TREE BIO-ELECTRIC POTENTIAL (TBP) OBSERVATION AND PRACTICAL EARTHQUAKE (EQ) PREDICTION EXPERIMENT BASED ON MULTI-METHOD AT MULTI-POINT BY ENGINEERS AND CIVILIANS

2014/12/10

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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

Behaviors of big animals before huge earthquake

Animals have instinct to catch precursor from huge earthquake

Elephants at Sumatra EQ
M=9.1 2004/12/26
© University of Virginia
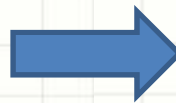
Plants shows anomalous action

Plants feel external stimulation

Mimosa Pudica reacts when it is touched by hand, vent down before typhoon and anomalous action before EQ
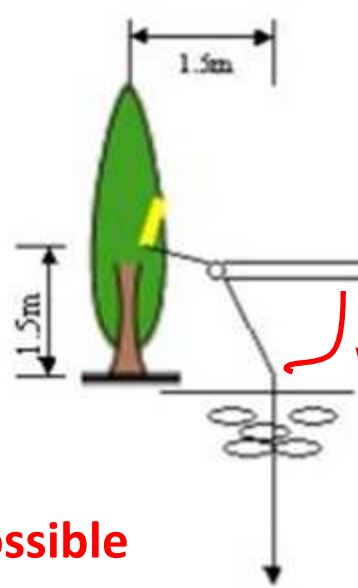
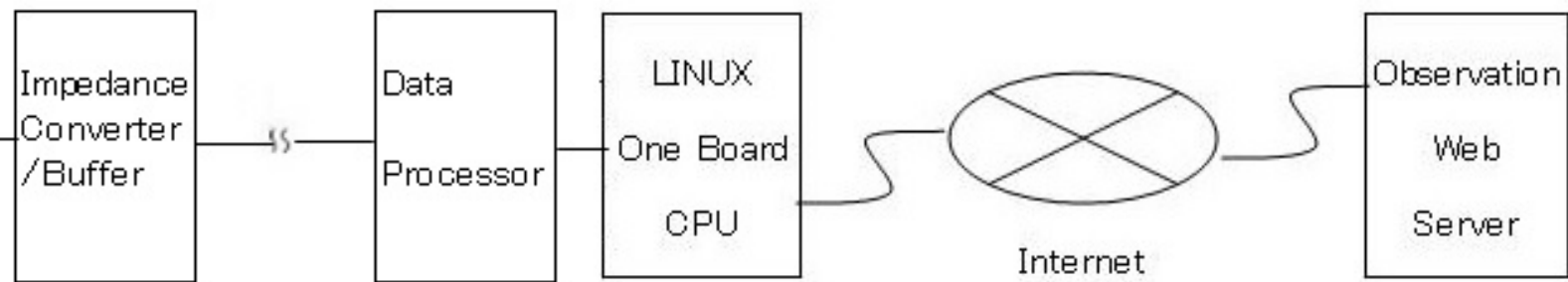**Plants have instinct to catch precursor from huge earthquake, too**

touch

Observation System

As short as possible

Tree Bio-electric Potential (TBP)

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┌──────────┐      ┌──────────┐   ┌──────────┐                      ┌──────────┐
│ Impedance │      │  Data    │   │  LINUX   │                      │ Observation│
│ Converter │──ss──│          │───│ One Board│───  Internet  ───────│   Web     │
│ /Buffer   │      │ Processor│   │   CPU    │                      │  Server   │
└──────────┘      └──────────┘   └──────────┘                      └──────────┘
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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

Anomaly was observed at 17 EQs of 28 EQs with magnitude of about 7.0 occurred between 1977 and 1989 around Japan

28 EQs with magnitude of about 7.0 occurred between 1977 and 1989 around Japan, obvious anomaly was observed at 17 EQ of those.

Year	m	d	h	m	Location of epicentre	Latitude (N)	Longitude (E)	Epicentral distance (km)	Epicentral Depth (km)	M	Intensity at Tokyo	Anomalous potential	Precursor time (h)	Pattern of Anomalous[*]
1977	3	9	23 : 27		East off Northern Korea	41°40′	131°24′	1000	600	7.2		—	—	—
1978	1	14	12 : 24		East off Izu-Peninsula	34°46′	139°15′	120	0	7.0		+	6	UR
"	3	7	11 : 48		Southeast off Kii-Peninsula	32°08′	137°44′	400	440	7.6		—		
"	3	25	04 : 47		Inshore Kuril Islands	44°20′	149°49′	1200	40	7.3		—		
"	6	12	17 : 14		East off Miyagi Prefecture	38°09′	142°10′	370	40	7.4	IV	++	50~ 0	ST
"	7	23	23 : 42		Inshore Formosa	22°11′	121°21′	2500	20	7.1		—		
1980	6	29	16 : 20		Northeast off Izu-Peninsula	34°55′	139°14′	100	—	6.7		+	11	UR
"	12	31	19 : 32		Inshore Kuril Islands	46°14′	152°22′	1500	70	7.1		—		
1981	1	19	03 : 17		East off Mid-Northern Japan	38°36′	142°58′	440	0	7.0		+	39~15	SST
"	1	23	13 : 58		Southern shore of Hokkaido	42°25′	142°12′	720	130	7.1		±	22~20	SST
1982	3	21	11 : 32		South off Hokkaido	42°04′	142°36′	750	40	7.1		—		
"	6	30	10 : 57		Kuril Islands	44°40′	151°24′	1600	50	6.9		—		
"	7	23	23 : 23		Northeast off Kanto Prefecture	36°11′	141°57′	160	30	7.0	III	+	22~29	ST
"	9	6	10 : 47		Tori-shima Islands	29°23′	140°58′	800	180	7.0		—		
1983	5	26	11 : 59		Mid Japan sea	40°21′	139°04′	480	14	7.7		±	{20~11 {6~ 1	ST
"	6	21	15 : 25		Northwest off Northern Japan	41°15′	139°02′	560	6	7.1		+	6~ 0	ST
1984	1	1	18 : 03		South off Kinki District	33°37′	136°50′	400	388	7.3	IV	+	9~ 3	N
"	3	6	11 : 17		Inshore Tori-shima Islands	29°20′	139°12′	800	452	7.9	IV	+	25~23	N
"	8	7	4 : 06		East off Hyuga-nada	32°22′	132°09′	800	33	7.1		±	14	N
"	9	14	8 : 48		Western Nagano Prefecture	35°49′	137°33′	170	2	6.8	III	+	11~10	S
1985	4	11	01 : 26		Inshore Tori-shima Islands	29°57′	137°17′	760	415	6.8	III	—		
1986	2	4	5 : 47		West off Ogasawara Islands	27°54′	139°57′	960	541	6.9	I	—		
1987	1	14	20 : 03		Mt. Hidaka (Hokkaido)	42°32′	142°55′	800	119	7.0	I	±	40~20	SST
"	5	18	12 : 07		Southern Sea of Okhotsk	48°47′	149°02′	1200	497	7.0	I	±	40~16	SST
"	12	17	11 : 08		East off Chiba Prefecture	35°21′	140°29′	120	58	6.7	IV	+	2~ 1	S
1988	9	7	20 : 54		South off Tohkaido	40°16′	137°49′	550	518	6.8	II	+	21~ 1	ST
1989	6	17	08 : 43		South off Tohkaido	41°53′	138°24′	480	378	6.8	III	—		
" •	11	2	03 : 25		West off Iwate District	39°50′	143°04′	580	0	7.1	II	+	6~ 1	S

(*) Abbreviation for pattern of Anomalous potential is as follows; UR: rise upward wave, ST: saw-toothed variation, SST: small saw-toothed variation, N: needle-like variation, S: S-type wave.
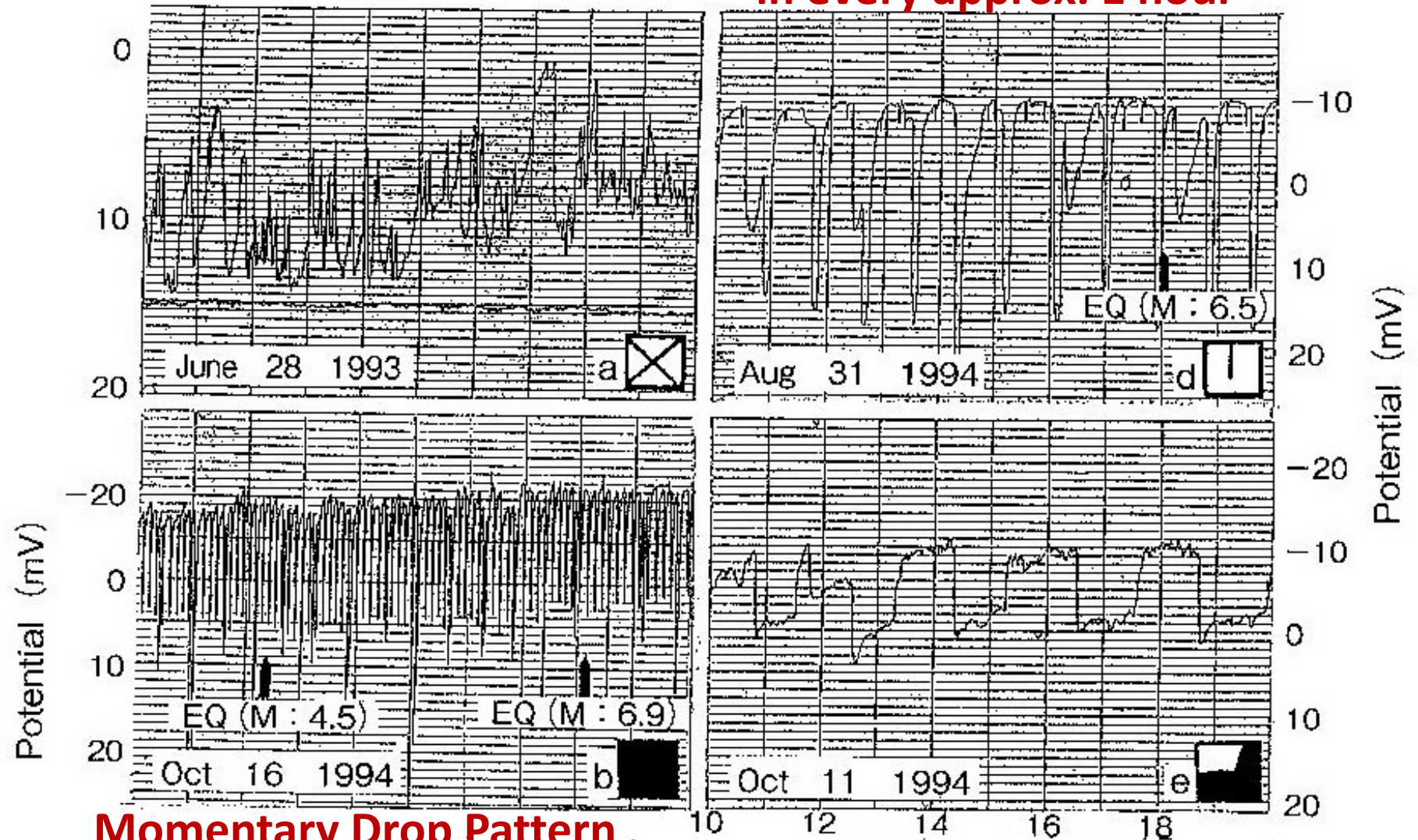
Anomaly was observed at 17 EQs of 28 EQs with magnitude of about 7.0 occurred between 1977 and 1989 around Japan
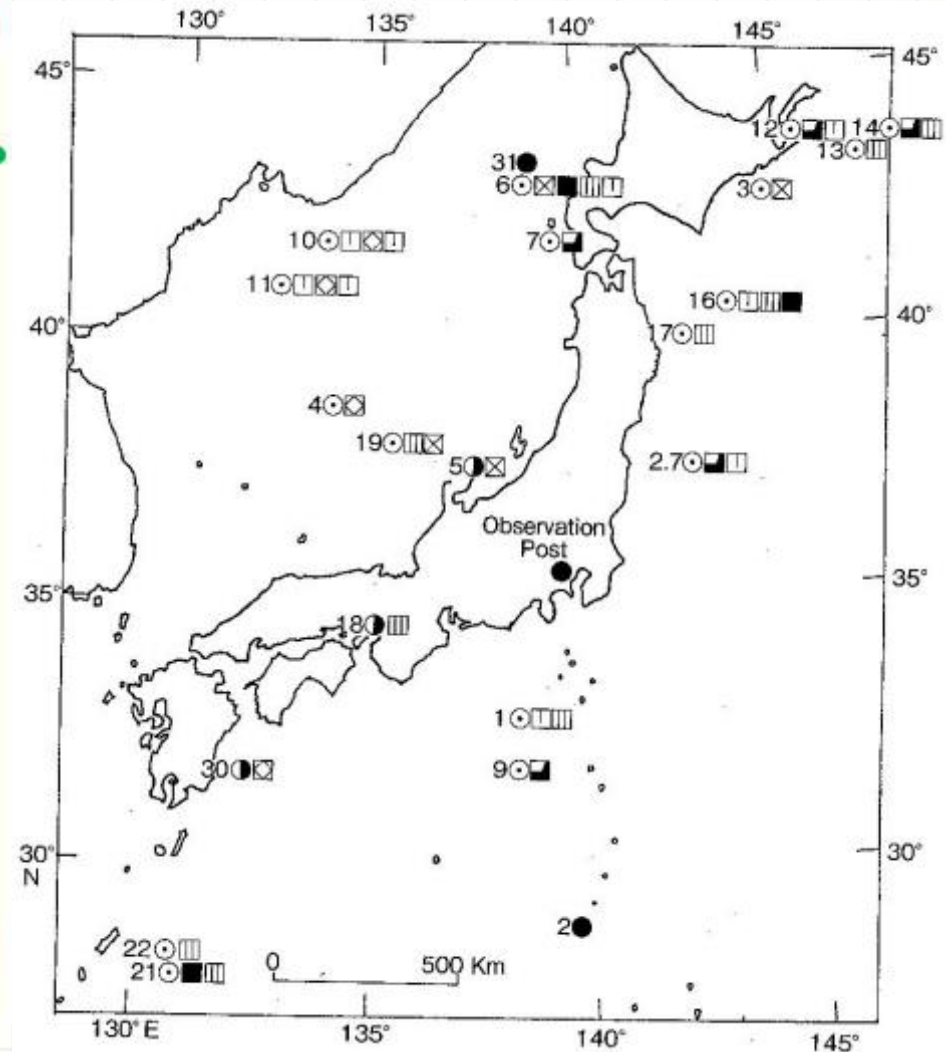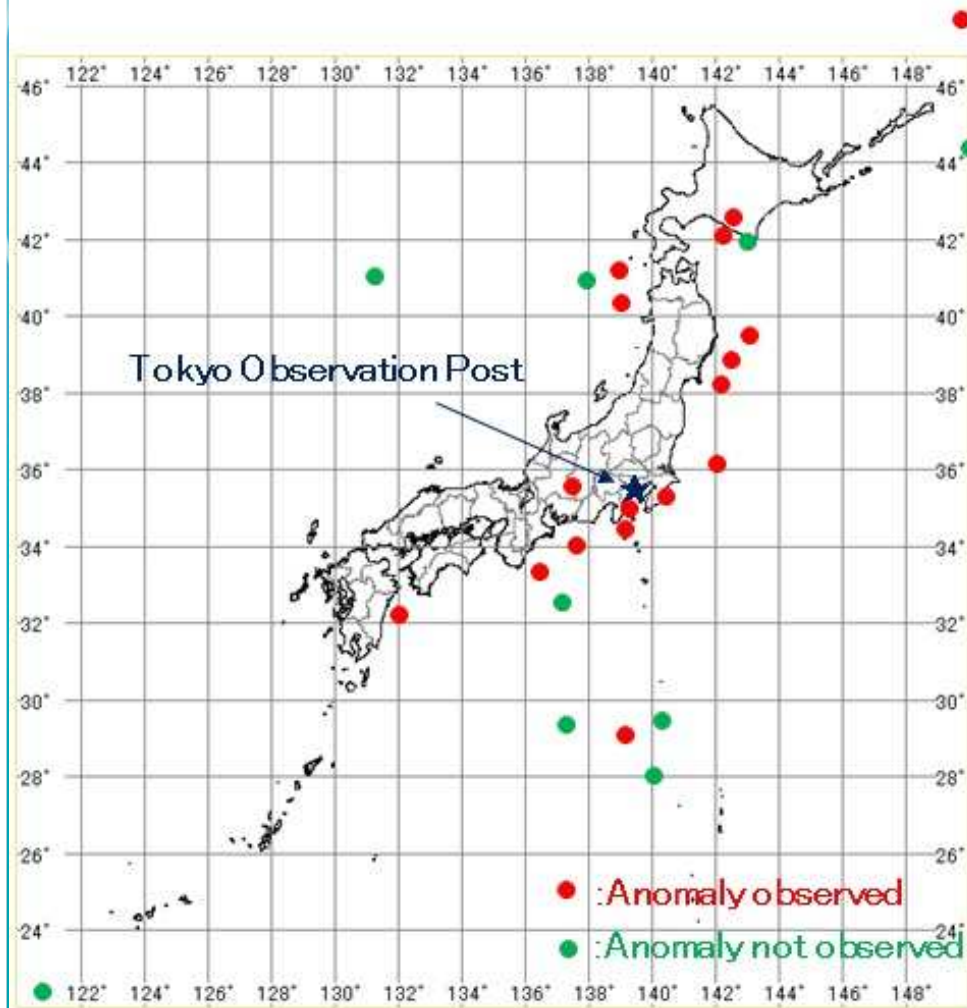
Anomalous patterns

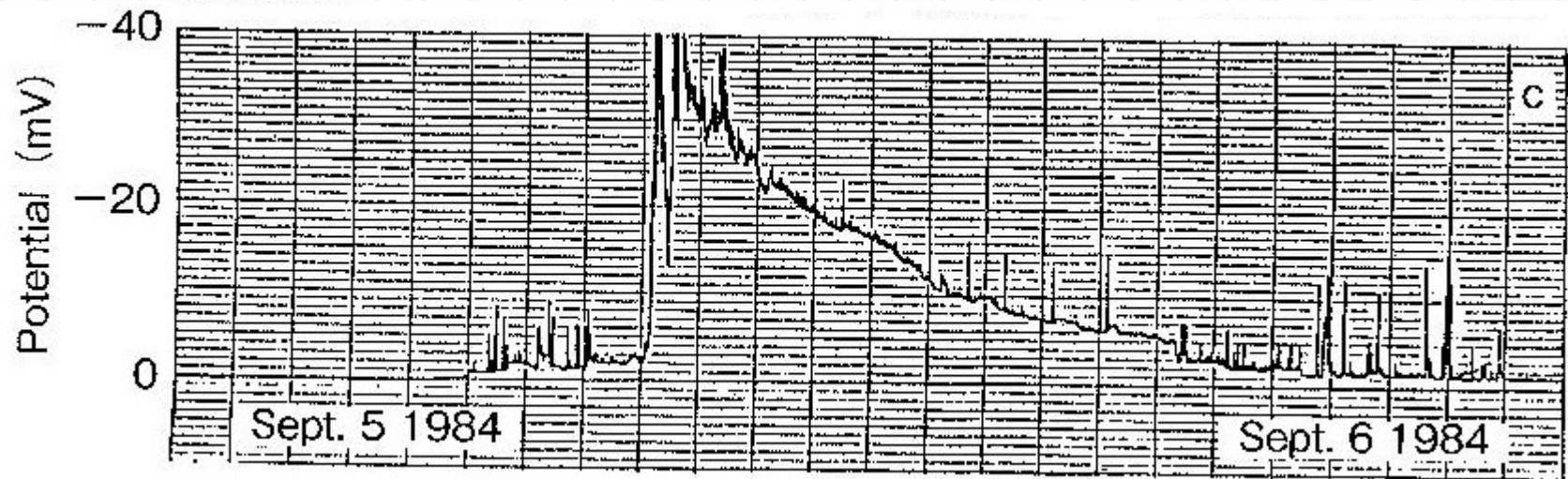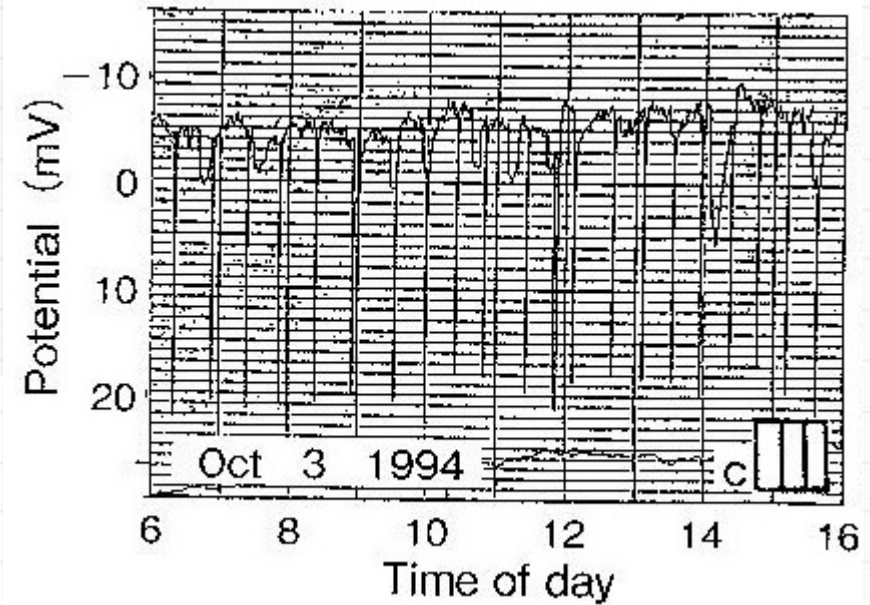**Noisy Pattern**

**Momentary Drop Pattern
in every approx. 1 hour**

**Momentary Drop Pattern
in every approx. 10 minutes**
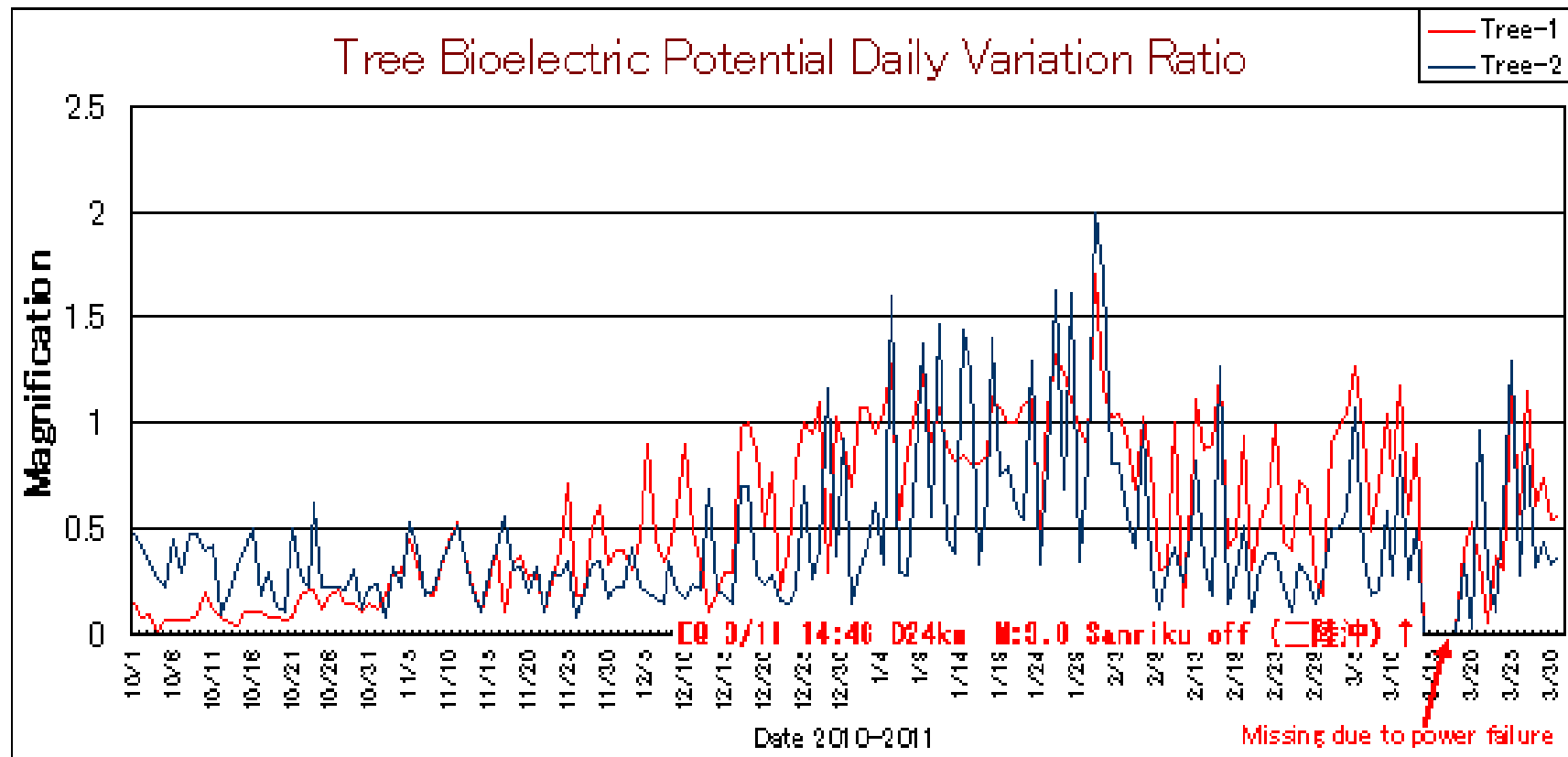
Rectangular Pattern

9

Anomalous patterns

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

Charge-Discharge Pattern

Anomalous patterns

Long Term Pattern

Tree Bioelectric Potential Daily Variation Ratio

Legend: Tree-1, Tree-2

EQ 3/11 14:46 D24km M:9.0 Sanriku off (三陸沖) ↑

Missing due to power failure

Date 2010-2011

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
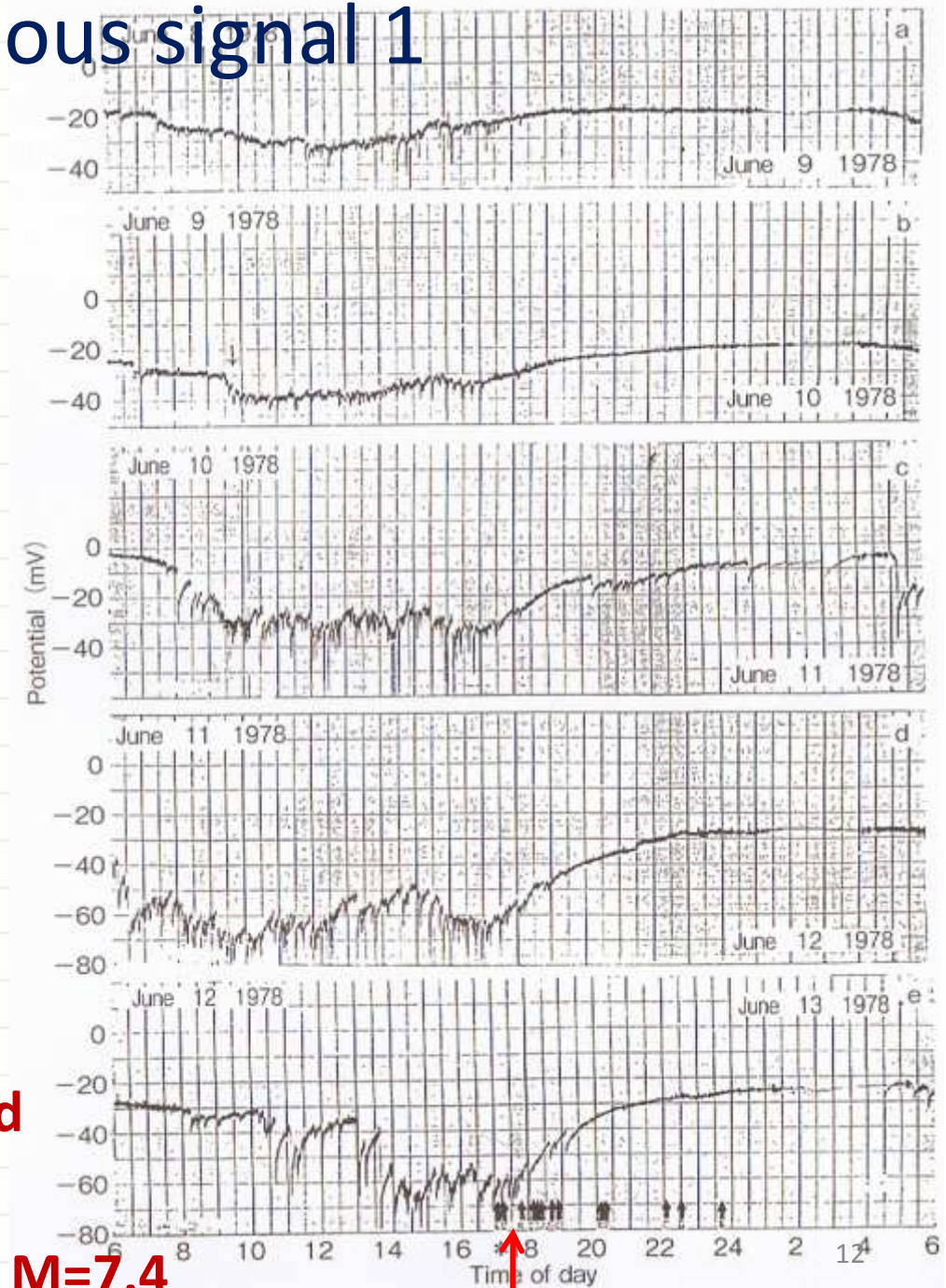
Examples of Anomalous signal 2A

4 days before

3 days before

2 days before

13
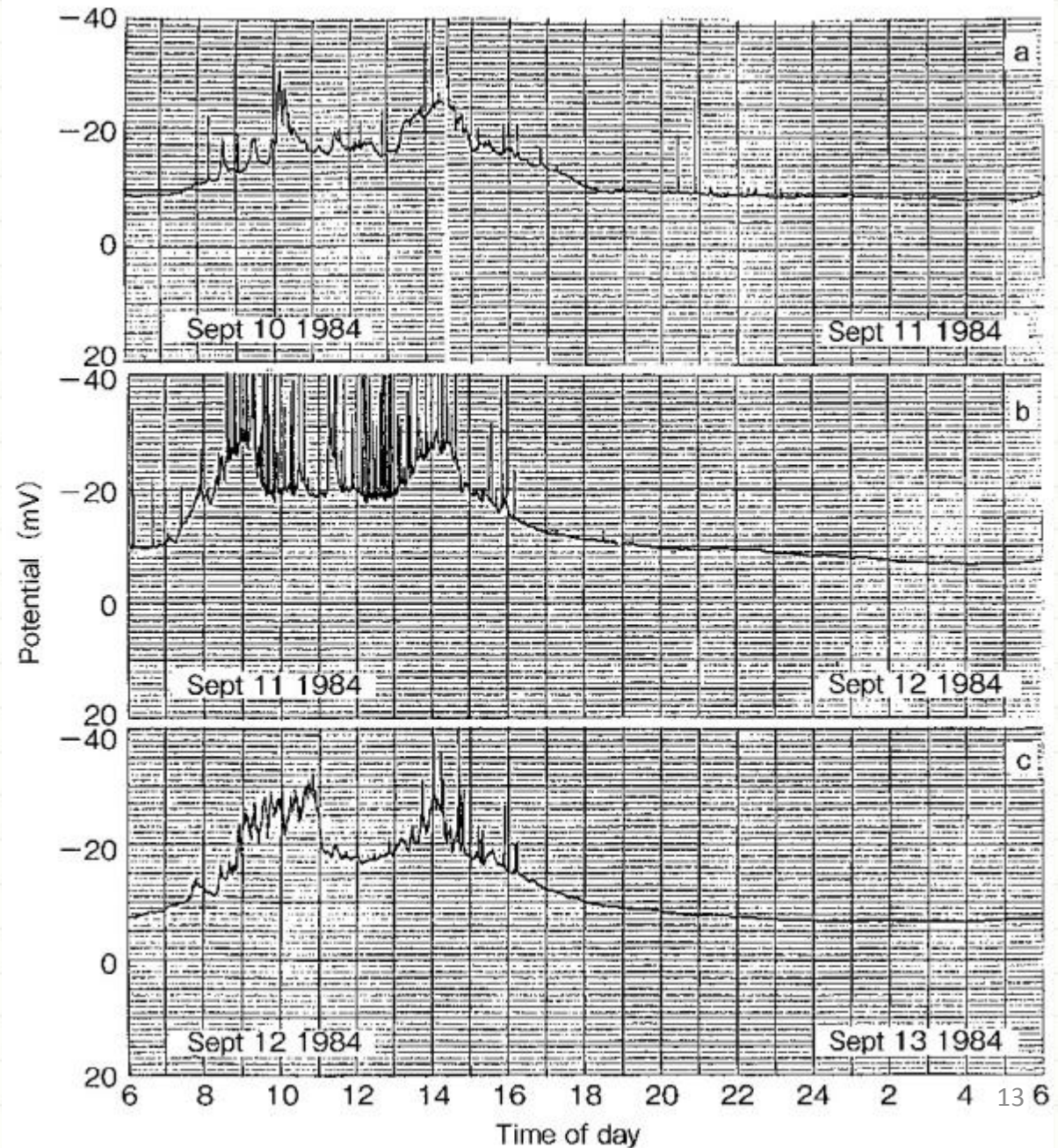
Examples of Anomalous signal 2B

1 day before

The day EQ occurred

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

1 day after
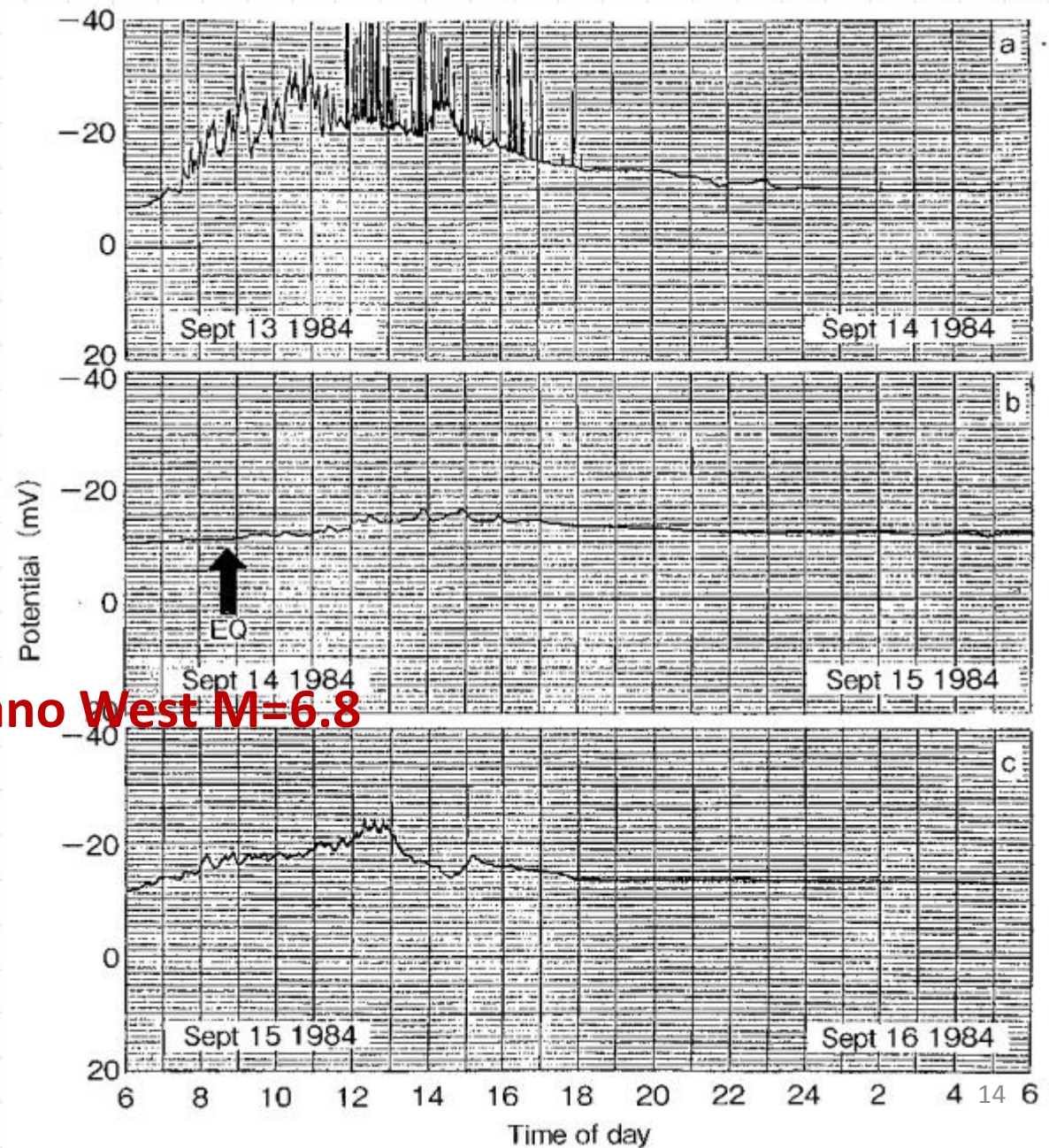
Examples of Anomalous signal 3

Synchronous at various observation posts

Tokyo Suginami

Tokyo Daita

Kawasaki

Tokyo Seijo

Mobara
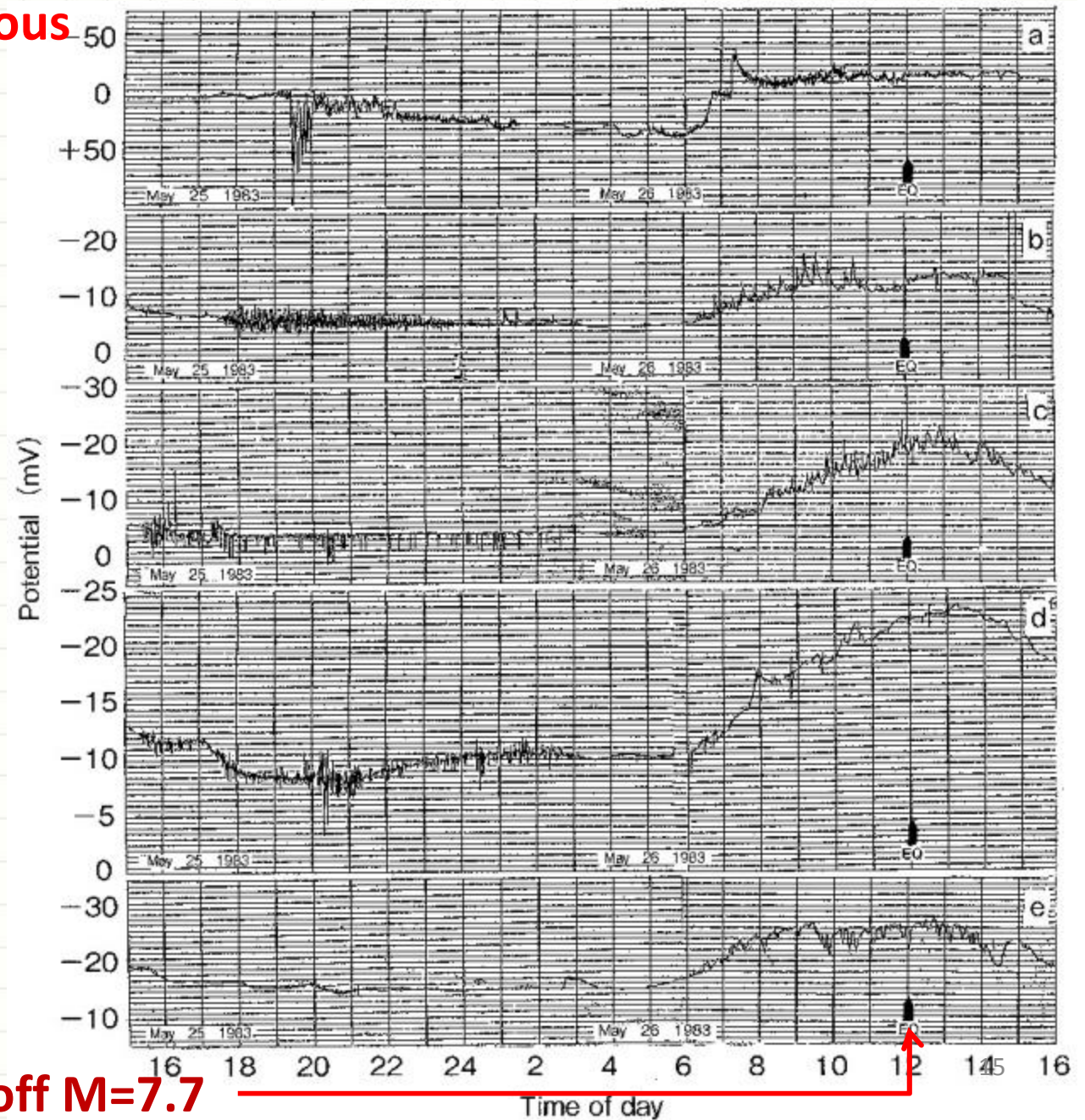
1983/05/26 Akita off M=7.7

Examples of Anomalous signal 4

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

TBP at Sagamihara
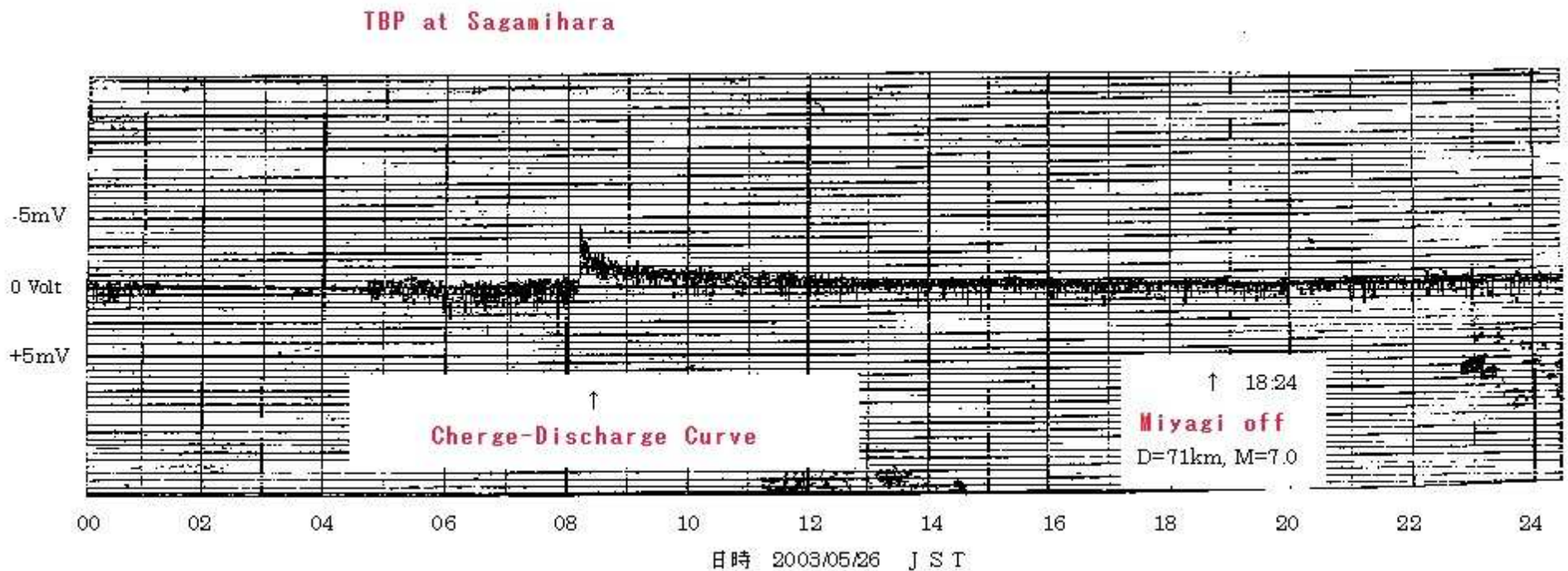
T B P法：Toriyama Bioelectric Potential Method

© SAITO Yoshiharu

2003/5/26 Miyagi off M7.0

Location of Epicenter and Observation Post
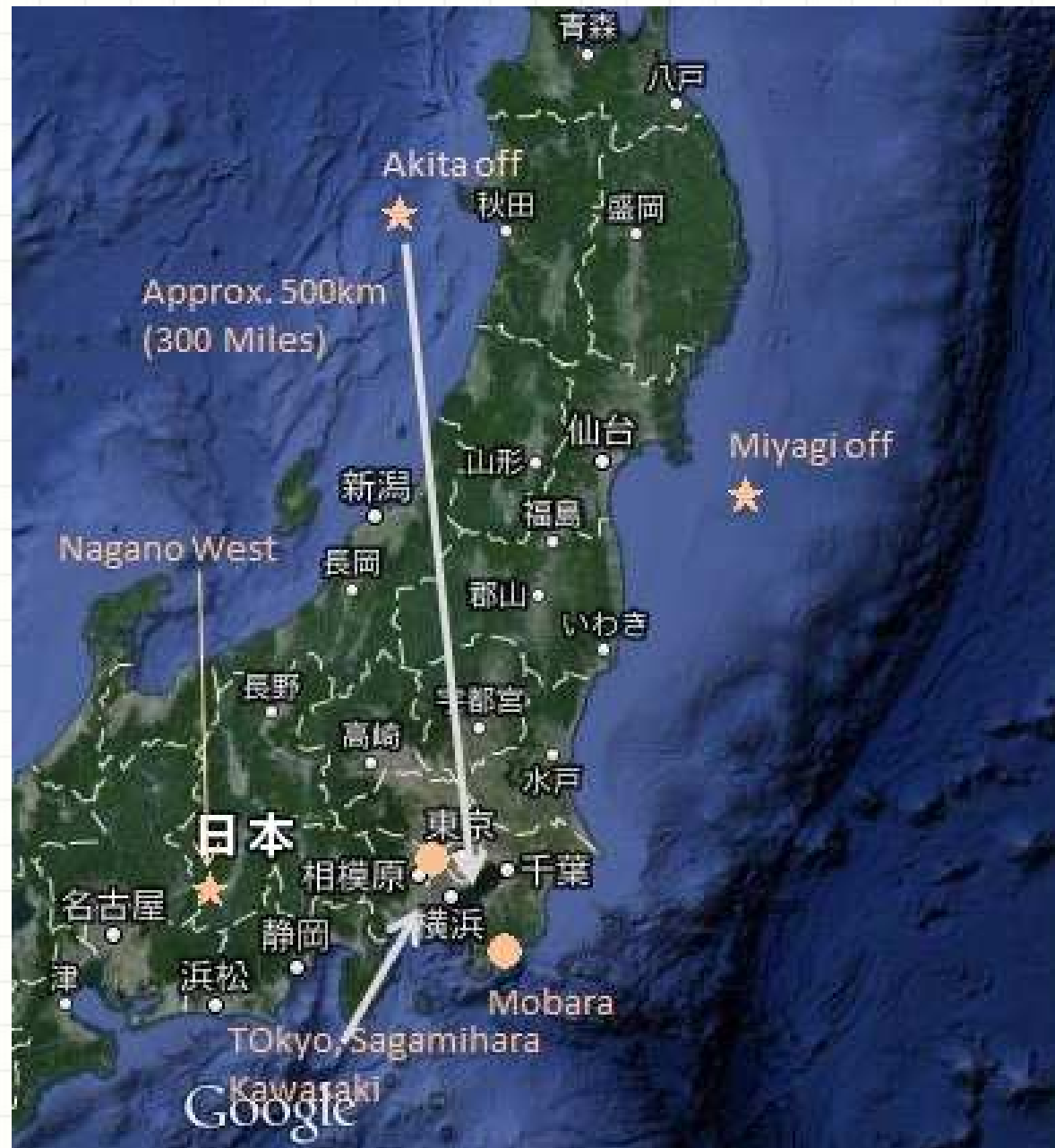
Where anomaly signal comes from?

Isolate root from ground

-> No anomaly was observed
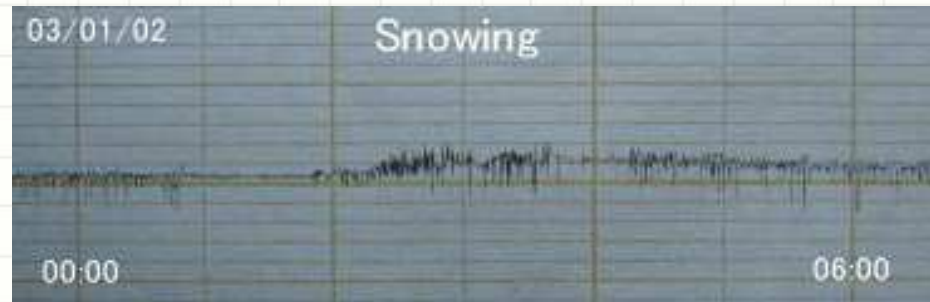
-> Provably thru root

18
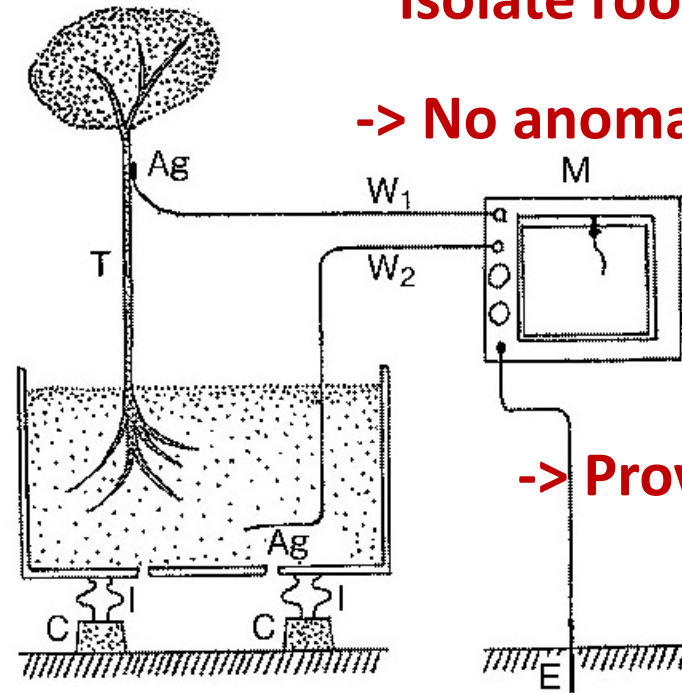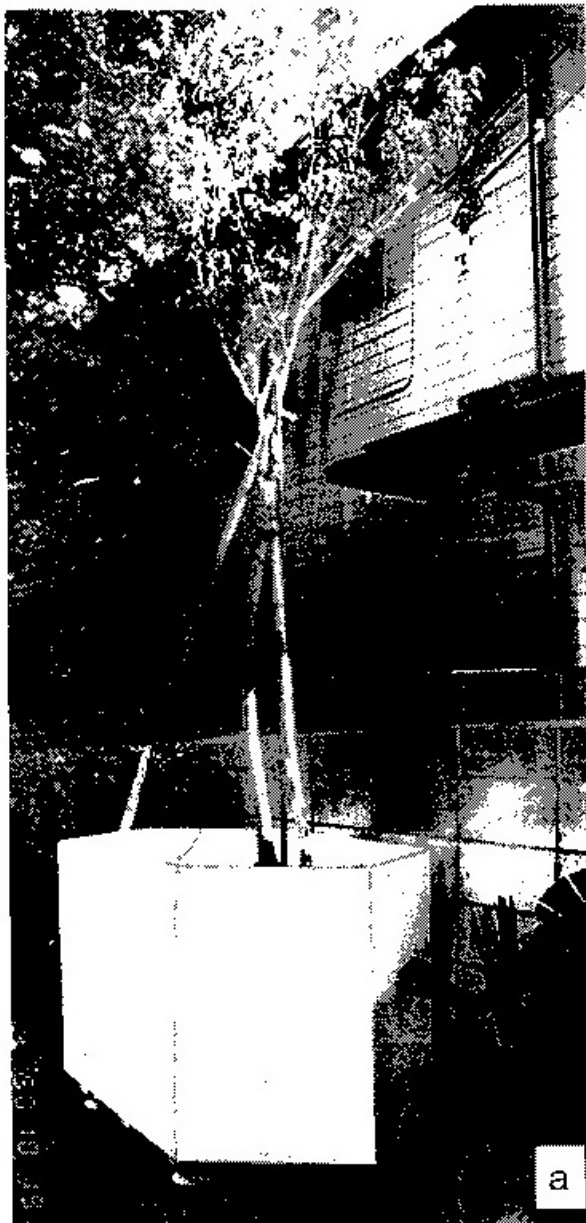
Non seismic signal

Felling of a branch
Hitting tree by baseball bat
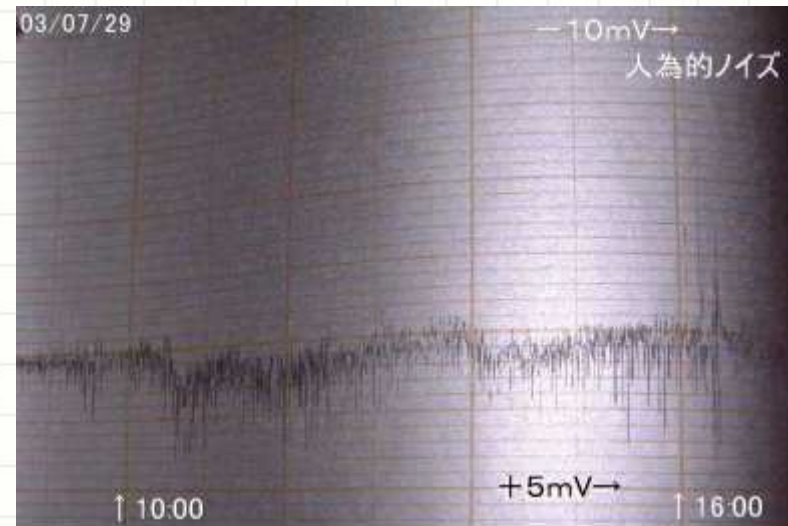
**Lightning**
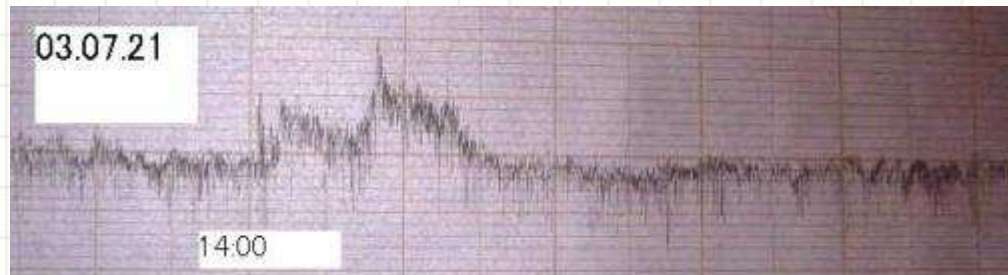
Electric train

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 severa frequency bands with adjacent dual frequency
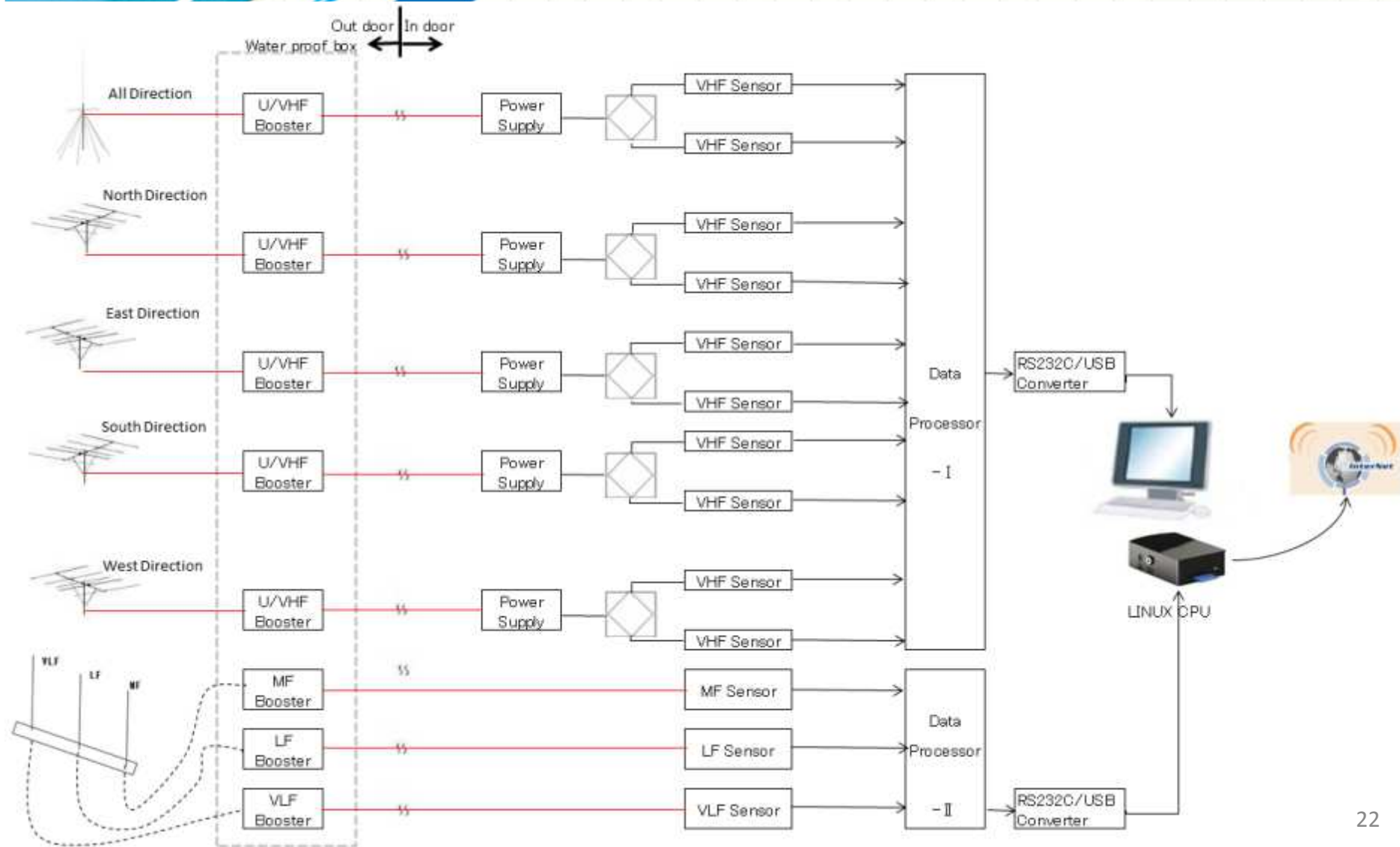
Seismic signal contains some frequency band width

→ Signal appear at both channels: may be seismic
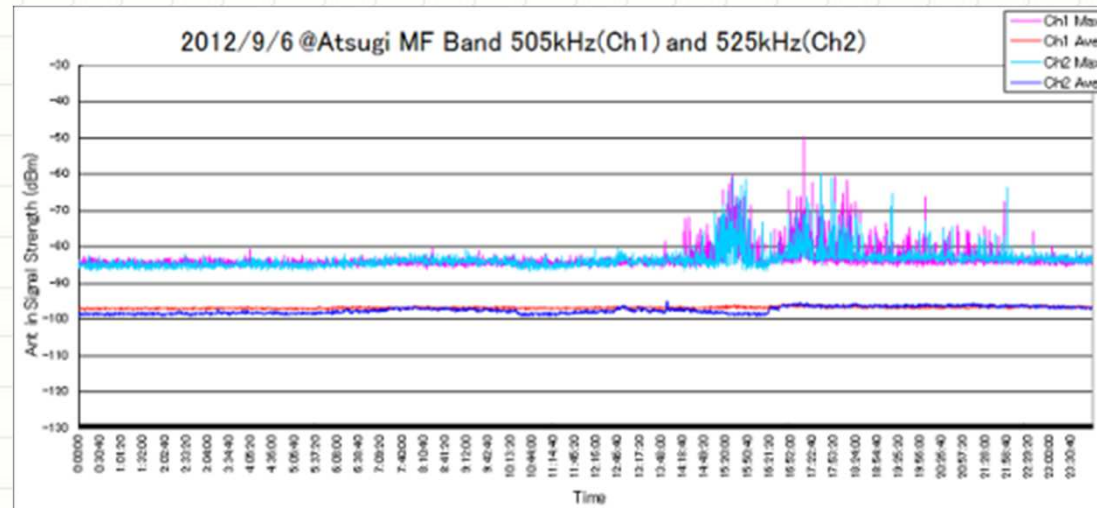
→ Signal appear at one channel: may be not seismic

Frequency Spectrum

Signal strength

Seismic Noise

f1   f2

Frequency
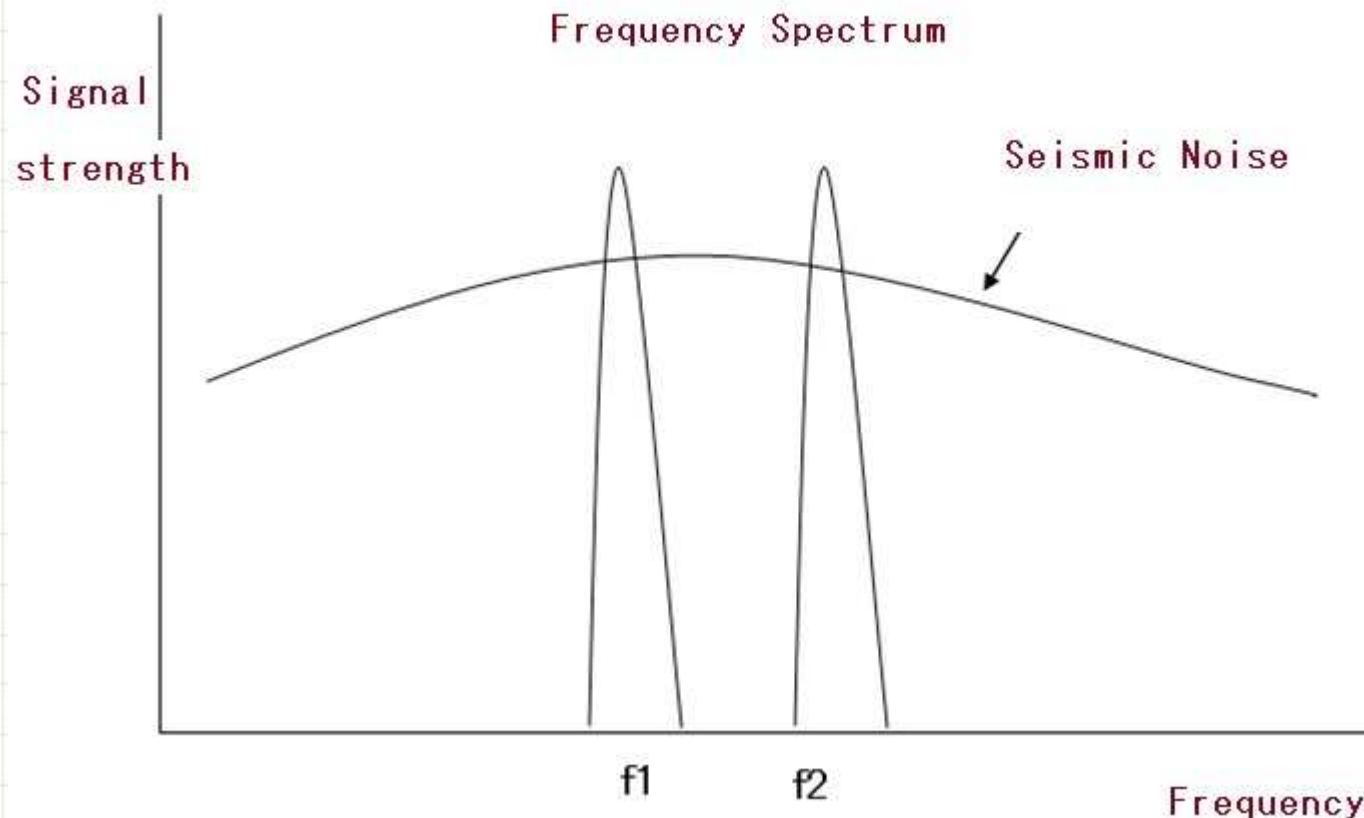
Observation System

Data Processor

1. Capable to input 10 Channels 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.

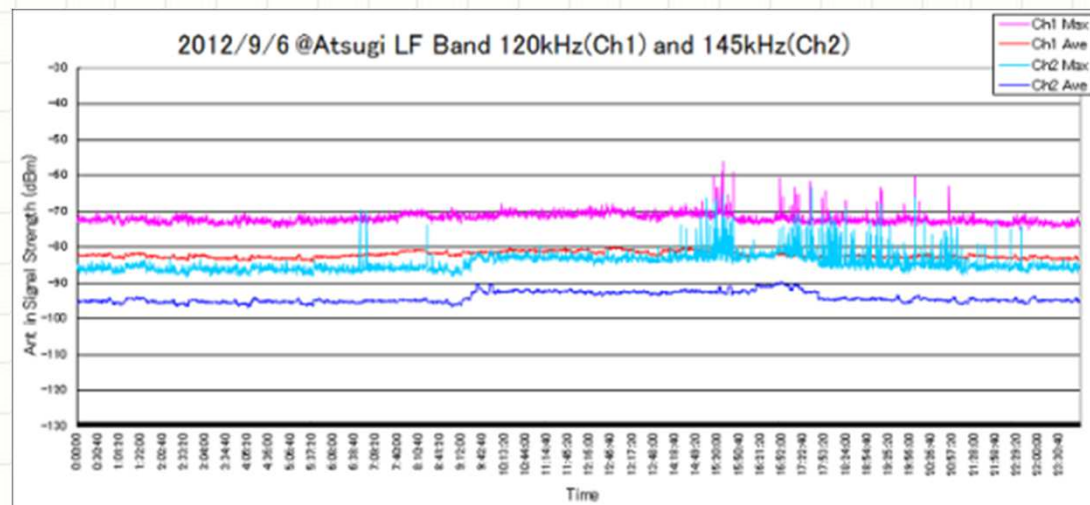# EM Anomalous signal prior to 2012/09/14 02:22 Chiba North-East M5.1

Synchronous at various freq. band and observation posts

1 week before at Atsugi MF Band

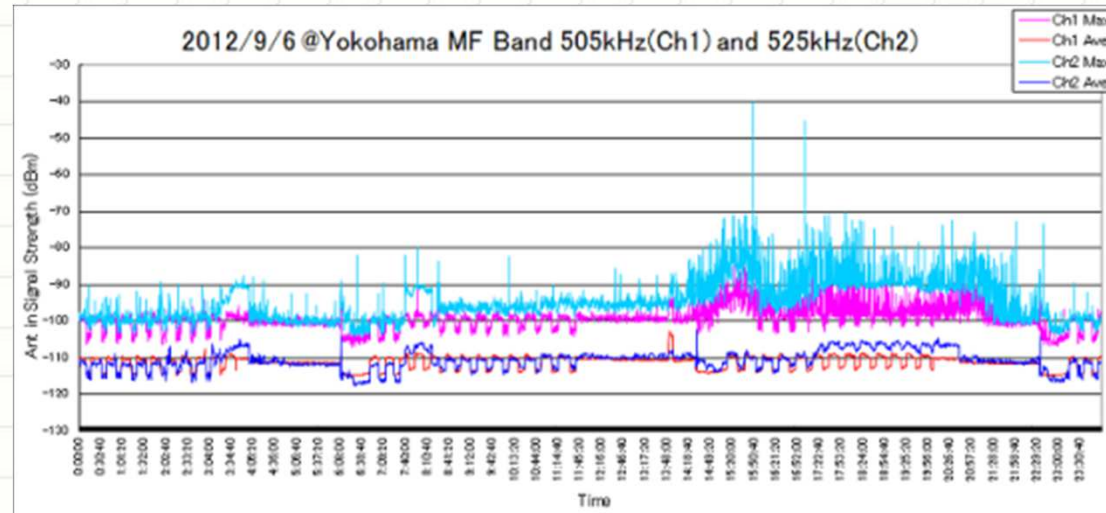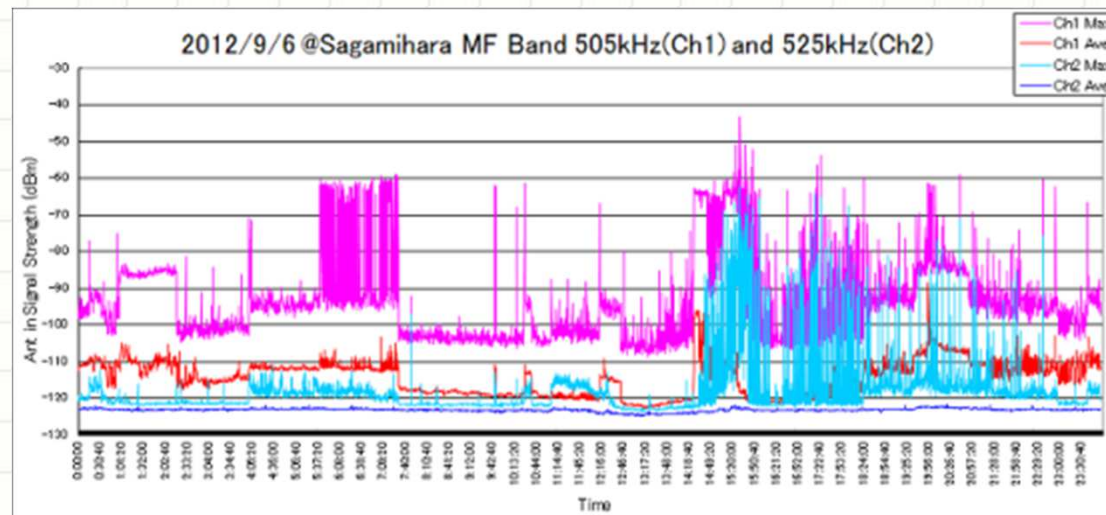**1 week before at Atsugi LF Band**

2012/9/6 @Atsugi MF Band 505kHz(Ch1) and 525kHz(Ch2)

2012/9/6 @Atsugi LF Band 120kHz(Ch1) and 145kHz(Ch2)

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
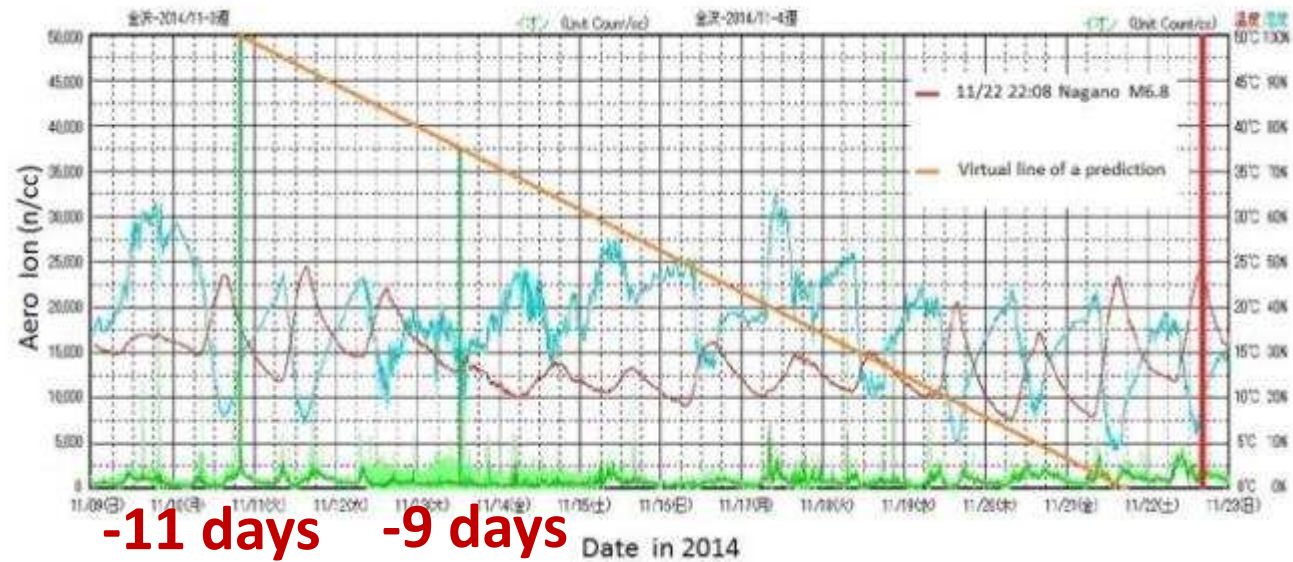
1 week before at Sagamihara MF Band

2012/9/6 @Yokohama MF Band 505kHz(Ch1) and 525kHz(Ch2)

2012/9/6 @Sagamihara MF Band 505kHz(Ch1) and 525kHz(Ch2)

Location of Epicenter and Observation Post

国土地理院承認 平・4総複 第149号

2012/09/14 02:22 Chiba North-East M5.1

Tokyo

Approx. 120km （75Miles）

Sagamihara

Yokohama

Atsugi

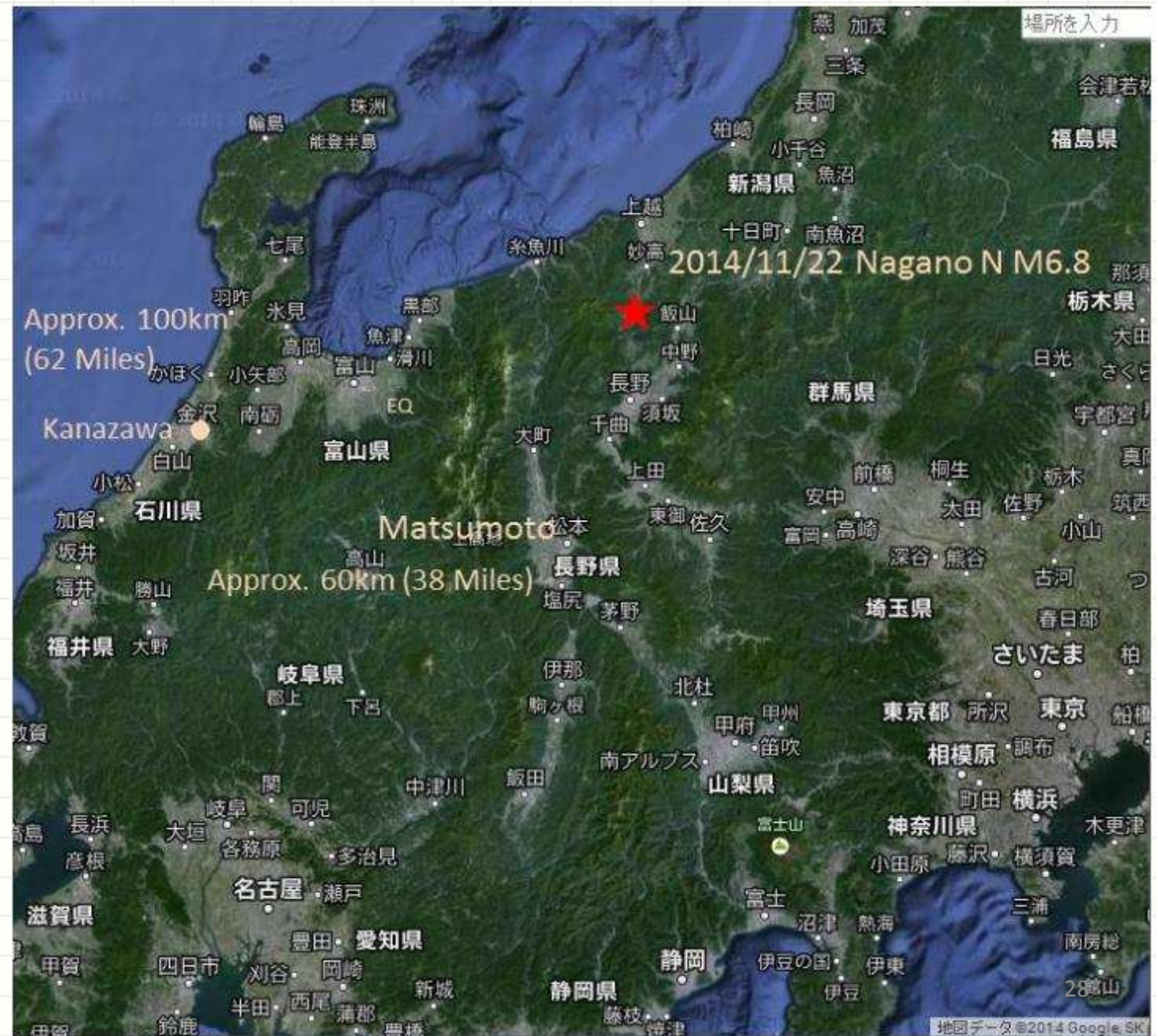# Aero Ion Observation

Kanazawa city Ishikawa Pref.

-11 days   **-9 days**

Matsumoto city Nagano Pref.

27
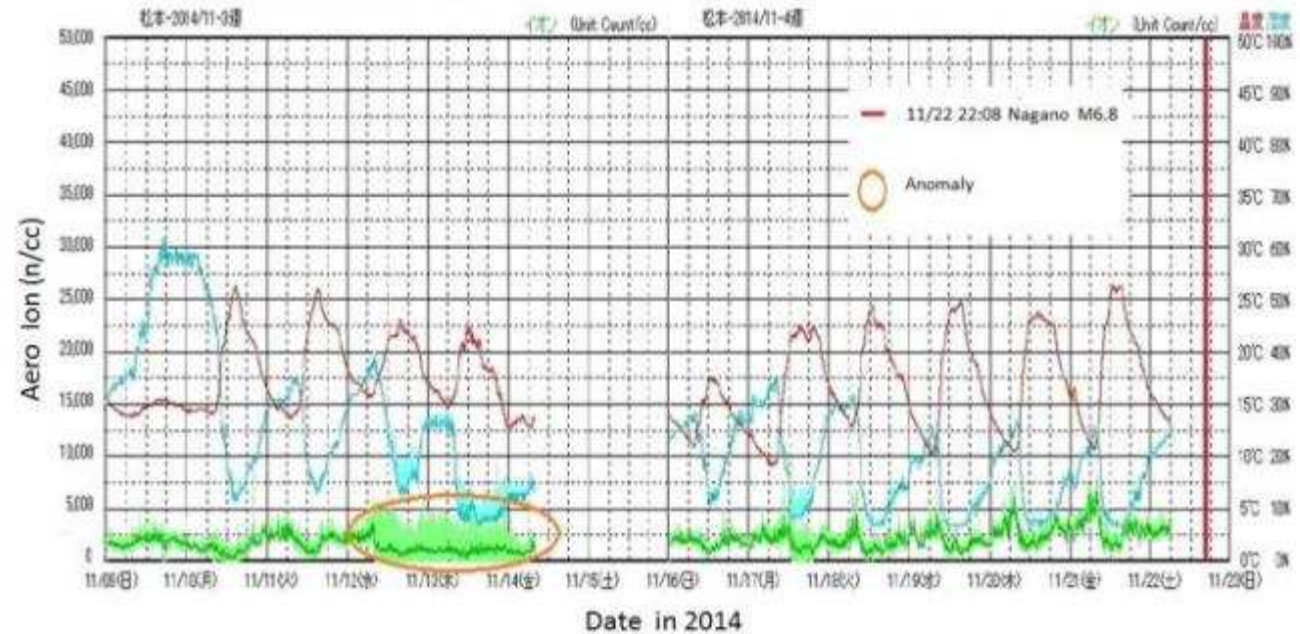
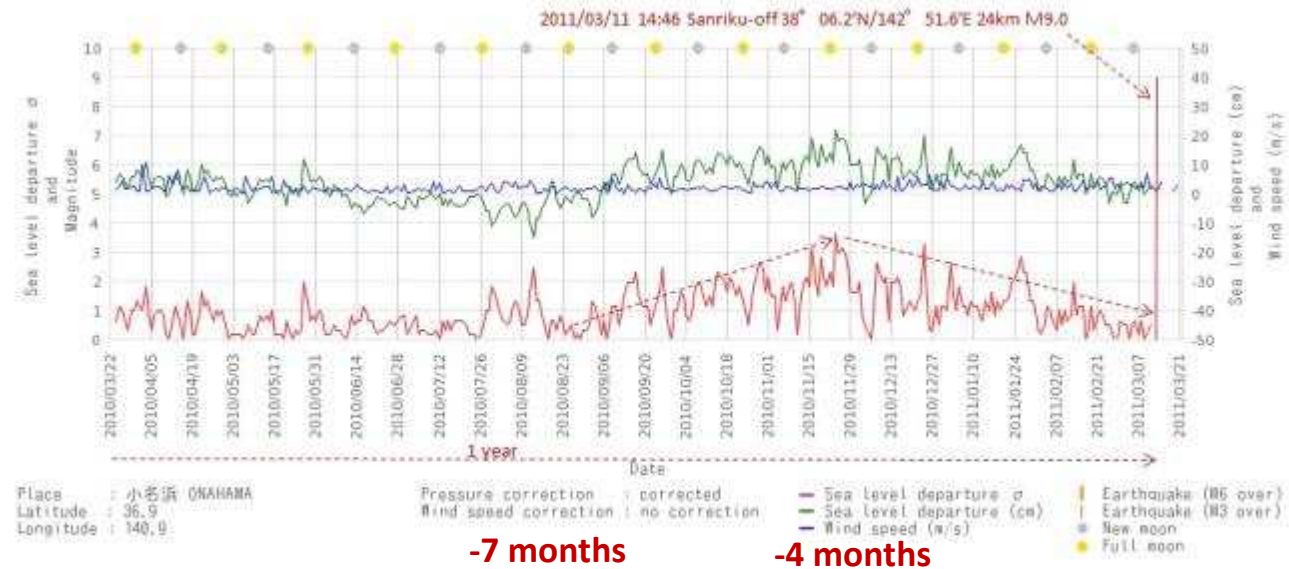# Location of Epicenter and Observation Post

Tidal Level Deviation

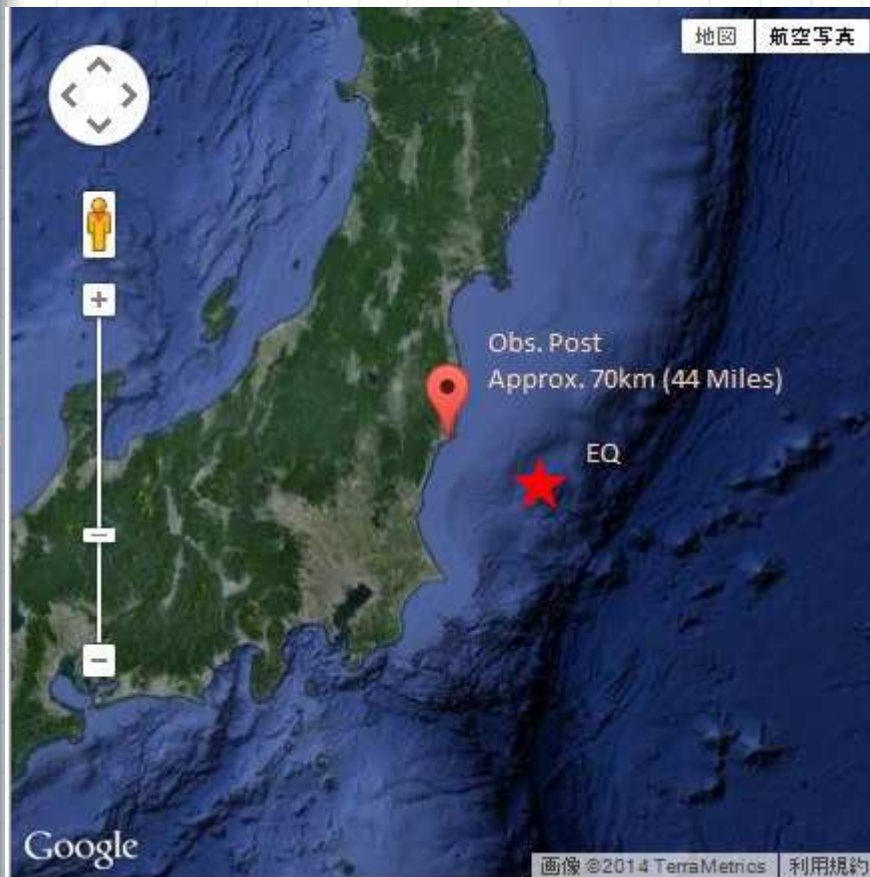**Before 2011/03/11 M9 Tohoku EQ**

1 year before the EQ

-7 months   **-4 months**

1 day on the day of EQ

29

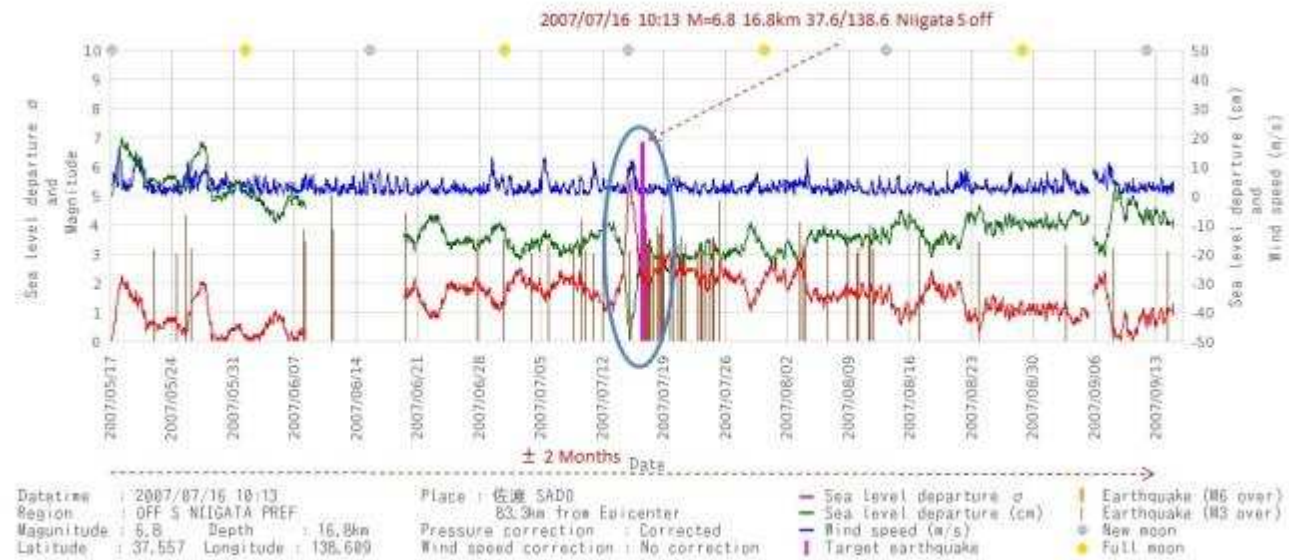# Tidal Level Deviation

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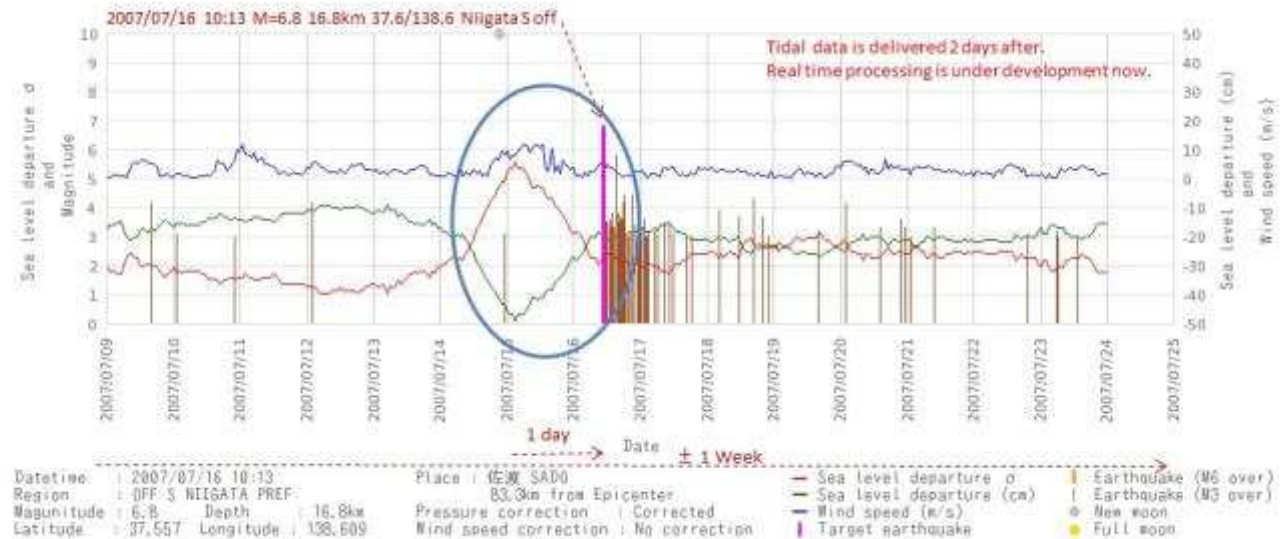**Tohoku EQ**

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

31

Tidal Level Deviation

2014/03/14 M6.2
78.0km Iyonada

±15 days

32

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"
5. NPO will be approved in January 2015
   -> NPO Japan Earthquake Precursor Comprehensive Observation Center (JEPCO Center)

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