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Characteristics of frictional properties' relationship with afterslip propagation speed

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The propagation speed of postseismic slip seems to vary from place to place. For the 2003 Tokachi-Oki earthquake (M8), there was a time lag of about 80 minutes for the largest aftershock (M7.4) at about 40 km distance off Tokachi [Miyazaki and Larson, 2008 GRL] and of one year for the M7 earthquakes off Kushiro about 160 km away [Murakami et al., 2006 GRL]. If these aftershocks were triggered by ΔCFS increase in the passage of afterslip [Uchida et al., 2009 Gondwana Res], these time lags suggest that the propagation speed of the afterslip from the mainshock to the largest aftershock is significantly higher than to the M7 aftershocks off Kushiro.
On the Sanriku-Haruka-Oki earthquakes, Matsuzawa et al. [2004 EPS] pointed out that propagation speed of the postseismic slip seems to be on the order of 10 km/day for the shallower part of the subduction plate boundary while it appears to be 10 km/month for the deeper part. These results indicate that the propagation speed of postseismic slip depends on frictional properties and effective normal stress in addition to slip velocity.
To better understand the frictional properties controlling the propagation speed of postseismic slip, some numerical simulations of interplate earthquakes based on a rate- and state-dependent friction law (RSF) [Dieterich, 1979 JGR; Ruina, 1983 JGR] have been recently performed. These previous studies suggest the propagation speed of postseismic slip becomes lower in case of higher frictional stability, longer characteristic slip distance [Kato and Hirasawa, 1999 PAGEOPH], and higher effective normal stress [Ariyoshi et al., 2007 EPSL]. Since we do not quantitatively understand why such cases make the postseismic slip propagation slower, it is necessary to find an analytical relation between the frictional properties and the propagation speed of postseismic slip.
In this study, we develop an expression for the propagation speed of postseismic slip as a function of frictional properties including effective normal stress, and discuss its validity quantitatively by comparing the expression with trial numerical simulation results in addition to previous studies.