



## **Brittle dynamic damage due to earthquake rupture**

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The micromechanical damage mechanics formulated by Ashby and Sammis, 1990, and generalized by Deshpande and Evans 2008 has been extended to allow for a more generalized stress state and to incorporate an experimentally motivated new crack growth (damage evolution) law that is valid over a wide range of loading rates. This law is sensitive to both the crack tip stress field and its time derivative. Incorporating this feature produces additional strain-rate sensitivity in the constitutive response. The model is also experimentally verified by predicting the failure strength of Dionysus-Pentelicon marble over wide range of strain rates. We then implement this constitutive response to understand the role of dynamic brittle off-fault damage on earthquake ruptures. We show that off-fault damage plays an important role in asymmetry of rupture propagation and is a source of high-frequency ground motion in the near source region.