

Key parameters for definite detections of earth-origin electromagnetic pulses

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In order to find electromagnetic (EM) pulses which might be generated by strong stress impacts to the earth crust when the earthquakes occurred, we have been conducting following observation methods for the sake of surefire detections of EM pluses in the earth. They are as follows:

1. Frequency spectra in a range up to 6.4 kHz are continuously obtained every 2.6 minute from signals of EM fields detected by sensors installed in a borehole and are displayed for monitoring electromagnetic environment in the earth [1].

2. We developed an analysis method of obtaining real-time frequency-time (f-t) diagram of EM pulses detected in the earth for obtaining information on the pulse behavior in detail, because dynamical energy collapse generally starts with impulsive movement and would be followed by radiations of heat, sound and electromagnetic waves including light. Using the information, we have developed a basic analysis method for obtaining horizontally arrival directions of detected EM pulses [2].

3. We have clarified propagating properties of EM pulses simultaneously detected on the ground and at the bottom of borehole, and have classified their propagation modes and their possible sources from analysis of their amplitudes and phases, their three dimensional polarization loci at the different detecting points, and local time dependences of their detections [3].

4. We have found observation sites in electromagnetically quiet environment for identifying source locations of EM pulses in the earth. Furthermore, we have developed a new EM sensor system which make it possible to detect tri-axial electric and magnetic field components sensitively in boreholes. We have also developed an analysis method for calculating strict Poynting vector of the EM pulse using the data of tri-axial (six) field components and for obtaining accurate arrival directions of an EM pulse at one point in the earth [4].

Since we have never confirmed earth-origin EM pulses yet, we have to employ key measure to detect them whose intensity would be extremely weaker than the environmental noise level. Now we are improving the system for the sake of detecting the weak earth-origin EM pulses in the earth.

References

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