



Mechanical and numerical modelling of earthquake dynamic rupture in seismology: recent progress and challenges

Jean-Pierre Vilotte

► To cite this version:

Jean-Pierre Vilotte. Mechanical and numerical modelling of earthquake dynamic rupture in seismology: recent progress and challenges. 9e Colloque national en calcul des structures, May 2009, Giens, France. hal-01396046

HAL Id: hal-01396046

<https://hal.science/hal-01396046>

Submitted on 13 Nov 2016

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

Mechanical and numerical modelling of earthquake dynamic rupture in seismology: recent progress and challenges

Jean-Pierre Vilotte

Institut de Physique du Globe de Paris

Understanding earthquake source dynamics is an important challenging problem in seismology. Earthquake faulting is mainly controlled by multi-scales dissipation processes within the fault interface, and by the geometry of pre-existing faults. Recent observations during the Denali and Izmit earthquakes have shed evidence for supershear propagation in relation with the fault geometry. Moreover generation of high frequency wave by seismic faulting is a long standing issue in seismology with important implications in terms of seismic engineering and seismic risk assessment. Numerical simulations of earthquake rupturing can bridge the gap between laboratory experiments and observations of large earthquakes. The simulations needs to capture the different space and time scales involved in the nucleation phase, the rupture front propagation and the short wave radiation, owing to the fault heterogeneities and geometrical complexities. Numerical methods based on non smooth contact mechanics allow for efficient simulations of dynamic rupture along planar and non-planar faults. We shall present here recent progress in the mechanical and numerical modelling of dynamic earthquake rupturing and of the associated short wave radiation in seismology. In conclusion, some of the mechanical and numerical challenges will be discussed.