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Simulation of dynamic rupture on a branched fault system

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We study the dynamically self-chosen rupture path on a branched fault structure by using an elastodynamic boundary integral equation method. Failure is described by a slip-weakening Coulomb friction law. Our results show that dynamic stresses around the rupture tip on a main fault could initiate rupture on a branching fault. Whether branched rupture can be continued depends on principal stress directions in the pre-stress state and on rupture velocity. The most favored side for rupture transferring on a branching fault switches from the extensional side to the compressive side as we consider progressively shallower angle of the direction of maximum pre-compression with the main fault. Simultaneous rupturing on both faults can be activated when the branching angle is wide, but is usually difficult for a narrow branching angle due to strong stress interactions between faults. However, it can be activated then too by enhanced dynamic stressing when the rupture velocity is very near the Rayleigh velocity. Natural examples, including the splay fault structure of the Nankai Trough subduction zone, seem consistent with the simulations we present.