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# Healing processes of faults during the deceleration of the co-seismic velocity.

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The evolution of rock friction during co-seismic slip is a key parameter controlling the stress drop and the energy budget of seismic events. With the advances of high velocity friction apparatuses, recent studies have shown that fluids play a fundamental role in fault weakening. However, high velocity friction experiments allow to study other aspects of the co-seismic process, as for example the healing (frictional re-strengthening) of faults during the deceleration of the co-seismic velocity. Co-seismic healing processes have first order implications on the energy budget of earthquakes, because it controls the radiation of waves during the deceleration of the seismic rupture. Here, for the first time, we investigate the role of fluids and lithology on fault healing during the deceleration of co- seismic velocity. We performed friction experiments (normal stress up to 30 MPa, maximum slip-rate $\sim$3 m.s$^{-1}$, room temperature) on cohesive silicate-bearing rocks (basalts) and carbonates-bearing rocks (calcite marble) under (1) room-humidity, (2) in the presence of water (drained) (3) and vacuum conditions. Acceleration and deceleration were step-up to a value of 7.8 m.s$^{-2}$. Our results showed that under dry conditions, the frictional re-strengthening during the deceleration stage was about ten times faster in calcite marbles than in basalts. Experimental results highlighted that for basalts, the healing rate increased with the power density, i.e. the frictional heat, generated during the seismic slip. The presence of fluid enhanced further this trend. In contrary, in marble, the healing rate decreased drastically with the power density and with the presence of fluid. This deceleration or acceleration of the healing rate highlights the importance of the host-rock composition and environmental conditions in controlling co-seismic healing of faults, with consequences on the energy radiated during earthquake sequences.