

Precursor observed by MF Band Dual Frequency 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 (herein after called as EM) wave dual frequency simultaneous measuring method observed at Kyoto EM observation post prior to the 2011 off the Pacific coast of Tohoku Earthquake(EQ herein after).

Distance between Kyoto and epicenter is about 700km. 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 obtained this measuring method from “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.

2. Observation System

This system contains a MF BAND BOOSTER with Antenna, a MF BAND EM WAVE SENSOR and an EQ EM WAVE DATA PROCESSOR and observes EM as EQ precursor at MF band 2 frequencies 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.

Received MF EM is amplified by about 30dB at the MF BAND BOOSTER located at out door and cabled in door MF BAND EM WAVE SENSOR in which EM is changed into DC logarithm potential in order to be displayed in dBm scale. The DC logarithm potential is sampled once in 20m Second (50 times/Sec.) picked up maximum and average value in 20 second at the DATA PROCESSOR then output in CSV format to PC. Maximum 10 channels are available to process.

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 caught 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 because this signal contains some meaning, and if signal strength goes up at both channel simultaneously, this will be judged as seismic, as seismic EM has some frequency width like natural noise.

3. What's observed

MF band dual frequency simultaneous observation is performed at residential area with little EM interference in Kyoto Fushimi-ku since January 2010. Attached figure shows input signal strength variation at 2 MF band frequency 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 whose distance from the epicenter is approximately 700km, and anomaly timing was just before the Earthquake almost co-seismic in some meaning, the EM in MF band could be regarded as precursor of the 2011 off the Pacific coast of Tohoku Earthquake M=9.0.

4. Conclusions

In usual observation, row data is only displayed in daily, weekly, and monthly graph, we could know that another world is shown, if we make 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 in this method 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 time 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 and to define huge, middle or small scale EQ occurrence. Huge EQ brings human damage, middle scale EQ brings people big surprise and small scale EQ brings some people surprise. Huge EQ may be grater magnitude of 6, middle scale may be magnitude 5 class, and small scale may be magnitude 4 class.

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.

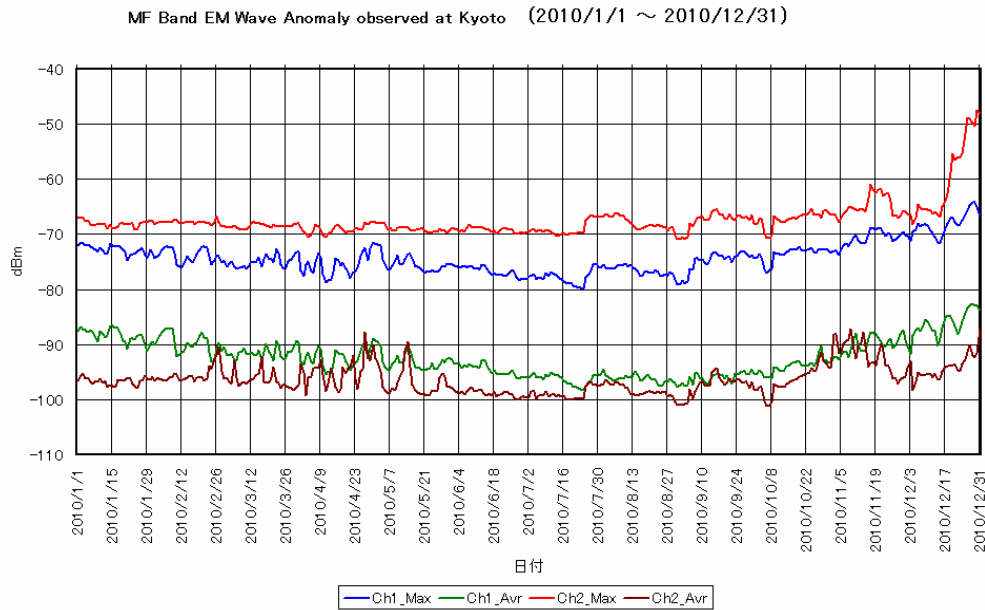


Fig. 1 Quiet condition during 1 year period before the EQ

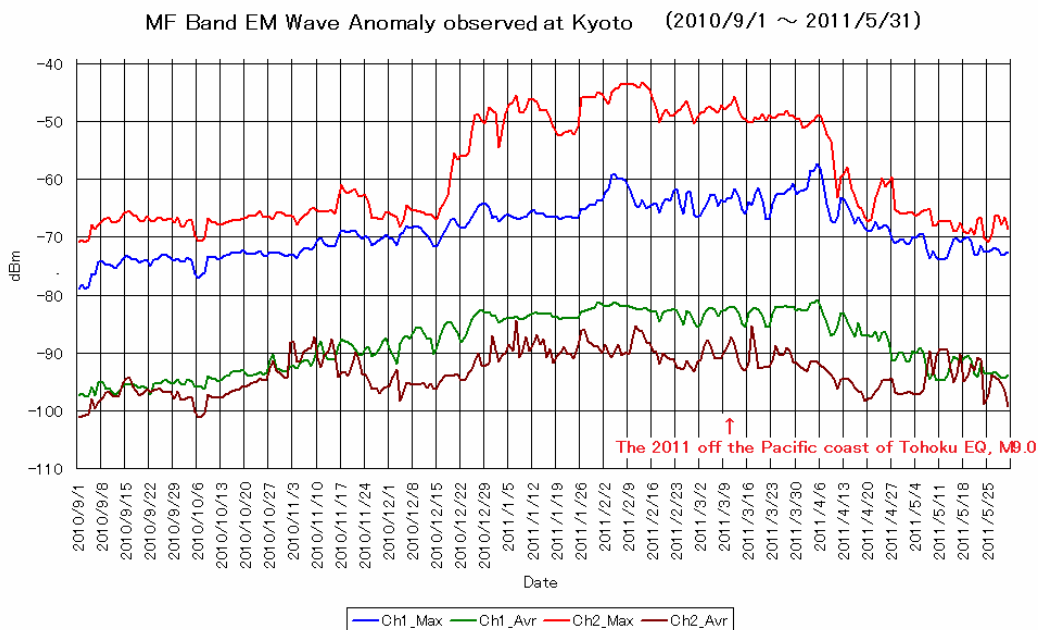


Fig. 2 Anomaly condition since 3 months from the EQ