Effect of seismic radiation damping term on the simulation of the Tokai earthquake

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We simulate recurring great earthquake in the Tokai region basing on the rate- and state-dependent friction law (Dieterich, 1979, 1981; Ruina, 1983). To save the computational time we have been using the method of Tse and Rice (1986) in which the source area of a large earthquake and the slip speed during an earthquake are predetermined. However, the solutions for this method are often unstable against the change of parameters and setting of the source area is arbitrary. Therefore instead of predetermining the source area we have decided to adopt the quasi-static model also during the rupture of an earthquake, which results in the spontaneous stopping of the rupture. We also refine the size of cells in simulation as from 5 km to 3 km to reduce the effect of cell size. Since all the change of the method above mentioned leads to the great increase of computational time, we applied a large value for the seismic radiation damping term (Rice, 1993) to save the computational time, which may affect the way of occurrence of a large earthquake. So, in this study we investigate the effect of the seismic radiation damping on the simulation results.

By applying various values of the factor for the radiation damping, we find the larger the factor is, the shorter the recurrence period of earthquakes is , because the stress drop becomes smaller as the radiation damping becomes larger. It is also found that the way of stress accumulation, the initiation point of an earthquake, and the propagating direction vary depending on the values of the radiation damping. One example showing the variation of the way of stress accumulation is that the turning point from subsiding to uplifting of the relative surface elevation at the Hamaoka station in reference to the Kakegawa station varies from 5 to 30 years before the earthquake depending on the variation of the radiation damping as 10 to the 1st-3rd power.