

Viscoelastic effects in avalanche dynamics: A key to earthquake statistics

Eduardo Alberto Jagla, Francois P Landes, Alberto Rosso

We model the frictional dynamics of two frictional tectonic plates along a fault as an interface sliding in a heterogeneous medium. Because of the asperities of the medium, the dynamics is jerky and proceeds via sudden and large reorganizations of the interface shape. Such events correspond to earthquakes. In friction, plastic rearrangements lead to an increase of the contact area with time. Here, we demonstrate that these mechanisms are key ingredients to have a realistic description of seismic activity. In particular, they are responsible for the presence of aftershocks, for the quasi-periodic occurrence of major earthquakes (the so-called seismic cycle) and accounts for a correct Guttenberg-Richter law.