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Titre :

Effect of water on the frictional behavior of cohesive rocks during earthquakes

Résumé :

Fluid-rock interactions control earthquake nucleation and the evolution of earthquake sequences . Experimental studies of fault frictional properties in presence of fluid can provide unique insights into these interactions. Here, we report the first results from experiments performed on cohesive silicate-bearing rocks (micro-gabbro) in the presence of pressurized pore fluids (H_2O, drained conditions) at realistic seismic deformation conditions. The new experimental data are compared with those recently obtained from carbonate-bearing rocks. Contrary to common believe based on theoretical argumentations , we evidence that frictional melting of a silicate-bearing rock develops even in the presence of water. In silicate-bearing rocks, the weakening mechanism (flash melting of the asperities) is delayed in the presence of water; conversely, in carbonate-bearing rocks the weakening mechanism (brittle failure of the asperities), is favored. This opposite behavior highlight the importance of host-rock composition in controlling dynamic (frictional) weakening in the presence of water: cohesive carbonate-bearing rocks are more prone to slip in the presence of water, whereas the presence of water might delay or inhibit the rupture nucleation and propagation in cohesive silicate-bearing rocks.