A Dynamic Study of Frictional and Viscous Effects on Rupture of the 1999 Chi-Chi Earthquake

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Abstract

Friction is commonly considered an important factor in controlling earthquake rupture. In this work, it is assumed that viscosity is also a significant factor. A strike-slip-type, two-body spring-slider model in the presence of both friction and viscosity is applied to approximate the rupture processes of an earthquake along the fault-striking direction. Results show that in addition to friction, viscosity is also an important factor in controlling rupture. The M_s7.6 Chi-Chi earthquake, which struck central Taiwan on 20 September 1999, ruptured a $>$100-km-long, east-dipping transpressive fault (the Chelungpu fault). Measured and inferred results show that there are differences in physical properties between the northern and southern segments of the fault. Simulation results from a two-body model can explain the differences in displacement, velocity, acceleration, and predominant period between the two fault segments.