Predictability in earthquake science and its uncertainties

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Prediction of future seismic phenomena with a reasonable accuracy is one of the important goals of seismology. However, in recent years it becomes a general agreement in the seismological community that accurate prediction of location, time, and size of large earthquakes is impossible at least for now. In addition, the 2011 Mw9.0 Tohoku-oki earthquake revealed that long-term forecast of seismic activities also have large uncertainty. Under such circumstances, the emergency act against the large earthquake along the Nankai Trough is now being discussed in a governmental working group and the emergency response based on earthquake prediction shall be changed. It should be rigorously questioned if there is any information available before the occurrence of a big earthquake. These experiences brought us important lessons about the nature of seismic hazard that predictability of earthquake science in present-day is highly limited and that it is of essential to take such a large uncertainty into account in protection of important facilities such as nuclear power plants. It should be also noted that the degree of uncertainty is often underestimated as long as such evaluation depends on our limited experience.

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