

## Limitation of slip-weakening distance estimation from near-fault seismograms

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Estimation of slip-weakening distance ( $D_c$ ) is a very important issue to understand the breakdown process of the earthquake faulting. Ide and Takeo (1997, JGR) proposed a technique by reconstructing the stress distribution from the spatio-temporal distribution of slip and estimated the  $D_c$  of 0.5 -1 m for Mw6.9 Kobe earthquake. This method, however, requires very accurate slip time functions as demonstrated by Piatanesi et al. (2004, GRL). More recently, Mikumo et al. (2003, BSSA) proposed a method by using a slip-velocity function on the fault to estimate  $D_c$ . As Fukuyama et al. (2003, BSSA) noted, this method will not work properly when a very heterogeneous distribution of slip exists or the gradient of slip-weakening curve does not change sharply at its breakdown time. In addition,  $D_c$  tends to be overestimated by the band limited nature (Spudich and Guatteri, 2004, BSSA) or spatial smoothing effect (Yasuda et al., 2005, GRL). Thus there still exists a difficulty when applying this technique to the near-fault seismograms, which is a proxy of the observational fault motion. To examine the additional constraints when using near-fault seismograms, I investigated the near-fault wavefield due to 2D anti-plane / in-plane rupture propagation with constant sub-shear rupture velocity. The computation results show that the farther the station is located from the fault, the smoother the waveforms are. Thus the near-fault waveforms are the function of distance from the fault; more precisely, the pulse width is a linear function of distance from the fault. This pulse broadening effect is the main cause of the overestimation of  $D_c$ . According to Tinti et al. (2005, BSSA),  $D_c$  is mainly controlled by the ratio of the time to peak slip velocity ( $T_{acc}$ ) to the rise time. Thus by comparing  $T_{acc}$  on the fault with the pulse broadening effect off the fault, we can introduce a constraint on the selection of near-fault records available for the estimation of  $D_c$ . I will present some examples of near-fault seismograms that satisfy the conditions introduced.