Relation between coupling and tremor activity around the Shikoku region: An insight into the roots of tremors

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The Shikoku region is located in the western part of the Nankai subduction zone in Japan, where the Philippines Sea plate subducts beneath the overriding continental plate. Interactions between the two plates include the interplate coupling, the short- and log-term slow slip evets, and the deep and shallow low frequency tremors. In this study, we focus on small fluctuations of the coupling in the deep low frequency tremor occurrence zone at a deeper location next to the strongly coupled area and examine temporal relation between coupling and tremor activity.

We examine the spatiotemporal distributions of the interplate couplings and the tremor count rate in the Shikoku region from July 2007 to June 2015 by comparing the results of static geodetic inversion using onshore GNSS coordinate data and the published tremor catalog. GNSS data and the tremor catalog used in this study are the daily F3 solutions of site coordinates of GEONET data published by GSI and the tremor catalog published by NIED, respectively. Through the analysis, we find that the temporal fluctuations in the annual coupling rates ("coupling rate" in this study does *not* mean the proportion of the slip deficit to the plate convergence velocity but means *the annual-averaged value* of the slip deficit) and tremor count rates correlated well at a few spot-like points in the tremor-occurrence zone (Fig. 1). The well-correlated points are densely distributed around the long-term slow slip area in the Bungo Channel, such as "A" in Fig. 1, and are also randomly dispersed in the central and eastern portions of the study area, such as "B" and "C". The correlation coefficients of the well-correlated points differ from point to point and this result may reflect a few physical aspects, such as plate shapes, thermal conditions, or friction properties. On the other hand, it is commonly observed that the zero tremor counts can be expected when the coupling rates reach the plate convergence rate at the well-correlated points. This indicates that tremors cannot occur during the condition of full coupling and that the hypocenters of the tremor are located at the plate interface and that the tremor count rates can be used as proxies for monitoring the small fluctuations in interplate coupling.

(Reference)

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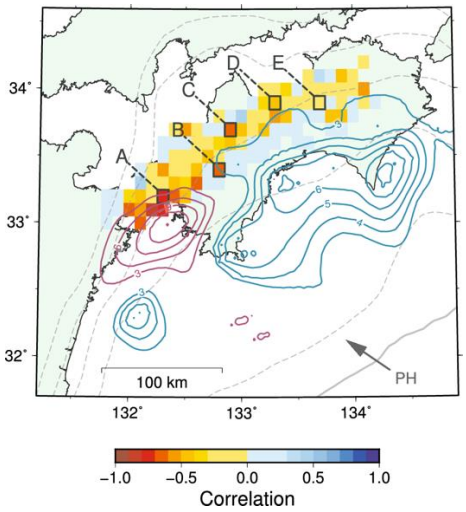

Fig. 1. Correlation coefficients between the coupling and tremor count rates in each grid. Blue and red contours show the interplate coupling and the long-term SSE in Bungo Channel between 2010 and 2011.