A *b*-value map based on seismicity of the Nankai Trough subduction zone

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The Nankai Trough megathrust earthquakes inflicted catastrophic damage on Japanese society and more widely. Various precursory phenomena are expected to appear before this occurrence. Possible candidates include, but are not limited to, reported precursors to the 2011 Tohoku-oki megathrust earthquake of magnitude (*M*) 9, such as weakening of interplate coupling, seismic quiescence and activation, tidal triggering, and changes in the relative occurrence of large and small events. In order to detect these phenomena, steady and intense monitoring of seismicity and crustal movement is indispensable. A number of studies have been conducted aimed at identifying strongly-coupled regions that should be a major source of released seismic energy in future disastrous earthquakes because megathrust earthquakes are driven by interplate coupling. Focal areas of historical earthquakes are thought to be located around high slip-deficit rate (*SDR*) regions on the plate interface, where differential stress is high. Therefore, to search high-*SDR* and highly-stressed areas is most important. Yokota et al. (2016) elucidated the distribution of *SDR*s in the Nankai Trough subduction zone by analyzing seafloor as well as land geodetic observation data obtained from GPS-A and GEONET.

Here we present a *b*-value map for the entire Nankai Trough zone. The *b* value, which represents the rate of occurrence of small earthquakes relative to larger ones, is inversely dependent on differential stresses, and has been used to detect highly-stressed areas on fault planes in various tectonic situations. Although the *b* value is spatially heterogeneous, we find that it is low in the focal areas of the *M*8-class 1944 Tonankai and 1946 Nankai earthquakes. A remarkable finding is that the *b*-value is inversely correlated with the *SDR*. Moreover, the *b*-value for the areas of high *SDR* in the eastern part is lower than that in the western part, indicating that differential stress on asperities in the eastern part is higher than that in the western part. This may explain the history of the Nankai Trough earthquakes, in which the eastern part tends to rupture first.

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