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## Fast and localized temperature measurements during simulated earthquakes in carbonate rocks

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The understanding of earthquake physics is hindered by the poor knowledge of fault strength and temperature evolution during seismic slip. Experiments reproducing seismic velocity (~1 m/s) allow us to measure both the evolution of fault strength and the associated temperature increase due to frictional heating. However, temperature measurements were performed with techniques having insufficient spatial and temporal resolution. Here we conduct high velocity friction experiments on Carrara marble rock samples sheared at 20 MPa normal stress, velocity of 0.3 and 6 m/s, and 20 m of total displacement. We measure the temperature evolution of the fault surface at the acquisition rate of 1 kHz and over a spatial resolution of ~40  $\mu\text{m}$  with optical fibers conveying the infrared radiation to a two-color pyrometer. Temperatures up to 1250 °C and low coseismic fault shear strength are compatible with the activation of grain size dependent viscous creep.