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Abstract

To understand the effect of plate coupling on very low-frequency event (VLFE) activity resulting from megathrust earthquakes, we performed long-term multi-scale earthquake-cycle simulations (including a megathrust earthquake and slow earthquakes) on a 3-D subduction-plate boundary model, based on a rate- and state-dependent friction law. Our simulation suggests that the quiescence of shallow VLFEs off Miyagi may be explained by the location in the shallow-central part of the 2011 Tohoku earthquake because of the locally strong coupling, while observed activation of VLFEs off Iwate (northern part of Tohoku district), Fukushima (southern part of Tohoku district), and Ibaraki (northern part of Kanto district) are explained by the location on the outer rim. We also calculate the time series of hydraulic pressure data at DONET, comparing with the leveling change expected from our numerical simulation of the 1944 Tonankai earthquake. Since leveling change due to shallower VLF swarms is so local as to be incoherent, removal of the moving-averaged data from the data stacked by four nearby observation points in the same node may be useful to detect the short-term local leveling change. However, we need collaboration between seismology, geology, meteorology and tsunami engineering in order to separate components of crustal deformation, ocean fluctuation due to Kuroshio and instrumental drift from raw data of hydraulic pressure gauge on the seafloor around the source regions of megathrust earthquakes along Nankai Trough.