The role of curvature in earthquake mechanics

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In recent years, many studies have tried to catch the influence of geometry in earthquake mechanics. In this paper, we suggest a new interpretation of the effect of geometry on the stress on a fault, as a direct effect of local curvature and torsion of line field of slip along the surface of the fault. Within this framework, it is possible to unify the understanding of bends, kinks and roughness, as an effect of local parameters along the fault. Starting from the representation theorem, that links the displacement in a medium to the slip distribution on his boundary, and assuming homogeneous infinite medium, we first derive a new regularized boundary element method. Using this equation, we were able to separate the influence of geometry, express by curvature and torsion of the fault surface geometry and the slip direction, from the effect of the gradient of slip. This allows us to shed a new light on the mechanical effects of geometrical complexities on fault surface. We used that new discovery to solve a paradox between smooth and abrupt kink [Tada and Fukuyama 1996] as well as re-interpret the effect of roughness on the fault: It can be shown that the effect of drag stress [Fang and Dunham 2013] along the fault it actually exactly equal to the effect of curvature along the fault.

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