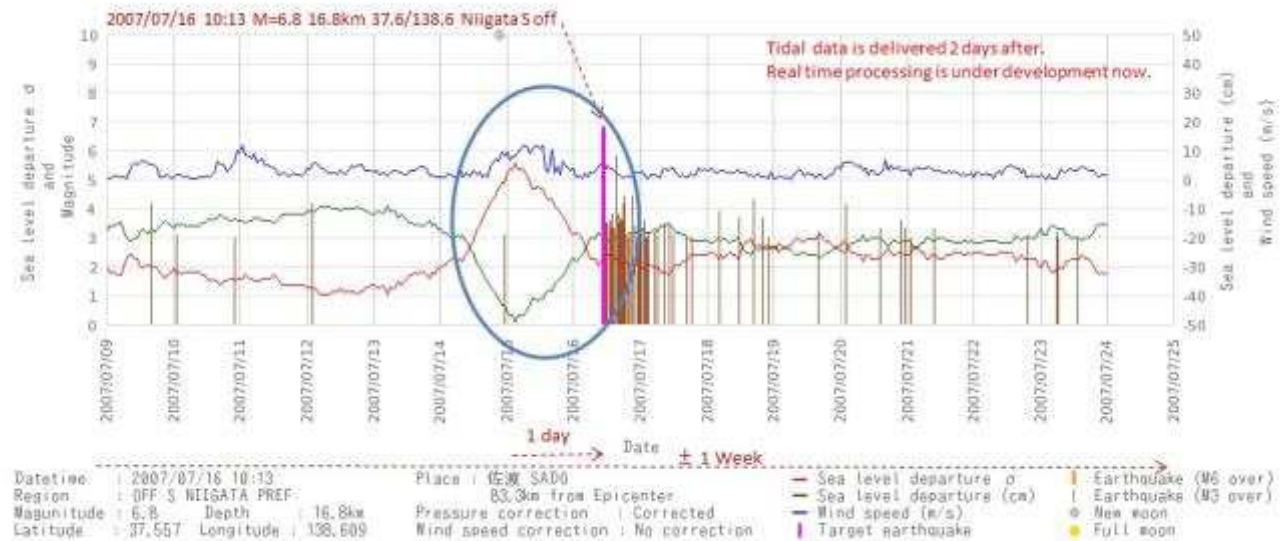
Tidal Level Deviation

2007/07/16 M=6.8
Niigata S off

±2 Months



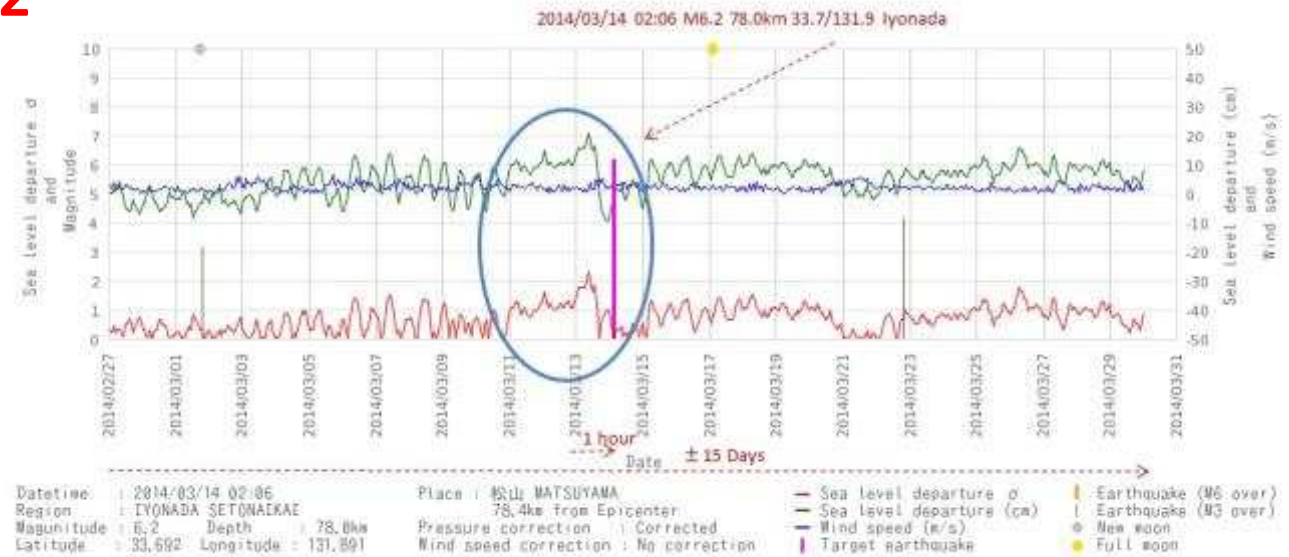
1 day on the
day of EQ



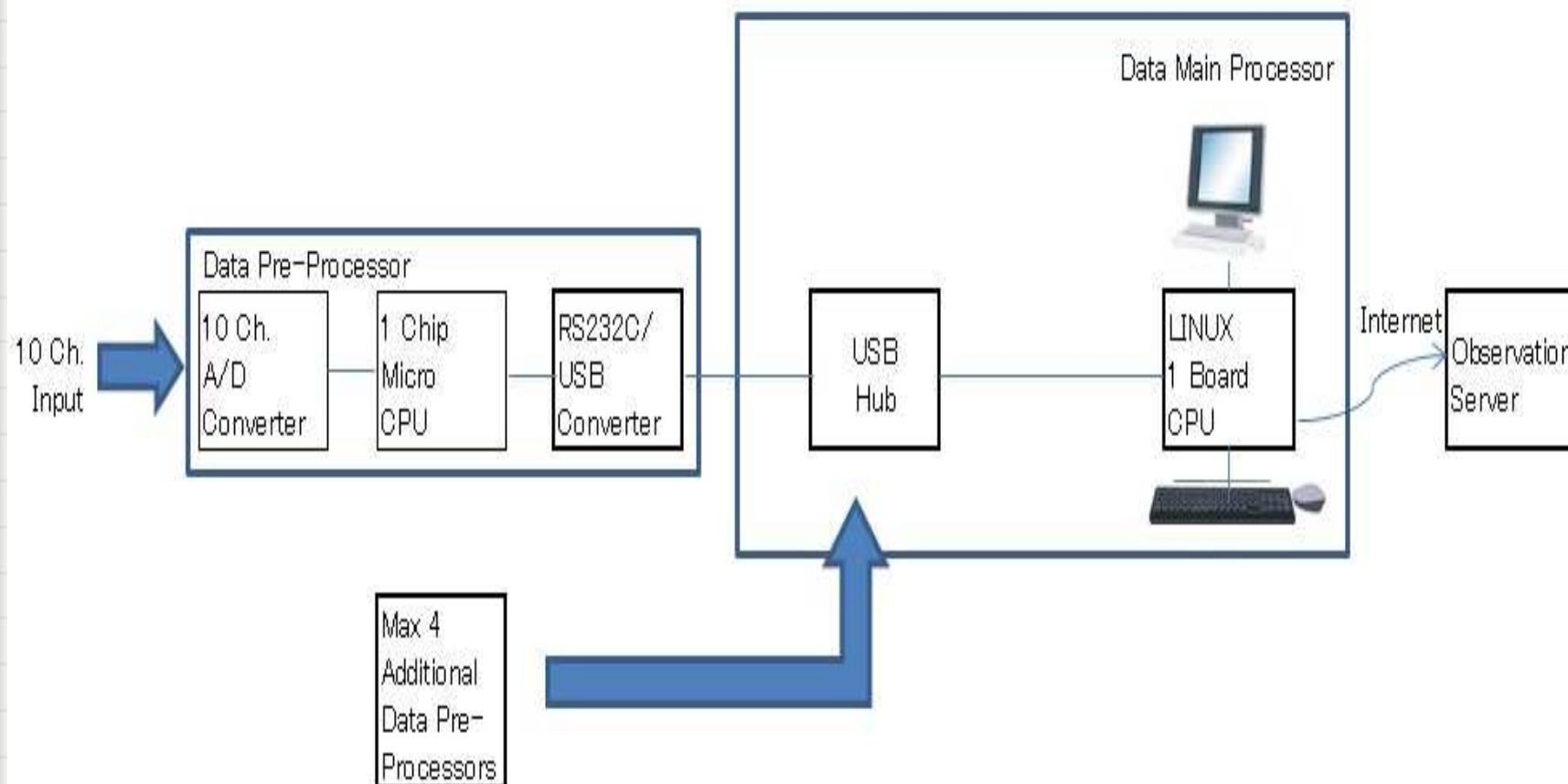
Tidal Level Deviation

2014/03/14 M6.2
78.0km Iyonada

±15 days



Data Processor System Block diagram





Feature

1. Capable to input 10 Channel analog data
2. Digitize in 1kHz sampling rate
3. Outputs maximum, minimum and average value in every 1 minute in CSV format to CPU (LINUX one board Micro CPU)
4. Maximum value is useful to measure impulsive signal
5. CPU outputs to Observation Web Server to produce daily, weekly, monthly and 3 monthly graphs.



Conclusions

1. **Multi Method and Multi Observation Post is significant for EQ Prediction**
2. **Government and Scholars are difficult to announce prediction of EQ**
3. **Engineers and Civilians are possible to announce prediction of EQ**
4. **Important for practical EQ prediction that “Swing and miss is better, no swing and strike is worth”**



**Thank you
for your attention!**

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