

Asperity as a key to the earthquake occurrence and strong motion generation

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Heterogeneous fault slip is often characterized by asperities/barriers. They are responsible for the pattern of earthquake sequence as well as the strong motion generation. In this paper, we call a larger co-seismic slip area 'asperity'.

As the definition, the area surrounding the asperity is characterized by a barrier to rupture propagation and/or aseismic slip area.

Recent studies have revealed the following general properties of the asperities for large earthquakes. (1) There exist characteristic sites of asperities where fault slip occurs only in a co-seismic way. (2) The rupture propagation is mainly unilateral. Even if it seemed like a bilateral rupture, a close inspection often showed the rupture propagation over two fault planes with a jog at the hypocenter. (3) Aftershocks tend to occur in areas surrounding the asperity. (4) Episodic slip is often observed to occur in surrounding area of the asperity. (5) The spatial distribution of asperity seems to be well correlated with the low seismicity and low b-value area.

Based on these characteristics, we will be able to identify the asperity not only by the co-seismic slip derived from the seismic data and tsunami data, but also by aseismic slip derived from GPS data. In viewing the recent high quality data of seismicity, (5) also becomes more important in the identification of asperity distribution.

For a more reliable strong-motion hazard, we have to clarify the role of barrier surrounding to asperity, and the detailed structure of the asperity itself. It is now desired to integrate these studies to make an asperity catalogue for the assessment of not only the strong motion hazard but also the occurrence of forthcoming large earthquakes.