

Relations among temperature, dehydration of the PHS plate, and a large earthquake, a SSE, and LFEs in the Tokai district

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In this study, we performed numerical simulations of temperature distribution at the plate boundary and estimated the dehydration process of hydrous mid ocean ridge basalt (MORB) in the oceanic crust in the Tokai district, central Japan. We discuss the relationships among temperature, dehydration, and a future megathrust earthquake, deep low-frequency earthquakes (LFEs), and a slow slip event (SSE). Our results identified a strongly coupled region for an expected megathrust Tokai earthquake based on temperature conditions at the plate boundary. The depth range of the plate boundary where the megathrust earthquake may occur is 9~21 km, narrowing toward the east. An SSE is estimated to have occurred in the transition zone between unstable and stable sliding. Hypocentral depths of LFEs deviating from the isodepth contours of the Philippine Sea plate toward the east may be explained by differences in the dehydration process associated with phase transformations in hydrous MORB.

Keywords: 2-D thermal modeling, megathrust earthquake, low-frequency earthquake (LFE), slow slip event (SSE), temperature, dehydration from hydrous MORB