Photo-acoustic study of supershear ruptures in the laboratory

Nielsen, S[(1)], Schubnel, A[(2)], Taddeucci, J[(1)], Vinciguerra, S[(1)] and Rao, S[(1)]

(1) Istituto Nazionale di Geofisica e Vulcanologia, Roma, Italy
email stefan.nielsen@ingv.it
(2) Ecole Normale Superieure, Paris, France

We report the first visible seismic signature of a mach wavefront produced by a supershear fracture propagation, observed in a laboratory microearthquake. In our spontaneously nucleating laboratory faults, transducers detect the wavefield both close and at a distance from the fault, allowing to characterize the amplitude and the decay of (1) mach wavefronts radiated from the supershear fractures and (2) diffractions emitted by stop-and-go jerks in fracture propagation. In addition to motion recorded by the transducer array, high-speed photography allows an independent tracking of the rupture front, the radiated wavefiled and the quasi-static instability leading to rupture nucleation.