

Identification of Electromagnetic Signals Emitted by Earthquakes

Hisatoshi Baba[1], Toshi Asada[1], Masahisa Sugiura[2]

[1] Inst. Research and Development, Tokai Univ., [2] Res. Inst. of Sci. & Tech., Tokai Univ.

Investigations of electromagnetic radiation possibly associated with earthquakes have been made in the last two decades. In some studies the relation between the change in the electromagnetic noise level and the occurrence of earthquakes has been discussed. However, the discussions on the relationship between the changes in the noise level or the changes in the frequency of signals per hour and the occurrence of earthquakes were not sufficient, because wave forms of these signals were in most cases not recorded. In the present study, signals in the frequency range from 1 kHz to 10 kHz are recorded.

Investigations of electromagnetic radiation possibly associated with earthquakes have been made in the last two decades. In some studies the relation between the change in the electromagnetic noise level and the occurrence of earthquakes has been discussed. However, the discussions on the relationship between the changes in the noise level or the changes in the frequency of signals per hour and the occurrence of earthquakes were not sufficient, because wave forms of these signals were in most cases not recorded. In the present study, signals in the frequency range from 1 kHz to 10 kHz are recorded. Most of these signals have been determined to be atmospheric. Therefore one of the fundamental problems is to establish a method of delineating signals that are related to earthquakes from those that are not related to them. The location of the source of atmospheric generally changes every time, while signals associated with an earthquake appear to be generated in a definite area close to its epicenter. This feature, if established, would be useful in distinguishing signals related to an earthquake from atmospheric. In our instrument, signals are recorded digitally, and the direction of approach is calculated for each signal. During the one and one half years period of our observation we have obtained a result that among the four earthquakes that occurred during this period, three generated signals in the areas close to their epicenters several days prior to their occurrences. The magnitudes of these earthquakes were about 5, their depths 20 to 40 km, and the epicentral distances from our recording networks less than 100 km. We have concluded that these signals can be regarded as being precursors of the three earthquakes. Earthquakes which occurred in the ocean floor did not generate signals in the areas close to their epicenters. These earthquakes were of magnitude smaller than 4, more than 50 km in depth, or more than about 100km in distance.