

Earthquake prediction by detecting precursory electric pulses

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[Introduction] Predicting earthquakes has been tried by observing precursory electric pulses, which have been observed before every great earthquake. But the operational prediction has not been realized, because it had been difficult to discriminate the precursory pulses from artificial or natural noise. But since 2005, the pulses have been detected which generate before the earthquake, and the concrete method has been proposed to predict the earthquake a few days before.

[Receiving system] The following system has detected the pulses before the earthquakes.

Receiving antenna: vertical micro-dipole antenna

Observing frequencies

1.5 kHz: 1 - 2 kHz

3 kHz: 2.5 - 3.5 kHz

12 kHz: 10.5 kHz - 13 kHz

Sampling rate: 25 kHz

Recording interval: 2 minutes

Observing sites: Hasaki (35.8deg N, 140.7deg E), Katsuwura (35.2deg N, 140.3deg E), Ohshima (34.7deg N, 139.4deg E), and Sagara (34.4deg N, 138.1deg E)

[Method for detecting precursory pulses] The following relations will be valid for the precursory seismic fields, when the fields are inversely proportional to frequency, as usual natural noise is.

$E(1.5\text{kHz}) > E(3\text{kHz}) > E(12\text{kHz})$

where $E(f \text{ kHz})$ is field intensity of $f \text{ kHz}$.

Concerning natural noise, the fields of lightning are strongest and relatively strong within 100 Hz - 1 MHz. The maximum field intensity is usually within 3 - 10 kHz, and the fields within 1 - 3 kHz absorb heavy attenuation loss through the ionosphere propagation over long distance. These spectrum and loss result that the fields of distant lightning are maximum at around 12 kHz, and do not satisfy the right side of the above relations. The spectrum also shows that the fields of near lightning at 1.5 kHz are weaker than those at 3 kHz, and do not satisfy the left side of the relations. Considering both cases, the fields of lightning do not satisfy the above relations.

In the case that the received time difference at two sites is more than 0.4 ms, then the distance difference between the distance from the source to one site and the distance from the source to another site is more than 100 km, and the locations of the source must be different. According to our observation of 1 - 13 kHz over 10 years at the sites where the continuous and strong noise is rare, the temporal artificial noise is a pulse, is not observed simultaneously within 0.4 ms at two sites of about 100 km distance, and is discriminated.

When the pulses, which satisfy the above relations, are observed at the sites of about 100 km distance within time interval less than 0.4 ms, the precursory seismic pulses may be generated.

