

# The Single-Couple Component of the Far-Field Radiation from Dynamical Fractures

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## ABSTRACT

We re-exam the two canons of the seismological literature that elastic displacements in the far-field are proportional to slip velocities on the dynamical fault surface, and that dynamical in-plane slip on an earthquake fault has a double-couple body-force equivalent. It is shown that if faulting takes place on a fault of finite thickness and there is a strength-weakening zone near the advancing crack tip, there is an additional single-couple term in the body-force equivalence and additional terms in the far-field displacement that are proportional to the time rate of increase of stress drop in the advancing weakening zone. It is also shown that the single-couple equivalent does not violate principles of Newtonian mechanics, since the torque imbalance in the single-couple is counterbalanced by rotations within the fault zone; the crack therefore radiates “torque waves”.

**Key words:** single-couple, dynamical fracture, body-force equivalent, torque waves, rotation within the fault zone