

Advanced Research Workshop

State of scientific knowledge regarding earthquake occurrence and implications for public policy

Le Dune, Piscinas - Arbus, Sardinia, Italy
October 15th - 19th, 2000

Critical Rupture in the Laboratory

Matteo Ciccotti

Dipartimento di Geofisica
Università di Bologna – Italy

matteo@ibogeo.df.unibo.it

Web page: <http://ibogeo.df.unibo.it/matteo>

Both in laboratory experiments and in the Earth crust, rupture appears as a phenomenon involving many different scales. The appearance of temporal and spatial clustering of the events and of power laws in the frequency magnitude distributions suggests that both systems can be treated as critical statistical systems and the hope is that they are governed by the same process at different scales. However, accurate observation of scaling laws extending over more than a decade has proven to be a very difficult task since good measuring sensitivity and a large number of data are required at very different scales. Moreover, physical cutoffs breaking the power law behavior are very common. The laboratory conditions allow a better definition of the boundary conditions and of the stress field, and an independent measurement of system parameters over a commendably large number of events for model validation. Nevertheless, the environmental and strain conditions are still far from the ones pertinent to the earth crust, and natural cutoffs are introduced by the specimens' limited dimensions which need to be carefully considered.