

## Precursor observed by MF Band 2 Freq Simultaneous Measurement prior to The 2011 off the Pacific coast of Tohoku EQ

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### 1. Abstract

This paper is to report detail about anomalous phenomena on the MF Band Electric Magnetic(EM herein after) wave dual frequency simultaneous measuring method observed at Kyoto EM observation post about 700km from the epicenter prior to the 2011 off the Pacific coast of Tohoku Earthquake(EQ herein after).

The EM anomaly has been detected since about 2 month and half before the EQ and continued till about 1 month after the EQ. We tried this measuring method from a paper of Teruaki YOSHIDA, June Heisei 17.

### 2. Observation System

This system contains a BOOSTER with Antenna, an EM WAVE SENSOR and a DATA PROCESSOR and observes EM as EQ precursor at MF band 2 frequency 505 kHz and 525 kHz simultaneously. Those 2 frequencies are out of band from MF broadcasting band and vacant frequency are chosen. Received and detected MF EM is transferred to observation center automatically through Internet.

Received MF EM is amplified at the BOOSTER located out door and cabled in door EM WAVE SENSOR in which EM is changed into DC logarithm potential in order to be displayed in dBm scale. This potential is sampled once in 20mSec (50 times/Sec.) picked up maximum and average value in 20 second at the DATA PROCESSOR then output in CSV format to PC. Sensitivity of the system is -110dBm in band width +-1kHz/3dB.

The reason why maximum value is observed is to be intended to measure impulsive noise, however, thunder noise may not be cached as it seems to be shorter than 20 mSec.

If only one of two frequencies receives some signal, this will not be regarded as seismic, and if signal strength goes up at both channel simultaneously, this will be judged as seismic, as seismic EM has wide frequency.

### 3. What's observed

This observation is performed at calm residential area with little EM interference in Kyoto since January 2010. Attached figure shows 2 input signal strength variation from 2010/9/1 to 2011/5/31 and daily average graph of maximum and average value sampled in 20m sec.

Calm status has been continued since January 2010 of observation start up to middle of December 2010, after that, receiving signal strength at both channel raise up gradually and reached at peak in the middle of February 2011. Then anomalous condition continued till early April and returned to calm condition after middle of April.

On 2011/03/11 14:46:18 prior to the 2011 off the Pacific coast of Tohoku Earthquake M9.0 D=24km occurred. As the signal strength has raised up by more than 10dB comparing with calm period at Kyoto observation post, and anomaly timing was just before the Earthquake almost co-seismic in some meaning, this EM in MF band could be regarded as precursor of the huge EQ.

### 4. Conclusions

In usual observation, row data is only displayed in daily, weekly, and monthly graph, we could know that another world is shown by making long span graph in different way. It may be possible if we develop another analysis data processing way in real time.

If MF band EM is observed at many places, exact place of epicenter may be pointed out and be lead magnitude by calculating distance between epicenter and each observation post and signal strength. Proceeding period of EQ occurring of bigger magnitude of 7 may be 1 to 2 months from our experience of this time, and smaller scale EQ may occur within 1 week from our past experience.

Our aim by using this method is not academic EQ prediction, our aim and purpose is practical EQ prediction as disaster prevention information. Important thing as practical disaster prevention information is to predict huge (M>6, brings human damage), middle (M5 Class, brings people big surprise) or small scale (M4 Class, brings small surprise) EQ occurrence.

### Reference;

"Observation of VHF Band EQ EM measured by dual frequency measurement method" in paper-C of Institute of Electrical Engineers of Japan issued on June Heisei 17 year by Teruaki YOSHIDA, Hiroshima City University.

Keywords: earthquake, precursor, MF Band, EM, electro magnetic wave, EM wave

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