

Importance and method of visualization of future occurrence possibilities of giant earthquakes along the Nankai trough

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Earthquakes occur in a diverse fashion and we can only make probabilistic forecasts on their occurrence. In a future, we might be able to make deterministic forecasts for certain earthquakes, but at the current status we do not foresee a realization of such a type of forecast.

Currently, discussion on how to take countermeasures on the anticipated giant Nankai trough earthquakes based on forecast information is going on in Japan, led by a Japanese governmental working group. On the giant Nankai trough earthquakes, it has been known mainly from historic documents and seismological observations that 1) the mean recurrence interval of giant Nankai trough earthquakes is 100–150 years, 2) there are two segments, west and east of the Kii peninsula, and they tend to generate earthquakes one after another with a short time interval (within a few years) or rupture simultaneously, 3) normally there are few interplate earthquakes along the Nankai subduction.

Based on such current knowledge, the report by the governmental working group issued in December 2018 emphasizes on the case where a magnitude ~8 earthquake rupturing only one side (west or east) and another earthquake is strongly anticipated on the other side. The report also mentions the cases where a smaller earthquake (magnitude ~7) or an unusual slow slip occur, but with conservative descriptions on the countermeasures for such cases. In short, the report focuses on relatively certain and presumably impending case of what to do in case of the “half-rupture” .

While, at the standpoint of the national government, the framework of the report is appropriate, there seems to be potential motivation on local government, public organizations and private companies to make own flexible decisions depending on their circumstances. There may be cases where some anomalous geophysical phenomenon, even without an eventual occurrence of a giant earthquake, would lead to social reactions and the organizations should take some countermeasures. It seems thus useful for the organizations to understand the possibilities of anomalous natural phenomena that might lead to an earthquake (and social phenomena that follows). Event tree diagrams used in volcanology and other fields can be useful for that purpose. It would be important that experts collaborate with the stakeholders (potential users) and know their needs and opinions in developing them.

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