# Numerical experiments using a friction law both for fast and slow sliding

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To realize various fault slip behavior as regular and slow earthquakes, I assume a simple friction law. In the friction law, the frictional strength decreases due to fault slip and recovers with time. These two processes along the fault, slip-weakening and healing are the intrinsic ones to model regular and slow earthquake sequences. Here, an evolution equation of the frictional strength proposed by Nielsen et al. (2000) is used. In this equation, there are two frictional parameters, dc and tc, which represent a characteristic displacement for slip-weakening and a characteristic time for healing, respectively. The balance of these two parameters controls how frictional strength evolves depending on the fault slip history. To examine fault slip behavior with the evolution equation, a single degree of freedom elastic system, composed of a block and a spring with constant loading is introduced. The block starts to slip following the strength evolution equation when the shear stress acting on the contact surface of the block reaches the strength. On the other hand, the block is in stationary contact if the shear stress is less than the strength. Note that this is a classical constitutive law without direct effect in a rate- and state-dependent friction law (Nakatani, 2001). To examine the slip behavior depending on the above system, I modified a simulation code used in Aochi and Matsu’ ura (2002), which introduces more complex evolution equation of fault strength. Some preliminary results show that both fast and slow fault slip sequences can be demonstrated depending on the two frictional parameters. These slip behaviors are similar with regular and slow earthquakes. One interesting behavior in slow fault slip sequences here is that both the stress drop and the recurrence time interval are much smaller than those of the fast fault slip sequences but the peak strength is identical. Furthermore, the slow slip behavior is similar with that found at Izu-Bonin Trench (Fukao et al., 2021).