Dynamics, radiation and overall energy budget of earthquake rupture with coseismic off-fault damage

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When a dynamic earthquake rupture propagates on a fault in the Earth's crust, the medium around the fault is dynamically damaged due to stress concentrations around the rupture tip. Recent field observations, laboratory experiments and canonical numerical models show the coseismic off-fault damage is essential to describe the coseismic off-fault deformation, rupture dynamics, radiation and overall energy budget. However, the numerical modeling of "localized" off-fault fractures remains a challenge mainly because of computational limitations and model formulation shortcomings. We thus developed a numerical framework for modeling coseismic off-fault fracture networks using the combined finite-discrete element method (FDEM), and we applied it to simulate dynamic ruptures with coseismic off-fault damage on various fault configurations. This paper addresses the role of coseismic off-fault damage on rupture dynamics associated with a planar fault, as a base case, and with a number of first-order geometrical complexities, such as fault kink, step-over and roughness.

REFERENCES

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