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

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
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.

<table>
<thead>
<tr>
<th>Year</th>
<th>m</th>
<th>d</th>
<th>h : m</th>
<th>Location of epicentre</th>
<th>Latitude (N)</th>
<th>Longitude (E)</th>
<th>Epicentral distance (km)</th>
<th>Epicentral Depth (km)</th>
<th>M</th>
<th>Intensity at Tokyo</th>
<th>Anomalous potential</th>
<th>Precursory time (h)</th>
<th>Pattern of Anomalous</th>
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<td>+</td>
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(*) 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. 10 minutes
- Momentary Drop Pattern in every approx. 1 hour
- Rectangular Pattern
Anomalous patterns

Momentary Drop Pattern in every 30-40 minutes

Charge-Discharge Pattern
Anomalous patterns

Long Term Pattern

Tree Bioelectric Potential Daily Variation Ratio

- Tree-1
- Tree-2

- Magnification

- Date 2010-2011

- EQ 3/11 14:46 D24km M=9.0 Sanriku off (二陸沖) ↑

- Missing due to power failure

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 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

2003/5/26 Miyagi off M7.0
Location of Epicenter and Observation Post

[Map showing locations in Japan with stars indicating epicenters and observation posts]
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

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
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
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

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

Approx 120km (75Miles)

Tokyo
Sagamihara
Atsugi
Yokohama
Aero Ion Observation

-11 days -9 days
Location of Epicenter and Observation Post

Approx. 100km (62 Miles)

Approx. 60km (38 Miles)

2014/11/22 Nagano N M6.8
Tidal Level Deviation

Before 2011/03/11 M9 Tohoku EQ

1 year before the EQ

-7 months

1 day on the day of EQ

-4 months
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
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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