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# Frictional properties of sedimentary rocks and natural fault gouge from the Longmenshan Fault Zone, Sichuan, China

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The Longmenshan Fault Zone (LFZ) in southwestern China slipped catastrophically during the Great Wenchuan Earthquake of May 2008. In this contribution, we report friction experiments performed on samples collected from the region of the LFZ hit by the event. The materials tested consisted of simulated gouges prepared from intact clay-rich mudstone and sandstone, a calcite limestone, plus a natural fault gouge from a trenched, surface rupture cutting the mudstone and sandstone. The clay-rich samples, including the natural gouge, were dominated by illite and quartz. In our experiments, we sheared 1-mm-thick gouge layers between saw-cut driver blocks, using a triaxial testing machine at conditions corresponding to $\sim$2 km depth in the LFZ. Temperature was varied from 25 to 150˚C and, to investigate the velocity dependence of friction, we stepped the shear displacement rate between 1.22 and 0.122 $\mu$m/s. Our results show that the natural gouge was more illite-rich and much weaker than the protolith mudstone and sandstone, and showed a steady-state friction coefficient of $\sim$0.4 compared with $\sim$0.6 for the latter. The limestone gouge displayed values of 0.6-0.7. All samples, except the limestone, showed stable, velocity-strengthening slip. The limestone showed velocity-strengthening at 25-50˚C, but quasi-static oscillations at 100-150˚C along with velocity-weakening behavior at 150˚C. We apply our results to discuss the role of the sedimentary rocks studied during events such as the Wenchuan earthquake, and argue that the clay-rich sediments of the region may have a damping effect upon ruptures propagating from depth, whereas the limestone may accelerate propagation, producing significant stress drops and enhancing seismic risks.